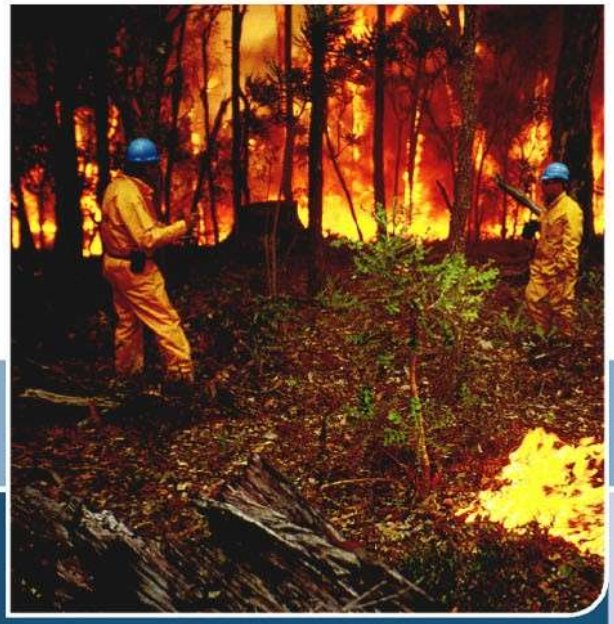
THE JOINT FORCES OF CSIRO & SCION

ensis



FOREST BIOSECURITY AND PROTECTION

Protecting our forests

Wildfires and Communities: International Perspectives

Helen Bones

CSIRO SCION

THE JOINT FORCES OF CSIRO & SCION

Client Report No. 15564

Wildfires and communities: International Perspectives

Helen Bones

Edited and supervised by
E.R. (Lisa) Langer

Date: March 2005
Client: Foundation for Research, Science and Technology
Contract No: C04X0403

THE JOINT FORCES OF CSIRO & SCION

ensis

ACKNOWLEDGEMENTS

This was a Social Science Research Centre Summer Studentship at the University of Canterbury (2004-2005), and supervised by the Bushfire Research Group, November 2004 - February 2005..

Funding by the Foundation for Research, Science and Technology (Rural Fire Programme COX0403), and New Zealand rural fire sector stakeholders (National Rural Fire Authority, New Zealand Forest Owners' Association, Department of Conservation, New Zealand Defence Force, Territorial and Local Authorities) is gratefully acknowledged.

Assistance provided by Stuart Anderson and Grant Pearce (Ensis, Bushfire Research Group), in accessing and interpreting technical fire information, and by Margaret Richardson (Scion, Rotorua), in editing the report is appreciated.

Additional copies of this publication are available from:

Bushfire Research Group
Ensis Forest Biosecurity and Protection
Forestry Road, University of Canterbury
P. O. Box 29 237
Christchurch 8540
New Zealand

Phone: +64 03 364 2949

Bones, H. 2007. Wildfires and communities: International perspectives. Ensis Forest Biosecurity and Protection, Scion, Bushfire Research Group, Christchurch. Ensis Contract Report No. 12562. 40 pgs. [Output No. 41718].

ensis

EXECUTIVE SUMMARY

This report summarises international perspectives on community resilience to, and recovery from, wildfires. While wildfire is not a natural part of New Zealand's ecosystems, most of these findings are relevant to the wildfire problem in New Zealand, particularly those relating to communities living on the urban fringe.

Since the 1990s, the social impact of wildfire has been studied in some detail, particularly in the United States. A common approach is to apply research on disasters in general to the specific case of wildfire. This report contains a review of the literature available on both disasters and wildfires and their impacts on communities. This review provides background information for the Ensis Bushfire Research programme (Ensis is a joint venture between CSIRO and Scion).

The main issues surrounding the impacts of wildfire disasters on communities are summarised below:

- Natural wildfire occurrence and balance has been interrupted in many countries, leading to an increase in catastrophic wildfires. This is the result of:
    - Policies of suppression now seen by fire managers as being misguided.
    - Increased population on the edge of wildland areas (i.e. the wildland-urban interface.)
    - Poverty forcing unsafe uses of land in developing countries.

- There is general debate around whether disasters cause social change or not. All disasters have short and long-term impacts, and wildfires are no exception. The main impacts have been documented as being:
    - Personal losses ranging from possessions with sentimental value, to the extreme impact of losing a loved-one.
    - Economic loss, both community-wide and personal.
    - Conflict, due to blame regarding responsibility for the disaster or damage caused, insurance issues, etc.
    - Residential dislocation or disruption of normal routine.
    - Trauma due to the decision to evacuate and the process of evacuation.
    - Emotional trauma, or Post-Traumatic Stress Disorder, which can result from any of the above.
    - Positive effects, from influx of aid into communities and increased focus on the need for mitigation.

- The effects on communities are mediated by various social forces :
    - Personal perceptions of fire and fire suppression techniques, largely influenced by the media, can greatly affect reactions to wildfire events.
    - The philosophical perception of disasters and their causes are also important; for example, a fatalistic approach to wildfire means less mitigation and harsher effects.
    - The level of vulnerability (size, poverty level, etc.) is proportional to the amount of damage a community will suffer.

- The effects of wildfire can be worsened by cognitive clashes between communities and fire agencies. Solutions offered are transparency in agency actions, community involvement and better relations between agencies.

- Community involvement in wildfire mitigation is seen to be the most important method of reducing impact on communities. A more effective mitigation is achieved, and self-involvement in preparedness leads to a lower level of trauma.

ensis

TABLE OF CONTENTS

1. INTRODUCTION

The social impact of wildfires on communities is beginning to be studied more comprehensively in the United States. As shown in this report, many academics begin addressing this issue by considering literature related to research on the impacts of disasters in general, and then drawing conclusions from this with regard to wildfires. This report is the result of a review of both disaster and wildfire literature, in an attempt to understand what has been concluded up until now about wildfires and their impacts. In addition, first-hand accounts of wildfire experiences and internet sites for survivors were included in the search as important primary resources.

A similar paper by Laura Kelly (2005) examines community recovery in Australasia, whilst this report extends to the rest of the world. The first section examines the problems facing communities where wildfire is an issue. General areas of debate on disaster impacts are then outlined and this discussion is linked to wildfires and their effects. These effects include financial loss both personally and throughout the community, other kinds of personal loss and the damaging conflicts that can arise.

To understand fully the complex ways in which societies interact with fire, the ways in which people view the world around them must be considered. The effects on communities are mediated by various social forces (including personal perceptions, which are affected by our environment and the media) and vulnerability to disaster. Taking all these social forces into account, many authors suggest the need for a wider viewpoint to be adopted. This involves seeing the community as part of a wider ecosystem and the community members as personally involved in their own mitigation and effective recovery efforts. Many pieces of literature point to the importance of community involvement and stop there. Others go so far as to assert that community involvement in prevention and mitigation is the most important factor in improving community resilience and reducing negative impacts of wildfires.

The vast majority of international research on social impacts of wildfires centres on the United States. Though wildfire is a significant problem in Canada, Europe, Africa and Asia, the US will be the focus of this review.

Finally, possible relevance and implications for future New Zealand study are discussed.

2. PROBLEMS AND RESEARCH APPROACH

2.1 Communities Interacting With Fire: Why is there a Problem?

2.1.1 Traditional Methods versus Imported Views

The problem with wildfire in America has been exacerbated largely by misplaced management tactics and irrelevant views of fire imported from totally different climates. This has led to a clash between differing cultural perceptions of fire and fire danger. American Indians possessed specialised knowledge of useful methods of

burning that Europeans did not. According to W. Jackson (2003) there is historical evidence for aboriginal-type fire use actually being helpful in sustaining the savannas.

Recent research has shown that fires are essential to forest ecosystems in America, as they “return nitrogen to the soil, an essential link in the nitrogen cycle, thereby encouraging flora rejuvenation” (Weisshaupt 2004). The methods used by indigenous people were effective because of their similarity to the natural occurrence of fire, which they simply controlled for their own purposes.

European culture does not see wildfire as a resource and tends to view it as a threat. Because they treat it as a menacing force, the threat is realised (Moore 2000). Previously in Northern America, wildfires would occur naturally in forests, having a “cleansing effect”, “clearing out thick stands of trees and consuming weakened or dead vegetation” (Teague 1991). This was disrupted by early unsustainable interference with the forest. Settlement meant extensive forest clearing and logging, leaving everything else behind as readily available fuel.

It was most likely this poor use of land that led to such disasters as the Peshtigo fire in 1871, the worst fire disaster in U.S. history, with a death toll of 1,200. Nonetheless, this and the 1910 Idaho fire in which 78 fire fighters died, resulted in a policy of suppression of all fires (Babbitt & Glickman 2001). Pyne (2001) discusses how the 1910 US fires led to changes in policy. By 1930 federal policy stated that all fires had to be put out by 10:00 a.m. the next day (Vaughan 2003). This approach worked initially, but over the years, a build-up of vegetation and fuel meant that huge, catastrophic fires resulted. It is only since the 1970s that fire managers have begun to realise that a return to more natural cycles is necessary.

2.1.2 Other Areas of the World

In many other countries, usually those known as ‘developing’ countries such as India and Indonesia, the problem with wildfire is more difficult to deal with. In these countries, traditional relationships and techniques for managing fire have also been disrupted, but for less easily addressed reasons. A changing economic base in many countries means that the previous equilibrium with fire has ceased to function. According to the Food and Agriculture Organisation, quoted by Jackson (2003), wildfire is on the increase as poverty forces residents of these areas to turn more and more to unsustainable land use. In places where communities rely on forested areas for their livelihood, fire is often used as a tool to clear land. As a result, the number of wildfires increases, causing even more hardship and aggravating the problem further (Chokkalingam and Suyanto 2004).

These human-caused fires have underlying causes: “perverse economic incentives, inequitable land tenure and access to resources, failure to enforce the rule of law and to recognise and respect customary law, lack of economic opportunities, weak or under-resourced government institutions and inappropriate land-use”. Governments fail to recognise these causal factors and tend towards policies addressing suppression only. In addition, extreme population pressure means people are allowed to settle in obviously fire-prone places (Jackson 2003). People who are poor are more vulnerable to the effects of disaster, but are also more likely to take risks that jeopardise their wellbeing for short-term gains.

2.1.3 Issues of the Wildland-Urban Interface

In stark contrast to developing countries, the people most affected by wildfires in Western countries are those wealthy enough to live in the most desirable areas. Increasing numbers of people are fleeing the crowded environment of cities and moving to sought-after properties near forests: the area known as the wildland-urban interface. This is a phenomenon in many countries in Europe and Australasia as well as the USA and Canada.

Dan Bailey supports this trend with US census data from 1970 to 1988. During this period there was a population increase of twenty-three percent around wildland areas, as opposed to an eleven percent increase nation-wide (Bailey 1991). Because of this residential spread, fire is an issue that has to be dealt with by many more people on a personal level, and often people that have never had any contact with it before. Building close to wildland areas increases risk because many houses are in close proximity to wildland fuels. If houses are highly ignitable, as is likely with new residents unaccustomed to fire danger, then this can lead to many houses being destroyed at once (Cohen 2000). At the same time, these recent arrivals are less likely to have the local knowledge and skills required to deal with a wildfire emergency, so are at a greater risk of the fire having a severe impact (Butry, 2001a).

