

COMMUNITY WILDFIRE PREPAREDNESS:  
BALANCING COMMUNITY SAFETY AND ECOSYSTEM  
SUSTAINABILITY IN SOUTHERN CALIFORNIA CHAPARRAL

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## ABSTRACT

### Community Wildfire Preparedness: Balancing Community Safety and Ecosystem Sustainability in Southern California Chaparral

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San Diego County, CA has had an increasing number of wildfires in the wildland urban interface, resulting in loss of lives, property and habitat for sensitive and endemic species (San Diego 2008). As San Diego's population continues to grow and expand into the wildland urban interface, not only are more households in danger of experiencing the effects of wildfire but already scarce natural resources and habitats are further compromised from development. Due to increasing populations and development pressures on the environment and the cost of fire management, it has become imperative that residents be an integral part of wildfire preparedness and conservation efforts in their surrounding environment (USDA and USDI 2001). Collaborative processes and public education are key factors in bridging the biophysical and social landscapes of a community (Walker et al 2002). This thesis explores the role that education and community fire safe councils play in creating a community ready for wildfire through the perceptions of local fire experts, agency staff, and community fire safe council representatives. Key informant interviews of federal, state, and county agents and community organization leaders revealed that community fire safe councils are vital facilitators in bringing together all stakeholders in community wildfire preparedness.

Further, federal, state and county agents rely on community fire safe councils to be their intermediaries in public outreach and education, facilitating community-wide fuel management programs, and at times in enforcing defensible space practices. However, contrary to agency stakeholders' dependence on community fire safe councils, there are still many barriers that fire safe councils face with regard to being equal collaborative partners with agencies and land managers. Despite praise given to the councils, a content analysis of agency public education brochures indicated that they rarely mention partnership with councils. Analysis revealed that brochures rarely mentioned impacts of poorly executed vegetation management practices. Further, there was very little dialogue addressing habitat restoration and the possibility of combining efforts of defensible space landscape and restoration. In brief agencies' overall public outreach did not reflect their supposed support of fire safe councils or promote environmentally protective fuels reduction opportunities. This study argues that greater public support and legitimization of fire safe councils by federal, state, and county agents can bring together ecosystem resilience and wildfire preparedness.

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## Preface

San Diego is my home. Growing up on the wildland urban interface I was able to access both the city and live surrounded by the San Dieguito River Valley wildlife corridor. This corridor stretches 55 miles from Vulcan Mountain near Julian to the Pacific Ocean in Del Mar. However, in the Cedar Fire of 2003 and the Witch Fire of 2007, the corridor acted as a fire pathway bringing fire from the wildland areas to the city. Many of the adjacent communities felt that the corridor should be irrigated or converted to green space to lessen fire risk. However, at the same time, private home landscapes were often highly vegetated and houses did not meet class A fire standards. I found it interesting that a wildlife corridor valued by adjoining communities and wildlife was now a point of contention and fear due to fire risk. Several months after contacting different leaders in wildfire preparedness in San Diego, I attended a meeting on wildfire preparedness held by the San Diego Natural History Museum, local community members, agency members, and the local fire authorities. From that meeting, I joined the San Diego Natural History Museum and a small consulting firm's initiatives in spreading education on wildfire preparedness as a research assistant. We worked with several communities, local fire safe councils, and homeowners associations and brought them a three part class based on: fire ecology and behavior, creating defensible space and retrofitting individuals' houses, and finally a site assessment- what individual homeowners should look for in their own home. From these classes and interactions with various communities, I began to realize how complex and value laden community

wildfire preparedness is and how important education and localized support and collaboration are to initiating and maintaining effective wildfire preparedness and sustaining surrounding natural ecosystems.

## INTRODUCTION

Wildfires in the wildland urban interface (WUI) have increased significantly over the last decade, due to a combination of factors including: variable drought and wind patterns as climate changes (Keeley et al. 2007, Keeley 2008); a rise in population density (Keeley and Zelder 2009, Syphard et al. 2007); development expanding deeper into the WUI (Reams et al. 2005); past fire management practices (Keeley and Fotheringham 2003); and an increase of human ignited fires (Keeley et al. 2009).

Although fire is recognized as integral to many ecosystems in California (Sugihara and Barbour 2006), identifying appropriate management techniques that balance health of native ecosystems and safety of human communities remains contentious. Treatments and management plans including fuel hazard reduction (Van Wagtendonk 2006) typically seek the preservation of naturally functioning ecosystems and the promotion of conditions favorable to wildlife (Parsons et al. 1986), the elimination or maintenance of specific vegetation types (Keeley 2001), and the protection of life and property on the WUI (Kneeshaw et al. 2004). These objectives have in the past often been mutually exclusive in practice. Past fire management practices such as suppression in combination with other land uses have fundamentally altered many forests, watersheds and related ecological processes (Pyne 2001, Hessburg et al. 2005). However, through collaborative wildfire management plans and community involvement it may be possible to meet all of the previously stated objectives (Kaufmann et al. 2004).

The question is how to combine conservation and community wildfire protection efforts. There is broad agreement among fire professionals and agencies that fuels

treatment should focus on restoring a more natural condition on the land and on reducing severe fire hazard (Husari and McKelvey 1996, NWCG 2001, GAO 2002, Menning 2007). Unfortunately, there is considerable disagreement about the natural role of fire in some ecosystems, especially in chaparral ecosystems (Cissel et al. 1999, Hutto et. al 2008). Thus, defining and implementing management plans that balance *naturalness* and fire safety quickly becomes value laden. The ability of fire managers, agency employees and the public to come together to create a fire safe and resilient natural environment is a complex process that continues to cause conflict. However, consensus built through collaboration has demonstrated the potential to achieve balance between fire suppression and maintaining natural resilience.

Collaborative efforts have been shown to bridge the boundaries that subdivide jurisdictions so that resource management decisions can be better informed and effective (Potapchuk and Crocker 1999, Jakes 2003). The literature also suggests that a truly collaborative process will bring about best management practices because important information will be shared amongst stakeholders and through networks created in the process and ones already in existence (Carrol and Bright 2009). In 1999, the Government Accountability Office (GAO) called for a cohesive strategy for wildfires (GAO 1999), which resulted in the establishment of the National Fire Plan (NFP) in 2000 and the Healthy Forest Restoration Act (HFRA) in 2003 (Dombeck, et al. 2004). These initiatives were created to promote and standardize collaborative planning processes as well as to prioritize and implement fire management and hazardous fuel reduction projects. HFRA codified the Community Wildfire Protection Plan (CWPP) to facilitate

collaboration amongst all levels of stakeholders. The CWPP places significant responsibility on community intermediaries to bring together the public and experts to create a community fire plan.

In Southern California, many communities in high fire risk areas along the wildland urban interface have created local fire safe councils as their community intermediary. Fire safe councils are each unique to their representative community and vary in organizational structure ranging from unincorporated neighborhood groups to county level non-profit 501 (c) 3 organizations (Everett and Fuller 2010). Through a study of stakeholders' perceptions of collaboration in community wildfire preparedness, and an analysis of public education facilitated by three San Diego fire safe councils, this research addresses the question whether Southern California fire safe councils' current collaboration and public education processes support the dual fire management goals of conserving ecosystems and protecting communities. Fire safe councils' general mission is protect lives and property through a variety of public outreach activities to provide information, demonstration and support on how to prepare for wildfire (Everett and Fuller 2010; CAFSC 2010).

## LITERATURE REVIEW

This study focuses on whether collaboration process among stakeholders can both conserve ecosystems and protect communities along the wildland urban interface. Thus it is important to understand what a wildfire is and what causes it, and in what ways the risk of wildfires can be reduced. Further, it is necessary to identify conflict and barriers in literature to including all stakeholders in fire management practices that conserve ecosystem values and reduce wildfire risk.

Fire is a major agent of change in many ecosystems in the West (Pyne, Andrews, and Laven 1996, Smucker et al. 2005, Menning 2007). Under normal circumstances, fire acts as a dynamic process of ecosystem renewal. However, in extreme weather patterns, fire behavior is more erratic and disruptive to the ecosystem (Sugihara et al. 2006). Ecosystems in the southwestern United States are adapted to particular fire frequency and intensity, as evidenced by their ability to regenerate after fire and to maintain their ecological function and diversity within specific fire intervals (Regan et al. 2010). However despite known benefits of fire to maintain ecosystem function and diversity, suppression of all conflagrations has been central to fire policy in order to safeguard social values such as natural resources and human communities (Pyne 1996).

Current research has shown that fire exclusion in Western ecosystems has changed fire frequency and intensity, resulting in reduced plant and animal diversity, greater vegetation density and fuel loading, and increasing the risk of catastrophic fire over time (Sugihara and Barbour 2006, Bodin, 2007). Agee and Skinner (2005)

concluded that there is a critical need for widespread fuel reduction in the West to counteract the increased vegetative fuel accumulated from decades of fire suppression. Although this proclamation for fuel reduction holds true for a majority of the West, the need to reduce and manage fuels in particular ecosystems is highly debated.

Fuels management is important because it affords the opportunity to modify the pattern of future fire by altering present fuel loads (Van Wagtendonk 2006). Fuel treatments take on a wide assortment of forms but can generally be divided into two categories: fire treatments and mechanical treatments (Pyne et al. 1996, Sugihara et al. 2006). Fuel treatment programs often include the use of mechanical treatments to restore vegetation to a condition where fire treatments (prescribed fire) can then be used to maintain the desired mosaic of conditions or age classes over a longer period of time (Husari et al 2006). Treatments depend on types of fuel and management goals, and they are most effective when they are carefully planned and site specific, taking into account contours of land, climate, fuel moisture, vegetation type, and social communities (Pyne et al. 1996). In the growing wildland urban interface (WUI), the opportunity to treat fuels in a site specific way depends on cooperation and participation from many private landowners and jurisdictions. Treatments that are by contrast very large scale or generalized may not be feasible or as effective in meeting fire suppression or forest conservation goals (Agee and Skinner 2005), especially in chaparral ecosystems (Keeley et al. 2009). Wildfire conflagrations in southern California chaparral ecosystems, according to Keeley (2007), although influenced by fuel, are more greatly determined by high speed wind patterns referred to as Santa Ana winds.

Currently, a debate centers on the costs and benefits of putting fire back into Western chaparral ecosystems through prescribed burns (Dombeck et al. 2003). Prescribed burning according to the USDA Forest Service Fire Policy Report (2008) is defined as fire applied to a specific land area under selected weather conditions to accomplish predetermined, well-defined management objectives. These objectives focus primarily on reintroducing the historical benefits of a natural fire regime to forests and other natural area (Carroll and Bright 2009). Experts argue over whether use of prescribed fire could be an effective way to recreate diversity in vegetation composition as well as whether use of fire is even necessary (Keeley 2005, Goforth and Minnich 2007, Keeley et al. 2009). Risks of prescribed fire, noted in literature, leading to environmental and human harm from escaped burns, complicate fire management and lead to differences in public and expert beliefs about fire management techniques (Carol and Bright 2009).

One difference in lay-public and expert views of fire management stems from fire suppression advocates' perception of vegetation as fuel and of its potential harm to humans, overlooking the many tangible benefits that vegetation provides (Dicus 2006). Within the WUI, such benefits, commonly referred to as ecosystem services, lessen the need for storm water runoff infrastructure, lower home cooling costs, increase air quality, improve habitat and water quality (Dicus 2006, Carroll and Bright 2009). These ecological services are rarely factored into the cost and benefit of vegetation treatments both on small and large scales. Little to no literature has factored ecosystem services and natural resilience into the long term sustainability and overall cost of vegetation

management and fire suppression. The loss of ecosystem services and resilience and the increasing need for fire suppression have become very important issues along the WUI. However, determining proper management techniques to balance these issues for a given area is still controversial.

