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Adaptive Management of Fire

The role of a learning network

Fire and adaptive management

report no. 76

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By Claire Campbell, Simone Blair and Andrew A. G. Wilson

Contents

Summary

Adaptive management is the practice of managing in the face of incomplete knowledge by engaging in a continual cycle of action, learning and adjusting understandings. The 'currency' that flows through the cycle is knowledge; and conversation enables the knowledge to flow.

Extensive literature demonstrates that the critical influences on conversations are knowledge, learning, motivation, values and beliefs. As participants in conversations differ widely, a critical key to effective conversation, in divisive and polarised groups in particular, is facilitation. In short, successful adaptive management depends on effective facilitation.

When individual conversations are strategically linked for broader learning and sharing they become a learning network. Three case studies of learning networks were reviewed:

- The National Health Service in the United Kingdom implemented a learning network that resulted in the involvement of Trusts increasing from 12 to 2300 within one year and becoming largely self-sustaining. To date the network has been limited to health professionals and has therefore missed the opportunity to include participants with other relevant knowledge.
- The Nature Conservancy in the USA has implemented a fire learning network. The network works well within its own paradigm of strong structure, direction and funding. It does, however, work with limited diversity of participants, which excludes some sources of knowledge; is externally controlled (by the Conservancy); appears to depend on continuation of funding and has limited scope to spontaneously adapt and grow.
- The Australasian Fire and Emergency Authorities Council (AFAC) launched an online fire knowledge network (Knowledge Web) to connect fire organisations, staff and researchers. The focus of the network is connecting people to the latest fire research and AFAC business. As a new initiative, its overall effects are still unknown, although it appears to be limited to a specialised audience.

The theory and case studies point to a proposed learning network model suitable for improving fire outcomes in Victoria. The model provides a way to allow a diverse range of people to explore fire and how it is managed, and to feel that they can listen to others, without having to feel that their position/agenda is threatened. **People can listen to others and understand why the others think as they do, without having to agree.** The process promotes more collaboration and respect and focuses on longer-term systems thinking and more sustainable solutions. It avoids entrenching positions and, instead, allows people to learn, adapt and move forward.

A learning network that reflected these elements would evolve over time and at different time scales, depending on the nature and tone of individual local conversations. Within one year, many network elements (such as relationships) would be evident. In three years, some aspects of the network would be operating independently, and a modest number of distinct fire outcomes would have emerged. In five years extensive outcomes that work with systems complexity and benefit natural resources and the community would have emerged. The network would be a standard way of working that, with background support, would be directing, sustaining and growing its own activities.

The report applies aspects of the adaptive management process to the practice of adaptive management itself.

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We look forward to continued conversations with all of you.

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Attorney-General's Department
Emergency Management Australia

About the Authors

Claire Campbell

Claire is a clinical psychologist who has worked in the community development field over the past ten years. She has systematically worked and developed processes, tools, approaches and mechanisms designed to empower communities to respond to the issues they are facing including HIV/AIDS (Africa, Asia Pacific), and the issues of loss and grief encountered after the natural disaster of the tsunami in 2004 and the earthquake in Pakistan in 2005.

Claire spent a number of years working across cultures as the lead researcher in a participatory action research project evaluating the impact of HIV/AIDS prevention approaches implemented by the international Salvation Army. This research occurred in eight countries (Kenya, Zambia, Malawi, Uganda, PNG, Indonesia, India and Sri Lanka) and involved sharing what was learned with other organizations.

Claire believes that all people have the capacity to respond to the issues facing them in their own context. By systematically applying core concepts related to building relationships through ongoing conversations, dynamic change is possible, irrespective of culture or issue - whether this be HIV/AIDS or fire.

Simone Blair

Simone is an anthropologist and before joining DSE Land and Fire management she taught, and undertook research, in this discipline at the University of Melbourne. She has worked with Victorian commercial fishing communities to describe how they learn about, understand, use and pass on knowledge about the marine environment and how their values and social relationships affect these processes of learning and inter-generational knowledge transfer.

The common thread that runs through her work with commercial fishing communities and her work in land and fire management is her interest in how groups of people come to know, value, care about and use the natural environment. She believes that different life ways, cultures and ways of knowing can offer all people insights as to how we can better live in, and adapt to, our world.

Andrew Wilson

Andrew is a forester by training and has worked for DSE (and the departments that it succeeds) since 1987. He has worked in the functional areas of fire management, whole-of-department information management, geological survey and corporate IT. Before joining DSE, he worked with CSIRO's National Bushfire Research Unit in Canberra, and the Rural Fire Research Centre in Melbourne. His masters degree researched the survival of people and houses at Mount Macedon following the devastating Ash Wednesday fires of 1983. That research is the basis of "so-called" 'Wilson house survival meter'.

Common threads that run through Andrew's work include making practical sense of complexity, and linking disparate people and concepts together to release the benefits of them working as a whole.

Foreword

At the heart of emergency management is a focus on building resilient communities who practise preparedness and can respond to and recover quickly from emergencies. Community engagement as a means to this end has become a top priority. No longer do we work for the community, we work with the community.

A strong foundation of shared local knowledge and robust community involvement is crucial to building resilience from the group up. At its most basic level, this stems from conversations shared across community networks. New models enabling these conversations to take place organically, like those explored in this report, help encourage individuals and groups to build relationships, allow for openness and diversity and enable fire-affected community members to be heard on their own terms.

In my experience, - after talking with almost 1000 people in communities affected by emergencies – the majority of people simply want to tell their stories to ensure that what happened, does not happen again. Understanding the perceptions of communities after emergencies is a major part of my work, and I support the effort to establish long-term knowledge sharing and strategic facilitated conversations through 'learning networks'.

The 'learning by doing' project, initially partially funded by my office and the Commonwealth Government's Natural Disaster Mitigation Program in 2006, and the adaptive management approach in this report work to ensure that after emergencies we move forward. In the spirit of Judge Stretton, the chair of the 1939 Black Friday Royal Commission, from every disaster 'good must come out of bad'.

Bruce Esplin
Emergency Services Commissioner, Office of the Emergency Services Commissioner

Introduction

Bushfires in Victoria and more generally Australia and other countries present a significant threat to human life, assets, livelihoods, water catchments, carbon balances, timber supplies, air quality and biodiversity. Paradoxically, land managers ignite planned fires to provide essential benefits to biodiversity and reduce fuel levels to retard the spread of subsequent high-intensity fires in the area.

Typically, the current conversation about fire involves interest groups competing to attribute blame and promote specific solutions with little interest in listening to, or acknowledging, differing views. For such an important issue to all Victorians, conducting a conversation in this way is divisive, defensive and unhelpful.

Though much has been learned about fire and its effects, substantial knowledge gaps remain. No single person or group holds all the knowledge that exists, and debates about interpretation abound. System factors, such as demographics, climate and biodiversity, change continually. No single approach works in all situations. Applying the best available knowledge in decision-making about fire is complex, vexed and important.

Existing approaches to decision-making are inclined, understandably, to focus on specific results (such as a decision, plan, action, agreement or piece of information imparted) and to place government at the centre (as mediator/ broker and decision-maker). At one level this 'gets the job done', but at another level it perpetuates conflict and misses significant opportunities to utilise existing knowledge and discover new knowledge. It builds little community capacity and the conversations are rarely strategic.

The purpose of this report is to review the potential role of learning networks to improve understanding of land and fire management, and ultimately to improve decision making in community and fire aagencies about fire. It complements a report by Blair, Campbell,Wilson and Campbell (2010) on understanding, creating and developing knowledge. The main sections of the report review, in turn, adaptive management, factors that influence conversation, three case studies, learning, and the characteristics of a proposed fire learning network that would be suitable for Victoria.