Long-time residents are more adapted to living with fire than new arrivals who are generally more alienated from nature and ill equipped to live with it. In a study on the victims of the Bitterroot fires in Western Montana in 2000 new residents seemed "more astonished by and outspoken about the fires and were frustrated by the lack of 911 services" (Halvorson 2002). The unique situation in the wildland-urban interface is that people expect the same services available in a city, as they still live within easy distance of one. In reality, however, a fire truck will not be available to defend each house (Arrowood 2003). Therefore, the impetus for wildfire protection has to come from the individuals themselves.

The new phenomenon of the wildland-urban interface fire is made worse by the increase in visitors to the forests who create more opportunities for fires to be lit, for example by lighting a barbecue (Cortner and Gale 1990). This leads to fire-fighting resources being overstretched. In addition, rural firefighters are not necessarily trained to fight structural fires, and vice versa (McCool et al. 2003) (US Fire Administration, 2002).

There are increased problems with the multiple jurisdictions of firefighting teams, and access to more densely populated areas and water supply. Negative effects on firefighter health are increased by wildland-urban interface fires, as the respiratory systems used in structural fire-fighting (self-contained breathing apparatus) are not very useful for wildfires. After the Oakland/Berkeley fire that killed 25 people in California in 1991 it was noted that "the combination of long and arduous work hours, dehydration, respiratory tract irritation, and low-level carbon monoxide exposure took its toll on many of the firefighters" (Shusterman, Kaplan and Canabarro 1993).

The wildland-urban interface problem is not confined to Northern America, though this accounts for the vast majority of literature on the subject. Gavril Xanthopoulos (1987) describes similar problems in Greece, and it is an increasing issue in New Zealand and Australia. In Australasia, large sections or small farms encroach on rural land around cities (for example, Sydney basin, Australia).

2.2 Research Approach

2.2.1 Social Change?

The Effect of Disasters on Communities: The History of the Debate

The study of wildfire impacts on communities and possibilities for aiding recovery is an increasing focus for sociologists, especially in the United States. In general, the technique involves reviewing the large volume of disaster research that has been carried out in America and elsewhere and then drawing conclusions about wildfires from this to base their studies on. One of the main goals of disaster research, according to Dennis Mileti (1987), is "to enhance the ability of society to respond to emergencies in ways that lessen the costs and losses imposed by disasters when they occur". This is similar to that of organisations interested specifically in wildfire like the Ensis Bushfire Research programme.

Most disaster research available begins by referring to the work of Samuel Prince from 1920 (Nigg and Tierney 1993), who supposedly was the first person to study disasters from a social perspective and conclude that they caused major social change. The body of literature following Prince's fundamental work tends to identify three schools of thought on the question of social change following disaster:

1. No significant long term change results, as the disaster has little effect beyond the immediate disruption, attributed to the likes of, Friesema et al. (1979) and Rossi and J. D. Wright et al. (1979, 1983).
2. No innovation of change, just the acceleration or deceleration of change that is already happening, favoured by Bates and Peacock (1987), and Oliver-Smith (1990).
3. Major change, asserted by Prince (1920).

The thesis that any change resulting from the disaster is only temporary is maintained by the argument that will be raised later. This argument states that after a disaster there is an initial burst of social cohesion and mutual cooperation amongst the victims, but this is short-lived and soon gives way to tensions and conflict. Friesema et al. (1979) argue that the 'only temporary' idea is especially true in the US because any effects on communities are absorbed by the larger systems (Nigg and Tierney 1993).

Disasters are special cases and the basis for interesting sociological observations because of the unique 'zero points' (aftermath of destruction) that they bring about (Cavalli 1986). A zero point is a unique opportunity for change as in many cases infrastructure has been destroyed and the only possible solution is to entirely rebuild it. The usual difficulties in implementing change that communities experience because of the weight of tradition are suspended at these zero points, represented by the way people tend to measure time as 'before' and 'after' the disaster. In testing Bates and Peacock's theories on Hurricane Andrew's effect on Miami in 1992, Morrow encounters this point. People described feeling that nothing was the same 'after Andrew' as 'before Andrew' (Morrow and Peacock 1997). Therefore, the exceptional circumstances in a disaster act as turning points for change (Cavalli 1986).

It seems unlikely that a large disaster would not cause any permanent social change, as exponents of that view would have us believe. Drabek and Hoetmer (1991) are very critical of the methodology used by Wright and Friesema to draw conclusions,

and they cite Bolin and Rubin as authors of studies that came to the opposite conclusion. The reason for disagreement is that many variables have to be taken into account and, most importantly, the concept of 'disaster' has not been clearly defined (Morrow and Peacock 1997). Very small calamitous happenings that only affect a few people probably cause no large-scale social change. Most academics facing this problem decide that a disaster is something that must affect a large portion of a community and overwhelm the resources. This then allows 'collective stress' to build up (collective stress is Barton's term for the effects of disasters and is the result of "large aggregation of individual trauma and the effect of actual physical removal of social resources" (Barton 1969)). This collective stress may have a lasting impact. If only a small section of a community is impacted, then cultural and social structures are not impacted (ibid and Bates and Peacock 1987).

Wildfires often overwhelm small rural communities and therefore the effects must be serious enough to be classed as disasters. Even if 'collective stress' does not result, individual stress is still something that needs to be addressed.

As much of the disaster literature available focuses on American society, a somewhat skewed view results. Nigg and Tierney (1993) state that disasters are well-handled in the US because they employ civil response units instead of the military. This means that professional emergency managers are on hand to preside over a well-coordinated, planned response. In other countries, the impact can be much greater, and studies on the effects of a major disaster on developing countries show that development can be impeded. This tends to imply that social resilience is only important in countries that are already suffering, but there are people vulnerable to disaster in every society.

2.2.2 Disasters and Wildfire Impacts: Justification for Research

A number of people in the United States are beginning to apply disaster theory to wildfires in order to understand them better in terms of sociology. In general, the scientific and preventative aspects of wildfires have received much attention. While there are circumstances that are unique to wildfire, it is also true that they exhibit most (if not all) of the aspects of any, more widely studied, disaster. The work of US social scientists Yoshitaka Kumagai, Matthew S Carroll and Patricia Cohn (Kumagai, Carroll and Cohn 2004b) and Sarah McCaffrey (2004) employs this approach. Following are statements that support the need for more research in wildfire impacts. In the next section, disaster and wildfire research are discussed jointly.

"It is self-evident that more money should be devoted to community-scale fire research and that presumably we should get some portion of it" (Carroll and Daniels 2003).

"Fires can cause impacts as damaging as other natural disasters, such as threats to mortal harm or the destruction of property, yet there is far less research on wildfire recovery than other types of disasters" (Burchfield 2004).

"Communities are involved in complicated trajectories, therefore "longitudinal" studies of communities are needed in order to study fire impacts, and none have been done" (Carroll and Daniels 2003).

"Questions related to wildland fire management and communities are significant because the risks associated with the fire event are large; our knowledge of the potential or actual impacts wildland fire on a community, before, during, and after the

event is incomplete; and the capacity of communities to deal with these impacts is limited” (Jakes and Nelson 2004).

“The human community impacts of wildland fire is an understudied area” (Kumagai, Carroll and Cohn 2004b).

"Recovery is perhaps the most overlooked aspect of living with wildfires, both from a practical and emotional standpoint" (Arrowood 2003).

3. WILDFIRE IMPACTS

3.1 Loss

3.1.1 Community-Wide Economic Loss:

The disaster research of Bates and Peacock (1987) documents community-wide economic impacts resulting from a general loss of production both during a disaster and the disruptive period following it. If lives are lost, then a certain amount of productive capacity is also lost. Productivity is interrupted during a disaster and subsequent reconstruction, and then resumed in a stunted form due to the psychological states of employees. Regular production is interrupted by the sudden need to build many times more houses than would normally be needed, and resources being stretched in terms of workers and materials (Bates and Peacock 1987).

After a wildfire disaster there is the possibility of communities facing suppression costs, disaster relief expenditure, timber losses, property damage, tourism-related losses, and human health effects (Butry, 2001a). After the Hayman fire near Denver, Colorado in 2002 a case study noted: “Some of the immediate impacts that are relatively easy to tally up include the destruction of 132 residences, one commercial building, and 466 outbuildings; estimated suppression costs of $39,100,000; and numerous resources threatened including communities, subdivisions, isolated homes, gas transmission lines, electrical facilities and lines, timber, the major watershed for Denver County and recreation areas” (Kent et al. 2003). These represent a loss of resources for the community that must be replaced before normal functioning can resume. Kent et al. (2003) also identify economic impacts in the form of reduced property values and property tax revenues, though there is debate over whether these are long-lasting enough to be important. There are numerous flow-on effects from wildfires, such as increased water treatment costs and long-term health costs, and as Kent’s study found it is very difficult to take all of these factors into account.

3.1.2 Personal Loss

The economic impact on the community is often absorbed to some extent in larger infrastructures, or even mitigated in the form of government aid. However, personal loss is a far greater cause of stress among residents. Loss of life is the greatest impact that can be experienced. This seems to be so obvious that most researchers do not spend much time addressing it. Loss of pets, and the knowledge that they

suffered can be just as devastating as the loss of a family member. In the Bitterroot fires of 2000 it was later reported that “concern for animals equalled that for humans” (Bitterroot National Forest 2000).

Aside from the financial impact of the physical destruction of a home, the loss of personal, irreplaceable mementos can be very disturbing (Bolin 1982). Sandra Mendez describes a man involved in the Wenatchee National Forest fires in Washington in 1994 as being more worried about trees that he and his wife planted than his house which could be rebuilt (Mendez et al. 2003). Wildfires differ from disasters such as floods in that the total destruction of houses is common, leaving no chance to salvage anything at all (Cohen 2000). Aesthetic values are very difficult to replace (Bitterroot National Forest 2000). The destruction of the landscape, often in areas that are valued precisely for this, can be a constant reminder of the disaster and the hardships that follow and can hinder recovery (Ring 2003). The sense of loss is often emphasised by the blackened trees and impaired scenery, affecting quality of life (Clark and Simons 2001). People also do not want to lose trees from near their houses. Even when threatened by fire, removing them made one owner feel like a “butcher” (Shorb 2002).

Losing important assets such as a car can be an immediate obstacle to recovery (Bolin 1982). In addition, financial stress exacerbates effects and impedes recovery. Kirp (1997) describes the easy recovery of people who received complete reimbursement from the Oakland/Berkeley disaster. The opposite is also true. Insurance, or lack of it, can add another dimension to the impact of a fire disaster. One homeowner affected by the Oakland/Berkeley fire reported feeling initially quite spiritually uplifted by the “Zen-like loss of material possessions”. However, on receiving the insurance money she found it difficult to cope with the disaster (Kirp 1997). Numerous issues surrounding insurance means that many people are not really as prepared for a disaster as they may think, providing an even more upsetting and shocking realisation for them at the worst possible time. Many steps need to be taken before and after a disaster to ensure adequate coverage (Arrowood 2003), and there are many opportunities for insurance companies to dispute claims. Many Americans are not insured for major disasters, as they think that FEMA (the Federal Emergency Management Agency; the organisation that deals with disasters and provides aid) will provide cover for them. In fact, financial aid from FEMA is actually quite limited and is usually provided in the form of a loan (Mileti 1999).

3.2 Conflict

A major area of concern in response to wildfires is the tendency for societies to become engaged in damaging conflict in the aftermath of the fire. This is related to an area of debate in disaster research which centres on the question of whether communities act cohesively or conflictingly after a disaster. It seems that often the immediate response is the ‘bonding together’ of afflicted people in order to help one another in the initial emergency phase. Natural disasters can, according to Freudenburg and Jones (1991, quoted in Nigg and Tierney), lead to the creation of “therapeutic communities”. A therapeutic community is defined as one usually united in the battle against a common enemy providing support and continuity between pre and post disaster conditions (Nigg and Tierney 1993). There are always instances where fires are seen as completely unifying. After the Santa Barbara fire residents reflected on the positive outcomes from the fire, saying: “This has been the best part of the fire. The fences came down and we became friends” (Myers 1994, quoting Malcolm 1991).

