EXHIBIT 1

The California Chaparral Institute

...the voice of the chaparral

FIRE & SCIENCE

Fire Suppression, Science, and Personal Opinion

When discussing an idea, it is usually best to ignore personalities and stick to the data. This is how science is supposed to work.

Well, there comes a time when a viewpoint becomes so disconnected from the accepted body of scientific knowledge that it distracts from constructive dialogue. At times it can even delay or alter important policy decisions. Such delays create negative consequences for future generations by creating unproductive, "my expert" vs. "your expert" politicized debates in the press. Although each of the experts are assumed to have equally valid viewpoints supported by objective data, one or more are solely interested in promoting their own individual cause or agenda regardless of the facts. Often these causes are pushed by narrow, special interests in a consciously dishonest manner. Or alternatively, the promoter honestly believes his or her own view of the world so strongly that he or she is unable to objectively evaluate contrary data. Instead, everything is seen in light of a favored theory and seemingly obvious contradictions are dismissed (often unconsciously). Consequently, when the cause is continually taken to the popular media instead of being objectively discussed within the framework of science, it becomes impossible to ignore the messenger. This is why a number of well-know fire scientists spoke out this year about Thomas Bonnicksen who was disregarding scientific fact to promote politically motivated policies dealing with wildland fire.

The June 16, 2007, San Bernardino County Sun news article "Forests Need to Burn" was a signal to many of us in the wildland fire and fire science communities that the time has come to directly address Richard Minnich's continual promotion of incorrect and potentially damaging notions about wildland fire management.

In summary:

In his insistence on focusing on only one variable (chaparral age), Dr. Minnich does not appear to have a clear understanding of wildland fire. Wildland fire risk in Southern California is not the fault of the fire service, or the result of old stands of chaparral, it is an inherent part of the landscape. Laying more fire on the ground on a landscape level or allowing fires to run is unacceptable in Southern California for both safety and ecological reasons. The Baja California fire mosaic model originally described in 1983 and elaborated in 1997 is not applicable to Southern California. The best and most efficient way to reduce wildland fire risk is through proper community design, fire-safe building construction, adequate vegetation management around structures and strategically placed fuel treatment projects.

Download the full document, "Fire Suppression, Science, and Personal Opinion," here.

The Baja-Southern California Fire Model

Or, what's the story behind that map showing such big differences between wildfire size in Baja compared to Southern California?

It is a common perception that wildlands are unnaturally overgrown with a half-century's worth of highly combustible brush and small trees because of successful firefighting efforts since the 1950s. In addition, environmental groups and government regulations are often blamed for preventing thinning and prescribed burns to help alleviate this buildup because of misguided priorities. Such oversimplifications of a very complex problem are not helpful in finding solutions. They also have nothing to do with California's most characteristic wildland, the chaparral.

It does appear that some, but not all, of our nation's forests are unnaturally overgrown, a consequence of past logging and grazing practices as well as fire suppression efforts. However, without understanding the dramatic differences between forests and the chaparral-covered hillsides in California, some are promoting a single solution to deal with the threat of wildfire everywhere. This will not only lead to inappropriate use of scarce resources, but will do little to prevent the kind of firestorms southern California experienced in 2003 and 2007.

The notion of performing controlled burns to alternate patches of backcountry chaparral as a way to prevent wildfires is the basic tenet of the Baja-Southern California Fire Model first suggested by Richard Minnich of UC Riverside in 1983. This model is based on the hypothesis that the size of wildfires north of the Mexican-Californian border are larger than those in Baja because of dramatically different fire management strategies.

According to this theory, a century of fire suppression in Southern California has caused an "unnatural" accumulation of brush that has consequently led to large, destructive chaparral fires. A map showing small fire perimeters south of the border and large ones to the north is often used as supporting evidence.

The map is convincing and the logic appears reasonable. However, after being tested by a diversified group of scientists over the past ten years, the Baja-Southern California Fire Model fails for a simple reason. It ignores a significant number of important variables.

Scientifically, the comparison between southern California and Baja is problematic because of variations between the two regions as well as how the data was collected. Baja is much drier, has different soil types, and is not subject to the same Santa Ana wind conditions as Southern California. In addition, the Baja landscape has been heavily damaged by ranchers who consistently burn back natural vegetation in order to increase grasslands. It is difficult to find an area south of the border that does not show signs of grazing activity.

The other important factor to consider in the Baja comparison is how fire perimeters were determined. In California, fire size is recorded and mapped by state

agencies. Such detailed records do not exist in Baja. Instead, fire perimeters in Baja have to be estimated by LANDSTAT satellite images and subjective, on the ground measurements. These create two completely different data sets which are consequently difficult to use for any comparative analysis. In addition, smaller fires that were extinguished by firefighters in California before they became large ones were left out of Baja/California comparisons.

Extensive research by J.E. Keeley and C.J. Fotheringham has shown that burn patterns have not changed significantly in Southern California since 1878. The California Statewide Fire History Database clearly indicates that since 1910, the mean size of fires in San Luis Obispo, Santa Barbara, Ventura, Los Angeles, San Bernardino, Riverside and San Diego counties has remained constant. The timing of fires is equally consistent, with most igniting June through November with September representing the most flammable period (reference #1).

In a study by S.A. Mensing and others, seabed charcoal deposits off the coast of Santa Barbara County have shown that the frequency of large, Santa Ana driven fires has not changed over the past 500 years (see reference #2). Similar results are produced even when comparing years before and after 1950 when advanced fire suppression technology was developed and utilized on a massive scale. The only important change revealed by these studies has been an increase in fire frequency during modern times, not a decrease.