Adaptive management

Adaptive management is the systematic process of 'learning by doing'. It involves a continual and intentional practice of trying new ways of doing things, learning from the outcomes and changing future actions based on the learning (Jacobson et al. 2004). The process involves a cycle of seven main steps (Sabine et al. 2004), illustrated in Figure 1.

Central to adaptive management is people's interactions and participation. Adaptive management involves understanding the reasons for changing ways of doing things through using many sources of input. It recognises that everything exists within systems of relationships. Making sense of complex, significant and diverse issues require a wide variety of sources of knowledge. Informing and driving this management process forward, and bringing together the inputs, are conversations.

A new concept

The concept of adaptive management first appeared in the 1970s to help strengthen management of the environment using the premise of 'learning by doing' (Sabine et al. 2004). Existing knowledge about the sociological, ecological and economic factors influencing environmental management is limited (Sabine et al. 2004; Warner 2006). Any action has direct and indirect effects on all of these factors. Adaptive management is a way of addressing these gaps in knowledge and making more effective management decisions (Sabine et al. 2004).

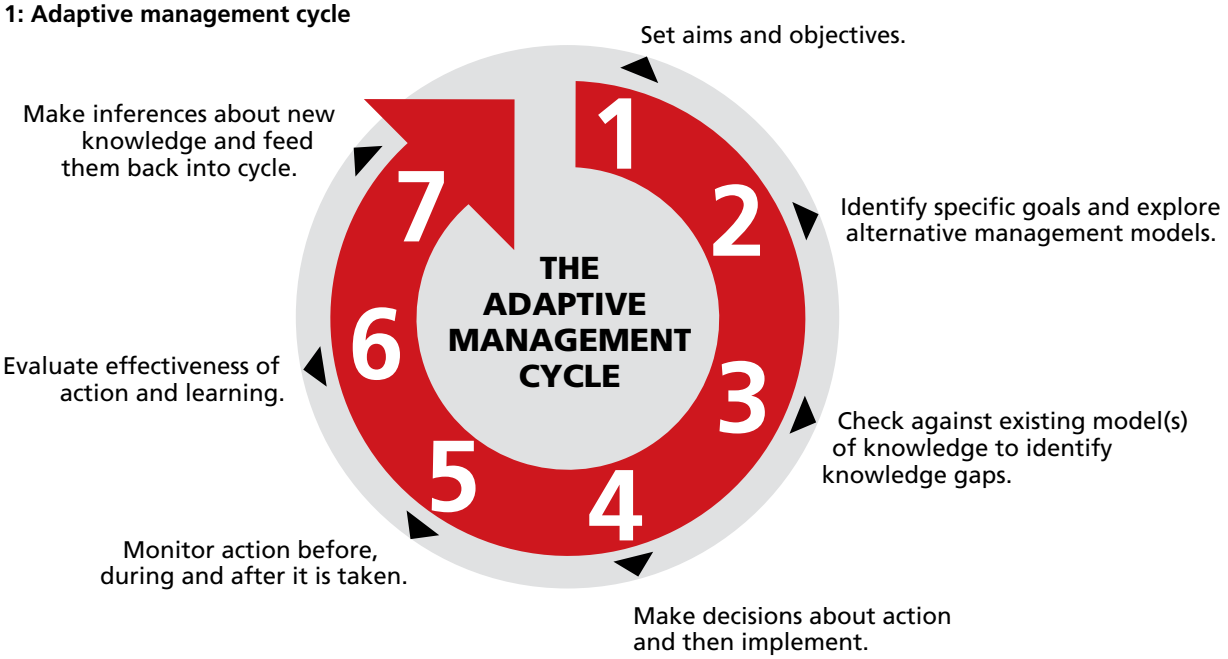
Adaptive management and fire

Fire management involves numerous sociological, ecological and economic issues. The resulting complexity challenges managers when identifying suitable courses of action and results in widespread debate.

Exacerbating the debate are knowledge gaps regarding the impact of current fire management practice, and the future impact of climate change. Adaptive management is a way to address these gaps. The approach shifts the working paradigm from one that is reactive to one that openly acknowledges that there is always more to learn and ways to improve.

The capacity of any system or organism to learn and change - in response to external changes in its environment - is a measure of its resilience (Holling and Meffe 1996; Olsson, Folke & Berkes 2004; Goldstein 2008; Norris et al. 2008). One way to

Figure 1: Adaptive management cycle



improve the resilience of the socio-ecological system we live within, is by deliberately learning from what we do and, crucially, acting on that new knowledge and changing what we're doing. Coupling an adaptive management approach with a learning network, increases the quality and quantity of what is learned by an organization or society and thus, can improve system resilience.

Depends on people

Adaptive management depends entirely on the people involved. Each step requires people to think, interpret and make decisions. Rather than an external source telling people 'what to do' and 'how', people interact as they share and generate their own ideas and knowledge.

The people involved will have pre-existing knowledge, values and beliefs, which shape how they talk and what they talk about. Therefore, who is involved, and how each conversation takes place, is extremely important.

Current practice

Examples of attempts at adaptive management exist across a wide range of issues. These include the management of forests (Timsina 2003; Wintle & Lindenmayer 2008), water catchments (Light 2002; Warner 2006), large carnivores (Skogen 2002), leafy spurge (Cornett et al. 2006), the Mallard Duck (Case 2004) and conservation in general (Nicols & Williams 2006). However, documented effectiveness has been rare as the process is long-term and the long-term implications have not been evaluated fully (Sabine et al. 2004).

Researchers complain, however, that the adaptive management cycle usually stays open (Sabine et al. 2004). Those applying the process do so to the point of making decisions and taking action, but do not complete the cycle of learning and strategically adapting (Sabine et al. 2004). A critical challenge, therefore, is to implement an adaptive management approach where the learning/action cycle is completed.

Suggestions of factors that influence the cycle include time, staffing, funds, attitudes, institutional and conceptual understanding (Jacobson et al 2005; Kelly & Perry 2002; Sabine et al. 2004). One key factor is communication and, specifically, the role of conversations.

Conversations

When people come together in conversation they exchange information or 'conversation content'. The pieces of information may be small (such as when one participant had a haircut), or reflect deeper issues (such as experiences from the last fire season or thoughts on the meaning of life). The exchange results in change because it changes each person's knowledge. As the participants learn and understand more about each other, the exchange also changes the relationships between them.

Any situation that results in learning or change in knowledge may influence values, beliefs and motivation. These sociological factors directly affect the adaptive management cycle.

Influences

As conversations are critical to the success of adaptive management, understanding the factors that drive and shape the conversation is important. These factors include knowledge, learning, motivation, values and beliefs.

Knowledge

A brief overview of theory surrounding knowledge, learning, motivation, values and beliefs is presented below. Understanding, creating and developing knowledge specifically about fire in Victoria is the subject of a separate report by Blair et al. (2010).

Conversation builds knowledge

According to Elmholdt (2004), knowledge is information that a person holds and has verified – by whatever means – to be true. Researchers have explored how a person obtains, develops, explains, shares and then utilises knowledge for the purposes of continued growth and change from many perspectives (Elmholdt 2004). Berger and Luckmann (1966) suggest that how people construct their knowledge reflects their construction of reality. Elmoholdt (2004) builds on this idea and suggests that knowledge develops and grows when people with different experience come together to talk. When they talk they can generate new ideas or knowledge.

Everyone has knowledge

Several authors have highlighted the theme of discerning which people hold the relevant or necessary knowledge. Some of these authors have shown particular interest in fire management and how knowledge can be shared and applied to develop better practices (Rosentrom et al. 2006; Wilson et al. 2007; Tsunda 2006).

According to Rosentrom et al. (2006), those who hold the knowledge about managing include not only the 'experts', scientists and those in powerful positions, but also those who live in communities, work in the field and have a passion and commitment to knowing all there is to know about the issues. Therefore, each person who has some of that knowledge can both share and learn. Holistic conversations should include all available sources (Tsunda 2006).