However, many studies have reported that this initial positive reaction within a stricken community is only temporary and soon gives way to a conflict (Nigg and Tierney 1993). Although Nigg and Tierney (1993) argue that blame is possible in any disaster, corrosive communities are usually resultant from a disaster situation where issues of blame or human error are present. This is more common to technological hazards than natural disasters, as natural disasters are perceived as being beyond mortal control. In a study of the impact of Hurricane Floyd in 1999 on North Carolina, Moore (et al. 2004) quotes a survivor as saying: "people get along better ... they can talk to each other ... People who hadn't talked before, they talk now, a lot closer". They go on to state, however, that this condition did not continue after the immediate response period. After an earthquake and tsunami in Alaska in 1964 “intense altruism, eagerness to participate in repair and reconstruction, and a revival of neighbourhood spirit” was fairly soon replaced by a state where “annoyance over the long-term effects of the disaster are realised, and discontent, criticism and complaints become prevalent” (Davis 1996). The recent catastrophic tsunami that hit the coasts of Asia in 2005 resulted in a temporary truce between Tamil Tiger rebel fighters and the Janatha Vimukthi Peramuna (JVP) party in Sri Lanka. It is unlikely many were naïve enough to see this as a permanent arrangement, with fractures appearing quite soon after the disaster. Furthermore, Nigg and Tierney (1993) raise the point that the most vulnerable of people, minority groups and the elderly, may not have access to this initial burst of community spirit anyway.

While natural disasters can act as a cohesive force for a community, as they are beyond human control and represent a common enemy, technological disasters often have a divisive effect, leading to blame and conflict. Viola Mecke’s study reports that “man induced disasters are considered more harmful in their psychological effects than “natural” disasters” (Mecke 1997). There is a natural tendency for humans to search for an explanation for devastation by a disaster that is not a random or natural one (Kumagai et al. 2004a). Carroll and Cohn deal extensively with the social psychological reasons for blame and conflict in their study of the Rodeo-Chediski Fire of 2002 in Arizona (Carroll and Cohn, 2004). If there is seen to be a responsible party, then pursuit of some sort of ‘pay-back’ will probably result. This is totally non-constructive, as the effects of wildfires are caused by more than just the wildfire itself.

Assigning blame for a technological hazard often means initial bonds soon disintegrate into conflict. In the case of wildfire, it seems more likely that conflict and the creation of ‘corrosive’ rather than ‘therapeutic’ communities will result. In the towns of Entiat and Leavenworth (studied by Mendez after the Wenatchee National Forest fire in the Cascade Mountains of Washington State), blaming the Forest Service for not taking appropriate measures to control the fire led to “further antagonism”, replacing the initial bonds that had developed (Mendez et al. 2003, p. 69). Usually the most obvious “last line of defence” is blamed, and this is often the land managers. In reality, it is difficult to pinpoint the actual source of blame, as many factors are involved. Examples such as the Rodeo-Chediski fire illustrate the divisive nature of wildfires (Kumagai, Carroll and Cohn 2004b). The wildland-urban interface problem also increases the possibility of conflict as newer residents expect higher levels of response and are outraged when it does not eventuate. Because of their divisive nature, technological disasters result in the biggest social changes, either in the form of unification or opposition about the cause of the disaster (Nigg and Tierney 1993). Blaming processes may be the cause of documented “lowered levels of community attachment, satisfaction with life in the community, and trust in government” (Nigg and Tierney 1993).

The allocation of response can lead to arguments, often in the form of insurance disputes or arguments over aid provided by the government or other agencies. There

is the possibility of conflict between neighbours, if, for example, one received a larger payment than the other (Kirp 1997). In the case of the 1991 Oakland/Berkeley fire the initial united front which had people "banding together, in groups with acronyms like FIRE and MIFFED, to negotiate bigger settlements" soon gave way to antagonism. Once cheques were received, residents quickly lost interest in the project (Kirp 1997). Furthermore, others readily consented to payouts on the condition that they did not tell their neighbours (ibid). Whether the lack of insurance is due to the residents' inattention to detail or the insurance company's refusal to pay out, conflicts emerge. A year after the West Melton fire in Canterbury, New Zealand, these matters still had not been settled (Courtney 2004). This is true for many cases (Anonymous 2004a).

Controversy and arguments following a wildfire can only add to the existing intense stress within a community and hinder its recovery. Litigation attempts against those perceived to be responsible may seem like a solution to angry victims, but really achieve nothing but strife. Strasburger explains the problem very well when he says: "There is an inherent irony in the judicial system in that individuals who bring suit may endure injury from the very process through which they seek redress. The legal process itself is often a trauma" (Picou et al. 2004). A loss of trust in authorities can result if they are believed to be responsible and their credibility is brought into question. According to Picou (et al. 2004), this "contributes to a pattern of long-term psychological stress and perceived damage to the community". Viola Mecke, a clinical psychologist, was called upon after the Pebble Beach fire to assess the trauma levels of victims as part of a lawsuit that was brought against those responsible. Nowhere does she consider the possibility that the process she was involved in may have contributed to their trauma. Rue Bucher's article is an interesting survey of the reasons for blame after disasters (Bucher 1957). Bucher disputes the assumptions of her predecessors that assigning blame is a necessary but irrational consequence of experiencing a disaster (these earlier approaches are discussed in a previous survey: Bucher 1954). She finds that blame is common after a disaster but only when certain factors are present to cause it. It is when a disaster is seen to be preventable, and natural or conventional explanations fail, the need for blame is felt. A hopeless situation, where a catastrophe is seen to be caused by an 'act of God' or the weather, can be accepted without the need for blame.

3.3 Residential Dislocation and Disruption of Routine

A disaster invariably leads to homes being destroyed and their occupants being forced to find temporary accommodation. Bolin (1982) discusses several aspects of this that cause strain on disaster victims. The dislocation can last for an extended period of time, even years, while permanent housing is being rebuilt. It is a very stressful process, often exacerbated by a certain lack of privacy. It is possible for entire communities to be relocated, causing huge disruption (Nigg and Tierney 1993). Dislocation can change patterns of interaction and lead to conflict. If the temporary relocation becomes permanent, this can impede the recovery process. After the Buffalo Creek flood in 1972 residents were quickly placed in mobile housing. While this was good short-term policy, no attempt was made to recreate neighbourhood or family groups. This had the effect of "stabilis[ing] one of the worst forms of disorganisation resulting from a disaster by catching people in a moment of extreme dislocation and freezing them there in a kind of holding pattern". For more than two years Buffalo Creek was "in a kind of suspension" (Erikson 1979).
Further disruption can come from closure of, or restricted access to community facilities (McCool et al. 2003). The fire recovery efforts can also have an impact. In

Entiat (a town affected by the Wenatchee National Forest fire, in Washington State) the once-peaceful valley was filled with heavy machinery and equipment, meaning a lack of privacy and continued stress (Mendez et al. 2003).

3.4 Evacuation

Evacuation is a traumatic process in itself and the issues surrounding it lead to potential impacts on individuals. McCool's 'knowledge synthesis' on communities and wildland fire asserts that "a better understanding of evacuation and impacts would help mitigate impacts of evacuation actions and potentially improve relationships between the community and public safety institutions" (McCool et al. 2003). Evacuation from wildfire introduces a new aspect to the issue. There is an element of choice that is not present in other disasters, since staying behind to defend one's property is possible (Mendez et al. 2003). It is argued that staying to defend a property is beneficial to the owner's wellbeing after the fire, as they were in control of the situation and did everything they could to save the property. Fiercely independent people want to stay and defend their property. Candace Boyle, a fire survivor, said: "The most difficult part of any of the fires that have surrounded us has been not being there, the uncertainty, helplessness and lack of accurate information about the exact movement of the fire" (Arrowood 2003).

After the Bitterroot Fires people expressed the sentiment that living near a fire-prone area is "a risk you take" and wildfire danger part of "the natural order of things" (Bitterroot National Forest 2000). Though the authorities tend to err on the side of caution and favour evacuation, it is argued that staying can be a better idea, as it is possible to save houses and they offer much better protection than a car (Fogarty 1996; Alexander 2000). Otherwise, the effects can be traumatic, especially for children who have to be part of heart-wrenching decisions about which possessions to rescue and the possibility of having to leave pets behind (Madigan 2003), (Mendez et al. 2003). Cova and Johnson (2002) have attempted to discover the most effective form of evacuation by creating an evacuation simulation. Their aim is to avoid disasters like the Oakland/Berkeley fire where 23 people died fleeing in their cars. Fire policy in America tends towards the enforced evacuation of threatened residents, but the issues surrounding evacuation are evidently more complex than this attitude addresses. Whereas in Australia the policy is either to leave early or stay and defend (covered in Kelly 2005).

3.5 Environmental Effects

Aside from the scenic devastation that wildfires cause, and the economic effects of destruction, there are further threats to health and property from wildfires. Large, intense wildfires can cause the soil to become hydrophobic, and then it repels "thunderstorm rains like a tin roof" (Lynch 2004). This results in the possibility of severe flash-flooding. After the Buffalo Creek fire in May 1996 in Denver, the floods were remembered as having much more impact than the fires. Just one and a half months after the fire, "flash floods swept ash, buildings, trees and propane gas tanks into the Strontia Springs Reservoir, part of Denver's drinking-water supply. To extract trees and debris from the reservoir cost $900,000" (Pelgar 2000). In many countries the smoke from large fires can cause respiratory problems. In countries like Indonesia the large number of wildfires results in a constant haze. Higgins and Tilley (1997) state that the haze covered not just Indonesia but also "neighbouring countries comprising Malaysia, Singapore, Thailand, Brunei and the Philippines".

This is an enormous problem, but even in more isolated fires like the Bitterroot Valley fire the smoke prevented people from going outside for several days (Halvorson 2002).

3.6 Post-Traumatic Stress Disorder and Disasters

It is widely believed that all of the above impacts of disasters (economic loss, personal loss, conflict, dislocation, disruption and the devastation of natural surroundings) contribute in some way to symptoms of Post-Traumatic Stress Disorder (PTSD) among survivors. One study that addresses this concerns the effects of the eruption of Mount Lamington in the northern region of Papua. The author quotes an earlier account of the people of the area as being “gentle and harmonious”. He then describes recent experience (post-eruption) of them, saying they are now “highly excitable” with “rapidly inflamed tempers” (Belshaw 1951).

Various studies have been carried out to investigate the truth of this matter in terms of wildfires. Viola Mecke (1997) has assessed the instance of PTSD among survivors of the Pebble Beach fire of 1987 in California in view of a related law suit against those responsible. The study provides evidence of the temperament of disaster-affected communities changing after the disaster, and reinforces the previous point that technological disasters produce the most harmful effects. Perceptual Orientation is tested (among other things): “It was assumed that the fire victims would suffer a distortion of their view of everyday contingencies because of their experience with the fire, its unpredictability and their unpreparedness for such a disaster; this would sharpen their sensitivity to possible dangers around them”. They found that this disaster, which was one of “overpowering suddenness” “had a severely disruptive impact upon its victims’ ability to process reality experiences”. This “corroborates the hypothesis that they now experience difficulties in making appropriate responses, especially under stress” (Mecke 1997). A study of the Baldwin Hills fire in Los Angeles in 1985 led to the reporting of “various mental health problems including “jumpiness”, sleep disturbance, trouble concentrating general lethargy and loss of appetite. Greater effects were found for those who actually lost homes” (McCool et al. 2003, quoting Maida et al. 1989). Emotional triggers cause occasions where the traumatic effects of disasters are more readily displayed. These can be anniversaries of the disaster, as symptoms of fear and anxiety that begin to recede after the disaster are reawakened around the anniversary (Myers 1994). A more frequent trigger is the recurrence of conditions that led to the disaster, such as the effect rain and storms have on flood survivors. Wilbur, a survivor of the Buffalo Creek flood is quoted as saying: “every time it rains, every time it floods, I just can't take it. I walk the floor. I get so nervous I break out in a rash” (Erikson 1979).