A schism has emerged between ecological conservation organizations focused on habitat and species conservation, and organizations and agencies that prioritize the protection of human communities (Underwood et al. 2009). These two camps base their management strategies upon different characterizations of natural fire regimes, resulting in different methods and intensities of vegetation management (Halsey 2008a). There are two main bodies of thought that influence fire management practices in the chaparral ecosystem. The first theory, spearheaded by Richard Minnich (1983) follows normative fire management practices, and argues that the natural fire regime has been suppressed, leading to an unnaturally high fuel load. Minnich's theory supports using landscape-level management of small, frequent fires to re-create patches of different aged stands commonly referred to as a vegetation mosaic (Minnich 1983; Goforth and Minnich 2007). The other theory, spearheaded by Jon Keeley and C.J Fortheringham (2003), suggests that past suppression efforts have not altered the natural fire regime in southern California and that in fact there has not been an increase in mean fire size and frequency in the past 125 years (Keeley and Forthingham 2003, Keeley and Zedler 2009). Fire management based on Keeley's assumption not only focuses on strategic placement of fuel breaks within the WUI but emphasizes the need to retrofit individual houses to be more fire resistant and advocates a move away from landscape-level mosaic treatments

because of the danger of too much fire causing the loss of native vegetation (Keeley 2005, Keeley and Zedler 2009). Keeley's construction of fire history permeates the majority of research on southern California fire patterns, whereas national fire research and policy is more closely aligned with the assumptions of Minnich (Keeley et al. 2009). Despite the large body of current research on fire behavior and fire ecology, there is still a lack of cohesive evidence in the literature upon which theory local stakeholders in chaparral regions should base their fire management policy and action on.

Defining appropriate management techniques and monitoring outcomes of treatments is important because, depending on the desired result, techniques and their impact on the environmental can vary drastically. Some techniques such as the creation of large fire lines or intensive broad scale prescribed burns are believed to impose more environmental harm in the long term, such as habitat fragmentation, loss of biodiversity, and severe erosion, than the benefits created by the possible fire protection in the short term (Stephens and Moghaddas 2005, Husari et al. 2006). A fire abatement notice for Monrovia, California states:

Do not cut vegetation to bare soil, and do not rake steep hillsides or use heavy equipment. These actions may accelerate soil erosion and mudslides...Remember: Thin, you win; strip, you Slip (City of Monrovia 2009).

Currently, few studies have assessed how individual fuels treatments interact with one another, or if human development practices and the need for constant fuels treatments have significant impacts on the larger ecosystem and its services (Carey and Schumann 2003, Radeloff et al. 2005, Syphard et al. 2007, Theobald and Romme 2007).

Continued development in WUI areas has not only increased human exposure to wildfire but has also increased frequency of wildfire due to encroachment of more flammable non-native grasses and plants as well as accidental anthropogenic ignitions (Halsey et al. 2009, Keeley et al. 2009). In the wildland urban interface of California, Washington and Oregon, over a million new homes were constructed during the 1990s (Hammer et al. 2007). According to the California Department of Forestry and Fire Protection (CDF), more than 60 % of the housing in California are at high risk for wildfire damage (Miller 2007). Despite the documented knowledge of fire risk in the WUI, many residents who have moved into suburban and rural areas from the city may not be informed of the risk of fire, understand fire behavior and fire ecology. Vogt (2008) indicated that on average, residents who purchase or acquire homes in the WUI have put low levels of thought into the possibility of wildland fires affecting the area when searching for an appropriate lot or home. Due to new communities and constant movement of people into and out of the WUI, social scientists and fire managers alike have realized that wildfire preparedness is not just about managing fuel, it is also about managing people and including them in wildfire management practices.

Fire policies increasingly focus on local government and community-based efforts to enhance ecological resilience and participation in vegetation management practices (USDA and USDI 2001, WGA 2001, Winter et al. 2009). The focus on local response and communities has grown for a number of reasons, for example, the cost of fire suppression increased from \$213 million in 1995 to \$1.5 billion in 2006 (Strategic Issues Panel 2004, Winter et al. 2009). According to Young (2006), Forest Service managers

estimate that 50% to 90% of fire suppression costs are related to protecting private property in the WUI (Winter et al. 2009). The cost of fire suppression is rising critics argue, because development pressures influence fire protection decisions, and development planning is not based on how best to protect lives, property and natural resources (Halsey 2008b). Responsible growth and wildfire preparedness are active and adaptive processes that require extensive funding and buy in from all levels of government and the public.

One of the main policy initiatives to curb the growing cost of fire suppression requires residents on the expanding WUI to manage vegetation on private property, referred to as creating defensible space. An adequate level of defensible has been codified for regulatory purposes by CDF as 100 foot clearance of all vegetation around all built structures in the WUI (California Department of Forestry and Fire 2010). This definition is further supported by a Memorandum of Understanding (MOU) between the U.S. Fish and Wildlife Service, the U.S. Department of the Interior, the California Department of Fish and Game, the California Department of Forestry, the San Diego Fire Chief's Association, and the Fire District's Association of San Diego County in 1997. The MOU was established so that the CDF and Fire Chiefs of San Diego could continue to protect lives and property from the threat of fire by requiring the removal of flammable vegetation and to establish a “cooperative mechanism” to assess, account for, and minimize possible adverse impacts to sensitive species and habitats resulting from vegetation removal activities (MOU 1997). Despite the possible adverse effects of vegetation removal activities like defensible space, several experts suggest, defensible

space plays a key role in firefighter safety during acts of suppression and helps minimize spread of fire and heat from vegetation to built structures during a fire event (BOF 2006, Winter et al. 2009).

Defensible space is beneficial to homeowners and state and federal governments, because it promotes public safety, it potentially lowers the cost or need for full suppression efforts, and it transfers the financial and labor burden of maintaining defensible space to individual homeowners. However, its potential harm to the environment may outweigh its perceived benefits when it is not implemented properly. Some argue that too much emphasis is placed on vegetation abatement surrounding the home rather than retrofitting homes to class A fire code<sup>1</sup> (Halsey, 2008, Keeley 2009, Skelly 2009). In addition, creating defensible space of 100 feet is found to be less effective for structures surrounded by mature chaparral and steep slopes greater than 40 percent (BOF 2006). In these particular landscapes, fire authorities suggest “aggressive space clearing” to ensure safety from chaparral fire and burning embers even beyond the 100ft allowance (BOF 2006: 7). However, clearing to this degree could generate harmful environmental effects, such as vegetation fragmentation, erosion, soil disturbance and encroachment of non-native species (Husari and McKelvey 2006). According to a study done by Merriam et al. (2006), the nonnative plant abundance was over two times higher in fuel breaks than in adjacent wildland areas. When native vegetation is removed, soil is disturbed which allows for quick colonization of non native annual grasses. Thus

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<sup>1</sup> Class A building materials are developed to keep a structure from igniting. Building code focuses on roof cover, eave and vent design, screening for embers, wall covering, dual-pane windows with tempered glass, and deck materials and construction (Coleman and Dargen 2010)

requiring management practices to be carefully implemented, monitored, and maintained (Soule et al. 1992, Regan et al. 2006, BOF 2006).

The responsibility for making sure that defensible space is properly implemented and maintained often falls onto the homeowner and in some cases, community intermediaries because agencies such as CDF often lack funding or staff to monitor individual treatments. Due to the burden of maintenance and monitoring being delegated to the community it is important that intermediaries be well informed on the most effective ways to implement and sustain vegetation treatments. Further, if there is frequent communication with local agencies and fire professionals they can offer support such as monitoring vegetation treatments, providing information and expertise during implementation process, and possible funding opportunities.

In 2003, the federal government initiated the National Fire Plan and the Healthy Forest Restoration Act. Each of these policies promised funding and support for community wildfire initiatives (HFRA 2003). One key tool that emerged from HFRA was the formation of the Community Wildfire Protection Plan (CWPP) as a collaborative management tool. The CWPP provides a standardized framework for initiating a community-level collaborative process to identify key stakeholders as well as detect and prioritize areas for fuels treatment. Collaboration and consensus-building among communities and agencies have become integral parts of creating and adapting natural resource policy to overcome conflict and barriers.

Conflict has remained entwined with natural resource policy due to differences in ideology, perspectives, and desired objectives of landscape management (Kaufmann et al.

2004, Putnam and Wondolleck 2003, Stephens and Sugihara 2007). It is important in resolving a conflict that there is an effort among all stakeholders to understand the underlying values associated with the surrounding landscape. Cohn et al. (2008) and others suggested that some residents and agency objectives may value ecosystem protection over protection of personal structures or built structures on adjoining lands. Fire policy however, is predicated on the assumption that human settlements must be protected from wildfire (Cortner 2008). When faced with making a decision to manage landscape for wildfire or protecting a valued ecosystem or sensitive species conflict can ensue. However, if differing knowledge and values are discussed during consensus and collaboration processes, they can be incorporated into preparing for unplanned ignitions, and when fire does occur, can help influence decisions during fire event (Gray 1998, Cortner and Moote 1999). This perceived adaptive capability of communities through collaboration helps promote communities' resilience to wildfire, and facilitates their ability to understand the surrounding landscape, and to manage the ecosystem for both conservation value and fire suppression (Muñoz-Ericson et al. 2006)

Increasingly, community-based groups, fire safe councils, watershed councils, and other forms of stakeholder organizations are using collaborative decision making because it provides an organizational structure that facilitates dialog among stakeholders including agency members and balances the power distribution among a broad range of participants (Cortner and Moote 1999, Wondolleck and Yaffee 2000). Elements that are identified as key components to the collaborative process are: common goals and shared visions, relationships and trust, information sharing, interdependence, resource pooling,

and community outreach and education (Sturtevant and Jakes 2008). Despite the amount of community-based groups employing collaborative management techniques land-management agencies have had a difficult time fully adopting collaborative approaches to decision-making and wildland fire management due to time and commitment involved (Machlis et. al. 2001, Davenport et al. 2007). However, if the time needed for consensus based decision making is not taken, the varying complexities and definitions of an ecosystem, perspectives on how community members interpret ecosystem function and community, and their individual roles in preventative practices may not emerge, and conflict may become entrenched (Husari et al. 1999, 452, Potapchuk and Crocker 1999). Bringing forth the complexities of various stakeholder perspectives can help illuminate possible barriers and can promote effective and efficient community wildfire preparedness programs.

Community involvement in wildfire preparedness and educational outreach is important because relevant community outreach requires local knowledge that is constructed in a specific place and passes along formal and informal networks (Pimbert and Pretty 1997, McEvily and Reagans 2003, Sturtevant and McCaffrey 2006). Providing scientific information to the public is an important objective of any educational or outreach program or informational brochure. Knowledge of local environmental problems and knowledge of action strategies have been consistently identified as correlates of environmentally responsible behavior and fundamental to public acceptance of agency programs (Young and Witter 1994, Daniels and Walker 1996, Shindler et al. 1999, Jacobson et al. 2001). Further when people in the community interact with each

other to alleviate risk of wildfires or attend outreach programs, they transfer their knowledge and skills along the informal networks created, reaching a broader audience (McEvily and Reagans 2003). These networks created through information sharing, according to Putnam (2000), can be used to achieve a variety of objectives including promoting vegetation management and conservation values.

Although knowledge of environmental issues has been identified as an important predictor of environmentally responsible behavior, few studies have empirically evaluated educational information available on wildfire preparedness or how community wildfire outreach programs and single source information, such as brochures and flyers, affect wild fire preparedness actions (Daniel 2003, McCaffrey 2008). Generally, informational public texts require near-universal understanding and should be written at an 8th grade level (Fazio and Gilbert 1986). Unfortunately, a study done by the American Medical Association, showed that information that is accessible to readers does not always improve literacy on the subject and often over-simplifies information. (Glassman 2010). Literacy, as defined by the American Medical Association, is not simply based on an individual's ability to read, but it requires a complex group of reading, listening, analytical, and decision-making skills, and the ability to apply these skills to situations (Glassman 2010). Literacy in regards to wildfire issues and prevention requires individuals to read, listen, and adapt information gained from community wildfire outreach information and programs and apply it to various situations and levels of risk. Literacy is significantly improved, when information sharing through printed

means is combined with face to face interaction with experts in the particular field (Fazio and Gilbert 1986).