Learning

When one or more people develop knowledge, they are learning. Though learning is subject to numerous definitions, it can be summarised as being a cognitive process that usually invokes the acquisition of knowledge, skills, understanding and/or values (Bain & Bond 2000). Understanding and exploring learning is the subject of a vast field of endeavour (Bain & Bond 2000), on which the material below touches.

Individual

Learning depends on the context and situation and on the values and beliefs about learning that a person holds (Bain & Bond 2000). For example, learning is more likely for a person who believes that learning and developing new knowledge has high value.

Many factors affect the value that a person ascribes to learning. These include the importance that the person's family places on learning; upbringing, past experiences of learning and interest in the topic.

Group

Theories about communities-of-practice posit that how a person learns also depends on the structure of the surrounding community. The research shows that learning is stronger if it occurs with others, and is more likely if the people involved share values, beliefs and sense of direction (Davies 2005). As individuals within a community of shared interest learn, their identity and relationships with the group change (Davies 2005; Gee 2005).

Role of conversation

A key element of information exchange and learning is conversation. A context of good communication supports people in continually developing and building knowledge (Gee 2005; Jacobson et al. 2005). Developing the means for people to come together to discuss, learn, share and shape strategic thought and action is critical. There are several types of means, including some that are electronic, but the richest and most important is face-to-face interaction.

Motivation

Central to people engaging in conversations about an issue, and therefore central to adaptive management, is each participant's degree of interest or motivation. Adaptive management depends on those who implement and apply its principles being motivated to learn and adapt (Sabine et al. 2004). The motivation of the participants to learn affects the knowledge they generate and accept, and the decisions and actions they consequently take.

Participation in conversation requires motivation

A person participates fully in a conversation only if motivated (Fekadur & Kraft 2002). Motivation varies from context to context, reflecting external forces (e.g. pressure from others), internal forces (e.g. the value a person places on the topic being discussed) and the reasons the person wants to share and learn (Ajzen 1988; Fishbein & Ajzen 1975; Hofstede 2001). Each person's reasons for being involved in the conversation may differ widely. For example, some may participate to push their own point of view or talk about themselves, whereas others may not care about the topic but instead want the social company.

Sense of reward

The basis of motivation is a sense of reward. A person's reward may be internal (e.g. feeling good), or external (e.g. being paid) (Huitt 2001). Motivation is more powerful and long lasting if internal rather than external (Barr 2003).

Internal motivations reflect influences such as personal thoughts and feelings and social and spiritual factors. External motivations reflect externally rewarded behaviours that come in forms such as payment, praise or avoidance of threat (Huitt 2001).

Relationship with learning

Central to all the theories of learning is the idea that learning depends on a desire, or motivation, to learn. That is, a process, usually internal, of desire, want, and/or need, that impacts on action toward a desired end (Huitt 2001; Smith & Schwartz 1997). The motivation an individual or group has for learning about an issue reflects the value that they place on it. Motivation is the energy behind any action or change.

Self-measurement of change is a mechanism for influencing motivation for continued change. Identifying concerns, taking action and measuring the results of that action can act as a catalyst for further action (Woodward & Hetley 2007). This can increase the value placed on learning more about a particular issue.

Values and beliefs

Reflecting a person's sense of identity – his or her internal state of being – are values and beliefs (Hofstede 1984, 1998; Smith & Schwartz 1997). Values reflect the things a person perceives and feels as being important, whereas beliefs reflect a sense of how things in the world should be or be done. For example, an individual may place high value on the flavour of a cup of tea, and hold a particular belief about the appropriate method of making one.

Values and beliefs are closely related. They reflect the factors that a person ties to their sense of identity and what is important in life (Hofstede 1998). For any given issue, these two 'people factors' significantly affect how a person thinks, feels, responds and acts.

Impact on way of working

Values and beliefs affect the ways in which people work (Hofstede 1984, 2001; Kashima et al. 1992). They affect how we approach people and interact with them, how we talk about an issue with others, what actions we take and how we take them. For example, a person who believes in strategically managing land to break the flow of fire will take action and advocate for the use of firebreaks. Conversely, a person who believes that firebreaks are ineffective will take action and advocate ceasing their use and will cite examples and evidence of firebreaks being ineffective. Both people may value human life, but they have different beliefs about how to realise that value.

Connect people together

Values and beliefs do not, however, relate solely to the individual (Fishbein & Ajzen 1975; Hofstede 2001). When two or more people hold the same value or belief, it can connect those people together. For example, some fire ecologists in Australia and the USA may believe that planned burns are an effective way to reduce bushfire risk and increase biodiversity. Although the people come from different geographic and cultural situations, this common belief connects them and enables sharing and learning from each other's experiences. Shared beliefs and connections across borders can help the emergence of a shared vision for future action.

By contrast, a fire ecologist and a conservationist may believe that fire can regenerate flora, but may want to create a quite different landscape because they hold different values.

Influence choices

Common values connect people around a shared vision, and guide the 'why and how' of action (Hofstede 1984, 1998, 2001). They fundamentally link whether people see themselves as working independently or as part of a whole.

For an often-divisive theme such as fire management, an obvious question is whether a shared vision is even possible. After all, a shared vision, and consequently a shared purpose, requires communication, openness, respect and flexibility. Fortunately, the challenge is not so much whether people can share a vision, but how well they see the connections (Smith & Schwartz 1997). People being aware of what they have in common supports a context that is conducive for people to make decisions about action and improve ways of working.

Values, beliefs and fire

Our values and beliefs inform our perception of reality. The phenomenon of fire can be emotive and divisive. Many Australians – as a result of their upbringing – often perceive fire as negative, destructive and dangerous. In contrast, fire managers typically perceive fire as a powerful tool for preventing major disasters and fostering flora and fauna regeneration.

Gaps in knowledge compound the differences in views about the impacts of fire (Sabine et al. 2004). Connecting people for conversations that build understanding, support decision-making, action and subsequent learning from that action, are vital.

Facilitating conversations

When participants of diverse views interact, the conversations are often difficult and unproductive. As knowledge, motivation and values are powerful sources of influence on a conversation and may be conflicting, a critical aspect of conversation is facilitating the 'conversation process'.

Facilitating a conversation involves one or more people supporting the conversation by asking questions that open up thought and discussion (Campbell, Blair and Wilson 2010; Campbell et al. 2000a, 2000b; Lindsey et al. 2001). A person who facilitates a conversation stays aware of the dynamics of motivation, values and beliefs that are present. The person works with those process dynamics to create an environment where the participants feel free to share and listen in a respectful and thoughtful manner. Ideally, the person ensures that space is available for the participants to explore the issue in depth. Such conversations may occur over time and expand naturally, so that they can consider a broad range of issues.

A facilitated conversation is necessarily strategic. Facilitation implies that the conversation has a purpose and is being supported. In a strategic conversation a person who facilitates intentionally opens up issues for discussion and asks questions to support deeper thinking and understanding. This can occur within one conversation event or a series of events. (See Campbell, Campbell & Blair, forthcoming for more detail about facilitation skills and process). Alternative processes, such as 'deliberative democracy', which, although applying a similar philosophy, focus on specific outcomes (Hartz-Karp 2004).

The knowledge that conversations generate is available to the adaptive management cycle. It informs the model, facilitates thought around decisions and action, supports actions and ensures that monitoring and evaluation occur.

Learning Networks

In order to manage more adaptively, broader learning can be fostered through the deliberate activity of connecting conversations to form a learning network (Barr 2003; Kerkhoff & Szlezah 2006). It opens up understanding of the wider 'system' in which participants are a part.

Even if participants do not agree – and, indeed they often wont – they have at least discussed and heard alternative perspectives. The act of discussion allows for greater understanding and consequently learning occurs.