Evacuation and dislocation after a disaster can heighten these effects, especially in vulnerable people like the elderly. Burchfield (2004), quoting Crause, says that in one instance PTSD was higher among “those residents that had been warned to be evacuated but remained in a state of uncertainty during the fire event, with those being evacuated having the assurance of their immediate safety and the predictability of their near term situation during the fire event”. According to McCool (et al. 2003) “Carroll and Cohn (2003) and Graham (2002) cited the opinions of local health officials and local community leaders in Arizona and Colorado that a small number (not specified) of elderly people died prematurely in the aftermath of large fire events as the result presumably of stress and disorder in their lives during and after the fires”.

3.7 Post-Disaster Relief

The main institution in the USA that deals with emergency response and aid is FEMA: the Federal Emergency Management Agency (Chappell 1987). The usefulness of this agency was examined by Kamel and Loukaitou-Sideris (2004). This organisation provides assistance to those people adversely affected by natural and technological disaster, including the provision of temporary housing. Families whose needs exceed the help available through "insurance or other forms of disaster assistance including low-interest loans from the US Small Businesses Association" (Arrowood 2003) can be eligible for grants. FEMA also is able to arrange assistance in the form of repairing watersheds and implementing mitigation efforts, such as larger water reservoirs (Goettee (ed) 2004).

Aside from this, there are a number of informal church groups and charities that tend to assist in times of need. After the 2003, San Bernardino wildfires in California this announcement appeared on the United Church of Christ website: "The United Church of Christ has sent $5,000 from One Great Hour of Sharing to Church World Service as part of our ecumenical commitment to long term recovery. Anticipating that this will be a long process for persons affected, and in order to allow the UCC a greater response, an additional $50,000 is being sought from UCC members and friends" (Anonymous 2003). It seems that these groups are more concerned about long term recovery than FEMA, as FEMA is perhaps more interested in immediate, financial concerns. The Red Cross serves to provide the one-to-one help that people really need after a disaster. Though chartered by the US government in 1905 and are really just an arm of the federal government, the Red Cross is able to successfully "meet human needs" (Drabek and Hoetmer 1991).

3.8 Positive Social Change from Relief Efforts.

Although wildfire recovery is plagued with insurance and liability disputes, there are positive impacts as well, as mentioned in this section covering disaster research. New groups formed to address the situation can be retained long after the event. After Hurricane Andrew in 1992 new groups like We Will Rebuild (WWR) were formed. This was an umbrella organisation of community leaders. Following this, Women Will Rebuild was set up when it was thought that the original WWR was not addressing the needs of women and children (Morrow and Peacock 1997). The exposure of weakness can have positive effects, as the community is "called on to face up to its problems on an overall basis and to give an equally overall solution: the reconstruction plan" (Cavalli 1986).

It is also common for constructive changes in legislation to be made after disaster events, addressing future issues. The possibility of disasters causing political change is explored by Nigg and Tierney (1993). As a shock to the system, disasters expose needs that were not obvious before and act as catalysts for positive change. This can be viewed with some scepticism; however, as Passerini (2000) noticed the good effects may only last as long as media attention is focused on the event. In addition, there is no easy way to predict whether a fire event will result in lasting change. There are many variables involved, such as the influences on the people affected, media coverage and many other reasons (McCool et al. 2003). More dramatic, widely publicised disasters tend to induce "sweeping policy changes" (Burchfield, 2004, quoting Birkland 1996). The Healthy Forest Restoration Act (HFRA) passed by US Congress in 2003 (Anonymous, 2004) directed interagency action to reduce wildfire risk via active fuel reduction treatments.

There can be positive economic benefits, contrary to what might be expected, as the decline in housing prices after a disaster is often only temporary. The huge number of different resources required for recovery efforts and rebuilding can create employment and "reinvigorate" economies (Kamel, 2004). Therefore, some people's lives may actually improve as the result of a disaster. There may be large injection of capital into the state, from things like sales tax from the building supply boom. In the case of Hurricane Andrew, this surplus money led to the setting up of a Hurricane Trust Fund to help with future disasters (Morrow and Peacock 1997).

4. PERCEPTIONS: EFFECT ON RECOVERY

4.1 Perception of Fire and the Problem of Prescribed Burning

The nature of ecosystems in America and other wildfire-prone countries means that fire is necessary for regeneration (some species require high levels of heat to germinate). Low-intensity fires naturally occur in the forests and serve to clean out debris from the forest that can otherwise result in a build-up of fuel. Obviously, if people have built homes in areas that are likely to be affected by this, fires must be controlled. The way to do this is by using prescribed burns to remove fuel build-up in a controlled fashion. Without this, there is an increased risk of large, damaging fires occurring. The same problems exist in Europe (San-Miguel-Ayanz, Barbosa and Schmuck 2001).

The perception of fire that residents of wildland areas hold, however, must inevitably have been influenced by years of a misplaced mentality that insisted that fire was bad and must be suppressed at all costs. This is both the result of irrelevant ideas being imported from abroad and also the increasing tendency to build in areas where interference with natural processes is necessary. It is very hard for wildland residents to resist the urge to suppress a fire if it is threatening their homes. In 2002 Timothy Egan wrote in a *New York Times* article that: "Convincing people in the West that the only way to save the forest around them is to let the government burn it is perhaps the biggest challenge facing the Forest Service as it tries to reverse a century-old policy of fighting every fire" (Egan 2002). Conflict arises because of the influx of people to the wildland-urban interface. Those who can afford to move there usually do not appreciate the idea of smoke and fire spoiling their expensive scenery.

The media has a major influence on the way people view and respond to fire. In 1988, fires were allowed to burn in Yellowstone Park to try and counter the bad effects of years of total suppression (Dombeck, Williams and Wood 2004). Media coverage of the Yellowstone fires used words like 'destroyed', 'blackened' and 'devastated' (Jacobsen, Monroe and Marynowski 2001) instead of the less emotive 'swept' or 'cleansed'. This contributed to the overwhelming public opinion that the fires were the result of negligence and should have been prevented, and reinforced their negative views of fire. Jacobsen et al. (2001) blames overly simplistic information campaigns such 'Smokey Bear' for the widespread 'fire is bad' mentality, which does not leave room for the complexities of the issue (ibid). McCool et al. (2003), however, denies that there is consensus over the issue. The public's perception of wildfire correlates significantly with media coverage rather than actual events, according to mental map studies carried out by C. M. Rodrigue (Rodrigue, Rovai and Place 1997). This will not result in a well-informed public, as only catastrophic fires make the news, and only controversial elements of prescribed fire

and ‘let-burn’ policies make the media (Jacobsen et al. 2001). An example of this is the very-well publicised Cerro Grande fire in Los Alamos, where a prescribed burn got out of control and caused much damage. This distorted view of fire is linked with the section on perception of disaster and its obstacles to recovery.

4.2 Perceptions of Risk

The perceptions of risk that are held by members of a fire-prone community are very important in terms of recovery. If residents of a high-risk community underestimate the danger of a devastating wildfire, then they will not be adequately prepared in a way that could mitigate the impact. In addition, the shock and mental trauma that is experienced will presumably increase. In general disaster research this has been shown to be a major area of concern. Dennis Mileti (1999) says: “Research has shown people are typically unaware of all the risks and choices they face. They plan only for the immediate future, overestimate their ability to cope when disaster strikes, and rely heavily on emergency relief when disasters occur”. Such misinformation and complacency can only contribute to the feeling of being helpless when a seemingly overwhelming disaster does hit. It seems, however, that widely publicised fire disasters have not impacted on perceived risk enough to discourage people from all over the world moving to wildland-urban interface areas (Burchfield 2004).

4.2.1 Fatalism

Fatalism is a dangerous way of viewing life that can lead to inaction, which results in dire effects. Citizens who see fire as a force that has been caused by an external “locus of control” (Bolin 1982) are less likely to respond to warnings or make preparations. Bolin associates this way of thinking with (American) Southerners and fundamentalist Christians. However, when it comes to dealing with wildfire, much of the criticism is directed at the homeowners themselves. There are often many things that could have been done by residents personally to mitigate the effects of the disaster. Instead, “by defining events as natural disasters or acts of God, we emphasize the inevitability of catastrophe and fail to recognize both the man-made sources of our vulnerability and the social fault lines that determine who is at risk” (Klinenberg, 2002). The danger of relying too much on religion for answers and help is shown by Frierson (1996) in his article on cultural perceptions of fire in 19th Century Russia. He describes peasants as seeing fire as ‘divine punishment’, which led them to adopt very ineffective ways of dealing with it. One example was the practice of locking the person who caused the fire in the burning house, as fire supposedly followed the instigator. This is related to accepting responsibility for it as well, as it may be reasoned that accepting personal liability will mean the authorities are less likely to assist.

4.2.2 What Effects Perception?

According to McCaffrey (2004), the perceptions that control response to wildfire risk are created by several factors. The most important of these are how long the resident has lived in the area and their past experience with wildfire. This knowledge then needs to be translated to action, which depends on the resources available and how long the resident expects to remain in the area.

Though experience with wildfire may seem like an obvious factor in increasing awareness of risk, according to several sources the opposite is true. Survivors of

wildfire events are not necessarily going to be more prepared for the next one, as "natural hazard studies have shown experience to have an inconsistent effect on increasing risk perception and decisions to mitigate" (McCaffrey 2004). Experiencing a fire seems to dampen perceived risk. The term 'gambler's fallacy' is used to describe this process of assuming that if 'lightning' has struck once, it is less likely to happen again. The length of time spent in the area also has the opposite effect than expected. Newer residents are often more aware of risk, possibly because of high media attention (Gardner and Cortner 1985, quoted in Kent et al. 2003). McCaffrey (2004) says that in order to invoke change, a disaster needs to be either of "long duration, affect a large area, and/or … frequent". Wildfires do not often cover these categories, and therefore can be easily passed over as not important.

4.3 Perceptions of Disaster

According to Carroll and Daniels (2003), the impact of a disaster is "socially constructed". In other words, what a fire means is created "through a complex social process". Therefore, various elements that are at work after a disaster can have more impact on survivors than the actual disaster. People react to their perception of it, which they receive from the people they interact with and the media. They "respond not merely to the event, but to [their] interpretation of it". An example is given of the Buffalo Creek Dam disaster in 1972 where the residents' inability to reorganise and recover was attributed to their perception of the disaster as being one caused by human negligence, and thus harder to cope with (Carroll and Daniels 2003). E. L. Quarantelli (1979) is cited by Bolin and Bolton (1986) as saying that victims can be impacted themselves by the overall nature of the society's response to the disaster. One of the most distorting sources of information can be the news media. Though this can be a useful way of transmitting information to isolated communities, there is a dangerous responsibility attached. Too often the media's priority seems to be sensationalist stories to attract viewers and readers, rather than accurate reporting. As a result, television coverage of disasters tends to focus on "the worst, most cataclysmic scenes"(Alexander 2000). Media companies are not necessarily trying to achieve the same outcomes as disaster recovery agencies. Such influences often only add negatively to victims' perception of the disaster as overwhelming, and impact negatively on their recovery.