Despite the knowledge that literacy is greatly improved by personal contact with wildfire experts, budgetary limitations often lead federal and state management agencies to focus their communication strategies on generic printed materials to influence citizens' attitudes and understanding of resource management, including fuel reduction and forest restoration practices (Fazio and Gilbert 1986, McKinley and Evans 2007, Shindler and Toman 2007). The importance of general literacy with regard to fire management is well documented. Individual acceptance of wildfire mitigation programs is directly related to comprehension of the uncertainty of actual fire risk and acting accordingly (Winter and Fried 2000). For example, residents who believe that fires are random, uncontrollable events may be less likely to support proactive measures to reduce their risk (Nelson et al. 2005). However, a Florida survey, examining influence of wildfire education and perception of risk, found that 42% of those surveyed (after having been exposed to an education program) had already taken preemptive measures, such as removing shrubs and branches from near the home and moving flammable objects like woodpiles away from the house, without knowledge of when the next fire storm would hit (Monroe and Nevil 2006). Participants in Florida, many of whom had previous experience with wildfire, illustrated that one of the most important ways in which recipients learn new concepts and take action is by associating new information gained from educational outreach with their existing knowledge of wildfire and applying recommendations to their individual situations (McEvily and Reagans 2003, Sturtevant and McCaffrey 2006). Research has

shown that locally formed community organizations like fire safe councils can more easily address local needs, and encourage motivation among residents within their represented community (Sturtevant and McCaffrey 2006, Everett and Fuller 2010).

#### Fire Safe Councils: Collaborative Community Management

Fire safe councils are becoming increasingly common in California especially in areas of high fire risk. The fire safe council logo has come to represent a variety of non-profit and community organizations involved in community wildfire preparedness. Each council is a unique organization. Some are organized as non-profit 501(c)(3) corporations, others operate under a MOU with a county, city, and/or local fire protection district, and some have no formal structure (Everett and Fuller 2010). Their mission involves “mobilizing Californians to protect their homes, communities and environments from wildfire” (CFSC 2010). Since its inception, the California Fire Safe Council (CFSC), a state level umbrella organization, has worked towards distributing fire prevention education materials, evaluating wildfire safety legislation, and helping to build community fire safe councils. The importance of community organizations and fire safe councils is their access to the public and already established community networks. Many communities with fire safe councils are high capacity, because often they can support fire suppression professionals, have strong social capital and networks that can be accessed during a fire emergency. Community capacity, is the interaction of human resources, organizational assets, and social capital existing within a given area that can be leveraged to solve collective problems and improve or maintain the well-being of a given community (Chaskin 1999). In addition to community capacity and emergency

preparedness, councils often provide a forum where community residents can voice concerns and come to a common understanding of risk and safety and ecosystem health on private and public lands, as well as how to affect state and federal policy (Jakes et al 2003; Sturtevant and McCaffery 2006). However, there is little to no literature that compares the sustainability and longevity of vegetation treatments in relation to community capacity and strength of collaboration in chaparral ecosystems.

There are many factors that play into creating effective and sustainable collaborative wildfire management efforts and mitigating negative environmental effects. This thesis more narrowly explores the role of fire safe councils as community representatives and intermediaries in community wildfire management efforts. There is extensive literature on collaborative management in community wildfire preparedness and CWPP from an agency perspective, focused on how to get individuals involved in efforts and overcoming public complacency (Lang, Nelson, and Jakes 2006, Sturtevant and McCaffery 2006, Ganz, Troy, and Saah 2007). However, there is little to no literature on fire safe council perspectives on how well collaborative fire management with agencies is working. This thesis seeks to fill that gap. How the perceived role of fire safe councils in community wildfire management differ from both the agency perspective and community fire safe council perspective. Based on the perceived roles, what type of support and information are fire safe councils given in order to take part in best management practices for fuel treatments and community wildfire safety.

Currently, there is little evaluation of what information is available to the public through community intermediaries, especially if informational brochures are one of the

main ways in which agencies educate the public on preferred vegetation management actions (Shindler and Toman 2007). These are particularly important topics in areas that are highly developed, have extreme fire risk, and are in danger of losing native biodiversity. San Diego, although an extreme case of fire in the wildland urban interface, can help shed light on WUI's across the nation.

## San Diego

San Diego's natural landscape is both complex and prone to fire. It is characterized by a Mediterranean climate of wet winters and dry summers and periodic drought (Dicus 2006). The most extensive vegetation types in San Diego are chaparral and coastal sage scrub. Chaparral is composed of mostly evergreen sclerophyllous shrubs such as manzanita (*Arctostaphylos sp*), Chamise (*Adenostoma fasciculatum*,) and Coastal Sage Scrub (*Artemisia californica*). San Diego's native vegetation is generally characterized by its adaptations to fire, drought as well as its high volatility. San Diego's quickly decreasing biodiversity, frequent fires and continuously growing population make it an intensified microcosm to study and from which insights can be applied to other places facing similar issues (Halsey and Keeley 2009).

Seven California WUI fires destroyed a total of 8877 structures, on average over 2200 structures per year between October 2003 and October 2007 (Maranghides et al. 2009). San Diego's Cedar fire in 2003 and the 2007 California Firestorm in Southern California between Los Angeles and San Diego were among the top fire incidents in terms of acreage burned, and property and lives lost since fire suppression in the last 20 years, costing \$1.2 and \$1.9 billion dollars respectively (National Fire Protection Agency 2009). The Witch fire, the largest of the fires that occurred during the 2007 California firestorm, burned 197,990 acres and destroyed 1,125 residential structures, 509 outbuildings and 239 vehicles (Maranghides et al. 2009 and Sign on San Diego 2008).

In a report written by the city of San Diego after the October 2007 fires, one of the lessons learned and recommendations for change was the need for a comprehensive community outreach and education program to raise the public awareness of the importance of personal and family preparedness to increase fire prevention and safety and to create survivable communities both through vegetation management and hardening of structures (City of San Diego 2008).

In addition to the need for a more wildfire-conscious public, there is still a debate between fire ecology experts as to how best to manage San Diego's landscape for habitat conservation and fire prevention. The recent fire in October 2007 reburned over 30,000 hectares in San Diego County that had burned in 2003 (Keeley et al. 2009). This reburn revealed that past fire management practices could not successfully maximize fire protection. The Santa Ana winds, which drove the 2007 fires, illustrated that chaparral fires are not constrained by previous fire boundaries or a mosaic of fuel age and composition (Keeley et al. 2009). The extreme frequency of fire in southern California is driving large scale vegetation change, as shrub dominated landscapes become flammable non-native grasslands. This process is commonly referred to as type conversion (Keeley et al. 2009). However, the debate amongst stakeholders remains: (1) to what degree has fire suppression altered the natural fire regime, decreased plant diversity, and increased fuel density; and (2) how can San Diego best maintain and restore tracts and corridors of open space while also creating more fire resilient landscapes and communities.

Critics argue that fuel mitigation processes in San Diego have continued to focus on landscape level fuel modification practices and threaten San Diego's native landscapes through fragmentation (Keeley and Fotheringham 2003, Hassan et al. 2005). The director of the Chaparral Institute and several other professionals challenged the county's Vegetation Management Report in 2009 because they felt that there was too much focus on unneeded, costly fuel treatments and not enough time for the public to comment on plan.<sup>2</sup> The Chaparral Institute, a San Diego non-profit, and "the voice of the Chaparral" has been one of the most outspoken conservation organization in San Diego (Chaparral Institute Website last accessed 2011). According to Rick Halsey the director or the institute,

"Removing dead trees nearly two football field lengths distant from roads and structures in the backcountry will not significantly reduce fire risk to people as the county claims. In fact, besides potentially damaging habitat, such action may actually increase fire risk by introducing flammable weeds, giving people a false sense of security, and wasting taxpayer money that could have been used to create defensible space directly around homes and communities." (Halsey, 2009).

The Plan did not highlight Mediterranean ecosystems, ecosystem benefits of native plants, or fire behavior and conservation goals. This lawsuit between the county and other stakeholders over fire management and conservation goals is a perfect example of the complex issue San Diego residents, land managers, fire authorities and public officials are entwined in.

San Diego has many small communities within the county. Many of these communities have experienced fire either directly or experienced the effects of fire close

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<sup>2</sup> The Chaparral Institute, a non-profit established to be the "voice of the Chaparral" Chaparral Institute Website last accessed 2011

by. The three chosen for this study have experienced fire in different magnitudes. Rancho Bernardo, endured the most extensive loss of structures, Lake Hodges a loss of both protected habitat and structures, and Deer Springs experienced indirect effects of fire.

### Case Studies

#### Rancho Bernardo

Rancho Bernardo, California, is the northernmost residential community within the city limits of San Diego and has a population of 20,155. It is centered on Interstate 15 just south of Lake Hodges and the San Pasqual Valley. The Rancho Bernardo landscape is characterized by many hills, valleys, and Black Mountain, which rises to 1,554 feet. The community planning area encompasses approximately 6,511 acres. Rancho Bernardo has one fulltime fire station funded through the city of San Diego. However, there is a strong presence of volunteer fire fighters and Community Emergency Response Team (CERT) volunteers. In the wake of these fires, a community group called RB United formed as one of six long-term fire recovery efforts created by a grant from the San Diego Foundation.

The mission of these recovery efforts is to “provide and coordinate emotional, physical, financial, and spiritual resources to help rebuild the homes and lives of families affected by the San Diego Wildfires of 2007”(RB United 2007). More recently, through their coalition, several key members of RB United have established a Fire Safe Council in March 2009. The establishment of the fire safe council began as a method to address

the lack of public funding to create and maintain fuel reduction projects, and help homeowners assume the responsibility of living near open space (RB United 2007).

### Deer Springs

The community of Deer Springs is located in the unincorporated area of northern San Diego County. It is roughly bounded on the north by the San Luis Rey River Valley and has a population of 15,000 (Deer Springs CWPP 2005). The most prominent topographic features of Deer Springs are Moosa Canyon and The Merriam Mountains. The canyon covers approximately 2,500 acres. It sits immediately west of Interstate 15. There are no identified federal or state managed lands within the district. Deer Springs Fire Protection District contains 3 stations under contract with CDF.

Deer Springs Fire Safe Council began as a group of 14 residents working with the fire protection district to identify, and propose solutions to, problems that occurred during the Paradise fire in 2003. Two main concerns were identified: (1) the limited number of evacuation routes and (2) the lack of communication between public safety officials and the community during the Cedar Fire. The Task force realized that these concerns and other goals identified by the community could be met by creating a Fire Safe Council and later a CWPP. Deer Springs was one of the first fire safe councils in San Diego to write a CWPP. It has been one of the most successful fire safe councils in San Diego in terms of volunteer hours totaling 1,562 hrs for 2010 and over 400,000 of grant monies distributed to their council (Deer Springs Fire Safe Council 2009).

### Lake Hodges and Rancho Santa Fe

The roughly 42 square miles of the greater Lake Hodges area includes portions of the cities of San Diego and Escondido as well as communities in the unincorporated portions of San Diego County, ranging from Rancho Santa Fe east into the San Pasqual Valley. There are approximately 68,000 residents in the area. Lake Hodges is serviced by both the Escondido and Rancho Santa Fe Fire Departments.