Implications

A learning network implies that:

- Learning will take place
- Linkages exist between the participants – either technological or social. The most effective networks use both (Evans et al. 2007; Farrell & Holkner 2004; Hodgson & Reynolds 2005; Wild 1996).
- Connections ideally occur through face-to-face interactions.
- Information can be exchanged in many ways, including written form. Most information sharing usually occurs in the form of conversation. (Cummings et al. 2006; Farrell & Holkner 2004).

Examples

Several examples of learning networks exist in fields such as health, community development and the environment (Andrews 2004; Heimann 2006; Robinson & Hales 2007). Case studies of the different characteristics, effects and applicability of three such learning networks follows.

Case study 1: The engaging communities learning network (ECLN)

Background

The provision of health services in the United Kingdom is diverse and complex. The government-funded National Health Service (http://www.networks.nhs.uk/networks) provides multifaceted and diverse services in health care.

The NHS operates 2,300 Primary Care Trusts which each provides primary health care in its local community. The Trusts have been operating for many years. Feedback to the national body highlighted that medical professionals (such as doctors, nurses and physiotherapists) needed a platform to share experiences and work together to modernise thinking around how primary care is used and provided.

The network

In 2002, the NHS established a group to explore implementing a learning network. The aim of the network was to provide an environment where professionals involved in working in communities could share knowledge more effectively. The intention was that this sharing would lead to a more informed and improved delivery of service.

The NHS decided to establish a pilot to determine the usefulness of the concept and gather lessons for any subsequent scaling-up. 12 Trusts from different regions were invited to come together to share their thoughts and knowledge on themes such as working with local communities and how to involve staff and patients in decision-making. The network became known as the Engaging Communities Learning Network (ECLN). The ECLN initiators saw their role as being a focal point and support centre where the trusts could share their learning.

Within a year, two thirds of the Trusts across the nation had become involved, mainly through word of mouth. Participants from the initial 12 Trusts found the network so useful that they recommended it to their neighbouring Trusts, who in turn recommended it to others.

Way forward

A core group of members organise regional and national events with various themes to guide discussion. As the network expands, the initiators of the network are becoming less involved. They are handing over decisions about the themes and design of the event to network members. The members are participating in, owning and guiding the network's direction. The members are still mainly medical professionals. They are exploring how to link with networks that are addressing other health care themes.

Reflection

Strengths

The main benefit of the network seems to be the sense of connection that the participants gain.

The network's initiators demonstrated an awareness of the importance of the participants' motivation to be involved and stay involved. The network began by involving 12 Trusts that had expressed interest (i.e. demonstrated motivation). The network established itself and its ways of working with that smaller group, and adapted its processes from the learning that emerged.

The network initiators strongly supported the initial stages. However, they also recognised the importance of handing over responsibility to the participants, so that the participants could then own and guide the network and be more likely to stay motivated. This reduced the initiators' control over content and direction, but increased the chances of the network persisting.

Weaknesses

Membership of the network focuses on medical professionals, to the exclusion of recipients of the services or members of the general community. A future option would be to try to broaden the membership. This would help increase perspective and knowledge of health issues and needs in those communities.

Case study 2: The Nature Conservancy: Fire Learning Network

Background

In the United States, The Nature Conservancy (www.nature.org), a not-for-profit organisation, works to improve and conserve the natural environment. Its mission statement reflects the aim of preserving plants, animals and natural communities by working to protect the land and waters that they need to survive.

Global Fire Initiative (GFI)

Originally, the Conservancy mainly operated on funds from private donors to buy and manage large tracts of land for conservation. More recently, however, the Conservancy recognised that fire is of great importance to conservation and decided that a section of the organisation should focus on that theme. In 2002, the Conservancy launched the Global Fire Initiative (GFI). The aim of the GFI team was to address issues of biodiversity conservation relating to fire – issues of too little fire, too much fire or the wrong type of fire.

The GFI team was to advocate for the importance of fire as a conservation tool. It sought to involve local communities in that process, and to support them in implementing fire management projects of varying scales on their land and in conservation areas. It also sought a role in influencing agreements and policies that recognise fire's natural conservation role.

The GFI team proposed to achieve its aims through an Integrated Fire Management (IFM) framework.

Integrated Fire Management (IFM) framework

The IFM framework proposes that fire be approached from three perspectives: sociological, ecological and economic (see Figure 1). By using these perspectives in a conservation area, fire can be evaluated in terms of beneficial and harmful effects.

Figure 1: Sociological, ecological and economic triangle

The framework involves three actions:

1. Evaluating whether the effects of fire would be detrimental/beneficial or benign
2. Weighing relative benefits and risks
3. Responding appropriately and effectively based on the question that guides the action or evaluation.

The framework involves considering eight factors for every action taken. The factors are: assessment of the environment situation; economic role of fire; social and ecological factors; fuels; fire behaviour; fire-related threats; fire management goals and education.

Role of knowledge

The GFI team proposed that a key factor that underlies any action is knowledge. Specifically, the team identified that the areas of knowledge that are essential for the success of an integrated approach includes: those of current fire status, life history, habitat requirements, sustainable yields, fire dynamics and conservation targets.

Research highlighted that land managers make decisions about actions based on inferences they generate from the knowledge available. The team considered that keeping track of the knowledge used as the basis for inferences, and the way the knowledge changed subsequent decisions about action, was vital for ensuring that choices about future action were well informed.

The IFM approach aimed to support stakeholders to generate practical solutions for managing fire threats. It recognised that sharing lessons was critical, so it became involved in developing tools to support that process. An important tool that it developed and implemented was a Fire Learning Network.

Fire learning network

The team developed regionally-based networks for connecting individual projects so that the people involved could share the lessons they had learned. Through those networks the team aimed to apply the principles of adaptive management. More specifically, they worked with the belief that learning has direct application to future action and state of being.

The team determined that the goal of the networks was to provide a forum for sharing and learning that connected local, regional and national levels. It also hoped the network would help the participants to achieve mutual goals related to fire, and to identify their common needs and barriers to implementation. The network also provided a platform for developing and testing strategies for use in other landscapes.

Team

The GFI team divided the USA into seven regions and established a network and support team to connect local groups in each region. It established a clear structure, delineating roles and responsibilities at national, regional and local levels. The regional teams were responsible for identifying the aims and objectives of their particular regional networks, and for running workshops to guide participants through a standard process that the overall GFI team prescribed.

Identified key sites

In each region, the national and regional teams identified key sites that they felt would benefit from conservation and the use of fire. They asked community groups to propose projects and apply to be part of the network. The national and regional teams worked together to select projects within each region that appeared to complement each other. The Conservancy provides US$500,000 a year to support the overall program.

How does the network work?

The regional teams supported the regional networks using various guided approaches to facilitation. The purpose of the guidance was to build relationships and overcome project implementation challenges. The support included a series of facilitated workshops over a three-year period; site assessment visits; mentoring of participants; exchanges and online discussion groups.

Workshops

A series of facilitated workshops was integral to the network development. The workshops had three main aims:

1. Identify fire-related threats by using conceptual ecological models and situational diagrams that illustrate ecological and social relationships that affect and are affected by fire
2. Identify desired future conditions and fire management goals
3. Design integrated strategies.

The workshops lead participants through four stages of thinking and planning. Each stage contained a number of goals, such as:

- Collaboratively develop a scientific basis for landscape-scale fire management in the form of conceptual ecological models (Stage 1)
- Collaboratively begin drafting a monitoring plan (Stage 4).

The stages provided a way of measuring progress. The goals within each stage reflected a framework that was the basis of ongoing facilitated discussions on the issues of interest. In between the workshops, participants continued to work on, develop and implement the selected goals. The GFI team recognised that particular groups would work through the stages at different rates, depending on factors such as the individuals involved and time available.

Guidebook

To support land managers and decision makers in implementing the program the GFI team developed a guidebook (Fulks 2004). The guidebook provided suggestions for achieving success in managing the landscape with fire through a fire learning network.