5. VULNERABILITY

The severity of the impact of a disaster on a community is greatly influenced by the vulnerability of that community. In turn, the rate of recovery is often slower for communities that are more vulnerable. A community can absorb the effects of a disaster if they are sufficiently well equipped. Wright's impact ratio (discussed by Bates and Peacock, 1987) does not take into account this 'capacity to respond', which is part of the equation. Impact of a disaster can be determined by means of "coping self-efficacy" (CSE). If people have high levels of CSE then the impacts of a natural disaster will theoretically be less (Benight and Harper 1997). The inherent weaknesses in a system are exposed and exacerbated by disasters, according to Bates and Peacock (1987), which can lead to positive policy changes in those communities in a position to learn from them. In the most vulnerable areas, however, system weaknesses just add to the negative impacts. In the recent Asian tsunami this was immediately noted in the recovery effort (Gove, 2005).

The three main reasons for vulnerability to wildfires include the impacted community being small, the impacted community members being economically disadvantaged, or the impacted country being in a state of development. Vulnerability to hazards is not just how close a community is to a hazard or how likely it is to happen; social factors also contribute to this vulnerability (Cutter, Mitchell and Scott 2000).

5.1 Small Communities and Wildfire

Wildland-urban interface fire and rural fire generally affect small communities, which mean that the number of affected people compared to total population is definitely high enough to classify it as a disaster. Because of their size, small communities are much more vulnerable to the overwhelming needs disasters create than a section of a larger community. While big towns and cities can survive trauma with barely a ripple, small communities take a long time to return to the pre-disaster state and might never manage catch up with how they would have been without the disaster. Resources are diverted to recovery, so the return to normal can be even slower, especially if nothing is set aside for emergencies like might be the case in a big community. Communities can be well-integrated into the rest of society if they are within easy distance of the main centre. These communities are better able to cope (and therefore less impact is felt) than isolated ones (Kamel and Loukaitou-Sideris 2004). If part of a larger community, the impacted residents suffer more from the personal, emotional grievances (Cross 2001). More attention is often paid to larger cities, even if loss of life is not as severe. Smaller communities often lack broadcasting mediums to warn people of risks and mediate relief. The size of a community affected by wildfire is inversely proportional to both its vulnerability and the amount of damage it suffers.

5.2 Developing Countries

Developing countries are always going to be harder hit by disasters, but this is not necessarily reflected by the amount of aid provided. From a study comparing various disasters, “severe or very severe impairment was observed in 25% of the U.S. samples, 48% of the samples from other developed countries, and 78% of the samples from developing countries” (Norris et al. 2002). Unlike the US, which has the infrastructure to enable it to absorb the effects of a disaster, in countries where every day is a struggle to some a disaster can be much more catastrophic. In an example from Honduras and Nicaragua, 70% of agriculture was lost and this was estimated to have “set back development processes by between 20 and 50 years”. Disaster mitigation has “relatively little meaning while life in general is so precarious” (Alexander 2000). After Hurricane Mitch, which hit Honduras in 1998, much attention was paid to physical reconstruction as opposed to economic. It is suggested that this is because the need for rebuilding was “more immediately evident, projects were more visible and more easily managed, and results more rapidly measurable” (Telford et al. 2004). Nevertheless, Honduras’ national debt has climbed to even more unattainable heights, making progress very hard to foresee.

5.3 The Socially Disadvantaged

Underprivileged minorities and people of low socio-economic means are also harder hit by disasters, and stand out in contrast to their more privileged neighbours. The

pre-disaster inequalities simply carry through, as lower income families return to their houses more slowly because they possess fewer resources, and subsequently their recovery is slower (Bolin 1994). Poverty means an increased vulnerability to disaster, but also an increased likelihood to actions that might jeopardise them in the long term for the purpose of short-term gains. This is illustrated by the approach to forests in India, where immediately lucrative techniques are used that increase the danger of wildfire in the long term (Bahuguna and Upadhyay 2002). Lower income families are less likely to bother with prevention, even though the losses would affect them more. Added to this, they are also more unlikely to have insurance (Alexander, 2000).

5.4 Maintains Inequalities in Society

Relief efforts tend to address symptoms without looking at the real issues. They often do not attempt to quell imprudence, for example addressing why houses were built in dangerous areas in the first place (Alexander 2000). In addition, by not addressing unequal levels of impact, the response effort to disasters serves to support current social inequities, in some cases worsening the imbalance (Nigg and Tierney 1993). The tendency is to return to pre-disaster conditions and social stratification without much social change on the wider scale (Passerini 2000). Aid organisations in the US, such as FEMA, give grants to some and loans to others, but both these forms of assistance require qualification, which immediately excludes recent immigrants (Kamel and Loukaitou-Sideris 2004). After the Coalinga earthquake in 1983 some mobile homes were provided, but a lack of surplus low-income housing meant those with limited economic resources experienced difficulties (Bolin 1994). The Northridge earthquake in 1994 was examined and it was found that relief efforts were tailored to help upper and middle class people. One person from the hardest hit areas said: “Donations, which could make the difference between economic survival and devastation to a small community like ours, are pouring into San Francisco instead” (Rodrigue, Rovai and Place 1997). Aid given often does not necessarily reflect the amount of need, as seen in the case of the hurricane in Nicaragua in 1988 detailed by Blaikie (et al. 1994).

Media coverage also influences response, and tends to favour the interest of the target market, which is generally the more affluent people. The example Rodrigue (et al 1997) gives is the Northridge earthquake on January 17, 1994. Though Northridge did suffer a lot of damage, it was not the centre of the earthquake. It is, however, a more affluent area than Reseda (Rodrigue, Rovai and Place 1997). Concerns here concerned aid going to areas that needed it less than lower-income areas.

Some disaster researchers hold the opinion that disaster response actually increases the divisions in society (Kamel and Loukaitou-Sideris 2004). To some extent it benefits the wealthier people and adversely affects poor people (Passerini 2000). From experiences in Indonesia there is evidence that fires and famine are “reinforcing the marginalisation of indigenous Dayak communities” (Down to Earth 1998). Minority groups and the elderly, who are the most vulnerable to disasters, may not have access to the community support mechanisms that others do, such as the ‘therapeutic’ community. Not paying attention to or allowing for cultural differences can impede recovery as well. After the Afghanistan earthquake in 1998 strict Muslim cultural practices meant women were not allowed to be examined or even spoken to by male doctors and nurses, which must have slowed the recovery process (Barr 1999). When already disadvantaged citizens are not given access to the basic necessities after a disaster, the imbalance is certainly not redressed.

6. RELATIONSHIPS WITH AUTHORITY

6.1 Agency – Community Issues

There are many issues surrounding the relationship between fire authorities and communities that lead to real or perceived ineffective fire protection and traumatic effects on the people involved. According to Kumagi (et al. 2004a), the most "daunting challenges" for fire authorities are from human responses, and yet "little research has been devoted to the social impacts of fire". The problem centres mainly on the different frames of reference within which involved parties are operating. Fire authorities tend to have a more scientific, rational approach than the personal and emotional responses of families. It is a tactic of some disaster managers to "depersonalise an event, to allow clear analytical thinking (Carroll and Cohn 2004). Families can feel their personal needs are being overlooked for technical concerns, causing resentment. This has been described as a "cognitive versus emotional schism" (Kumagai et al. 2004a). Added to this is often a blind belief in technology and Authority's ability and duty to protect them. When, inevitably, the authorities fail to provide every piece of assistance that residents expect, a sense of wrong is created.

This sense of grievance causes several problems with recovery from wildfire disasters and future mitigation efforts. The credibility of the agencies involved can be negatively affected, leading to unnecessary time and energy being devoted to addressing a problem that is really located elsewhere. Such conflict can divert attention from community and household efforts that need to be implemented in order to make an actual difference. The "cognitive versus emotional schism" could mean communication breakdown and "misperceptions, hard feelings and in some cases overt conflict" (Kumagai et al. 2004a). If this is a recurring problem, the government's instructions can be seen as interfering and induce stubborn refusals to comply (Kumagai et al. 2004b). All of these things add to the negative impacts of conflict discussed earlier, especially in disasters where many people find out they did not have adequate insurance.

It is essential that agencies and communities work effectively together. The obvious presence of agency is very important (Duncan 1997), especially in the recovery period, to reassure stricken communities and encourage self-help. Communities can only do so much; in Idaho, timber needs to be removed from where it is accumulating to prevent future disasters. As Lynn Jungwirth says: "although forest communities in Idaho are planning collaboratively to protect themselves from catastrophic wildfire, the projects they can accomplish themselves are limited to non-federal lands" (Anonymous, 2004a). In order to combat negative relations between communities and authorities, Burchfield (2004) suggests, "clarity of communication and transparency of agency decision processes, especially those decisions regarding the allocation of scarce resources, can advance recovery and reduce the potential for misinformation that could lead to frustration and fragmentation". This requires the "prior establishment of trusted relationships"**.**

6.2 Interagency Relations

There are also many instances where the necessary cooperation of federal and local agencies during a fire event has been less than successful. If a situation exists where there is resentment for certain types of authority, then the conflict is practically predetermined. Local government agencies can often feel resentment towards the

federal and state fire-fighting authorities that are brought in during a disaster, especially if they do not feel involved in the decision-making process. This was the case in Entiat in Washington in Mendez's study (Mendez et al. 2003). Drabek and Hoetmer (1991) identify the problem of local governments preferring to bypass state legislative institutions in favour of federal ones. This cuts out one level of bureaucracy and seemingly gets decisions made faster (Drabek and Hoetmer 1991).

State governments are supposed to have "a number of specified responsibilities", and problems arrive between agencies from "incompatible perceptions of their roles in recovery, the priorities during recovery, the importance of post disaster mitigation efforts and the proper locus and form of recovery decision making (Drabek and Hoetmer 1991). Local officials have useful knowledge about the area that a federal visitor does not (Carroll and Cohn 2004), while a federal disaster manager probably has experience with other disasters that a local official would not.

One solution being offered for Drabek was the involvement of institutions known as Interagency Hazard Mitigation Teams that were specifically designed to maximise interagency co-operation. Unfortunately, these were only being used in water-related hazards (ibid). The National Interagency Fire Centre (NIFC) in the US coordinates national level movement/allocation of resources and incident management teams for wildfire and other disasters (e.g. Hurricane Katrina, www.nifc.org).

7. COMMUNITY INVOLVEMENT

7.1 Community as Part of the Ecosystem

More recent approaches to wildfire research often emphasise the need for a wider model of planning and mitigation, which sees wildfires and communities as part of the ecosystem. Carroll and Daniels' article addresses the importance of not seeing wildfires as independent variables, but more as part of a complex social system (Carroll and Daniels 2003). Mendez quotes Lively (1951) in saying: "forest fires are "part of [a] historical cultural complex and cannot be fully understood apart from it" (Mendez et al. 2003). In developing countries it is often the wider social problems that really need to be addressed, and increased forest fires are merely a symptom of this (Ing 1999). However, this is no less true for countries like the USA. Disaster research puts emphasis on the need for a wider viewpoint from which to study disasters. All disasters are both impacted by, and affect, the communities involved with them. Fire is part of the ecosystem in wildland America and so are humans to some extent. "Hazards… are a consequence of both the physical and social systems and the interactions between them" (Cigler 1988, quoted in Jakes and Nelson 2004). The same problem is being experienced in European countries. In Greece the percentage of area burned has tripled in recent times, which is attributed to "increased dead fuel availability and of the construction of houses within forest lands" (Xanthopoulos 1987), (Schweitheim and Glover 1999). Jackson's paper considers the role of the 'ecosystem approach' in linking fire management objectives to broader land use decisions, and concludes that this approach may assist fire management authorities to find ways to both protect communities and conserve biological diversity (Jackson 2003).