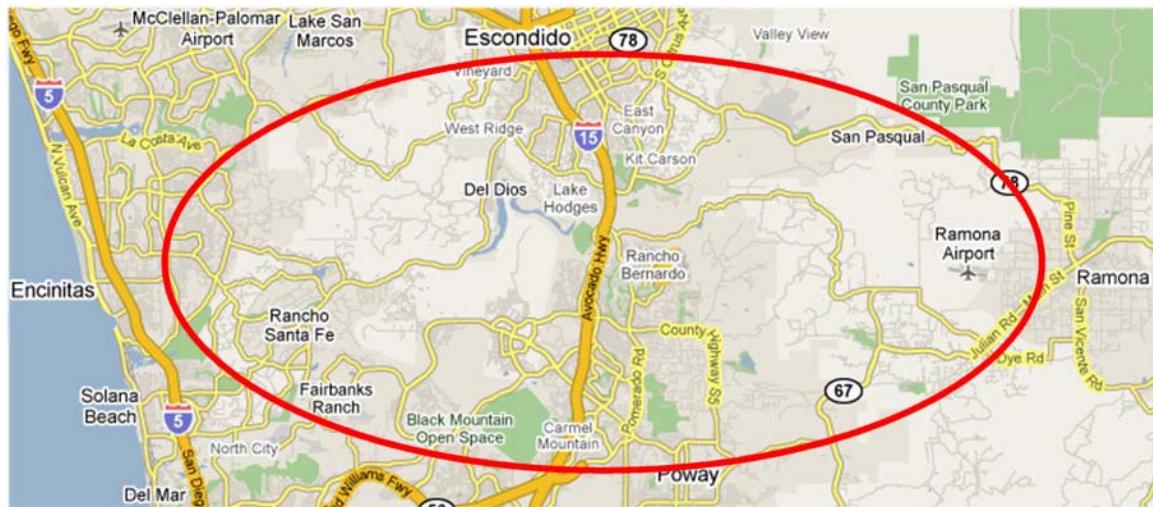
Lake Hodges and the San Dieguito River drain into the Pacific Ocean. Vegetation removal and soil disturbance in the upper watershed could result in soil erosion and runoff from winter rains with subsequent damage to the Lake Hodges ecosystem and sensitive downstream lagoon (Lake Hodges CWPP 2010).

The Lake Hodges Fire Safe Council was founded in July, 2006 and works closely with the Escondido Fire Department / Rincon Fire Protection District and Rancho Santa Fe Fire Protection District as well as through a collaborative partnership with Rancho Bernardo Fire Safe Council. The two organizations are also working with other fire safe councils, community organizations, fire agencies, and other entities to promote wildfire awareness, safety, and preparedness throughout the entire Lake Hodges basin.

These three communities are similar in social and economic terms, however they range in population density, and fire history. Rancho Bernardo is has the greatest population density of 4,064 residents per square mile, and lost 365 homes in the Witch fire (Warth 2009) and Lake Hodges community lost 169 houses. Although Deer Springs did not experience any fire damage during the 2003 and 2007 fires, they began to realize how devastating a fire could be due to their location (adjacent to a large canyon on one

side and the Merriam Mountains on the other), and the amount of dead vegetation in those two areas has accumulated for over 100 years (interview with Deer Springs). Each of these communities makes up a large part of San Diego's north county WUI, and are adjacent to key geographic features in the County.

Figure 1: Map of Lake Hodges and Rancho Bernardo Jurisdictions (Lake Hodges CWPP 2010)



## METHODS

This thesis utilizes a mixed-methods approach in the overall frame of a case study, consisting of a literature review, participant observation, key informant interviews and content analysis of educational brochures provided through local fire safe councils. The case study according to Berg (2000) is not actually a data-gathering technique, but a methodological approach involving a number of data-gathering measures. Using a triangulated approach takes advantage of different insights emerging from different methods to data gathering and strengthens research findings (Berg and Berg 1993).

This study adopted a case study design focused on San Diego. Utilizing a case study for this project allows data gathering techniques to contextualize the landscape and social conditions of the community, important factors to wildfire preparedness (Jakes et al. 2007).

Case studies and grounded theory research method are complementary to one another. In grounded theory, researchers use an inductive method of observing aspects of the environment, to search for patterns and emergent themes (Strauss and Corbin 1990, Babbie 2007, Jakest et al. 2007). Participant observation is approach through which a researcher becomes a member of a group, organization or event under study (Vinten 1994). Junkers (1960) suggests that there is a continuum between participation and observation, with two intermediate points of the participant as observer and the observer as participant (figure 1). The observer as participant makes known his or her investigation and that he or she is there to participate but mostly to observe.

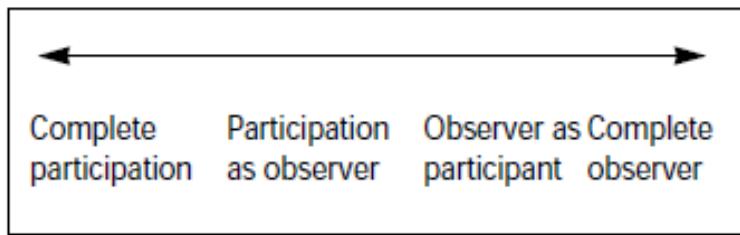


Figure 2 Participation and Observation Continuum (adapted from Junkers 1960)

As a participant observer, I joined a local initiative, Living with Wildfire, as a research assistant.<sup>3</sup> Through participant observation both in wildfire education classes, analyzing survey data from participants in classes, in attending county and regional fire safe council meetings, and urban forestry meetings, I began to formulate questions and identify key stakeholders for in depth interviews.

Key informants are essential to interview because they are particularly knowledgeable and articulate, and can prove useful in helping an observer understand what is happening (Patton 1982, Babbie 2007). Key informants were identified both through participant observation during county fire safe council meetings and purposive sampling (Berg 2000). Purposive sampling is a selection process, through which informants are identified because their particular knowledge, perspective, or representation. In this case, I selected people whose official duties required that they be knowledgeable about wildfire preparedness. Individuals included the chief of the fire department, county emergency services the wildfire management staff for the forest land adjacent to the community (federal, state, industrial, and/or county lands). Key

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<sup>3</sup> Living with Wildfire was a systematic approach to wildfire preparedness. There were three classes: Fire Ecology, Fire Behavior, and How to Retrofit Individual Houses. Surveys to asses knowledge of subjects were given before each class and after- then analyzed.

informants also included members of the city council from the case study area, community conservation organizations and others for whom wildfire preparedness was not part of their jobs, yet they played an active role in wildfire preparedness activities in the communities in the case study.

The use of qualitative methods, suggested by Weisshaupt et al. (2007), can help facilitate the necessary interaction between interviewer and subject to understand complex issues under investigation. Qualitative semi-structured interviews are important because they can lead a discussion to new insights and offer unique benefits and opportunities that may not be foreseen by the researcher (Berg 2000, Babbie 2007). In order to facilitate a space for interviewees to offer new insights beyond pre-determined questions, one question was added to illicit more information (i.e. “do you have anything further you would like to discuss or tell me?” (Babbie 2007).

### Interview Question Development

The question development process began by identifying themes that arose in survey analysis for Living with Wildfire Classes, by researching other studies done on community wildfire preparedness, and by recognizing conflicting themes emerging in fire ecology and community wildfire preparedness literature. Based on the study done by Kaufmann et al. (2004), questions were based on the assumption that understanding of place, community, the complexity of fire, ecological processes, and fire management are important to galvanize action and response by all stakeholders. Questions sought to identify: the perceived fire risks associated with development patterns, vegetation/ fuel loading, topography, weather, defensible space, and building code enforcement; whether

knowledge of fire behavior and effects influences individual action; what role fire safe council's play in wildfire management (management perspective and fire safe council perspective) and the role of the CWPP. Further, what kind of information was available to fire safe councils and public on best management practices for fuel treatments? (see questionnaire Appendix A).

### Sampling

To assess these questions, I constructed two sets of interview questions. Although very similar, one was tailored for agency staff who worked mainly with the entire county of San Diego and the County fire safe council, and the other was more specific to local community council leaders with questions regarding their specific region and community they represented (Berg 2000). A purposive sample of 25 individuals involved in county fire safe council meetings, county-wide vegetation management plan, and wildfire preparedness in Rancho Bernardo, Deer Springs, and Lake Hodges were contacted for interviews (Babbie 2007). Individuals not present at county fire safe council meetings were contacted first by phone and then by email. Out of 25 individuals contacted, 18 were interviewed.

Interviewees included twelve public authorities and agency staff whose position was public outreach coordinator, educator, or wildfire specialist from a federal, state, or local agency, three community fire safe council leaders and three community advocates and representatives of local nonprofits involved in wildfire preparedness in San Diego (Table 1). For the purpose of this study, community views will be represented by Fire

Safe Councils. Although they are not entirely lay public, their role is voluntary and most often they are residents of the community that the council is representative of.

Table 1: Subjects interviewed categorized by organization or agency being represented.

	Rancho Bernardo Fire Safe Council	Community Fire Safe Council
Community Organizations	Deer Springs Fire Safe Council	Community Fire Safe Council
	Lake Hodges Fire Safe Council	Community Fire Safe Council
	San Diego Native Plant Society	Associate
Non-Profit	Natural History Museum	Associate
	California Fire Safe Council	Associate
	Chaparral Institute	Associate
State University	UC Cooperative Extension	Public Outreach and Wildfire Education
	Fire District Authority	City of San Diego
	Fire District Authority	City of Rancho Santa Fe
	District 2 of San Diego	Associate
County of San Diego	District 5 of San Diego	Associate
	Office of Emergency Services	Public Outreach
	San Dieguito River Park	Associate
	San Diego Native Plant Society	Biologist
State Agency	CAL FIRE	Public Outreach and Wildfire Education
Federal Agency	BLM	Public Outreach and Wildfire Education
	US Fish and Wildlife	Public Outreach and Wildfire Education

## Content Analysis of Brochures

Further, I did a content analysis, on brochures that were accessible through the Fire Safe Council's websites (last accessed September 2010). Content analysis is well suited for identifying what is being conveyed to the public through informational material such as brochures, books, web sites and other forms of recorded human communications (Babbie 2007). Materials were analyzed for content, patterns, relationships, and disparities (Berg 2000).

Three types of brochures were explored: (1) brochures directly from community councils; (2) brochures from either San Diego County fire safe council or the California fire safe council, and (3) direct links to other organizations regarding wildfire preparation, (i.e. CDF). This sampling frame assumed that informational materials on stakeholder websites were representative of the viewpoint of the council or agency that posted the link or brochure. Several links were down and so I searched for the pamphlets away from the actual site, making sure wording was identical in each search. Pamphlets that were used had titles including Defensible Space or direct action words such as “Ready Set Go.” “Action words,” according to USDA, and “vivid information grabs us (the reader) emotionally, triggers our imagination, and is immediate in a sensory, temporal, or spatial way.” (USDA 2009). During this search, I came across several comprehensive interactive websites that offer scientific literature on wildfire preparedness issues when I searched under “San Diego and wildfire preparedness.” However, these sites were not linked to any of the three council’s web pages or the San Diego County website during this study.

When analyzing the brochures, I focused explicitly on five themes and attention tactics used to engage the audience. The themes were: how defensible space was described, what fuel management practices were advocated, potential negative environmental impacts of fuel reduction practices, suggestions on restoring native plant communities, and avenues of collaboration. Main themes were decided based on topics that were repeated or emphasized throughout the brochure (Frascara 2004) (see Appendix B).

## RESULTS

This study included interviews with 18 individuals involved in community wildfire preparedness efforts in San Diego. Informants ranged from community level (fire safe councils) to state level, CDF. Though perceptions of community wildfire preparedness are complex, there are a number of areas where perceptions and objectives overlap (either in agreement or in opposition). These areas emerged as prominent themes during the interview process: importance and meaning of collaboration, a need for an educated public to engage in meaningful collaboration and mitigative action, a need for coordinated and well planned fuel treatments at individual and community levels, and meaningful support from agency stakeholders to community fire safe councils and individuals.