Case study 2: The Nature Conservancy: Fire Learning Network *Cont'd*

Key elements of a successful GFI fire learning network

The national and regional teams identified nine elements they considered to be critical for a successful network:

1. Leadership
2. Participation by external scientific experts and partners
3. Outcome-oriented objectives and structured assignments
4. Dedicated, results-oriented participants
5. Network advisory team
6. Field trips
7. Experienced facilitators
8. Effective communication
9. Consistent funding.

Key challenges to a GFI fire learning network

As a result of implementing the networks, the GFI team identified a number of challenges:

1. When the GFI applied the same approach for implementing a network in a different culture outside the USA, the approach worked far less effectively.
2. Within California, one of the most fire-prone areas of the USA, the network has not been taken up. The GFI identified the reason as lack of cohesiveness between conservation groups. The GFI recognised that when there is division, or highly different perspectives on the role of fire, the GFI network approach is not as effective.
3. Regional networks may stop functioning if funding ceased.
4. Sharing of lessons learned and best practice is critical. To date, the GFI has not effectively achieved this.

Way forward

The GFI team continues to strive to bring groups together to work on conservation projects. It is systematically exploring methods for sharing the lessons learned and best practice. It does not currently work in areas where fire is a controversial issue.

Reflection

Strengths

Several factors appear to have contributed to the fire network's success. The network has been most successful where the participating groups share common values and motivation to conserve the land in a similar way. The GFI ensures a common value system by selecting groups through an application process. One of the selection criteria is the willingness of the group to sign a statement about commitment to common goals.

Another factor that contributes to the network's success is its strict guidelines. The guidelines determine who can join, the actions that members must take and processes they must follow. The network also has strong government and financial backing.

Weaknesses

The network's common values, perspectives and program structure have contributed to its localised success, but also to its weaknesses. For example, the network is closed. It excludes many who may be interested, those who hold more diverse perspectives and would provide the conversations with greater diversity of knowledge and options for action. Though including such people would increase the difficulty of facilitating the conversation, the resulting richness of knowlege emerging from such a conversation would more than likely compensate for this.

The rigidity of the program structure also reduces the chances of participants truly owning and directing the process. The network depends on the structures to make it what it is and esentially can't grow by itself. For example, the sustainability of the network probably depends on continued funding.

These issues are particularly relevant to any attempt to replicate the network in a different cultural or social context.

Case Study 3: AFAC Knowledge Web

Background

The Australasian Fire and Emergency Authorities Council (AFAC) (see www.afac.com.au) is the peak industry body for organisations that provide fire and emergency services in Australia and New Zealand. In 2008, AFAC launched a fire knowledge network to connect fire organisations, staff and researchers. The aim was to provide a focal point for fire knowledge within Australia and New Zealand. It was to offer a forum for bringing together the latest research on fire and its management and for sharing that research with a broad audience. That audience included agency staff, community members, other researchers and other interested parties. The network offered support in four key areas:

- A forum for identifying lessons learned through experience, history and research
- A fire research exchange centre where the most recent research can be accessed
- A central location for research-based communities-of-practice
- Consultancy services for those seeking expert support.

The primary mechanism for accessing these support services is a website.

Way forward

The AFAC knowledge web is progressing in its plan to connect organisations and help researchers to exchange information and experience. The website has sections for both the agencies and the public. Moderated online forums are encouraged and online discussion groups are facilitated through communities-of-practice. Bushfire-related publications are also available.

Reflection

Strengths

As yet, the impact of the knowledge web is unclear. Its key role seems to be research, which it makes available online via a website. It shows the strengths and weaknesses of a web-based network.

The knowledge web could support facilitated online conversations. It is a forum where participants could explore research around conversation topics, and gain access to resources that support the learning and sharing that occurs in face-to-face conversations.

Weaknesses

The knowledge web provides a mechanism for sharing the latest scientific information, and web-based discussion forums for developing understanding around the issues. It is, however, limited to those who know about it, are motivated to open up the information and read it and are motivated enough then to take part in a discussion forum. Realistically, this is a small pool of people, which greatly limits the scope and nature of the conversation and the extent of information sharing.

Limiting the sources of information to those of rigorous scientific research makes the information highly selective. It suggests a belief that the only source of valid information and knowledge on fire management approaches from scientific 'experts'. This again limits the nature and scope of the knowledge the network can cultivate. If the approach to managing fire were to be truly adaptive, it is both this scientific knowledge and the knowledge of non-scientific experts that informs the conversation and guides action. However suitable the network may be for its intended purpose, it supports a comprehensive conversation only in part.

Learning

Drawing on the foregoing discussion of adaptive management, conversation and case studies of learning networks, some key learning points are summarised below. They are grouped in terms of conversations, influences on conversations and learning networks.

In summary, the learnings about conversations are:

- The process of conversation is central and is the input activity and output.
- The conversation should be thought of a way for people to discover multiple perspectives on a topic or issue.
- The motivation of participants is central to the conversation and the creation of new points of connection beyond the conversation
- A conversation becomes strategic when it is facilitated and intentional.
- Strategic conversations are needed to support thinking, gaining new knowledge and making decisions. These activities are necessary for completing the adaptive management cycle.
- Facilitated conversations that occur through interpersonal networks provide a context and space that can lead to new understanding and how to apply that to one's own life.
- Skilled facilitation, in the early stages of the conversations, is critical. The more diverse the ideas and participants, the greater the need for skilled facilitation.
- The facilitator must be neutral. The facilitator must focus on process and has no role in conveying or 'hearing' views.
- Strategic conversation can identify connection points and discuss differences. Such learning reflects an increase in understanding, which can result in actions that are better informed.
- Differences can become areas of greater learning, if not agreement.
- Online systems should support the conversation rather than become the conversation.

In summary, the learnings about the influences on conversations are:

- The values, beliefs and motivation of each participant directly impact on the nature, tone and content of any conversation.
- It is important to start with those who are motivated to be part of a conversation and who see some intrinsic value in coming together to share experiences and learn. The learning network process works with, applies and grows motivation.
- Self measurement impacts on motivation.
- It is natural for people to be more interested in what is happening in the here and now, 'where I am', and not necessarily consciously consider how others are thinking/feeling/responding to the same issue and why/how this may differ from their own. However, a conversation that may start with these interests can lead to interest in fire or other fire aspects.
- Links can be made from values and beliefs to ways of working.
- Facilitation is required to ensure a balance in the tone of views expressed. This gives participants the space to hear and be heard.

In summary, the learnings about connecting conversations to form a learning network are:

- A network strategically facilitates the connection of conversations. It provides a context where people can intentionally come together with different sets of knowledge for sharing and learning and generate stronger, richer knowledge that allows for more strategic understanding of the issues.
- Connecting conversations supports a context for greater understanding of management models and the reasons for decisions.
- A network should be open to all who are willing to participate and not be overly controlled.
- A network that advocates an inclusive approach to sharing, learning and adapting may provide a mechanism for facilitating changes more widely e.g. in non-fire aspects of community function, issues and wellbeing. Thereby increasing overall community resilience.
- A network provides a means for intentionally breaking the artificial boundaries between areas of action (e.g. being able to work only within the confines of a job description or organisational structure), and creates a context for broader learning and understanding of the issues.
- Learning is a continual process. A network should adapt as new and better ways of doing things are learned.
- The knowledge generated within a network is not specific to that network and should be shared with other networks.
- A network should empower people to take ownership of the issue and the conversation group, rather than reinforce dependence on others
- Money should not be 'thrown at' a network (by the government or anyone), as sustainability, which has high value, does not depend on funding.
- A long-term view should prevail – even when a community is not interested in taking part in the short term, future connection and participation is possible through a sustained relationship.

Way Forward

The learnings about conversations, influences on conversations and connecting conversations suggest a way forward.