7.2 The Importance of Community Involvement

Part of acknowledging one's place in a wider ecosystem when in fire-prone areas is getting personally involved in fire mitigation efforts. Responsibility is often seen as being in the hands of authorities. In reality, it can often be found by looking no further than the homeowners themselves look. Kumagai's study recognised that residents' reaction tends towards blaming other people, when often there was a lot they could have done to mitigate the problem (Kumagai et al. 2004a). The Cerro Grande fire in Los Alamos, New Mexico was largely thought to be a huge act of negligence on the part of fire managers, and is often cited as evidence in the debate against prescribed burning (Egan 2002). However, fire scientist Jack Cohen commented that homeowners could have escaped much damage with simple things like "raking up pine needles that had accumulated against their houses and on their roofs" (Ring 2003). People working together within communities are very important. The nature of wildfires means a lot of effort can be pointless if neighbours do not cooperate and fire-proof their own properties (McCaffrey 2004).

The conclusion to be drawn from reviewing the literature is that community involvement in fire issues both improves the quality of the response, subsequently lessening the amount of physical damage to recover from, and also lessens the mental impact on the community members, as possibilities of blame are lessened which aids recovery. The common method of relying on outside help is not only ineffective but also leaves room for grievances to develop. The implementation of government schemes to prevent fires has not been very effective, as the following example from Northern India shows. There, government schemes to reduce wildfires had replaced indigenous fire fighting practices as the problem seemed to be on the increase. However, the problem was wider than that, and government schemes proved to be even less effective. Darlong (2002) recommends returning to modified versions of the old community-based practices to suit the new social dynamics. Also, Bahuguna and Upadhyay (2002) emphasise the need to involve women in these activities in India, as in not doing so a vital resource is being wasted.

Working together on disaster mitigation has been seen to lessen the impact of disasters. Having someone to blame leads to negative reactions, as in the case of the participants in Mecke's study (1997) who were "angry, hostile and resentful at the loss of their homes". Mecke is joined by Mileti (1999) in saying that being involved in one's own prevention affects perceptions in a positive way: "Research has also shown that recovery is most effective when community-based organisations assume principal responsibility, supplemented by outside technical and financial assistance". Involving a community in its own fire issues could reduce this capacity for assigning blame and can help to avoid the negative psychological effects that blaming can have (Moore 2002). Previously communities have only been considered negatively by authorities, as the cause of the problem and not part of the solution. There is a myth that people in disaster situations lose the capacity for rational thought and are no help to themselves. This means that authorities have been known to avoid letting victims get involved in their own relief effort, which is detrimental to their recovery (Furedi 2004). Utilising natural coping methods during and after the disaster is an important part of self-empowerment (Blaikie et al. 1994).

Also, the community approach improves the quality of the response; communities getting involved ensures that all the different agencies are working together effectively (Anonymous, 2004a). Without this, there are no checks in place to ensure all is working as it should. Residents of a stricken community possess local knowledge that is invaluable, and without which the recovery needs of the community can never be fully met. William Rosse says that "empowerment of each community's

indigenous resources" is vital to a full recovery. Otherwise, if "primary responsibilities are assigned to outside private and government agencies, the community's autonomy is diluted, and the recovery process is compromised" (Rosse 1993). The combination of agency and volunteer networks can help avoid misdirected interventions (Burchfield 2004). While the community is often overwhelmed by the event, agencies usually focus on land management, so community interaction can help with the more human-based needs (McCool et al. 2003). Without this, there are gaps that can only be addressed by someone with a community member's perspective. Arrowood (2003) suggests finding out what is happening with disaster mitigation in one's community. This means better understanding of what is happening, of the risk, and what will happen in an emergency and what is expected of homeowners. This prevents conflict after the event, when it can be damaging. Measures like recording serial numbers of possessions means a lot less trouble with insurance companies at a later date (Arrowood 2003).

If people are working on their own fire plans with authorities, and getting the right information, then their perception of disaster will be less overwhelming. Burchfield, citing Kumagi, says that in the fires he looked at, "those without information, or contact with fire suppression staff tended to blame human agents for damage, whereas others with more contact with firefighters and knowledge of the fire experienced greater perceived control, and thus attributed damages to natural causes instead of human failings" (Burchfield 2004). Community empowerment in terms of prevention and systems to deal with disasters must improve the quality of response.

7.3 What is Being Done?

Many authors writing about wildfire recovery and mitigation have stressed the importance of community involvement (Carroll and Cohn 2004). Only a few, however, report actual instances of this happening. According to Steelman: "federal policy has placed a priority on community-based approaches to address the wildfire risks facing communities and the environment" (Steelman, Kunkel and Bell 2004). However, there is a good deal of difference between saying this and doing this. What is known as the 'National Fire Plan' in the US is actually called *Managing the Impacts of Wildfire on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000* (Hubbard and Rains 2002). This, and more fires in 2003, led to the Healthy Forests Restoration Act of 2003, which defined Community Wildfire Protection Plans (CWPP). In areas where communities are taking responsibility for their own surroundings, priority is granted to fund hazardous fuels reduction projects there. The act "places renewed emphasis on community planning by extending a variety of benefits to communities with a wildfire protection plan in place (Anonymous, 2004a).

The Colorado Forest Service has made good progress in the area of community involvement. Its pilot project involves workshops that focus on cooperative learning rather than instruction, and removing the barriers to mitigation (Bear et al. 2005).

7.3.1 Communities Addressing Mental Health Issues

Communities naturally get together to find solutions after the event. When agencies fail the residents of a stricken community, they often take it upon themselves to create systems to address their problems themselves. After the Cerro Grande fire in 2000, a meeting was advertised by the Ombuds Program Office where Los Alamos

resident Vivian Laabs would share her experience in settling her homeowners insurance claim: “She will discuss some of the emotions she felt as she negotiated with the insurance company for fair compensation, how she approached obstacles, and the forms and information that she presented to the insurance company”. Communities also often unite to address trauma symptoms, such as after the Oakland/Berkeley fire. The local children's art museum conducted art therapy workshops related to the fire, and a psychiatry section at a local hospital was devoted to the issue of posttraumatic stress disorder and the fire. Neighbourhood support groups, dubbed "Phoenix Societies" after the mythical bird that emerges from its own ashes, sprang up in many fire-ravaged areas; block parties were organized to re-establish neighbourhood ties and to honour professional and volunteer firefighters. At the time of writing, Oakland's metropolitan newspaper still maintains a “fire bulletin board” announcing fire-related meetings and services, including counselling and support groups (Shusterman, Kaplan and Canabarro 1993).

Communities can easily and very effectively be involved in the recovery effort, as often where agency response is lacking residents form their own groups to address the situation. There are hundreds of examples of this, once the need is made obvious. So why can this not happen before and during the event to provide continuity and the most effective answer? Community involvement is a very important aspect of community recovery. The challenge to fire agencies is to incorporate this into emergency planning in order to take full advantage of it.

8. RECOMMENDATIONS AND CONCLUSIONS

8.1 Applications for New Zealand

Though there are distinct differences between the USA and New Zealand, much of the progress made by sociologists concerned with wildfire impacts can be used to inform similar studies in New Zealand. Certainly, the general impacts of wildfires from Section 3, such as loss of possessions, emotional impacts and community conflict are translatable around the world.

There are several issues that preoccupy many of the authors discussed in this report that should be carefully considered when approaching social investigations. The increased vulnerability of small communities is important in rural New Zealand, as a threatening wildfire can cause the evacuation of an entire town. As a reasonably sized disaster has been seen to overwhelm a community’s coping mechanisms, so can wildfires cause an immense impact on a small town. For the purpose of recovery, small towns must require more help than a community on the outskirts of a big city, as they are not integrated into and protected by a larger infrastructure. The same applies to less advantaged groups in societies who may either not have the same access to support networks as others, or the necessary resources to survive a fire without dire financial problems. It is recognised overseas that the distribution of aid does not address these differences, and the media attention does not necessarily focus on those hardest hit.

The growing phenomenon of wildland-urban interface living is just as relevant to New Zealand as elsewhere. The fires in December 2003 in West Melton near Christchurch illustrate this. In these outer suburbs, development is slowly encroaching more and more on the rural areas. Although America’s issues of prescribed burning near homes do not affect New Zealanders at this stage, the wildland-urban interface is still a problem.

Greater community education and community involvement in fire management is required in New Zealand, particularly as the community's perception of fire risk is low because of the low frequency of large damaging wildfires. Fire authorities need to educate and raise community awareness. The ability to self-help is important in rural New Zealand as there is a lack of emergency personnel, e.g. civil defence and volunteer firefighters. New Zealand has a long way to go to educate and involve communities, raise awareness and empower communities to help themselves. Improved communication and good interagency relations between fire authorities, and between fire authorities and other emergency services is crucial.

8.2 Conclusion

When it is accepted that a wide-ranging approach to recovery from, and resistance to, wildfire is necessary, the importance of the affected community members themselves is made clear. In order to enjoy the most effective recovery from wildfire the fire agencies and communities must work together, while viewing themselves as part of the ecosystem that both creates and is affected by fire.

Fire agencies' often systematic and scientific approach can fail to take into account the social causes and effects of the reaction of community members to wildfire. These perceptions contribute massively to the way in which people involved with wildfire react to and are affected by it.

Self-help or preparedness can improve perceptions of the risk of wildfire and subsequently lessen harmful impacts resulting from emotional trauma and conflict after the event. Community participation can also improve the quality of the response, so that there are fewer traumas to recover from. This wider, more people-focussed approach is completely obvious when it is realised that community members are often the objects of the protection that fire agencies are striving for.

APPENDIX

Studies

(Halvorson 2002): A study on the victims of the Bitterroot fires in Western Montana in 2000. In this study, data was collected in the following ways: field observations, interviews, secondary sources, and participation in a wide range of community-based fire meetings and events – onsite after fires and for a year afterwards. The need to look at gender, age and vulnerability-specific data was recognised. From this, the impacts of the firestorms on the rural population were assessed.

(Kent et al. 2003): A case study of the Hayman fire near Denver, Colorado in 2002. "The first framework we considered involved the identification of four dimensions (when, who, what, and where), and a set of parameters associated with each dimension (table 1). The first dimension – when impacts occurred or will occur – breaks the overall timeline into three periods, before, during and after the fire. The second dimension – who was impacted – much like the Wenatchee study, divides people into categories: individuals, nongovernmental organizations, governments, and markets. The third dimension or what is impacted includes money, attitudes and behaviours. Finally, the fourth dimension – where the impacts are felt – includes neighborhoods, communities, Counties, multicounty areas, States, and the Nation." Within this framework, economic data and other facts gathered from literature were analysed.

(Carroll and Cohn 2004): The Rodeo-Chediski fire of 2002 in Arizona. Interview data, gathered and analysed using "grounded theory". In-depth interviews were conducted with directly-affected residents. Research questions "revolve around the extent to which this particular fire event brought the affected community residents together and/or the extent to which it created tension and conflict".