Fire in chaparral is a natural, unpreventable event. Despite all our efforts to control them, large chaparral fires have continued unabated since our arrival in California. The assumption that old stands with an "unnatural accumulation of old brush" encourage fires to spread and become more dangerous is inaccurate. Studies by M. Moritz and others have shown that fuel age does not significantly affect the probability of burning. These findings analyzed some of the same data used in the Baja Model (reference #3).

P. Zedler examined the same question through mathematical modeling and arrived at the same conclusion. Under Santa Ana conditions, fire rapidly sweeps through all chaparral stands, regardless of age. Once the flames start, everything burns (see reference #4).

Years of fire suppression have not been successful in excluding fire in chaparral landscapes. Relying on non-strategic prescribed burning in the backcountry in order to create mosaics of "mixed-aged stands" will likely prove to be equally frustrating (reference #5).

What is the solution then?

The first task is to objectively examine the research. Unfortunately, fire management has become increasingly politicized. Instead of scientifically analyzing the data, some have the tendency to personalize the discussion and assign names or labels to particular positions. This is not only counterproductive, but confuses the public about how science is supposed to work. There are no positions. There are only collections of observations and facts with conclusions being derived from such data. By looking at the methods, the scientific design, and underlying assumptions, it becomes relatively easy to determine whether or not ignored variables or biases have influenced the results.

Another challenge is to implement fire-safe community planning and long term education programs to help maintain the public's fire vigilance. Unfortunately, developers will continue to be allowed to push farther into the backcountry as the population continues to grow. Homeowners will become complacent again as time goes

on and allow fire-prone vegetation to slowly accumulate next to their homes.

The best way to reduce the damage of wildfires is to allocate scarce fire management resources at the urban interface between development and chaparral and develop strict building codes reducing wildfire risk. This includes new regulations requiring the removal of fire dangers present now such as wood shake roofing and volatile pine and Eucalyptus trees near homes, designing fire-safe vents for attics, and carefully performing strategic vegetation management directly around communities.

Leave the rest of the landscape alone.

Cited References

See our bibliography for more

You will need Adobe Acrobat to read the referenced papers below. You can go to their site to download if you don't have it.

#1 Keeley, J.E., Fotheringham, C.J., Morais, M. 1999. Reexamining fire suppression impacts on brushland fire regimes. Science Vol. 284. Pg. 1829-1832.

#2 Mensing, S.A., Michaelsen, J., Byrne. A 560 year record of Santa Ana fires reconstructed from charcoal deposited in the Santa Barbara Basin, California. Quaternary Research. Vol. 51:295-305.

#3 Moritz, M.A., J.E. Keeley, E.A. Johnson, and A.A. Schaffner. 2004. Testing a basic assumption of shrubland fire management: Does the hazard of burning increase with the age of fuels? Frontiers in Ecology and the Enviroment. 2:67-72.

#4 Zedler, P.H., Seiger, L.A. 2000. Age Mosaics and Fire Size in Chaparral: A Simulation Study. In 2nd Interface Between Ecology and Land Development in California. USGS Open-File Report 00-02, pp. 9-18.

#5 Keeley, J.E. 2002. Fire management of California shrubland landscapes. Environmental Management 29: 395-408.

Below are the four seminal papers dealing with the entire Baja California fuel mosaic model. The original paper describing the model in 1983 is listed first. Then a detailed analysis with responses published in the December 2001 issue of Conservation Biology. Dr. Minnich has not responded to the final analysis and response in paper #4.

#1 Original Baja-Southern California Fire Model paper by R. Minnich. Fire Mosaics in Southern California and Baja California (1983).

#2 Analysis of Baja-So. Cal Fire Model. Historical Fire Regimes in Southern California Shrublands. J.E. Keeley and C.J. Fotheringham (2001).

#3 Minnich: An integrated model of 2 fire regimes (response to Keeley/Fotheringham from paper #2).

#4 Keeley and Fotheringham: History and Management of crown-fire ecosystems: a summary and response (to Minnich).