It is proposed that, alongside its existing activities, DSE develop a pilot learning network. It should apply to the development process the dicipline of the adaptive management cycle (Figure 1). It should adopt the ways of working shown in Tables 1 and 2. Then, after one, three and five years, it should compare the observed effects with the expected effects described in Table 3.

Table 1. Way of working for the network development team

Ways of working: the network development team	Implications
Work as part of a team	A team provides emotional support and ensures strong process.
	A team with different levels of experience allows learning and facilitation skills to develop in a supported environment.
	• Do work to support each other in a shared way of working and vision
	• Don't compete or be divisive.
Work by facilitation	A person who facilitates a conversation allows people to explore issues and discuss differences. The process enhances opportunities for learning and sharing.
	• Do work in accordance with facilitation guidelines and be neutral. Cultivate and coach leaders who emerge with the capability to facilitate conversations, and who may in turn develop other facilitators.
	• Don't act in a controlling manner. The participants own the direction and content.
Work with the view that the role of the network developers will change	As the network develops and evolves, the role of the network development team necessarily changes. Progressively, it becomes less about initiating and implementing, and more about providing background support to an ongoing process.
	• Do encourage, help and allow members of a conversation to take responsibility for the conversation.
	• Don't build dependency of conversations on the facilitation team.

Table 2. The ways of working for implementing conversations

Ways of working: implementing the process of conversations	Implications
Work in relationally oriented ways	Relationships will determine whether and how the network develops. Connecting with people, and then helping to connect those people with others, supports an environment where positive learning can occur.
	• Do start, and continue, by working through existing relationships and connections. Do ask for suggestions about other people who may be interested.
	• Don't specify that particular people or places must be involved.
Work by invitation	When people welcome conversation and ask to participate, they are more likely to build relationships of trust, discuss issues in more depth, learn more and take ownership of continuing the conversation over time.
	• Do accept invitations that seem genuine, wherever they originate.
	• Don't impose your involvement through power means, such as organisational mandate.
Work with a diversity of participants	Diversity and differences are good. Different perspectives allow greater opportunities for building understanding and learning.
	• Do take a holistic view of community. Include interested people from the wider community and DSE and avoid subtle barriers, such as the 'us and them' view.
	• Don't exclude anyone who wants to participate and wants to learn.
Work to identify multiple entry points from where conversations can start	People enter any situation with their own values, beliefs and motivations. A conversation may need to start on an issue that is unconnected with fire. Conversation enables learning about what people hold as important, and leads to insights about how fire may connect with their lives.
	• Do ask people about themselves and what's important to them, and listen. Do indicate your interest in jointly exploring whether there may be previously unrecognised links between their interests and conversations about fire.
	• Don't be impatient in engaging in initial conversations that may have little or no reference to fire.
Work with a long-term perspective	Conversations develop over time. They are not tied to a particular agenda for imparting information, making a decision, creating or changing a plan or policy, or even directly taking an action. Learning that leads to change usually takes time. Building understanding and knowledge occurs over multiple conversations and around other events.
	• Do resist the idea of connecting the learning network to a result-oriented process, such as one of planning.
	• Don't specify that particular rates of development or change must be achieved.

Table 2. The ways of working for implementing conversations Continued

Ways of working: implementing the process of conversations	Implications
Work with the view that multiple approaches are required	Any human community is a sociological, ecological and economic system in which many influences simultaneously impact on an individual or event. A single approach to seeking connections with issues, such as fire, is insufficient. Multiple and complementary approaches are needed.
	• Do continually check actions against the principles.
	• Don't impose particular structures or methods.
Work expecting to see different effects	Change will occur in: the people involved, the way they're involved, levels of respect for other people's perspectives, interest in learning and in the connections identified between different views. The process works within a social system and has no 'end point'.
	• Do think and talk in terms of effects rather than outcomes.
	• Don't expect to see instant dramatic changes
Work by continually assessing actions and their effects	Every interaction and conversation is an opportunity to learn and improve on how things are done. Learning and adapting intentionally is critical.
	• Do embed observation, documentation and 'after-action review' as an integral part of actions, such as meeting with people. Do continually check actions against the principles.
	• Don't 'pull up the seeds to see if they're germinating'.

DSE should compare the observed effects with the expected effects (shown in Table 3) after one, three and five years.

Table 3. The expected effects of implementing a pilot learning network in accordance with the proposed ways of working.

After one year	• Growing awareness and acceptance of the ideas and ways of working with a learning network are apparent within and outside the organisation.
	• Widespread new relationships exist between interested parties (individuals, communities, groups and organisations).
	• Some people say or show that they are not interested in participating, as a learning network is not a forum in which they can push their agenda.
	• In some areas, conversations have become established as a recognisable entity or functioning network.
	• The development stage of one or more conversations is advanced.
	• The individual or local conversations remain separate from each other.
	• Some potential facilitators have begun to emerge in the more advanced conversations.

After one year	• Some measurable changes in attitudes and understanding about the issue have emerged in advanced conversations.
	• For advanced conversations, local people have taken ownership.
	• One or two incidental, serendipitous and local fire and natural resource benefits have emerged.
	• Conversation participants begin to share with others what they have learned.
	• Commonly, but with exceptions, people in hierarchical organisations, such as government, will welcome the initiative but remain caught up in systems that reinforce existing behaviours and practices.

Table 3. The expected effects of implementing a pilot learning network in accordance with the proposed ways of working *Cont'd*

After three years	• Consistent conversations are taking place involving those within and outside the organisation. The conversations are beginning to be linked.
	• Many conversations are occurring in local areas.
	• Participants own and decide on the direction of the conversations.
	• Some significantly better approaches to fire and natural resources have emerged, such as increased understanding of the issues, less conflict and more working together, both at a local and broader level.
	• Some conversations have ceased as people have lost interest, moved away for other reasons or felt that the issues that interest them have been fully discussed – for the moment they've learned all they can or want to learn.
	• Relationships developed in conversations are being maintained outside of the conversation setting.
	• Conversation participants begin to see themselves as 'knowledge brokers', sharing knowledge with others in their personal networks.
	• In general the network is widely supported, however, there have been some difficult patches, expressed not least from within government, through the purpose having been misunderstood.
	• Connections exist and sharing and learning is occurring between several of the advanced and established conversations.
	• The network development team continues to support network development by connecting conversations, building relationships with people interested in forming new conversations and linking them into the network.
	• Facilitators have emerged from within the conversations and are facilitating conversations independently of the network development team.

After five years	• Ongoing conversations linked as a network are considered a natural part of how people within and outside organisations interact. People take their own initiative and action and adapt the learning network's philosophy in their own ways as circumstances evolve.
	• Extensive improvements in approaches to fire and natural resource management that address complexity and entail systems thinking have emerged, both at local and broader level. Improvements are indicated by increased understanding of the issues, less conflict and more working together.
	• Participants control the network and decide on its direction and the types of connections made.
	• The people involved in many individual conversations actively work to establish other conversations in nearby areas and to connect them with the network and with other networks.
	• Established conversations identify and develop new facilitators, independent of the formal facilitation team.
	• The network development team supports the conversations and the establishment of new conversations, from the background.

Conclusion

The report proposes, with supporting rationale, a learning network model for the role of knowledge, conversation and community in the adaptive management of fire.

The report describes how extensive and complex knowledge held by many parties with diverse value systems, can be harnessed to identify, and allow understanding of, fire-management practices. Facilitated conversations are the proposed key to sustained and beneficial change. The proposed model complements rather than replaces existing practices of planning and community engagement.

In order for others to evolve their approach to fire, be more willing to learn, value knowledge more highly and be adaptive managers, will require DSE staff too, to demonstrate these behaviours. Effective fire management requires recognition that 'simple' notions (such as superlative fire control or 'government protecting the people') are inadequate. To address the complex issues of fire requires the diverse knowledge, efforts and resources of the whole community.