### Collaborative Management

Collaborative management is fundamental to community wildfire preparedness dialogue as identified by all informants. Collaboration in various aspects came up in each interview. Collaboration was mentioned in terms of education and information retention through information sharing, expanding tunnel vision, and creating more opportunities to diversify fire preparedness actions. Wildfire preparedness in San Diego has become dependent on each stakeholder being an active part in the process, whether it's the federal or state manager offering funding or expertise in fuel treatments or the homeowner making sure his or her house and property meet county guidelines for defensible space and housing retrofits. Informants agreed that

“Wildfire preparedness is too much work and responsibility for only a couple people in a community to take care of. We rely on and encourage communities to take a vested interest in their homes and surrounding property”

A San Diego Fire Marshall put this into perspective when he said, “*My crew has 49,000 parcels to manage and there are only six of us.*” Managing and implementing fuel treatments, informants felt, were the individual homeowner’s job because of limited budgets, personnel constraints and the large populations living on the WUI.

A majority of the fire managers and agency members directly involved with community wildfire preparedness felt a strong sense of optimism when talking about community fire safe councils and their role in engaging the public in collaboration.

#### The Role of Fire Safe Councils

All informants recognized the strong need for community intermediaries like the community fire safe councils both the community councils and the county fire safe council. Community fire safe councils are able to identify their communities concerns and needs and combine them into one united forum. Other key roles of the fire safe council as assessed by agency informants were their ability to provide public education, facilitate CWPPs, help motivate individuals to create defensible space, and other wildfire preparedness efforts. Several of the agency informants also noted that with the help of fire safe councils, they are able to create community fire plans that cross multiple jurisdictions and they can facilitate crucial collaborative networks among other agencies and fire authorities. According to one agency informant,

“Community councils coordinate grassroots fuels treatments, projects, and create community ownership in fuels management projects...and they help find local projects adjacent to lands”.

A fire authority commented that:

“Everything done in collaboration with the fire safe council has been effective—even if you are able to only impact one homeowner and help them understand the different elements of wildfire preparedness in San Diego, then that is a success.”

Overall, 8 out of 9 state and federal agency informants praised the San Diego community and County fire safe councils for their role as liaisons between agency and land managers. They are,

“The folks on the ground...the community organizers, who find out what projects need to be done, especially on private lands abutting public lands”.

The fire safe council’s and County fire safe council’s Role as Public Outreach Coordinators

The San County fire safe council referred to themselves as the “information tree” and a “clearing house of information” for local councils. There is a very strong umbrella-like network that allows information to be relayed between the community councils, the County Fire Safe Council, the agency members, and San Diego County officials (County fire safe council 2010). These agencies mentioned that there are 86 community councils; too many to work with individually.

As one agency representative stated:

“It is the County fire safe council’s role to provide the necessary tools to help local communities help themselves recognize their needs and risk”

Another agent noted:

“They took over the community outreach section of our[ office]... giving us the opportunity to focus and give more time to other parts of our job....like working with communities that need guidance on their CWPP.”

Most agency informants noted that the public outreach that was provided by both the community and County fire safe councils was an essential component to wildfire preparedness efforts, because it was the most effective way to distribute information and encourage mitigative action among the public. Often, this was due to strong and well established connections in the target community.

#### Wildfire Preparedness Activities and Education

Agency informants established that education and information on fire preparedness is one of the most important ways to get public motivated and take appropriate actions on their own property or within a community. All informants expressed that knowledge of fire ecology and fire behavior in crown fire ecosystems, chaparral, during Santa Ana winds is essential to the wildfire preparedness discourse, shared understanding of risk and promoting action. Informants also noted that since the last fires, there had been an increase in educational sites offering information regarding wildfire preparedness and a noted improvement in public interest in the information.

However, an emergent theme that arose was that informants felt that not all information available to the public was scientifically sound, or emphasized appropriate preparedness actions. For example there was concern raised over how much vegetation should be cleared for defensible space, 100 feet or 300 feet (for insurance purposes) especially if risk or emergency is declared? Should creating defensible space mean

clearing to mineral soil or xeri-scaping<sup>4</sup>? Should there be strategic placements of small fuel breaks in the WUI or should managers strive to alter the vegetation mosaic across the landscape? The way to resolve misinformation, or misunderstanding one federal agent mentioned, is by demonstration:

One of our goals is to illustrate how plants will burn,” and “it is a combination of attributes that go into fire risk.... It helps if fire maps are 100 acres or more to show how fire moves and to offset any misinformation given by non-fire professionals, and competing interests.”

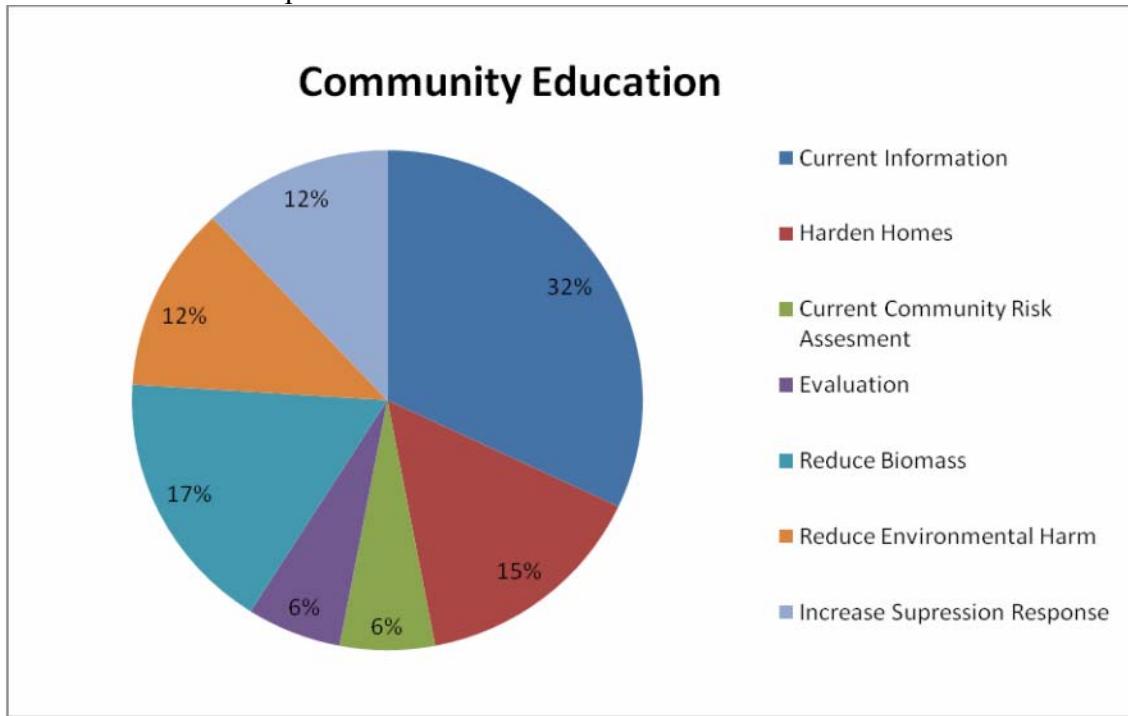
On a broader scale, conflicting information and its effects on expert understanding of conservation of San Diego’s chaparral ecosystems and fire management practices was illustrated by a recent lawsuit between two of my informants. According to an interview with an agency biologist, the five major fires in the past five years have followed predicted paths that had been delineated in modeling by Geographic Information System (GIS) specialists for San Diego County. Based on their past success with fire predictions, the county planners believed that they could accurately assess where large fuels treatments like prescribed fire would be most effective and compiled a comprehensive report based on their findings. However, a conservationist interviewed, had an opposing view, that the added fire through prescribed burns and vegetation management proposed by the county, could exacerbate the disturbance from development in southern California, and would intensify a large-scale vegetation type-conversion to more flammable non-native grasses.

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<sup>4</sup> Xeriscaping is landscaping with drought tolerant plants for water conservation(Randall, Hermansen-Báez and Acomb 2010)

However, the information that was provided by agencies for the public focused on simple and straightforward themes and instructions for individuals mitigate adverse affects from wildfire. When asked what type of information they stressed as a fire safe council, agency, or organization, respondents referred to a range of community education activities including providing current information and teaching people how to harden homes. Respondents ranked the relative importance of these activities (Figure 1). The main themes stressed in community education, revealed in the interviews, focused on reducing biomass, creating defensible space (17%) and the importance of current scientific information on creating a fire resistant home and community (32%).

Figure 3: Respondents referred to a range of community education activities including providing current information and teaching people how to harden homes. Respondents ranked the relative importance of these activities.



Despite this increase in available information and public interest, both agency and fire safe council respondents ranked public knowledge and interest as average, 3.25 on a scale of one (having little to no knowledge of fire behavior) to five (being an expert). One fire safe council respondent mentioned that although there were many more classes offered, (i.e. through the garden club and community centers), offering a class and getting the public to attend were still two different things. Just as producing outreach materials does not guarantee an audience will read, retain and act on the information provided. All

informants agreed that there was an overwhelming lack of awareness of community risk and an attitude of, “it can't happen to me” throughout San Diego County.

### Creating Defensible Space

In the past 10 years, there has been an increase in the educational materials and outreach focusing on creating and maintaining defensible space available to the public. Experts commented that how defensible space is maintained and implemented, is an important measure of how prepared a community is for a wildfire. Informants were asked to evaluate risk based on their community's implementation and current maintenance of defensible space. Both the fire safe council and Agency participant responses averaged 3.5 out of 5 (1 being not a risk to 5 being a primary risk). They noted that although the number of individuals creating defensible space has increased since the creation of [their] community fire safe council, the defensible space implemented, only 50% was sufficient or well enough maintained- even though it is a statewide requirement in state responsibility areas (SRA). Several agency informants also commented that despite the fires of 2003 and defensible space being more accepted by individuals, there was still a deficit in public understanding of how fire transfers and behaves in relation to fuel treatments and buildings.

A fire safe council member commented,

“they believe that they are protected from the fire, but look what happened to Rancho Bernardo Trails. They got infiltrated by fire brands.” Even houses that were several houses away from the edge of the wildland burned.<sup>5</sup>

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<sup>5</sup> Rancho Bernardo Trails is a clustered gated community in northern end of Rancho Bernardo overlooking the San Pasqual Valley (personal communication January 2010)

Several informants made a clear distinction between the creation of defensible space, maintaining it, and monitoring it. Often defensible space will be created, but not maintained. A problem, one fire safe council member mentioned is, if defensible space was not created efficiently the first time, there will be a lot of maintenance (such as weeding invasive grasses that frequently colonize disturbed ground or pruning vegetation to decrease ladder fuel).

#### Fuel treatments and environmental impacts

All informants agreed that monitoring vegetation treatments for environmental impacts was extremely important. However, they also mentioned that monitoring was very difficult because of lack of personnel and funding to monitor what homeowners did.

However, 16 of the informants highlighted the Memorandum of Understanding (MOU) with U.S. Fish and Wildlife and established that it was the compromise between environmental compliance and fuel treatments. Agency members felt strongly that homeowners should focus on creating defensible space within the 100ft area required of all California homeowners and that fire safe councils should focus efforts on managing lands beyond the 100ft because of the permitting process and frustration it can cause<sup>6</sup>.

However, one council informant mentioned that they worked closely with a biologist, and agency personnel to create their vegetation management plan, for fuels reduction along the hillsides adjacent to their community. Their management plan was

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<sup>6</sup> The permitting process for vegetation removal beyond the 100 foot MOU requires approval of a brush management plan from the San Diego Fire and Rescue Department or if a vegetation management plan goes beyond private property, the plan must be brought to the agency with local jurisdiction (MOU 1997)

not only granted federal funding, but they found summer holly *Comarostaphylis diversifolia*, an endangered plant while doing plant surveys in the project area. The fire safe council mentioned that he was able to use the endangered the summer holly as an example to teach homeowners why sensitive species are important, in order to diffuse the frustration of the homeowners because plan had to be reevaluated.

Although all informants agreed that Environmental Assessments (EA) required by the California Environmental Quality Act (CEQA) and possible impacts from fuel reduction were important to pay attention to, they also felt that the EA process was at times a huge barrier to implementation of treatments for all stakeholders because they were often cost- and time-prohibitive.