(McCool et al. 2003): Uses an "event-based model to understand the effects of wildland fire events on communities because it provides a logical, temporal view of the decisions that are made in the stages leading up to, during, and after a fire". The study uses "temporal dimensions around three basic phases pre-fire, fire, and post-fire, but in future applications of this model, additional consideration might be given to the immediate post fire period, since large fires commonly require special Burned Area Emergency Recovery (BAER) teams for several weeks after the fire to mitigate watershed damage and potential flooding risks". The methods of study and various considerations are described in depth in the paper.

(Mendez et al. 2003): Through qualitative research methods, the study analyzes these diverse responses in the context of local social history. This study focuses on two communities' response to wildfires during the intense fire season of 1994. The communities chosen were Entiat and Leavenworth, two communities that border the Wenatchee National Forest (Washington)

(Mecke, 1997): A study of the Pebble Beach fire of 1987. "Eighteen months after the fire, ten adults, whose homes and belongings were destroyed, were administered the Rorschach Test and the SCL-90-R Test. Comparison with the means of the normative groups for each test yielded significant results above the $p < .01$ level. The long term traumatic impact on the personalities was clearly reflected by interferences in thought processes, perceptual distortions and depressive reactions, inter alia".

REFERENCES

Alexander, D. 2000, *Confronting Catastrophe*, Oxford University Press, New York.

Anonymous 2003, 'Update: Southern California Wildfires', *United Church of Christ Website,* Available: [http://www.ucc.org/disaster/u112103.htm] (16th February).

Anonymous 2004a, 'Community Wildfire Protection Plans from Four Angles', *Journal of Forestry,* vol. 102, no. 6, p. 4.

Anonymous 2004b, 'October Wildfire Survivors File Class Action Suit Against Insurance Companies', *Insurance Journal*, Available: [http://www.insurancejournal.com/news/west/2004/05/05/41907.htm] (2005).

Arrowood, J. C. 2003, *Living With Wildfires: Prevention, Preparation and Recovery*, Bradford, Boulder, Colorado.

Babbitt, B. & Glickman, D. 2001, 'Managing the Impact of Wildfires on Communities and the Environment: A Report to the President in Response to the Wildfires of 2000 (Executive Summary), *Fire Management Today,* vol. 61, no. 2, pp. 9 - 11.

Bahuguna, V. K. & Upadhyay, A. 2002, 'Forest Fires in India: Policy Initiatives for Community Participation', *International Forestry Review,* vol. 4, no. 2, pp. 122-127.

Bailey, D. W. 1991, 'The Wildland-Urban Interface: Social and Political Implications in the 1990s', *Fire Management Notes,* vol. 52, no. 1, pp. 11 - 18.

Barr, J. 1999, 'Disaster Response with a Difference - Afghanistan June 1998', *Australian Journal of Emergency Management,* vol. 13, no. 4, pp. 2 - 6.

Barton, A. H. 1969, *Communities in Disaster: A Sociological Analysis of Collective Stress Situations.*, Doubleday, New York.

Bates, F. L. & Peacock, W. G. 1987, 'Disaster and Social Change', in *Sociology of Disasters: Contribution of Sociology to Disaster Research*, Franco-Angeli, Milan, Italy, pp. 57 - 69.

Bear, J., Burns, S., Downing, J. L., Hodgson, R. W. & Timm, K. 2005, 'Neighborhood Watch', *Wildfire,* Jan/Feb.

Belshaw, C. 1951, 'Social Consequences of the Mount Lamington Eruption', *Oceania,* vol. 21, no. 4, pp. 241 - 252.

Benight, C. C. & Harper, M. L. 1997, *Buffalo Creek Fire and Flood Report*, Natural Hazards Research and Applications Information Centre, University of Colorado.

Birkland, T. 1996, "Natural Disasters as Focusing Events: Policy Communities and Political Response." *International Journal of Mass Emergencies and Disasters* 14, no. 2, 221 - 243.

Bitterroot National Forest 2000, *Bitterroot Fires 2000: An Overview of the Effects on People and Resources, and Post-fire Recovery Priorities*, Available: [http://www.fs.fed.us/r1/bitterroot/recovery/bitterroot_fires_2000.htm] (16th December 2004).

Blaikie, P. M., Cannon, T., Davis, I. & Wisner, B. 1994, *At Risk: Natural Hazards, People's Vulnerability, and Disasters*, Routledge, London.

Bolin, R. 1982, *Long Term Family Recovery from Disasters.*, Institute of Behavioural Science, University of Colorado, Boulder, Colorado.

Bolin, R. 1994, 'Postdisaster Sheltering and Housing', in *Disasters, Collective Behaviour and Social Organization*, eds. Dynes, R. R. & Tierney, K. J., Newark, Delaware.

Bolin, R. & Bolton, P. 1986, *Race, Religion and Ethnicity in Disaster Recovery*, Institute of Behavioral Science, University of Colorado, 1986, Boulder, Colorado.

Bucher, R. 1954, *Blame in Disasters: A Study of a Problematic Situation* (unpublished Master's thesis), Department of Sociology, University of Chicago.

Bucher, R. 1957, 'Blame and Hostility in Disaster', *The American Journal of Sociology,* vol. 62, no. 5, pp. 467 - 475.

Burchfield, J. 2004, 'Community Impacts of Large Wildfire Events: Consequences of Actions After the Fire.' *Work in progress.*

Butry, D., Pye, J. M. & Prestemon, J. P. 2001, 'Prescribed Fire in the Interface: Separating the People from the Trees', in *Eleventh Biennial Southern Silvicultural Research Conference.*, ed. Outcalt, K. W., U.S. Department of Agriculture, Forest Service, Southern Research Station, Knoxville, Tennessee, pp. 132 - 136.

Butry, D. T., Mercer, D. E., Prestemon, J. P., Pye, J. M. & Holmes, T. P. 2001, 'What Is the Price of Catastrophic Wildfire?' *Journal of Forestry,* vol. 99, no. 11, pp. 9 - 17.

Carroll, M. & Daniels, S. 2003, 'Fire in Our Midst: A Look at Social Science Research Issues at the Community Level', in *Humans, Fires, and Forests: Social Science Applied to Fire Management: Workshop Summary*, eds. Cortner, H. J., Field, D. R., Jakes, P. & Buthman, J. D., Tucson, Arizona.

Carroll, M. S. & Cohn, P. J. 2004, 'A Community Fire Disaster as a Galvanising and Fragmenting Event', in *3rd International Symposium on Human Behaviour in Fire*, Belfast, UK.

Cavalli, A. 1986, 'Cultural Processes After Disasters: A Research Project and Some Preliminary Findings', in *Italy-United States Seminar on Preparations for, Responses to, and Recovery From Major Community Disasters*, eds. Quarantelli, E. L. & Pelanda, C., Disaster Research Centre, University of Delaware, University of Delaware, Newark, Delaware, pp. 277 - 285.

Chappell, G. 1987, 'The Federal Government's Role in Major Disasters: An Overview of National, State and Local Government Relationships.' in *Symposium and Workshop on Protecting People and Homes from Wildfire in the Interior West*, Missoula, MT, pp. 22 - 26.

Chokkalingam, U. & Suyanto, S. 2004, 'Fire, Livelihoods and Environmental Degradation in the Wetlands of Indonesia: a Vicious Cycle', *Centre for International Forestry Research Fire Brief,* vol. 3, p. 4p.

Cigler, B.A. 1988. 'Current Policy Issues in Mitigation', in *Managing Disaster: Strategies and Policy Perspectives*. (ed) L.K. Comfort, Durham, NC: Duke Press Policy Studies, pp. 39-52.

Clark, H. & Simons, J. 2001, *Forest Fire Recovery Begins, but Scars Will Remain for Lifetimes*, Available: [http://forests.org/archive/america/forfirer.htm] (18th February 2005).

Cohen, J. D. 2000, 'Preventing Disaster: Home Ignitability in the Wildland-Urban Interface', *Journal of Forestry,* vol. 98, no. 3, pp. 15 - 21.

Cortner, H. J. & Gale, R. D. 1990, 'People, Fire and Wildland Environments', *Population and Environment,* vol. 11, no. 4, pp. 245 - 257.

Courtney, D. 2004, 'Forest Owners Headed for Court: Insurance Denied', In *The Christchurch Press*, Christchurch, p. A4.

Cova, T. J. & Johnson., J. P. 2002, 'Microsimulation of Neighborhood Evacuations in the Urban-Wildland Interface', *Environment & Planning A,* vol. 34, no. 12, pp. 2211 - 2229.

Cross, J. A. 2001, 'Megacities and Small Towns: Different Perspectives on Hazard Vulnerability', *Global Environmental Change Part B: Environmental Hazards,* vol. 3, no. 2, pp. 63-80.

Cutter, S. L., Mitchell, J. T. & Scott, M. S. 2000, 'Revealing the Vulnerability of People and Places: A Case Study of Georgetown County, South Carolina', *Annals of the Association of American Geographers,* vol. 90, no. 4, pp. 713 - 737.

Darlong, V. T. 2002, ' Traditional Community-Based Fire Management Among the Mizo Shifting Cultivators of Mizoram in Northeast India', in *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*.

Davis, N. Y. 1996, 'Earthquake, Tsunami, Resettlement and Survival in Two North Pacific Alaskan Native Villages', in *Natural Disasters and Cultural Responses*, ed. Oliver-Smith, A., Department of Anthropology (College of William and Mary), Williamsburg, Virginia, pp. 123 - 154.

Dombeck, M. P., Williams, J. E. & Wood, C. A. 2004, 'Wildfire Policy and Public Lands: Integrating Scientific Understanding with Social Concerns Across Landscapes', *Conservation Biology,* vol. 18, no. 4, pp. 883-889.

Down to Earth 1998, *Forest Fires in East Kalimantan Bring Famine and Dispossession*, Available: [http://forests.org/archive/indomalay/kalimant.htm] (14th December 2004).

Drabek, T. E. & Hoetmer, G. J. 1991, 'Recovery From Disaster', in *Emergency Management: Principles and Practice for Local Government*, International City Management Association, Washington D. C., pp. 224 - 259.

Duncan, F. L. 1997, 'How a Community Heals: Lessons Learned From Buffalo Creek', *Fire Management Notes,* vol. 57, no. 3.

Egan, T. 2002, *Idea of Fighting Fire With Fire Wins Converts*, Available: [http://www.fs.fed.us/rm/main/pa/newsclips/02_06/0630_idea.html] (4th February).

Erikson, K. T. 1979, *In the Wake of the Flood*, George Allen and Unwin, London.

Fogarty, L. G. 1996, *Two Rural/Urban Interface Fires in the Wellington Suburb of Karori: Assessment of Associated Burning Conditions and Fire Control Strategies*, New Zealand Forest Research Institute (Bulletin No. 197). `

Frierson, C. A. 1996, 'Apocalyptic Visions and Rational Responses: Fire Narratives in Fin-de-Siecle Russia', *Canadian Slavonic Papers,* vol. 38, no. 3 - 4, pp. 357 - 384.

Furedi, F. 2004, 'Heroes of the Hour: the Resilience of Communities in Emergency Situations Can Be Vital in Limiting the Damage and Saving Lives. So Why are Governments Ignoring It.' *New Scientist,* vol. 182, no. 2246, pp. 19 - 19.

Gardner, P. D, and Cortner H. J. 1985, "Public Risk Perceptions and Policy Response Toward Wildland Fire Hazards in the Urban/Rural Interface." Paper presented at the symposium called: Fire Management: The Challenge of Protection and Use, Logan, Utah.