It is recommended that DSE test the proposed approach by implementing a pilot learning network. Such a pilot would be in keeping with the practice of adaptive management, and would allow government to learn first-hand about an approach with which it is largely unfamiliar and possibly uncomfortable. The pilot should then be documented and evaluated and future initiatives adapted according to the learnings. A review of the strengths and limitations of the approach, in relation to existing alternative practices, should also be undertaken.

References

Ajzen, I 1988, *Attitudes, personality, and behavior,* Milton Keynes: Open University Press.

Andrews, K 2004, 'Developing a learning network to support engagement with health communities', *Health Expectations,* 7, pp. 349–351.

Bain, L & Bond, S 2000, 'Trialling learning and skills development: A community driven approach', *International Journal of Employment Studies,* 8 (1), pp. 129–153.

Barr, S 2003, 'Strategies for sustainability: citizens and responsible environmental behaviour', *Area,* 35 (3), pp. 227–240.

Berger, PL & Luckmann, T 1966, *The social construction of reality: a treatise in the sociology of knowledge,* Anchor Books, Garden City, NY.

Blair, SL Campbell, CB Wilson, AAG, and Campbell, M. 2010, Understanding, creating and developing knowledge about fire in Victoria. *Fire and Adaptive Management report no. 77,* Department of Sustainability and Environment Victoria.

Campbell, CB Blair, SL and Wilson, AAG, (2010). Developing a Fire Learning Network : A case study of the first year. Fire and Adaptive Management. Report no. 78, DSE Victoria.

Campbell, ID, Foster, A, Chaava, T & Rader, A 2000a, 'Community counselling: a process for expanding a capacity development approach to HIV/AIDS related care and prevention', *Paper presented at the 13th International AIDS conference,* Durban, South Africa.

Campbell, ID, Foster, A, Chaava, T & Rader, A 2000b, 'Facilitating expansion of local community capacity development: an 'inside out' approach for scaling up responses to HIV/AIDS', *Paper presented at the 7th Canadian conference on international health,* Ottawa, Canada.

Case, DJ 2004, *Waterfowl hunter satisfaction think tank: Understanding the relationship between waterfowl hunting regulations and hunter satisfaction/participation, with recommendations for improvements to agency management and conservation programs,* The Wildlife Management Institute, Washington, D.C.

Cornett, MW, Bauman, PJ & Breyfogle, DD 2006, 'Can we control leafy spurge? Adaptive management and the recovery of native vegetation', *Ecological Restoration,* 24 (3), pp. 145–150.

Cummings, S, Heeks, R & Huysman, M 2006, 'Knowledge and learning in online networks in development: a social-capital perspective', *Development in Practice,* 16 (6), pp. 570–586.

Davies, B 2005, 'Communities of practice: legitimacy not choice,' *Journal of Sociolinguistics,* 9 (4), pp. 557–581.

Elmholdt, C 2004, 'Knowledge management and the practice of knowledge sharing and learning at work: a case study', *Studies in Continuing Education,* 26 (2), pp. 327–339.

Evans, V, Larri, LJ & Stoltz, S 2007, *Networks, connections and community: Learning with social software,* Australian Flexible Learning Framework, Commonwealth of Australia, Australia.

Farrell, L & Holkner, B 2004, 'Points of vulnerability and presence: knowing and learning in globally networked communities', *Discourse: studies in the cultural politics of education,* 25 (2), pp. 133–144.

Fekadur, Z, & Kraft, P 2002, 'Expanding the theory of planned behaviour: the role of social norms and group identification', *Journal of Health Psychology,* 7 (1), pp. 33–43.

Fishbein, M & Ajzen, I 1975, *Belief, attitude, intention, and behavior. An introduction to theory and research,*. Addison-Wesley Pub. Co.USA.

Fulks, W 2004, *Fire learning network regional leaders guidebook,* The Nature Conservancy's Fire Initiative, Boulder, CO.

Gee, JP 2005, 'Meaning making, communities of practice, and analytical toolkits', *Journal of Sociolinguistics,* 9 (4), pp. 590–594.

Goldstein, BE, 2008, 'Skunkworks in the embers of the Cedar Fire: enhancing resilience in the aftermath of disaster,' *Human Ecology,* 36, pp. 15-28.

Hartz-Karp, J 2004, Sharing decision-making, *New Matilda.* USA.

Heimann, D 2006, 'Supporting communication for development with horizontal dialogue and level playing field: the communication initiative', *Development in Practice,* 16 (6), pp. 603–610.

Hodgson, V & Reynolds, M 2005, 'Consensus, difference and 'multiple communities' in networked learning', *Studies in Higher Learning,* 30 (1), pp. 11–24.

Hofstede, G 1984, *Culture's consequences: International differences in work-related values,* Sage Publications, United States of America.

Hofstede, G 1998, 'A case for comparing apples with oranges: international differences in values', *International Journal of Comparative Sociology,* 39 (1), pp. 16–31.

Hofstede, G 2001, *Cultures consequences: comparing values, behaviours, institutions and organisations across nations,* 2nd edn, Thousand Oaks, California, USA.

Holling, CS & Meffe, GK, 'Command and control and the pathology of Natural Resource Management,' *Conservation Biology,* 10 (2), pp. 328-337.

Huitt, C 2001, 'Motivation to learn: an overview', *Educational Psychology Interactive,* Valdosta State University, Valdosta, GA.

Jacobson, SK, Morris, JK, Sanders, JS, Wiley, EN, Brooks, M, Bennetts, RE, Percival, F, & Marynowski, S 2005, 'Understanding barriers to implementation of an adaptive land management program', *Conservation Biology,* 20 (5), pp. 1516–1527.

Kashima, Y, Siegal, M, Tanaka, K, & Kashima, ES 1992, 'Do people believe behaviours are consistent with attitudes? Towards a cultural psychology of attribution processes', *British Journal of Social Psychology,* 31, pp. 111- 124.

Kelly, H & Perry, L 2002, 'Learning communities: developments in Victoria', *Unicorn,* 28 (3), pp. 55–60.

Light, S 2002, 'Adaptive management: a valuable but neglected strategy', *Environment,* 44 (5), pp. 42–45.

Lindsey, E, Stajduhar, K & McGuinness, L 2001, 'Examining the process of community development' *Journal of Advanced Nursing,* 33 (6), pp. 828–835.

Nichols, J & Williams, BK 2006, 'Monitoring for conservation', *Trends in Ecology and Evolution,* 21 (12), pp. 668–673.

Norris, FH, Stevens, SP, Pfefferbaum, B, Wyche, KF, Pfefferbaum, RL, 2008, 'Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness' *American Journal of Communinty Psychology,* 41 pp. 127-150.

Olsson, P, Folke, C, Berkes, F, 2004, 'Adaptive comanagement for building resilience in socio-ecological systems,' *Environmental Management,* 34(1) pp. 75-90.

Robinson, JW & Hales, BD 2007, 'Models and methods for creating sustainable community-based development organisations in diverse communities' *Journal of the Community Development Society,* 38 (2), pp. 33–51.

Rosentrom, U, Mickwitz, P, & Melanen, M 2006, 'Participation and empowerment-based development of socio-cultural indicators supporting regional decision-making for eco-efficiency', *Local Environment,* 11 (2), pp. 183–200.

Sabine, E, Schreiber, G, Bearlin, AR, Nicol, SJ & Todd, CR 2004, 'Adaptive management: a synthesis of current understanding and effective application', *Ecological Management & Restoration,* 5 (3), pp. 177–182.

Skogen, K 2003, 'Adapting adaptive management to a cultural understanding of land use conflicts', *Society and Natural Resources,* 16, 435–450.

Smith, PB & Schwartz, S 1997, 'Values', in JW Berry, MH Segall & C Kagitasibasi (eds.), *Handbook of cross cultural psychology: Volume 3.* Social behavior and application, 2nd edn, Allyn and Bacon, Boston.