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ABOUT US FACTS MYTHS BOOK EXCERPTS EDUCATION

FIRE & NATURE FIRE & SCIENCE FIRE & PEOPLE FIRE & POLITICS

THREATS VERNAL POOLS

WILDNESS WITHIN CONTACT & LINKS SITE MAP MEMBERSHIP EMAIL

EXHIBIT 2

CANYON POLICY PORTFOLIO

Pre-Release

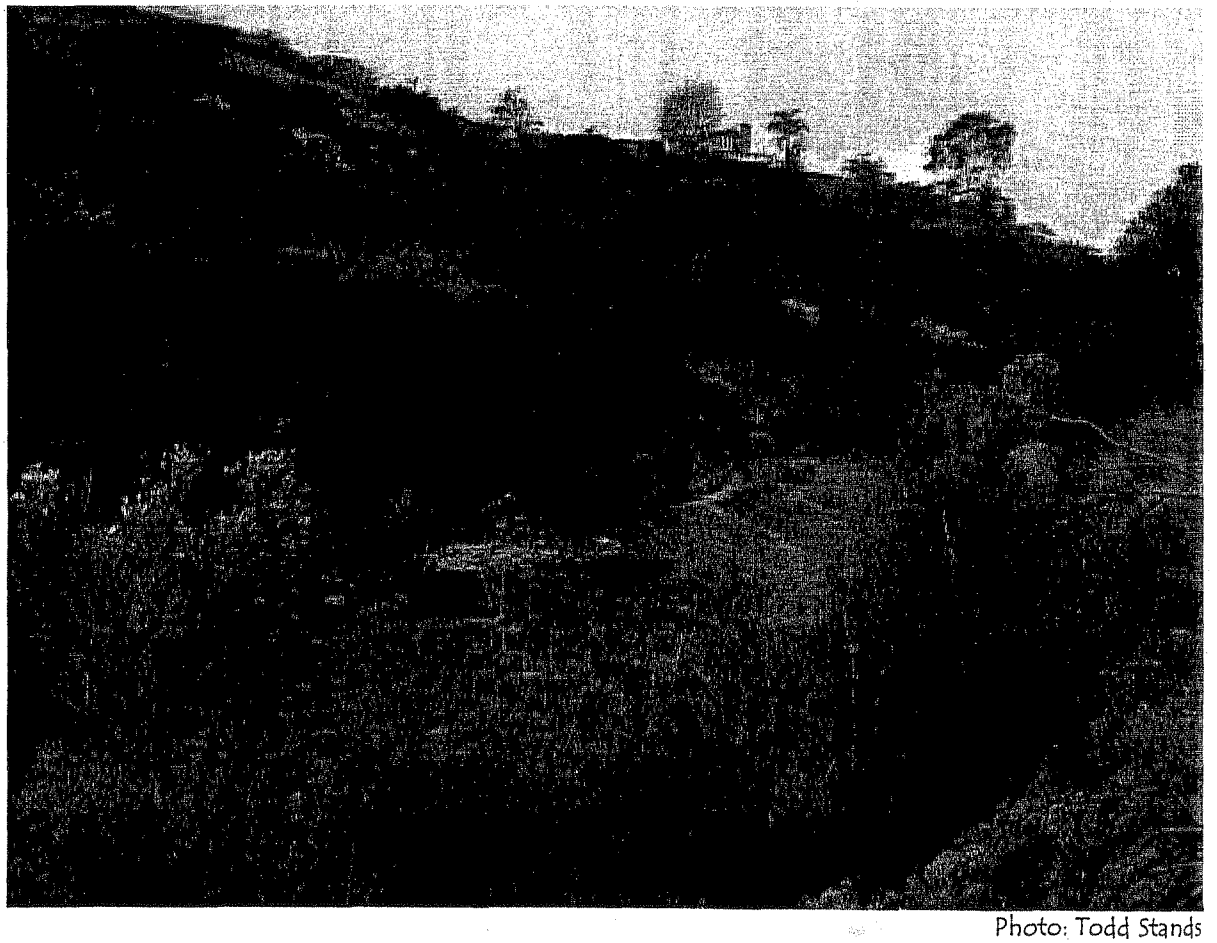


Photo: Todd Stands

Our Financially Rewarding Natural Wildlands

BUILDING INCENTIVE FOR BETTER CANYON STEWARDSHIP

For in the end, we will conserve only what we love.
We will love only what we understand.
We will understand only what we are taught.
– Senegalese environmentalist Baba Dioum

For
The Citizens of San Diego

With generous funding from

The San Diego Foundation
A foundation for your passion

Compiled by

The 32nd Street Task Force

with enormous assistance from

L. C. Burnett, Chris Sholley, Kay Stewart, Brandon Hanks, Megan Midgley, Ivana Medved, Rama Griffith, Louis Hock, Max Affarano, Demetrio Duran, Steven Haley, Tracey Hughes, Pati Johnson, Mike Klein, Josh Langham, Gary Moll, Eric Ray, JB Ruhl, Gabriele Wienhausen, Jenny Nimnual, Mike Klein, Phyllis Chapin, Scott Kessler, Chris Zirkle, James Nagelvoort and other City of San Diego staff.

TABLE OF CONTENTS

Canyon Policy Portfolio

Part I

Wildfires and Brush Management Practices in the City of San Diego

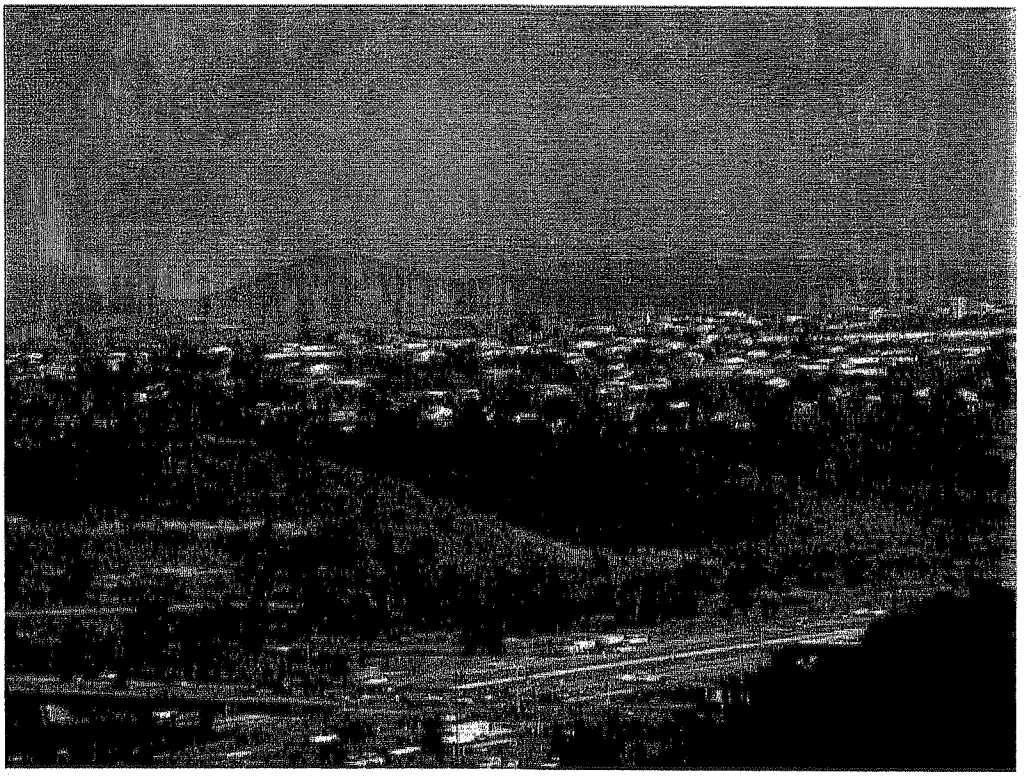
An Analysis

by the

32nd Street Canyon Task Force

in cooperation with Kay Stewart, The San Diego Fire Recovery Network, California Native Plant Society/San Diego, Jenny Nimnual and staff from the City of San Diego