One agency person noted:

“Because of environmental compliance, it is hard to get projects done outside the 100ft MOU and difficult to work with communities and help them to understand timing of projects... (e.g. bird migration) and funding...”

Another agency person indicated that:

“Going through the CEQA review process, a project could take up to two years and by then there might be a loss of interest from community,” and possibly loss of funding.

fire safe council members commented, that they often were frustrated when they tried to mitigate fire risk or replace non-native water-intensive landscaping with xeriscaping (with native plants) on adjacent properties of absentee landowners or open space owned by their Home Owners Association (HOA). Frustration primary stemmed from vegetation management activities being subject to review under CEQA or in the case of re-landscaping commonly owned HOA land with native plants, new landscape plans

conflicted with existing fire code because native vegetation was not accepted under code restrictions.

### The Community Wildfire Protection Plan: Beyond the MOU

The CWPP, was one of the main topics of the interviews. All agency informants viewed the CWPP very positively. The CWPP was praised as one of the most efficient ways to facilitate projects outside the MOU. It was seen as providing an opportunity to create a more comprehensive plan that had the potential to integrate environmental assessment on both private lands and public lands beyond the 100ft MOU. Having a CWPP can also be a means to get funding for public lands adjacent to communities, and can identify a majority of the fire risks in a community in a single document. One federal agent commented,

“working on CWPPs with communities that are adjacent to public lands helps to link and connect vegetation management projects among the different land ownerships, both private and public.”

However, the fire safe council respondents were not united in their enthusiasm for the CWPP. Although, they agreed that it helped to facilitate interagency communication, collaboration was not always easy and agency members were not always responsive to working as a team. However, when agencies were responsive and relationships were built among all stakeholders the process of writing a CWPP was perceived as successful by fire safe council. One council leader said, “collaboration and trust take time, and treatments don’t implement themselves.” Unfortunately 2 out of the 3 community council representatives interviewed considered the process of building consensus in a CWPP frustrating because there is an allotted time frame, procedure to follow, and

agencies were not always available for consultation. One fire safe council respondent noted that they rarely heard from agencies. He felt as though the agencies “operate in a vacuum” and never consult the fire safe councils.

Another issue that emerged with the CWPP, was that the guidelines focused too much on vegetation treatments and were not flexible enough to support other forms of wildfire preparedness. For example, plans could have funded proper signage on streets and houses to facilitate fire rescue, and efforts to gain a more in depth knowledge of their community and its demographics.

Overall, CWPPs illuminated the importance of strong ties to agency representatives; the need for continued funding; and the need for flexibility in planning projects that were not exclusively fuel treatments. A major complaint regarding the CWPP was that they placed a great deal of work and responsibility on a few people.

#### Analysis of Brochures

One of the main themes that all informants addressed was the need for wide spread public education. Often informants relied on printed materials, but more outreach methods were needed to reach a wider audience. Informants suggested that distributing materials through fire safe councils was the most effective way to reach the various communities.

Corollary to this response, I decided to look at the outreach materials that were accessible on the websites of the fire safe councils that were involved in this study. There were a total of eight brochures on the four website home pages of the San Diego

fire safe council (county fire safe council), Deer Springs fire safe council, the Rancho Bernardo fire safe council, and the Lake Hodges fire safe council. Although each brochure varied slightly, all were chosen because they were easily accessible on one of the main website pages of a fire safe council in this study. The brochures ranged from a standard three page foldout with minimal pictures to three paged handout with large visuals to interest and inform reader. Brochures were mostly crafted by the California fire safe council, the California Department of Forestry, and Insurance Agencies. Five themes were used to classify the brochure content. The themes were defensible space and vegetation management, environmental impact, restoration of native ecosystems, ecosystem health, and consensus and collaboration.

Each of the brochures analyzed in this study not only varied in theme but utilized a range of tactics to engage the audience. The most prominent tactic used was fear. Fear inducing words and pictures were used by 76% of the brochures to capture their respective audience. For example, in one brochure, the word *risk* was used four times before being resolved and changed to fire safe, with an image of a pristine house surrounded by charred vegetation placed next to a destroyed house to illustrate two possible outcomes. However, the fire safe council's general information brochure, quickly informed the reader how they, an individual, could be involved in their community's collaborative efforts (Table 2).

Table 2: Attention Tactics Used in Brochures

Attention Tactic	% Mentioned N=8
collaboration	13%
fear verbiage	13%
burning houses	38%
neutral drawn images	38%

Defensible space was mentioned in 100% of the brochures. Of the brochures analyzed, 63% also advocated hardening individual structures, and the importance of looking for the places where embers can catch and create fire (i.e debris in gutters) (Table 3). In addition to portraying its importance, defensible space was described in various ways. Each brochure mentioned some type of vegetation removal: 56 % stressed the removal of dead and dry vegetation, 33 % stressed not just the removal of plants, but the importance of planning landscaping in terms of the plants used and how plants were spaced to reduce ladder and crown fuels, and 11% mentioned the need to remove all dead and dry vegetation up to 100ft (Table 4).

Table 3: Description of Defensible Space in Brochures

Wording of Defensible Space	% Mentioned N=8
planning, watering and spacing	38%
removal of dead and dry vegetation up to 30'	63%
removal of dead and dry vegetation up to 100'	13%

Table 4: What Brochures Advocate for in Home Preparedness

What Brochures Advocate	% Mentioned N=8
Defensible Space and Home Hardening	38%
Maintained, clean, spaced and watered	38%
Strategic placement of driveways and walk ways	13%
collaboration and defensible space	13%

Of brochures analyzed, only 20% mentioned possible impacts from poorly executed vegetation management practices and the importance of ecosystem health. These brochures only 25% recommended consulting a regulatory agency before any implementation of extensive vegetation removal even within the 100' of defensible space zone. Only one brochure, mentioned the importance of drought tolerant plants, noting their ability to decrease erosion. There was no mention of ecosystem health or native plant use in 75% of brochures. Lastly, there was little mention of collaboration in the defensible space brochures. Collaboration and consensus building were only stressed in the fire safe council brochure.

During the search for brochures on the community fire safe councils websites, I came across several comprehensive interactive websites that offer scientific literature on wildfire preparedness when I searched under “San Diego and wildfire preparedness.” However, these sites were not linked to any of the three council’s web pages or the San Diego County website during this study.

One of the main websites for scientifically reviewed information on wildfire and wildfire preparedness was called the Wildfire Zone. This website was jointly managed

by UC Agricultural and Natural Resources Cooperative Extension, FAST (Forest Area Safety Taskforce), the Natural Resource Conservation District, Cal Fire, the Bureau of Land Management, the Fire safe council of San Diego County, and the Resource Conservation District of greater San Diego (UCANRCE 2010). The goal of this website, according to the public outreach chair, was to create a space where information about actions to take before, during, and after wildfire can be accessed. It was made clear that this site did not advise the right way to do mitigation, but only offered the resources to explain the different options available. This site encouraged homeowners to contact a local fire safe council by link and web address. However, the fire safe council sites did not have a link to the Wildfire Zone on their individual sites. The Wildfirezone website was not linked to San Diego Fire and Rescue Department or the main county web page. The website was finally linked to the County Office of Emergency Services “wildfire San Diego” during last access in February 2011.

## DISCUSSION

Wildfire preparedness in San Diego depends on every stakeholder being an active part in the preparedness process. Every actor has a role to play, whether it's the federal and state manager offering funding, expertise in fuel treatments, and fire prevention, the homeowner making sure his or her house and property meets county guidelines for defensible space and housing retrofits, or the community fire safe council holding classes to inform their neighbors on how to prepare for wildfire. There are too many homes for the number of public officials to have meaningful personal contact. The San Diego fire Marshall helped put the deficit into perspective, when he noted that he has six managers for 49,000 households.

Collaboration among all stakeholders in wildfire preparedness and education of the public are perceived by stakeholders in this study as the key to resolving the complex fire dilemma in Southern California. Balancing divergent values through consensus however, depends on the willingness and time of many individual stakeholders to come together and collaborate (Gray 1998). Trying to balance a community's safety from wildfire without compromising ecosystem health and sustainability is very complex and difficult to achieve (USDA and USDI 2001, WGA 2001, Winter et al. 2009). For some, combining both safety and conservation and restoration practices to wildfire preparedness is a great source of achievement. For others, there is a debate or controversy as to whether it is even possible to attain both (Keeley 2005, Goforth and Minnich 2007, Keeley et al. 2009). Agency informants recognize the importance of collaboration in community fire management, but are aware of their constraints as individual actors

unable reach out to individuals in the community. Adopting fully collaborative approaches to decision-making and wildfire management is difficult due to time and commitment involved (Machlis et. al. 2001, Davenport et al. 2007). However, community-based groups like the fire safe councils as demonstrated in this study are clearly able to facilitate collaborative management and engaging the public by their ability to educate and help motivate neighbors, to execute vegetation management practices, to facilitate the creation of a CWPP, and to be the eyes and ears of the agency staff.

#### The Role of the Fire safe council

In line with other research done on fire safe councils (Jakes 2003, McCaffrey 2004, Sturtevant et al. 2005, Fuller and Everett 2011), this study demonstrates that public intermediaries like the fire safe councils are recognized as being a fundamental part of the collaborative process. This holds especially true in places like San Diego that are spread out and very difficult to access as an individual agency member. Despite the sprawling public, community fire safe councils still have a proven ability to engage citizens, promote cooperation and teamwork between agencies, local governments, community organizations, and overall aid in the wildfire management and safety conundrum (Jakes et al. 2007).

The fire safe councils, both county and local, provide opportunity for the public to be involved in participatory inquiry around wildfire preparedness and facilitate networks among community members and wildfire and land management agencies. Local fire safe

councils purposefully seek to include diverse interest groups from varying fields such as fire personnel, wildlife biologists, ranchers, developers, the insurance industry, the environmental community, builders, air pollution regulators, and others to engage in local wildfire preparedness discussion in order to discover more creative solutions (Discus 2006). As revealed in this study, often times these groups are at odds with one another or do not take the time out of their scheduled obligations to converse with other groups. Open dialog, facilitated by fire safe councils, has helped bring new perspectives and answers to local wildfire preparedness issues.

Community involvement in wildfire preparedness and educational outreach is important because relevant community outreach requires local knowledge that is constructed in a specific place and passes along formal and informal networks (Pimbert and Pretty 1997, McEvily and Reagans 2003, Sturtevant and McCaffrey 2006). By collaborating with fire safe councils, federal, state, and county groups are able to reach out to the communities through established networks. The success that agency informants attested to, when working with fire safe councils is widely acknowledged (McEvily and Reagans 2003, Sturtevant and McCaffrey 2006). The network of fire safe councils works like an information tree as the San Diego County representative pointed out. Agencies such as CDF or county fire managers are able to relay information to the county fire safe council, and they are able to quickly distribute information and encourage action along their networks to community councils, and the councils to the communities.

## Scientific Information and Education

The general normative argument that better-informed citizens can constructively contribute to decision-making process and collaborative management holds true in this study (Kauffman 2004, Wang and Wan Wart 2007). However, there is a debate in the literature as to whether more information and in depth knowledge of fire risk and behavior motivates the public to take action (Kaufman 2004). This study confirmed this debate. Many of the stakeholders in this study had faith that if the public were able to fully grasp the risk and benefits of wildfire and fire ecology, their willingness to participate in fire preparedness practices would increase.

There are two main goals of educational outreach identified in this study, one goal identifies wildfire as an issue and offers general information to mitigate fire risk. The other seeks to establish a framework that identifies wildfire in southern California as an ecological process - what that means in terms of a critical understanding of place and acknowledging that fire will happen (Sturtevant and McCaffrey 2006). A local saying is that “wildfire is no longer a matter of *if* but *when*.