Timsina, NP 2003, 'Promoting social justice and conserving montane forest environments: a case study of Nepal's community forestry programme', *The Geographical Journal,* 169 (3), pp. 236–242.

Tsunda, E 2006, 'Japanese culture and the philosophy of self advocacy: the importance of interdependence in community living', *Journal Compilation,* 34, pp. 151–156.

Vygotsky, LS 1962, *Thought and Language,* MIT Press, Cambridge, MA.

Warner, JF 2006, 'More sustainable participation? Multi-stakeholder platforms for integrated catchments management', *Water Resources Development,* 22 (1), pp. 15–35.

Wild, M 1996, 'Building knowledge networks: the scope of the world wide web', *Australian Education Researcher,* 23 (3), pp. 45–54.

Wilson, LB, Harlow-Rosentraub, K, Manning, T, Simson, S & Steele, J 2007, 'Civic engagement and lifelong learning', *Generations, winter,* pp. 90–94.

Wintle, BA, & Lindenmayer, DB 2008, Adaptive risk management for certifiably sustainable forest management', Forest Ecology and Management, 256, 1311-1319.

Woodward, WR & Hetley, RS 2007, 'Diffusion, decolonializing, and participatory action research', *Integrative Psychological Behaviour,* 41, pp. 97–105.

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1. 1977. A Study of the distribution of aerially applied fire retardant in softwood plantations. R. Rawson.
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21. 1983. Otways Fire No 22 – 1982/83: A case study of plantation protection. P. Billing.
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30. 1987. Monitoring the ecological effects of fire. F. Hamilton (ed.)
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43. 1996. Fuel hazard levels in relation to site characteristics and fire history: Chiltern Regional Park case study. K. Chatto.
44. 2004. Surface fine fuel hazard rating – forest fuels in East Gippsland. G. J. McCarthy.
45. 1998. Effectiveness of firefighting first attack operations by the Department of Natural Resources and Environment from 1991/92-1994/95. G. J McCarthy and K.G. Tolhurst.
46. 1997. The development and testing of the Wiltronics T-H Fine Fuel Moisture meter. K. Chatto and K. Tolhurst.
47. 1998. Overall fuel hazard guide. G. J. McCarthy, K. Chatto and K. Tolhurst.
48. 1999. Development, behaviour, threat, and meteorological aspects of a plume-driven bushfire in west-central Victoria: Berringa Fire February 25-26, 1995. K. Chatto, K. Tolhurst, A. Leggett and A. Treloar.
49. 1997. Analysis of fire causes on or threatening public land in Victoria 1976/77 – 1995/96. C. Davies.
50. 2000. Assessment of the effectiveness and environmental risk of the use of retardants to assist in wildfire control in Victoria. CSIRO Forestry and Forest Products.

51. 2001. Effectiveness of broadscale fuel reduction burning in assisting with wildfire control in parks and forests in Victoria. G. J. McCarthy and K. Tolhurst.
52. 2003. Effectiveness of aircraft operations by the Department of Natural Resources and Environment and Country Fire Authority 1997-1998. G. J. McCarthy.
53. 2003. Modelling transport, dispersion and secondary pollutant formation of emissions from burning vegetation using air quality dispersion models. O. D. Valianatos, K. Tolhurst, S. Seims and N. Tapper.
54. 2003. Determination of sustainable fire regimes in the Victorian Alps using plant vital attributes. G. J. McCarthy, K. Tolhurst and K. Chatto.
55. 2004. Analysis of wildfire threat: issues and options. A. A. G. Wilson.
56. 2003. Prediction of firefighting resources for suppression operations in Victoria's parks and forests. G. J. McCarthy, K. Tolhurst, M. Wouters.
57. 2003. Ecological effects of repeated low-intensity fire in a mixed eucalypt foothill forest in south-eastern Australia. Summary report (1994-1999). Department of Sustainability and Environment.
58. 2003. Effects of repeated low-intensity fire on the understorey of a mixed eucalypt foothill forest in south-eastern Australia. K. Tolhurst.
59. 2003. Effects of a repeated low-intensity fire on fuel dynamics in a mixed eucalypt foothill forest in south-eastern Australia. K. Tolhurst and N. Kelly.
60. 2003. Effects of repeated low-intensity fire on carbon, nitrogen and phosphorus in the soils of a mixed eucalypt foothill forest in south eastern Australia. P. Hopmans.
61. 2003. Effects of repeated low-intensity fire on the invertebrates of a mixed eucalypt foothill forest in south-eastern Australia. N. Collett and F. Neumann.
62. 2003. Effects of repeated low-intensity fire on bird abundance in a mixed eucalypt foothill forest in south-eastern Australia. R. H. Loyn, R. B. Cunningham and C. Donnelly.
63. 2003. Effects of repeated low-intensity fire on terrestrial mammal populations of a mixed eucalypt foothill forest in south-eastern Australia. M. Irvin, M. Westbrooke, and M. Gibson.
64. 2003. Effects of repeated low-intensity fire on insectivorous bat populations of a mixed eucalypt foothill forest in south-eastern Australia. M. Irvin, P. Prevett, and M Gibson.
65. 2003. Effects of repeated low-intensity fire on reptile populations of a mixed eucalypt foothill forest in south-eastern Australia. M. Irvin, M. Westbrooke, and M. Gibson.
66. 2003. Effects of repeated low-intensity fire on tree growth and bark in a mixed eucalypt foothill forest in south-eastern Australia. K. Chatto, T. Bell and J. Kellas.
67. 2003. A review of the relationship between fireline intensity and the ecological and economic effects of fire, and methods currently used to collect fire data. K. Chatto and K. Tolhurst.
68. 2003. Effects of fire retardant on vegetation in eastern Australian heathlands: a preliminary investigation. T. Bell.
69. 2003. Effects of fire retardant on heathland invertebrate communities in Victoria. N. Collett and C. Schoenborn.
70. 2003. Effects of fire retardant on soils of heathland in Victoria. P. Hopmans and R. Bickford.
71. 2004. An evaluation of the performance of the Simplex 304 helicopter belly-tank. H. Biggs.
72. 2004. Operational performance of the S-64F Aircrane Helitanker – 1997-98 fire season. H. Biggs.
73. 2008 Underpinnings of fire management for biodiversity conversation in reserves. M. Gill.
74. 2008. Flora monitoring protocols for planned burning: a user's guide. J. Cawson and A. Muir.
75. 2008. Flora monitoring protocols for planned burning: a rationale report. J. Cawson and A. Muir.
76. 2010. Adaptive Management of Fire: The role of a learning network. C. Campbell, S. Blair and A.A.G. Wilson.
77. 2010. Understanding, Developing and Sharing Knowledge about Fire in Victoria. S. Blair, C. Campbell, A.A.G. Wilson and M. Campbell.
78. 2010. Developing a Fire Learning Network: A case study of the first year. C. Campbell, S. Blair, A.A.G. Wilson.
79. 2010. A Case Study of a strategic conversation about fire in Victoria, Australia. S. Blair, C. Campbell and M. Campbell.
80. Forthcoming. Guidelines: Facilitating Strategic Conversations as Part of Adaptive Management. C. Campbell, M. Campbell and S. Blair.
81. 2010. Fire Boss amphibious single engine air tanker: Final Report, November 2008. H. Biggs.

Supplementary report

1992. Ecological effects of fuel reduction burning in a dry sclerophyll forest: A summary of principle research findings and their management implications. Department of Conservation and Environment., Victoria. K Tolhurst, D.W. Flinn, R.H. Lyon, A.A.G.Wilson, and I. J. Foletta.

1992. Ecological effects of fuel reduction burning in a dry sclerophyll forest: First Progress Report. Department of Conservation and Environment. Victoria. K. Tolhurst and D. Flinn (eds)

www.dse.vic.gov.au