Table of Contents



Introduction

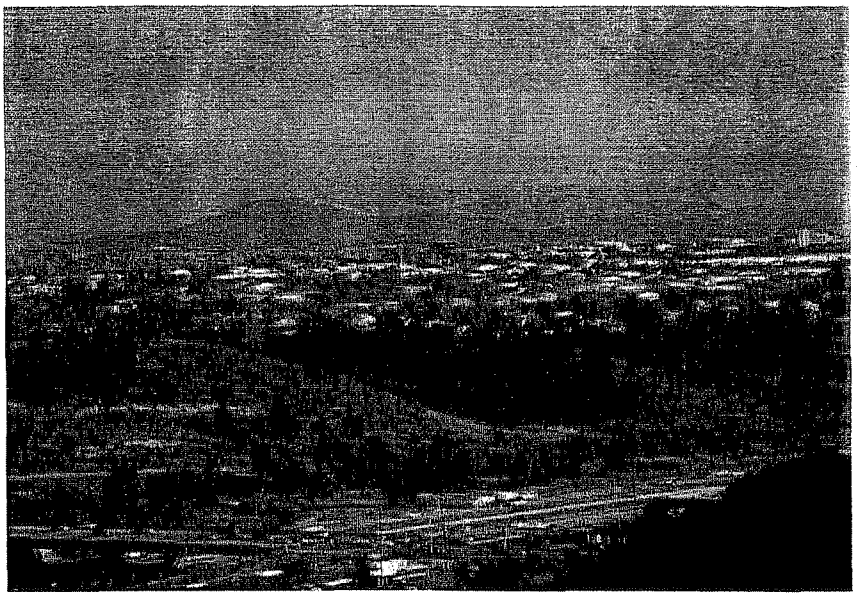
Over the millennia, San Diego's native landscape evolved to thrive with an average of ten inches of rain per year, and intermittent wildfire. This tough natural vegetation sheltered and fed upland wildlife. It produced fresh air, and sustained wetlands. It held down the soil and kept out the weeds. Filtered through canyons, stormwater runoff fed bountiful marine resources with organic nutrients.

Well, no more, because urbanization interrupted this balance and we humans have yet to establish our equilibrium with nature.

Unrestrained by sustainability regulations, people have imposed new contours, landscape and uses on land without weighing the consequences. As a result, we have urban ills with which we are all familiar. These include increasing air and water pollution, dwindling wildlife, dying marine environments, loss of recreation and quiet...*and dangerously frequent wildfires*.

California's exploding population growth has put exponentially more homes and workplaces next to wild landscapes, often called "wildlands." Urbanized lands in the city of San Diego expanded 39% between 1985 and 2002, jamming 30,977 acres of development on flat mesas or valleys, right up against sloping canyons that are too steep

for buildings or for roads.[1] This amounts to 900 lineal miles of homes on the edge of wildlands.[2]



This same population growth puts more sources of fire next to those wildlands. A century of records show over 95% of fires in Southern California have been caused by people, either through carelessness or arson. Simply put, more people cause more fires where nature and development intersect at the wildland-urban interface (WUI). [3]

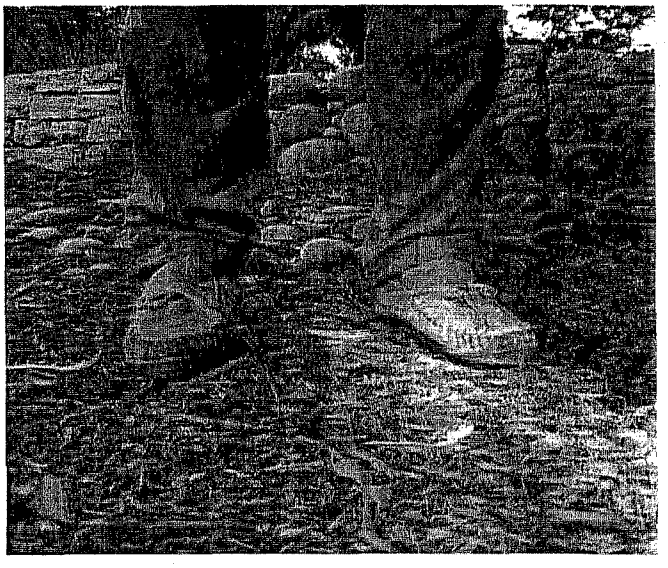
Without rigorous analysis, the City of San Diego chose to focus public and private assets, not on reducing the flammability of existing structures, but principally on expanding vegetation fuel management at the fragile and controversial WUI.

Analysis of recent fires, as well as fire prevention and response history, suggests that civilization may have pushed both nature and development to their limits, wildfire-wise. "Neither our strategy nor our priorities have changed," said Mark Rey, the undersecretary for natural resources and the environment at the Department of Agriculture, the parent agency of the U.S Forest Service. "What has changed," he said, "is growth in the number of people living in harm's way. That has bumped up costs, because defending structures is inherently more expensive than wilderness firefighting."