The information and educational outreach programs addressed various pieces of the wildfire preparedness puzzle. Although information and education produced by various agency members is based on current fire science. There is still a wide gap between the time it takes current studies and information to influence local policy and outreach materials. The emphasis on reducing biomass, although very important in the wildfire preparedness equation, does not adequately address the complex fire scenario in San Diego. An example of the simplicity of focusing on vegetation removal was

illustrated by a perfectly manicured backyard and maintained defensible space that surrounded a completely destroyed house, burned by fire embers (Rancho Bernardo Trails, personal observation 2010). It is important that both hardening homes and maintaining defensible space are given equal emphasis especially in the southern California WUI.

To highlight the importance of scientific information and motivating action, one fire safe council respondent felt that the more his community members knew, the more responsive they were in donating time or money to the community fire safe council and its efforts. Several agency informants and another fire safe councils felt that in spite of the amount of information available to the community coupled with their experience with fire, there were very few efforts being made to take action. Past studies have tried to explain the link between education and public outreach and public motivation to act based on outreach materials. Many ties between individuals taking action based on information is influenced their social and economic standing (McKinley and Evans 2007) and values (Sturtevant and McCaffrey 2006).

One way that informants addressed the gap between information learned to action, was to establish a framework that recognizes wildfire in southern California as an ecological process and not a random disaster. By shifting the focus as illustrated in the literature (Winter and Fried 2000), fires are not seen as random events, but events that eventually will happen. Although this framework does not have direct implications for small scale defensible space practices, it affects how large tracts of backcountry lands are managed because there is a pervasive debate as to what chaparral ecosystem processes

are and what characteristics define the natural state of the landscape (Moritz et al. 2008, Keeley 2009).

Despite the widely accepted axiom that fire is a natural part of the chaparral ecosystem, there remain many different perceptions on how wildfire spreads, whether it is driven more by wind or by fuel, and how these factors directly influence mitigation process. If wildfire is driven more by fuel as it is in most cases throughout the West (Agee and Skinner 2005), it makes sense to create landscape mosaics of fuel age and composition, however in chaparral ecosystems, fires are driven by Santa Ana winds that indiscriminately burn through old and new age fuel classes.

The conflict in expert understanding of conservation of San Diego's chaparral ecosystems and fire management practices was illustrated by a recent lawsuit between two of my informants. According to my interview with the San Diego County chief biologist, the five major fires in the past five years have followed predicted paths that had been delineated in modeling by Geographic Information System (GIS) specialists for San Diego County. Based on their past success with fire predictions, the county planners believed that they could accurately assess where large fuels treatments like prescribed fire would be most effective and compiled a comprehensive report based on their findings. However, opposing conservationists felt that the increase in frequency of fire (by prescribed fire) and vegetation management proposed in the Report, added to the disturbance from development in southern California, would intensify a large-scale vegetation type-conversion to more flammable non-native grasses (Keeley et al. 2009). Despite research illustrating that large landscape-level treatment may be an ineffective

buffer between wildland fires and the urban interface (Pyne 1996, Keeley et al. 2009), the County of San Diego still incorporated these practices into their proposed plans:

These two conflicting perspectives on how to manage fire on a broad landscape level pervade both San Diego policy and literature. Although these theories more directly affect landscape level management efforts, they made add confusion and affect the understanding of wildfire permeates into public understanding of risk and how public interpret their surroundings in terms of their risk perception (McCaffrey 2008).

### Defensible space

The responsibility for making sure that defensible space is properly implemented and maintained often falls onto the homeowner and in some cases, community intermediaries. Often this is a result of agencies such as CDF lacking funding or staff to monitor individual treatments. Therefore it is important that intermediaries be well informed on the most effective ways to implement and sustain vegetation treatments so they can educate their community on proper methods. Further, if there is frequent communication with local agencies and fire professionals they can offer support such as monitoring vegetation treatments, providing information and expertise during implementation process, and possible funding opportunities.

Defensible space practices are very important to community wildfire preparedness (BOF 2006, Winter et al. 2009). Defensible space is one of the largest public outreach campaigns across California, and required by law in San Diego. In this study, agency informants felt that how defensible space was

implemented and maintained, was an important measure of how prepared a community is for wildfire. Despite the statewide campaign by CDF and the fires in 2003 and 2007, only a small percentage of homeowners have created adequate defensible space.

There is a wide range of the types of defensible space practices created from removing vegetation to bare ground like a fire line, removing vegetation and planting irrigated lawns, to xeri-scaping. As vegetation management practices should be site specific, for San Diego, it is important that vegetation be drought tolerant because of reoccurring water shortages, drought, and the fact that 80-90 % of San Diego's water is imported (San Diego County Water Quality website). Although xeri-scaping is widely accepted in San Diego, it has to be carefully planned and in some situations approved by local fire authorities.

Defensible space does not have to focus on vegetation removal. One community organizer illustrated that through collaboration and creative solutions fire protection can also enhance the native environment. After much persistence and permitting for lands beyond the MOU, he was able to restore the wetlands bordering his community to act as a defensible buffer against wildfire coming from the adjacent lots of openspace.

Defensible space as shown above is an important component of community wildfire preparedness. However, on a broad landscape level scale, there is still no common understanding of wildfire science and appropriate preparedness actions agreed upon by all stakeholders. There is still considerable debate between fire ecology experts,

San Diego County, and fire authorities and community organizations on the proper way to manage the ecosystem, fire, and human settlement.

### Environmental Impacts of Fuel Treatments

The environmental impacts of fuel treatments and the potential loss of ecosystem services have been absent in community wildfire literature until more recently, where it has been addressed in the fire ecology literature (Husari et al. 2006, Dicuss 2006) and social science literature (Potapchuk and Crocker 1999, Jakes et al 2000), but are not emphasized. What is highlighted, is the lack of evaluation of the effects of both small and large vegetation treatments in the short term and long term. This research substantiated the findings in the literature. The impacts of vegetation treatments were far less of a concern than anticipated. All the informants agreed that environmental impacts and environmental impact assessments (EIA) were important, but instead of addressing the question, most informants referred back to the MOU. The MOU allows 100 foot clearance of vegetation from built structures to mitigate fire risk without an EA. The MOU refers to local fire jurisdictions to manage vegetation as they see fit (MOU 1997). It was interesting that the two informants that most concerned with the environmental impacts of vegetation management were the outliers in the study. One felt that there were not enough restrictions on the fire safe councils and that there were too many treatments done by the community fire safe councils that were unmonitored. Many of these treatments he felt did not qualify to be exempt from an EA under the MOU. The other outlier was regarded as crazy and proving “misinformation” to the public.

Environmental impacts and fuel treatments become a complex issue in southern California because of the topography, climate, types of vegetation, and the position houses are built (Syphard, Clarke, and Franklin. (2007). This usually describes houses that are in or on top of canyons and hills which is characteristic of San Diego's WUI, and the communities in this study. Often, under these circumstances, 100 feet of defensible space will not provide much protection. This situation often creates a predicament for homeowners because the defensible space needed is beyond the 100 foot MOU.

### The Community Wildfire Protection Plan

When first identifying all aspects of the wildfire issue, the CWPP seemed to combine them all. Through HFRA, the CWPP provides a standardized framework for initiating a community-level collaborative process to identify key stakeholders as well as detect and prioritize areas for fuels treatment, to apply for federal funding, and to build community capacity (HFRA 2003, Sturtevant and McCaffrey 2006). Unfortunately, constructing a meaningful community wildfire protection plan is not as easy as the preformatted check box format available online (Jakes et al. 2009). In concert with many of the positive attributes to the creation of the CWPP, this study illustrated that the agency and fire managers' perspective on the CWPP directly reflected state ideals. Through agency perspective, the CWPP is an efficient way to facilitate vegetation management projects beyond the MOU, identify fire risk in a community that they (agency members) that they might not detect otherwise, and create a management plan that crosses public and private jurisdiction lines (Jakes et al. 2009).

A key idea of CWPPs is that effective protection from wildfire is embedded in landscape and community, where risk operates at a larger scale (Jakes et al. 2009). In past resource management policy, public involvement, according to Reich (1988) and Fischer (2003), attempts to educate, and presumes that the expert decision-maker needs to impart knowledge to a passively receptive public in order for the public to add meaningful contributions (Daniels and Walker 1996). The CWPP provides a strategic framework for the public to engage in meaningful involvement in the process and the outcome. Unfortunately, the meaningful engagement between the public, fire safe councils, and the agency members is not guaranteed.

Collaboration as mentioned by some informants and in the literature is not always a panacea for natural resource management issues (Cortner and Moote 1999, Wondolleck and Yaffee 2000), or for bridging community wildfire preparedness and conservation efforts (HFRA 2003). According to one fire safe council coordinator, “collaboration is messy, and [it cannot come about] in a prescribed way... sometimes you just want to do it yourself.” Often, plans are created by a subcommittee or hired consultants and although they may come out with a document that is functional as a CWPP, it may never reach its full potential as a collaborative management plan (Muñoz-Ericson, Aguilar-González, and Sisk 2007).

Collaboration not only is “messy” at times, but it proved to be a point of contention for fire safe council councils and county informants. Collaboration has come to have various definitions and objectives depending on the individual and their position of power and expertise (Cortner and Moote 1999, Shindler and Toman 2007). However

as illustrated in this study, two of the three fire safe councils interviewed felt that they did not have as much influence on community wildfire preparedness as agency members allude too. Two of the three fire safe councils felt unsupported and disregarded when their ideas veered from the prescribed path of community wildfire preparedness as described by HFRA or the CWPP.

A fire safe council informant noted that collaboration is an iterative process and that process takes time. She felt rushed by agency members and the County fire safe council to produce a CWPP for her community with very limited collaboration because of a deadline. To her, the process was greater than the plan. If there was not enough community input, she was afraid she would get blamed if the CWPP was not funded or if it did not reflect enough of the community's voice.

In instances where the public are given opportunities to actually be an integral part of community wildfire preparedness, through fire safe councils and the creation of CWPPs, in the case of this study, they have been very successful and creative with the creation of defensible space, wildfire preparedness and stronger community capacity. Often, what comes out of the collaboration process "may look completely different than what science dictates," because it is a product of the communities who do not have the same perspectives as scientists or professionals. One informant was able to restore native wetlands to act as defensible space and create habitat, another community created a neighborhood watch program that lowered the crime rate, and yet another was able to build relations between community homeowners and an inmate fire crew during a community sponsored chipping day. Lastly, when given a legitimate chance, CWPPs and

fire safe councils create the opportunity for communities to debate their future and generate a variety of desired outcomes and shared learning through wildfire preparedness.

### Brochures

The general normative argument that better-informed citizens can constructively contribute to decision-making holds true in this study (Fischer 2003, Kauffman et al. 2004, Wang and Wan Wart 2007). In order to maximize output and public exposure to wildfire mitigation actions, the agencies' preferred method of public outreach, illustrated in this study, was brochures distributed through the County fire safe council and community councils. A majority of the brochures analyzed in this study were available online on the sites of the three community councils or on the San Diego County fire safe council website. Brochures are a tangible way for agency, land managers, fire safe councils, and others to reach and inform a wide audience with little sacrifice of personal time. Once opened by reader, the brochures are short, concise, and easily accessible. For these reasons however, brochures are very limited and only as good as the information they provide.

Single source information such as brochures are like advertisements, they need to grab and engage the reader quickly and keep their interest as long as possible (Frascara 2004). In general 76% of the brochures in this study either utilized vibrant pictures of fire juxtaposed with a burning house or fear inducing words. The 24% of the brochures that did not use fear tactics were very simple and straight forward, such as how to create

defensible space, and another on how to get involved in the community's collaborative efforts (i.e. chipping days).

The main thrust of information in the brochures was centered on defensible space methods. It is one of the most tangible preparedness actions a homeowner can take. Although all brochures stressed vegetation removal, they described it in various ways: 56 % stressed the removal of dead and dry vegetation, 33 % stressed the importance of planning landscaping in terms of the plants used and spaced to reduce ladder and crown fuels, and 11% mentioned the need to remove all dead and dry vegetation up to 100 feet. How defensible space is described has important implications. One agency informant mentioned that there is a strong push away from using the word clearance, because vegetation should be modified rather than cleared.