Goettee (ed), C. (ed.) 2004, *The Recovery Report: Cerro Grande Fire Recovery Newsletter*, Consetta Communications.

Gove, Michael 2005, "Indonesia: A Land Already Drowning", *The Press,* Christchurch, Jan 5, p. B3.

Halvorson, S. J. 2002, *The Fires of 2000: Community Response and Recovery in the Bitter Root Valley, Western Montana*, Natural Hazards Research and Applications Information Centre, University of Colorado.

Higgins, Y. & Tilley, K. 1997, 'Thick Haze in Asia Leads to Few Claims', *Business Insurance,* vol. 31, no. 41, pp. 25 -26.

Hubbard, J. & Rains, M. T. 2002, 'Protecting Communities Through the National Fire Plan', *Fire Management Today,* vol. 62, no. 2, pp. 4 - 12.

Ing, S. K. 1999, 'The Social Conditions of Wildfire in Mongolia', *International Forest Fire News,* vol. No. 21, pp. 75 - 80.

Jackson, W. J. 2003, 'Fire Management to Conserve Biodiversity and Protect Communities: A Global Perspective From a Conservation Organisation', in *3rd International Wildland Fire Conference and Exhibition*, Sydney, Australia.

Jacobsen, S. K., Monroe, M. C. & Marynowski, S. 2001, ' Fire at the Wildland Interface: The Influence of Experience and Mass Media on Public Knowledge, Attitudes, and Behavioral Intentions', *Wildlife Society Bulletin,* vol. 29, no. 3, pp. 929 - 937.

Jakes, P. J. & Nelson, K. 2004, *Community Interaction with Large Wildland Fire Events: Critical Initiatives Prior to the Fire*, USDA Forest Service North Central Research Station and the College of Natural Resources, University of Minnesota, St. Paul, Minnesota.

Kamel, N. M. O. & Loukaitou-Sideris, A. 2004, 'Residential Assistance and Recovery Following the Northridge Earthquake.' *Urban Studies,* vol. 43, no. 3, pp. 533 - 562.

Kelly, L. 2005. *Wildfires and Communities: Australasian Perspectives.* Ensis Bushfire Research, Forest Biosecurity and Protection, Ensis, Christchurch.

Kent, B., Gebert, K., McCaffrey, S. & et.al. 2003, 'Hayman Fire Case Study', *USDA Forest Service Gen. Tech. Rep. RMRS-GTR-114. 2003*.

Kirp, D. L. 1997, 'There Goes the Neighborhood: After the Berkeley Fire, an Architectural Disaster', *Harper's Magazine,* vol. 294, no. 1762, p. 45.

Klinenberg, Eric. 2002, *Heat Wave: A Social Autopsy of Disaster in Chicago.* Chicago, University of Chicago Press.

Kumagai, Y., Carroll, M. S. & Cohn, P. 2004b, 'Coping with Interface Wildfire as a Human Event: Lessons from the Disaster/Hazards Literature', *Journal of Forestry,* vol. 102, no. 6, p. 28.

Kumagai, Y., Daniels, S. E., Carroll, M. S., Bliss, J. C. & Edwards, J. A. 2004a, 'Causal Reasoning Processes of People Affected by Wildfire: Implications for Agency-Community Interactions and Communication Strategies', *Western Journal of Applied Forestry,* vol. 19, no. 3, pp. 184-194.

Lichtman, P. 1998, 'The Politics of Wildfire - Lessons from Yellowstone', *Journal of Forestry,* vol. 96, no. 5, pp. 4 - 9. ***SD 1 .J86***

Lively, C. E. 1951, 'Some Social Aspects of Forest Conservation', *Missouri Agricultural Experimental Station Circular*, no. 359.

Lynch, D. L. 2004, 'What do Forest Fires Really Cost?' *Journal of Forestry,* vol. 102, no. 6, pp. 42-49.

Madigan, N. 2003, 'Wildfire in Southern California Forces Thousands to Evacuate', In *New York Times*, New York, p. 10.

McCaffrey, S. 2004, 'Thinking of Wildfire as a Natural Hazard', *Society and Natural Resources,* vol. 17, pp. 509 - 516.

McCool, S. F., Burchfield, J., Williams, D. R., Carroll, M., Cohn, P., Kumagai, Y. & Ubben, T. 2003, 'Wildland Fire and Communities: A State of Knowledge Synthesis'.

Mecke, V. 1997, *Two Years Later: The Prolonged Traumatic Impact of a Fire Disaster*, Available: [http://www.aaets.org/arts/art29.htm] (8th December).

Mendez, S. R., Carroll, M. S., Blatner, K. A., Findley, A. J., Walker, G. B. & Daniels, S. E. 2003, 'Smoke on the Hill: A Comparative Study of Wildfire and Two Communities', *Western Journal of Applied Forestry,* vol. 18, no. 1, pp. 60-70.

Mileti, D. S. 1987, 'Sociological Methods and Disaster Research', in *Sociology of Disasters: Contribution of Sociology to Disaster Research*, eds. Russell R. Dynes, Marchi, B. d. & Pelanda., C., Franco Angeli, Milano, Italy, pp. 57 - 70.

Mileti, D. S. 1999, 'Disasters By Design', in *Conference on The Changing Risk Landscape: Implications for Insurance Risk Management.*

Moore, J. 2000, 'Forest Fire and Human Interaction in the Early Holocene Woodlands of Britain', *Palaeogeography, Palaeoclimatology, Palaeoecology,* vol. 164, no. 1-4, pp. 125-137.

Moore, P. G., D.; Tan, L. C.; Enters, T.; Durst, P 2002, *Communities in Flames: Proceedings of an International Conference on Community Involvement in Fire Management*.

Moore, S., M. Daniel, L. Linnan, M. Campbell, S. Benedict, and A. Meier. (2004), "After Hurricane Floyd Passed - Investigating the Social Determinants of Disaster Preparedness and Recovery." *Family & Community Health* 27, no. 3, 204-217.

Morrow, B. H. & Peacock, W. G. 1997, 'Disasters and Social Change: Hurricane Andrew and the Reshaping of Miami', in *Hurricane Andrew: Ethnicity, Gender and the Sociology of Disasters.*, eds. Peacock, W., Morrow, B. & Gladwin, H., Routledge, London, pp. 226 - 242.

Myers, D. 1994, 'The Anniversary of the Disaster: Mental Health Issues and Interventions', in *Disaster Response and Recovery: A Handbook for Mental Health Professionals*, Center for Mental Health Services. Rockville, MD.

Nigg, J. M. & Tierney, K. J. 1993, 'Social Change and Disasters: Consequences for Community Construct and Affect', in *Annual Meeting of the American Sociological Association*, Miami, Florida.

Oliver-Smith, A. (1990) Post-Disaster Housing Reconstruction and Social Inequality: a Challenge to Policy and Practice. *Disasters,* 14 (1): 7-19.

Norris, F. H., Friedman, M. J., Watson, P. J., Byrne, C. M., Diaz, E. & Kaniasty, K. 2002, '60,000 Disaster Victims Speak: Part I. An Empirical Review of the Empirical Literature, 1981-2001', *Psychiatry-Interpersonal and Biological Processes,* vol. 65, no. 3, pp. 207-239.

Passerini, E. 2000, 'Disasters as Agents of Social Change in Recovery and Reconstruction', *Natural Hazards Review,* vol. 1, no. 2, pp. 67 - 72.

Pyne, S. 2001. Year of the fires. The story of the great fires of 1910. Viking Penguin, New York. 322pp.

Pelgar, V. 2000, *Colorado Blazes Fuel Forest Restoration Efforts*, Available: [http://www.hcn.org/servlets/hcn.Article?article_id=5900] (31st March).

Picou, J. S. M., Brent K; Gill, Duane A 2004, 'Disaster, Litigation, and the Corrosive Community', *Social Forces,* vol. 82, no. 4, pp. 1493 - 1522.

Prince, S. 1920, *Catastrophe and Social Change: Based Upon a Sociological Study of the Halifax Disaster*, Columbia University, New York.

Quarantelli, E. L. 1979, *The Consequences of Disasters for Mental Health: Conflicting Views*, Monograph #62, Columbus Disaster Research Centre, Ohio State University

Ring, R. 2003, *Who Should Pay When Houses Burn?* Available: [http://www.fs.fed.us/rm/main/pa/newsclips/03_05/0526_who_pays.html] (4th February).

Rodrigue, C. M., Rovai, E. & Place, S. E. 1997, 'Construction of the "Northridge" Earthquake in Los Angeles' English and Spanish Print Media: Damage, Attention, and Skewed Recovery', in *Southern California Environment and History Conference*, California State University, Northridge.

Rosse, W. L. 1993, 'Volunteers and Post-Disaster Recovery: A Call for Community Self-Sufficiency', *Journal of Social Behavior and Personality*, p. 8.

Rossi, P. H., Wright, J. D., Weber-Burdin, E. and Pereira, J. 1983, *Victims of the Environment: Loss From Natural Hazards in the United States, 1970-1980*. New York: Plenum Press.

San-Miguel-Ayanz, J., Barbosa, P. & Schmuck, G. 2001, *Forest Fires in Southern Europe: Bulletin of the 2000 campaign*, Joint Research Centre of the European Commission.

Schweitheim, J. & Glover, D. 1999, 'Causes and Impacts of the Fires', in *Indonesia's Fires and Haze: The Cost of Catastrophe*, eds. Glover, D. & Jessup, T., Institute of Southeast Asian Studies, Singapore, pp. 1 - 13. ***SD 421.34 .I52 .I41***

Shorb, T. L. 2002, 'A Fire's Subtle Changes and Casualties', In *Denver Post*, p. E.06.

Shusterman, D., Kaplan, J. Z. & Canabarro, C. 1993, 'Immediate Health Effects of an Urban Wildfire. (Oakland-Berkeley fire of October 20 and 21, 1991)', *The Western Journal of Medicine,* vol. 158, no. 2, pp. 133 - 138.

Steelman, T. A., Kunkel, G. & Bell, D. 2004, 'Federal and State Influence on Community Responses to Wildfire Threats: Arizona, Colorado, and New Mexico', *Journal of Forestry,* vol. 102, no. 6, p. 21.

Teague, P. 1991, *The Oakland/Berkeley Hills Fire*, National Wildland/Urban Interface Fire Protection Institute.

Telford, J., Arnold, M., Harth, A. & ASONOG 2004, *Learning Lessons from Disaster Recovery: The Case of Honduras*, Hazard Management Unit of the World Bank, Washington D. C.

USFA, U. F. A. 2002, *Fires in the Wildland/Urban Interface*, National Fire Data Center, Emmitsburg, Maryland.

Vaughan, K. 2003, *Bitter Lessons of Hayman Blaze*, Available: [http://www.fs.fed.us/rm/main/pa/newsclips/03_01/0104_bitter.html] (7th February).

Weisshaupt, B. 2004, *When Your Dog Coughs: A Focus Group Approach Assessing the Acceptability of Smoke From Prescribed Burning*, Washington State University.

Wright, K. M. & Barton, P. T. 1994, 'Community Responses to Disaster: the Gander Plane Crash', in *Individual and Community Responses to Trauma and Disaster: The Structure of Human Chaos*, eds. McCaughey, B. G. & Fullerton, C. S., Cambridge University Press, Cambridge, pp. 248 - 284.

Xanthopoulos, G. 1987, 'Greek Forest Fires and Property Damage: A Brief History', in *Symposium and Workshop on Protecting People and Homes from Wildfire in the Interior West*, Missoula, MT, pp. 199 - 200.