The costs just keep rising. After every severe wildland fire of the last half century, including the Cedar Fire of 2003 and the recent fires, devastated and fearful homeowners, insurance companies, and firefighters demanded that public agencies reduce wildfire risks. Although known to be an essential part of fire-risk reduction, enforced retrofitting of at-risk buildings within 300' of the WUI (i.e. the very

[1] *San Diego Urban Ecosystem Analysis*, American Forests, 2002
[2] City of San Diego Brush Management Regulations, Bulletin #1, Brush Management Guide, 2006.
[3] "San Diego Fire History," http://www.sdfirerecovery.net/docs/FireHistorySDNHMfinal.xls

objects needing defense) would have a high cost. Politicians were reluctant to require these changes. On the other hand, "brush management," a catch-all term for manipulating fuel in plants, offered a less politically charged avenue for responding legislatively to the disastrous fires. Without rigorous analysis, the City of San Diego chose to focus public and private assets, not to reducing the flammability of existing structures, but principally on expanding vegetation fuel management at the fragile and controversial WUI.



"Easier to blame a bunch of shrubs for the fires than the developers and homeowners. Shrubs don't vote or donate to political campaigns."

The City of San Diego's risk-reduction actions were as follows:

1. Invest in some fire suppression tools such as helicopters.

2. Change regulations to require *newly permitted* structures and landscapes near the WUI to use approved products and configurations that reduce combustibility. These standards apply *only* to new construction, not the tens of thousands of existing structures already built near canyons.

3. Legislate Brush Management Ordinance revisions and modify Brush Management Guidelines with the hope of creating affordable, sustainable low-fuel conditions and therefore low fire risk, while having a negligible impact on natural resources. The principle change was to make the area to manage fuels 100' wide instead of the variable widths (30' to 100') required in the past. The revisions were adopted on September 19, 2005 in Ordinance Number O-19413.[4] The comprehensive Brush Management Ordinance, which is part of the Land Development Code in the San Diego Municipal Code, is appended to this report.

In short, "brush management" was represented as the cheapest and most effective pre-fire management priority for a population needing real solutions to high fire risks.

This report will discuss the consequences of this decision, including a review of research on the effectiveness of WUI fuel management in reducing risks, the City Ordinance's intent, how it is put into practice, and its costs and benefits.

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[4] City of San Diego Municipal Code; City of San Diego Brush Management Regulations. "Bulletin #1: Brush management guide for private property" Revised Oct. 10, 2006.

Overview of Concerns with Brush Management in San Diego Canyons

The City of San Diego actions, and the media coverage, have made brush management appear synonymous with fire-risk reduction. The public's sense of security and peace of mind may be assuaged by this perception. However, many of those who study and defend wildlands and their benefits (not just to other species but also to humans), have doubts and apprehension about the emphasis on brush management, and the revised Ordinance. These concerns are as follows:

1. The fire safety Ordinances fall short of the public's needs for significant reductions in fire risk, since they do not address:
   a) The need for risk-reducing structural changes to *all* homes near canyons, which account for 60% of fire risk in most California communities.[5]
   b) The need for risk-reducing landscape changes to existing older landscapes,
   c) The growth of "flashy fuels" (fast-growing weeds) after brush management,
   d) A brush management implementation strategy, which assures that skilled, trained crews will do the work required correctly and thus reduce risks
   e) On-going funding to continue brush management.
   f) The impact of irrigation, per the Guidelines, on risk.
2. No monitoring program will document if the process in fact reduces fire risk.
3. The Guidelines are too complicated to implement except by very knowledgeable, careful, and therefore expensive crews.
4. Existing staff are not responsible for training to reduce errors, and erroneous implementation is not penalized. Despite the Memorandum of Understanding with resource agencies, fire marshal notices do not distinguish sensitive lands nor enforce implementation to mimic the Guidelines, so impacts are not monitored. The risks are known: expert testimony on the impact of extensive thinning for fuel management in coastal sage scrub in Los Angeles County indicates that it results in slow death of the plant community, for instance.[6]

> In a **1997 Memorandum of Understanding between the Fish and Wildlife Service of the United States Department of the Interior**, the California Department of Fish and Game the San Diego County Fire Chief's Association and the Fire District's Association of San Diego County stated that the Department finds that implementation of the fire control, abatement and protection measures contemplated is not likely to result in jeopardy to the continued existence of the identified State listed or candidate species, if the terms and conditions of the MOU are fully implemented and adhered to. The Department finds, further, that by preventing or limiting the spread of fire to the identified species' habitat, this MOU will serve to protect the identified species from further degradation.

5. The Guidelines pointedly note that any wooden structure (such as decks, gazebos and fences) in Zone 1 not having a 1-hour fire resistance rating or built of

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[5] San "Diego Fire Recovery Network speech given in 2005 by Steve Quarles, UC Berkeley Fire Lab:UC Richmond Field Station: Steve Quarles UC Cooperative Extension Advisor Office: (510) 665-3580 E-mail: steve.quarles@nature.berkeley.edu.

[6] San "Diego Fire Recovery Network speech given in 2005 by Klaus Radtke, author of WI-I. 1983, Living more safely in the chaparral-urban interface. Gen. Tech. Rep. PSW-67, Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station, 51 pp.

combustible materials must be removed. To date, we know of no enforcement actions with regard to this fire risk concern.

6. The potential loss of "ecosystem services" (i.e. expense-related benefits of shrub lands) has not been analyzed and may prove irreversibly costly.

In sum, concerned citizens are not convinced that the City's brush management methodologies and practices will save homes or diminish fire-fuel in a sustainable way; nor do they feel that fuel-reduction will be achieved without significant environmental damage. Clearly, it is time to look at the subject carefully and conscientiously.

Poised to perceive the naked truth about canyons and fire.

The Science of Fire Risk Reduction

Better science can point to the most effective means to reduce risks, as well as improve land-use, construction, pre-fire prevention, and fire response. A body of sound research that examines the relationship between fires, shrub-dominated ecosystems and their urban interface is emerging.