What was surprising in the brochures was the lack of information about negative environmental implications for poorly executed defensible space. Only two of the brochures mentioned possible impacts of vegetation removal and only one brochure mentioned the positive effects of native plant use in defensible space landscaping techniques. There were no brochures or links to brochures on the three community websites for *xeri-scaping* at the time of this study.

In practice, brochures offered by community fire safe councils do not stand alone. When possible, Rancho Bernardo, Deer Springs and Lake Hodges offer "face to face" contact for their respective community. Therefore, it is important for community fire safe councils have up to date information and full support of agencies especially because they are the public interface when agencies are unable to provide enough staff for

outreach purposes (Fischer 2003). Two agency informants commented that there has been a tremendous increase in compliance in personal vegetation management since community fire safe councils began to promote it. The increase in compliance reinforces the important role that community fire safe councils play and as a result agency brochures and informational booklets should validate the fire safe councils role.

However, in the analysis of the defensible space brochures, there was little mention of collaboration or reference to contacting local organizations to share the cost of vegetation management treatments or knowledge with local wildfire preparedness groups. There is a dichotomy, one fire safe council coordinator suggested, between what agencies and authorities say the public can do and what they can actually do. This dichotomy permeates the literature and was encountered throughout this study both in my interviews and through information and action verbs in fire safe council brochures (i.e. the authorities do not have complete confidence in the fire safe councils to follow their guidance). Brochures and agency informants have the opportunity to reinforce collaboration and learning as well as to promote defensible space as a bridge between individual responsibilities to a community effort. This end could be achieved by just adding in one or two concise sentences in educational outreach material to prompt collective action and effective collaboration.

Further, brochures offered little information of possible adverse environmental effects if vegetation removal and defensible space are not implemented properly. Brochures also referred to native plants as brush and fuel, which relegates their importance to habitat resilience. Thus, it is important for the creator of the brochures to

acknowledge in a one sentence disclaimer adverse affects (i.e. loss of ecosystem services) of native plant removal.

Brochures can be used as a platform to promote understanding an inquiry of ecological processes and fire behavior, to help individuals and communities to take action in mitigating fire hazard, and to build community relations internally and externally with agency members (Shindler and Toman 2007).

## CONCLUSION

There are many factors that play into creating effective and sustainable collaborative wildfire management efforts and mitigating negative environmental effects. This thesis more narrowly explored the role of fire safe councils as community representatives and intermediaries in community wildfire management efforts. There is an abundance of literature on collaborative management in community wildfire preparedness and CWPPs, however, the majority focuses on how to get individuals involved in efforts, overcoming public complacency, and issues of trust (Shindler and Toman 2003, Lang, Nelson, and Jakes 2006, Sturtevant and McCaffery 2006, Ganz, Troy, and Saah 2007). There is little literature addressing fire safe council perspectives on collaborative fire management or much mention of environmental impact from fuel treatments in community fire literature.

As illustrated in this study, there are varying levels and perceptions of collaboration and trust built from the collaborative fire management process. All agency informants praised the community councils on their excellent work as intermediaries in helping the public understand their role in community wildfire preparedness and facilitating vegetation management plans that crossed public and private jurisdictions. Agency informants in San Diego essentially rely on community fire safe councils and the County fire safe council to be intermediaries because of the tremendous WUI, fire risk, and budget deficiencies.

Community fire safe councils perceptions of the collaborative process in community wildfire preparedness varied among the three councils interviewed. Two of

the three council representatives felt that although there was some collaboration with the agencies it was very limited and prescribed. This issue has likewise been identified in other research (Shindler et al. 2002). This feeling was reiterated in describing the challenges in trying to collaborate on a CWPP, and vegetation management plans beyond the 100 foot MOU.

To explore claims that there is an unequal collaborative relationship between fire safe councils and the agency groups, outreach materials on defensible space were analyzed. Generally brochures are created by the agencies and distributed by fire safe councils to homeowners. Few of the brochures mentioned contacting or collaborating with local fire safe council, community group, or neighbors to share information or financial burden of dealing with excess vegetation. The brochures mostly focused on what the individual homeowner must do to keep their house safe from wildfire.

Another factor in collaborative community wildfire preparedness both brought out in the brochures and in the interviews, was the lack of discussion about environmental impacts from fuel treatments. There is a debate in the literature on how different treatments can either affect natural fire regime or restore natural fire regime based on the native vegetation composition on the landscape. This issue is extremely controversial in San Diego among fire experts. However, the whole discussion is missing from the informational brochures. Only two of the six brochures analyzed mentioned getting an expert opinion before taking out large vegetation (i.e. trees). There was no explicit comment made linking poorly executed vegetation management with negative environmental impacts such as erosion or the invasion of non-native grasses (Beyers and

Keeley 2006). Even when questions were raised on the issue of combining both conservation efforts and wildfire preparedness, the answer from most informants was, that it already had been addressed through the MOU. There was no further discussion. Although, the MOU serves a very important purpose in allowing homeowners to remove vegetation from 100 feet, it does not challenge homeowners and agency members to be creative in their solutions to decreasing biodiversity and safety from wildfire in San Diego.

Conserving and restoring natural values such as biodiversity and enhancing community fire safety through collaboration can be achieved. As illustrated in this study by one fire safe council and one community organizer, both were able to creatively use their surrounding open space as defensible space while restoring the landscape to a more natural state.

Although collaboration does not work in all situations, there is a lot of potential in both the process and the outcome (Shindler et al. 1999, McCaffrey 2004). However, collaboration is not easy and often makes the process of creating and implementing management plans even harder. But, if the stakeholders can remain strong through the collaborative process, as illustrated by this study by Deer Springs fire safe council, it can be very beneficial to all stakeholders.

## FUTURE STUDIES AND RECOMMENDATIONS

A future study should focus on the CWPP process and how vegetation management and risk assessments are understood for each community at the local, state, and federal levels. There are varying understandings of how collaboration should be incorporated into management plans, and the degree of collaboration needed to create an effective plan.

Another study should more thoroughly explore (larger sample size) the various perspectives on fire regimes, restoration initiatives, and ultimate goals of both community wildfire preparedness and conservation efforts, in addition to how they can be achieved without diminishing each other. Currently, the polarized perspectives are causing personal strife among agencies and organizations that could be resolved if consensus and trust were built among all parties.

Lastly, a future study should conduct a spatial analysis of the distribution of funds for approved CWPPs, in relation to socio-demographics and fire history for either San Diego or all of California. Although the California fire safe council suggested that they do not discriminate against race or socio-economic status of a community, not all communities are equal in their ability to organize, collaborate, and write cohesive plans. It is important for statewide funding to be a balanced distribution to both large suburban centers and smaller rural councils (Everett and Fuller 2010).

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## APPENDIX A

Name:	Profession:
Educational Background	Fire Safe Council:

What is the management area your FSC feel responsible for?	
What are the geographic boundaries (i.e. watershed, mountain range) that define your membership?	

What are the primary causes of fire risk in your community?

1 being not a risk to 5 being primary risk ( numbers can be used more than once)

	Development Patterns	Fuel Loading on adj. Open space	Defensible space on Priv. property	Building Code enforcement	Topography Weather Patterns	Close proximity of native vegetation
Scripps Ranch		—	—	—	—	—

Risks not mentioned:

How would you rate your community's knowledge of:

1 being no knowledge to 5 being citizen expert      Explain (if significant):

Fire behavior? (i.e. how fire moves across landscape, fire regimes)		
Fire Effects on an environment? (Ecosystem regeneration, nutrient cycling)		
Does your FSC collaborate with other community groups or FSCs?		
1: not at all to 5: every week		

What actions does your agency advocate to encourage wildfire preparedness in terms of:

Community Action and outreach?	
Risk Reduction?	
Landscape methods?	
Habitat Preservation/ Environmental Review?	

What are the barriers that your agency faces in regards to community wildfire preparedness?	
What are the barriers that your agency faces in regards to fuel management and treatment?	

Has your agency worked with Fire Safe Councils to develop a Community Wildfire Protection Plan (CWPP)?	If yes continue, if no skip to last question
What is your agency's role in developing CWPP's with communities?	
Of the past FSC your agency has worked with has there been any common themes that have lead to success? <sup>1</sup>	

In your expert opinion, Have CWPP's been effective:

<sup>1</sup> Success defined as a collaborative process that lead to an implementation of state treatments

Rating: 1 not effective to 5: very effective, please elaborate if there are specific or significant reasons for your answer.

Building sustainable working relationships among communities and local, state and federal authorities?

12345 explain:

Building relationships within the community?

12345 explain:

Implementation of treatments?

12345 explain:

Working to establish other ways to create a fire safe community / build community capacity<sup>2</sup>?

12345 explain:

Do you have any other comments on the issues raised in this survey or anything else having to do with Community Wildfire Preparedness?

Would you like a copy of thesis results?

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<sup>2</sup> Community capacity: Defined by Lynn and Gerlitz (2005) through a study on wildfire and poverty in the western United States, is a community's ability to protect itself, respond to, and recover from wildfire...

## Appendix B

### Content Analysis of Brochures: Themes used.

Brochures	Creator	Attention Tactics	Main Points	Defensible space/ veg	Advocate	Consensus/ Collaboration	Environmental impact- Restoration	Ecosystem Health
Main brochure FSC	California Fire Safe Council	collaboration	empowering comm. To be fire safe	Fire safe landscape through planning, spacing and watering	education, collaboration, hardening of homes	some form mentioned 5x- including share and mobilize	no mention	ecosystem health
Defensible space you can do it!	California Fire Safe Council in partnership with State Farm Insurance	pictures of two houses one burned and one not	fire safe inside and out	remove all flammable veg 100ft (no def of flam veg)	defensible space and hardening of home	no mention	no mention	no mention
Defensible space	CDF <a href="http://www.fire.ca.gov">www.fire.ca.gov</a>	drawn picture of house with defensible space spheres	defensible space and noticing the little things	maintain by planning, cleaning and watering and maintained	cleaning and maintenance	no mention	making sure homeowners consult regulatory agencies	no mention
Homeowners checklist	CDF <a href="http://www.fire.ca.gov">www.fire.ca.gov</a>	drawn picture of well prepared house	defensible space inside and out	Remove 50 ft of flammable veg- and ladder fuels	house first and then defensible space	no mention	no mention	no mention
Fire Inside and out	CDF in partnership with CFSC <a href="http://www.firesafecouncil.org/education/insideoutfiresafesmall">http://www.firesafecouncil.org/education/insideoutfiresafesmall</a>	you are at risk- mentioned 4 times before resolution	make your house fire safe inside and outside	removal of dry grass, brush and dead leaf layer 30 ft	replace natives with ornamental fire resistant and tree spacing	no mention	no mention	no mention
Ready Set Go: 3 simple step	CALFIRE accessed through Lake Hodges FSC <a href="http://www.readyforwildfire.org/">http://www.readyforwildfire.org/</a>	pictures of burned cul-de-sacs	combination of defensible space and hardening	removal of dry grass, brush and dead leaf layer 30 ft	defensible space and hardening of home	no mention	no mention	no mention
100' defensible Space Make your Home fire safe		graphic of house with two zones of fire safe	100' defensible space it's the law	removal of dry grass, brush and dead leaf layer 30 ft	defensible space 30' 70'	no mention	no mention	no mention
Fire Scaping	Accessed on Lake Hodges website- Created by Nevada Cooperative Extension	house on the hill CDF	Creating an aesthetically pleasing and functional landscape while being Fire safe	Fire safe landscape through planning, spacing and watering	intentional placement of driveways and walkways- clearance effective fuel break but not recommended	no mention	no mention of drought tolerance of native species	native plants have habitat value