Every local agency has agreed that homes, workplaces and other structures are at lower risk with wider managed setbacks from canyons with wild vegetation; hence new developments have larger setbacks than older ones. More problematic are the practices needed to manage the structure, landscape, and wildlands that lack these pre-development boundaries to be what is sometimes called "fire safe."

To help City staff and advocates, the *Canyon Policy Portfolio* analysis defined criteria that could best determine the merit of long-term management choices as follows:

a) Proven effectiveness,
b) Achievable, affordable quality-controlled implementation,
c) Priority relative to other effectiveness-gauged approaches + cost,
d) Cost and frequency of implementation,
e) Impacts on sustainable ecosystems (including legal obligations to the MSCP) and potential and/or likely costs of those impacts and vulnerability to litigation,
f) Impacts on ecosystem services (i.e. water quality, air quality, energy conservation, etc.) and costs of those impacts, and
g) Availability of on-going funding sources

Investigation suggests that these criteria were inadequately addressed by the City of San Diego's actions following the Cedar Fire of 2003, to the detriment of ecosystem services and public safety, and at unnecessary cost to taxpayers.

"Fire-safe" is a doubtful term if there ever was one, because the science of pre-defending a home from risks is still evolving. The fire science specialist's estimated that 60-70 percent of the risk of typical California structures igniting is due to construction weaknesses that permit ignition from one of the following three causes:

1. Direct flame striking the structure;

2. Extremely hot air (radiated heat) causes windows or other parts of the structural envelope to fail thus letting in embers; or
3. Embers lodge on a structure or nearby combustible object, or embers are sucked into the structure through any unscreened opening, thus igniting the structure.

Burned The rubble left by a wildfire in San Diego County, Calif.

The Cedar Fire and recent 2007 fires bore this out. Many photos showed burned houses surrounded by still viable vegetation.

Post-fire evidence showed that many homes ignited from flaming wooden fences and decks that then breached flammable siding causing "piloted ignition" of the homes. Embers landed on wooden roofs or siding, and ignited them, or embers entered through unprotected openings including garage or service door voids, or windows that were not closed when people evacuated. Skylights, doors or windows buckled in winds 200 degrees or more in temperature because they not designed to resist the difference between inside and outside temperatures. In theory, if those aspects of a dwelling are retrofitted with appropriate materials and installed correctly, risk would be reduced in a typical California home, provided it is closed up tight when a fire front hits the adjacent wildlands.

Another large number of homes were consumed when flammable plant debris, wood piles, furniture, fencing, awnings, and flimsy wood structures near homes ignited from embers long after the fire front had passed, and these flames were large enough to breach house walls and ignite the homes. This risk can be reduced by managing the home site in

the thirty to fifty feet out from the house, by keeping plants and trees free of dead branches and leaves, and replacing fabric and flammable wood furniture, fences, etc. with non-combustible materials. However, unless the structure has been improved to reduce combustibility, it is clear that improvements in the home landscape are no guarantee of safety. Both must be done well, or a structure is still at great risk. Nearly 3.2 million homes are classified at "very high" or "extreme" risk of wildfire.[7]

A U.S. Forest Service report on the Tahoe fire confirms that homes were set ablaze by embers from other buildings. "It wasn't flaming trees that ignited many of the 254 homes lost in the Lake Tahoe wildfire in June; it was other burning houses."[8] Again, unless a structure has been improved to reduce combustibility, improvements in the landscape are no guarantee of safety. Both must be done well, or a structure is still at risk.

Numerous studies found that removing shrubs beyond a fairly small perimeter was much less effective in reducing risk of loss than changing roof, fencing, etc. to be non-combustible.[9] New building standards require special fire-resistant building materials, sprinkling systems and water supply fixtures for fire fighting, as well as fire resistant vegetation controls. Five communities built according to these standards, straight in the swath of October 2007 fires, survived.[10]

Unless the structure has been improved to reduce combustibility, it is clear that improvements in the home landscape are no guarantee of safety.

The remainder of risk-reduction opportunity lies beyond the 50' area nearest a structure, or wherever the wildland boundary occurs. Studies on flammability of structures during wildland fires indicate that fuel management out to 100 feet from the structure will reduce flame length to levels that may be acceptable.[11,12] In the City, the decision was made to manage plant material to 100' to reduce risk.

San Diego's climate is a cycle of roughly six months of cool, rainy weather and six months of hot dry weather. The most risk from wildfire occurs toward the end of the dry season. At the same time, high winds typically come out of the eastern deserts. This high wind at the end of the dry season has been shown to inflame wildfires capable of burning

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[7] Vick, Karl and Geis, Sonya, "Let Some Fires Burn, Ecologists Argue," The Washington Post, October 28, 2007, http://www.star-telegram.com/national_news/story/284306.html

[8] Boxall, Bettina and Julie Cart, "Houses Fueled Tahoe Blaze," Los Angeles Times, August 4, 2007

[9] Wilson, A.A.G. 1984. Assessing the bushfire hazard of houses: a quantitative approach. Technical Paper No. 6, National Centre for Rural Fire Research, Melbourne, Australia.

[10] Johnson, Kirk and McKinley, Jesse, "Rethinking Fire Policy in the Tinderbox Zone," The New York Times, October 28, 2007.

[11] Cohen, J.D., R.A. Chase, S.L. LeVan, H.C. Tran., A Model for Assessing Potential Structure Ignitions in the Wildland/Urban Interface. Proceedings of the 11th Conference on Fire and Forest Meteorology, April 1991. Missoula, MT. Patricia L. Andrews, Donald F. Potts, eds. Society of American Foresters, Bethesda, MD. pp. 50-57 (1991).

[12] Cohen, J.D. 2000. Preventing disaster: home ignitability in the Wildland-urban interface. Journal of Forestry 98(3):15-21.

through new or old growth of dry vegetation.[13,14] Federal analysis of the Angora Blaze near Lake Tahoe, for example, concluded that "the fire burned just as intensely in those areas [thinned] as on forest acreage that had not been thinned."[15]

San Diego Fire-Rescue Department has used the National Fire Protection Association (NFPA) 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire and the Wildland/Urban Interface Code-Danger Rating System as a basis for assigning risk values not related to building structure. Denser vegetation, more severe slopes, response times of five minutes or greater, difficult roads and lower proximity to fire hydrants increase the risk. Areas of the city that are far from roads and fire hydrants, are brush covered, and have a steep slope show as a high fire risk.[16] Infrastructure (fire hydrants and roads) is a risk factor, as are "suppression resources," meaning fire stations, firefighting equipment and firefighters.

Inadequate resource allocation was the former San Diego Fire Chief Jeff Bowman's greatest objection to the City of San Diego's post-Cedar Fire response, and the reason he resigned in frustration in 2006. Bowman wrote: "The most important component of an effective response system is adequate spacing of fire stations and staffing of equipment. The greater region, but particularly the city of San Diego, remains grossly understaffed for a metropolitan city. Before leaving as chief of the San Diego Fire Department, I recommended the need for over 20 additional staffed fire stations to meet minimum standards established for fire and medical response in urban environments. Since I left not one station has been added, and I am not aware of any plan to even work toward that goal incrementally."[17]

Many large native shrubs—are evergreen during the dry season, which means they provide shelter for wildlife, and they are less flammable and more drought tolerant than many other species.

The True Character of Native Shrubland

San Diego is a semi-arid region of low precipitation. Its two-season climate is called "Mediterranean" because, like that region, half of each year is hot and dry. Native plants evolved with an ability to reduce water loss in this dry climate by many strategies.[18] The most common native plant communities on San Diego's canyon slopes are chaparral and coastal sage scrub. These ecosystems include species that our unique to our region, some of which have protected status through the federal and state governments. In this low-water climate, these large shrubs are the largest plants that can grow on the amount of

[13] Moritz, M.A. "Spatiotemporal analysis of controls on shrubland fire regimes: Age dependency and fire hazard. *Ecology* 84(2), 351-361. 2003

[14] Keeley, J. E., Fotheringham, C.. J. & Moritz, M.A. "Lessons learned from the October 2003 wildfires in southern California." *Journal of Forestry*, October/November, 26-31, 2004.

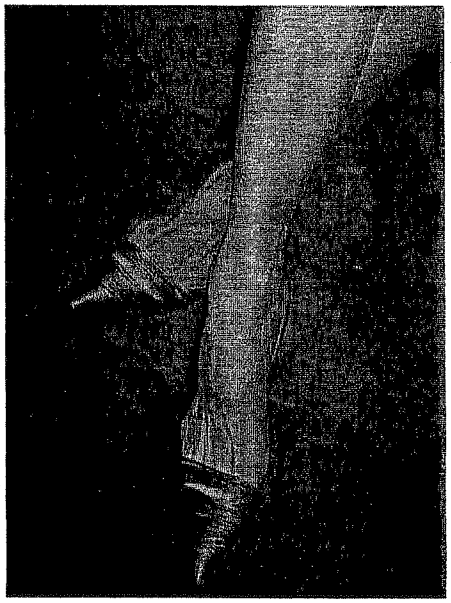
[15] Boxall, Bettina and Julie Cart, "Houses Fueled Tahoe Blaze," Los Angeles Times, August 4, 2007

[16] Mayor Sanders' brush management fact sheet: www.sandiego.gov/mayor_brush_factsheet_8_1.pdf

[17] Former San Diego Fire Chief Jeff Bowman, Commentary, San Diego Union Tribune, October 28, 2007.

[18] Halsey, Richard W. "Fire, Chaparral, and Survival in Southern California." Sunbelt Publications; San Diego, 2005.

rainfall. About two dozen large shrub species – including toyon, lemonadeberry, California lilac, redberry, scrub oak, hollyleaf cherry, manzanita and sumac – are evergreen during the dry season, which means they provide shelter for wildlife, and they are less flammable and more drought tolerant than many other species. Several hundred other species of native plants go dormant by dropping leaves or shriveling to mere roots during the dry season.



"Why should animals lose their homes, and even their lives, because humans build flammable houses too close to nature?"

Fire has also played a part in the evolution of these resilient native plant communities. Richard Halsey is an expert on the complex blend of plants known collectively as "chaparral." He explains that chaparral communities survive fires, but depend for their survival on fires that occur in a tolerable frequency, intensity, and seasonality.[19] He emphasizes that inaccurate reports overestimate the frequency of fires in healthy chaparral. Carl Bell, a professor from the University of California, Davis, concurs, stating that without human interference chaparral should burn once every 50 to 100 years.[20] They and other researchers state that the assertion that, "old stands with an 'unnatural accumulation of old brush' become more flammable," is inaccurate. Studies by M. Moritz and others have shown that after 15-20 years, fuel quantity stabilizes, so the age of the vegetation does not affect its combustibility.[21,22] Other scientists have examined the same question through mathematical modeling and arrived at the same conclusion. Under Santa Ana winds, the largest fires occur, and fire rapidly sweeps through *all* chaparral stands, regardless of age.[23] The 2007 fires bore this out.

Shrub-removal often damages soil, water, and wildlife, and further, the fast-growing weedy fuel that replaces the shrubs extends fire vulnerability, resulting in higher, not lower, risk to life and property.

[19] Halsey, Richard W. "Fire, Chaparral, and Survival in Southern California." Sunbelt Publications; San Diego, 2005.
[20] Bell, Carl. "Invasive Plants and Wildfires" Guest Speaker. Oct. 14. 2006
[21] Moritz, M.A., J.E. Keeley, E.A. Johnson, and A.A. Schaffner. 2004. Testing a basic assumption of shrubland fire management: Does the hazard of burning increase with the age of fuels? *Frontiers in Ecology and the Environment*. 2:67-72.
[22] Halsey, Richard, "Fire & Science," http://www.californiachaparral.com/firescience.html
[23] Zedler, P.H., Seiger, L.A. 2000. Age Mosaics and Fire Size in Chaparral: A Simulation Study. In 2nd Interface Between Ecology and Land Development in California. USGS Open-File Report 00-02, pp. 9-18.

Fuel Reduction Strategies from Other Ecosystems: Shrubs and Brush

As development increasingly encroaches on California wildlands, firefighters trained in coniferous forest-fire fighting are recruited as WUI wildfire fighters. State and Federal fire-fighting agencies assist county and city fire fighters, sharing policy, practice, and technique in efforts to try suppress wildfires and save structures and lives.

Hence, forest-fire fighter terminology and concepts, which have their origins in the timber industry, have been transferred to California shrub lands, including San Diego's. Forest-fire fighters call anything smaller than an overhead tree "brush." For a forester trying to grow lumber, "brush" appears to have no value. Dense, overgrown and aged shrubs can conceal fallen dead, flammable debris, which fuels large flames that will damage or kill mature trees. Recent ecological research is finding that healthy understory shrubs in fact play key parts in the health of forests by fixing nitrogen and absorbing rainfall, but in the eyes of many forest-fire fighters, "brush management" is the same as shrub removal is the same as pest-plant removal.

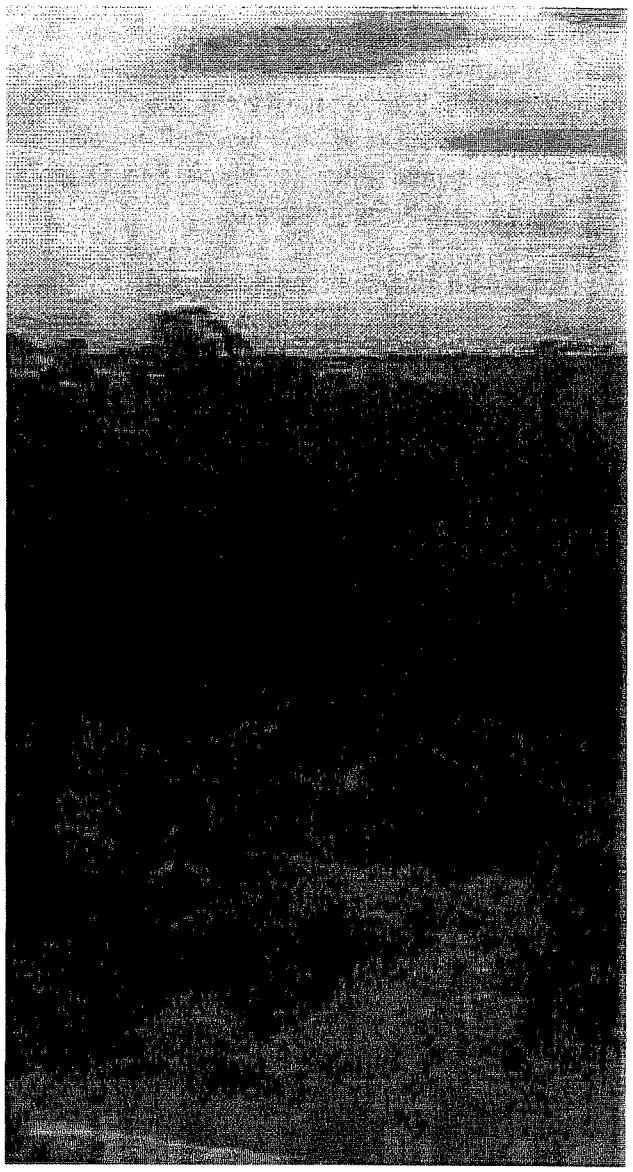
Post-fire native shrub landscape

This bias against shrubs has greatly impacted fire-fuel management at the WUI in coastal Southern California, where wild shrub landscapes predominate. Unfortunately, the forest-fire fighters recruited to suppress fires at the WUI, and the politicians who respect their experience and fire-fighting knowledge, call these well-adapted shrub landscapes "brush." In this context, brush (shrub) removal often damages soil, water, and wildlife, and further, the fast-growing weedy fuel that replaces the shrubs extends fire vulnerability, resulting in higher, not lower, risk to life and property.

SHRUB and BRUSH are anagrams, not synonyms.

Additional Stakes: Ecosystem Services

Drought tolerant native plant communities are adapted to this region. These defining landscape features of our region thrive. They hold soil down and serve as the regional version of an "urban forest." Vegetation in the city is very important to human health and the quality of urban life. The value of natural systems to humans is described as "ecosystem services," and ecosystem services equate to money, as explained in the *Canyon Policy Portfolio* Preamble.



Dense green canyons generate life support for humans.

Well maintained native vegetation can supply the following ecosystem services:

- Prevent or reduce erosion and flooding
- Improve water quality
- Provide oxygen
- Reduce summer air temperatures
- Sequester carbon
- Increase community health by reducing noise and providing areas to walk
- Lower crime by increasing community involvement in open space
- Sustain wildlife which interacts with the plants as needed for seed dispersal, pollination, pest control, and other interdependent roles in the ecosystem
- Raise property values if all these conditions are in place

Some of these ecosystem services save taxpayers money directly/ Others reduce the cost to repair environmental damage. That is why city planners and urbanists now refer to urban vegetation as "green infrastructure." It delivers