

Integrated Fire Management in the Asia Pacific Region.

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Abstract

Integrated Fire Management (IFM) is one of the strategies currently employed by The Nature Conservancy (TNC) and governmental and non-governmental partners to achieve biodiversity and conservation goals. It focuses on fire's ecological role, and its benefits and risks to society. IFM is defined as an approach to address the problems and issues posed by both damaging and beneficial fires within the context of the natural environments and socio-economic systems in which they occur. This is achieved by evaluating and balancing the relative risks posed by fire with the beneficial or necessary ecological and economic roles that it may play in a given conservation area, landscape or region (Myers, 2006).

TNC's Global Fire Initiative plays a unique role in the global fire community. TNC's organizational long-term goal to ensure effective conservation of 10% of every major habitat type on earth, is catalyzing accelerated geographic expansion of our fire work worldwide. TNC is currently the only global conservation organization with hundreds of in-house fire practitioners. These practitioners apply ecologically-based fire management on-the-ground; mentor and train others in ecologically-based applications; and implement a multi-faceted approach to address fire-related conservation issues, including policy, community-based collaborative conservation, capacity building, and science.

To date, TNC has largely focused its fire-related work in North, Central and South America. However, TNC will extend this work to the Indo-Malay and other biogeographic realms in the future. For example, in late 2007, TNC's Global Fire Initiative will collaborate with the United Nations Food and Agriculture Organization (FAO) and TNC's regional and country programs to build regional capacity to implement IFM through a training course in East Kalimantan. Participants will include governmental and non-governmental managers from around the region who work on fire management, land management, planning and conservation will participate in the training.

Drawing from the GFI's strengths and approach to abating fire-related threats to biodiversity in other regions, this paper will outline an approach to integrate fire management in the Asia Pacific region that addresses the issues, social context and needs of the communities and other stakeholders therein.

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Introduction

The Nature Conservancy (TNC) launched the Global Fire Initiative (GFI) in 2002 to help combat the threats that too much, too little, or the wrong kind of fire may pose to biodiversity conservation. The GFI is currently active in 17 countries where it works with partners to find solutions that allow fire to play a role in places where it benefits nature and people, and keep fire out of places where it is destructive.

TNC's organizational long-term goal is to ensure effective conservation of 10% of every major habitat type on earth. This ambitious goal has resulted in the geographic expansion of fire work in geographies such as the Asia Pacific region. The majority of wildfires in this region are human caused and are often associated with shifting populations, changes in land use patterns and practices (Goldammer, 2001; Ganz 2001). Many communities in countries located within the Asia Pacific region are quite familiar with fire in terms of its use for traditional livelihood activities such as clearing vegetation for agriculture, hunting and stimulating the growth of Non-Timber Forest Products (NTFPs). As such these communities historically have played a significant role in the management of fire in many areas of the region (Johnson, 2006). However, changes in land use patterns, and top down fire related policy and legislation often conflict with traditional fire use practices. In terms of modern fire management, the dominant thinking by many governments in the region today is that suppression, prevention and enforcement are the only effective strategies in managing fires (Ganz, 2001). This paradigm generally ignores the broader conceptual approach to fire management taken by many organizations such as TNC that recognize the need for maintaining the role of fire in fire-dependant ecosystems and the beneficial uses of fire by rural communities.

Fire is not always used in appropriate ways. For example, excessive or inappropriate burning can lead to damaged ecosystems and altered fire regimes. The top causes of altered fire regimes globally have been identified as urban development; livestock farming; ranching and agriculture; fire and fire suppression; resource extraction (including energy production, mining and logging); and climate change (Shlisky et al., 2007). More specifically, in the Indo-Malay realm, which is located in the Asia Pacific region and includes countries such as China, Australia and Indonesia, agriculture and logging have been identified as being the greatest threats to biodiversity (Shlisky et al., 2007). Further, inappropriate land development policies have led to extensive deforestation and ecologically inappropriate fire use in many of the countries in the Indo-Malay realm. This situation is exacerbated when local peoples' uses and needs are not considered in the development of legal and regulatory systems (Murdiyarso and Adiningsih 2006). The resulting social conflict has often become an indirect cause of fires in the region. In Borneo for example, Government granted concessions ignore indigenous claims on land and trees and are at the root of many forest and fire management problems (Colfer, 1997). This lack of recognition of local people's rights can lead to land tenure conflicts, where stakeholders may resort to the use of fire as a weapon to claim lands (Tomich et al., 1998).

If people have legitimate ownership of resources and can see long term benefit from the land that they are managing they will tend to be concerned with the protection and sustainable management of those resources and the land which supports them. Clearly defined land tenure, in terms of legal ownership, boundary demarcation and security in the form of enforceable rights are most likely to provide

the necessary incentives for communities to manage fire judiciously both in the short term and long term. Similar incentives would be necessary in order to gain the involvement and support of communities in managing wildfires that have origins outside of their traditional or legal boundaries. In most instances these incentives require the formulation of appropriate policy followed by its implementation and enforcement. This combined with education and training can result in a situation where communities are engaged and have a strong sense of ownership, and where fires, both beneficial and detrimental, are likely to be more effectively managed. In turn this can lead to increased opportunities for collaboration between communities, commercial interests and governments, and ultimately to the sustainable management of terrestrial ecosystems at a landscape scale.

This paper will discuss how and why an integrated approach to fire management is the most likely strategy to successfully achieve effective fire management solutions in the Asia Pacific region.

Integrated Fire Management

The term Integrated Fire Management (IFM) has been used by others to refer to various aspects of fire management. TNC's definition of this term includes the integration of science and society with fire management technologies at multiple levels. It implies a holistic, comprehensive approach to address fire issues that considers biological, environmental, cultural, social, economic and political interactions. Further, IFM is an approach that addresses the problems and issues posed by both damaging and beneficial fires within the context of the natural environments and socio-economic systems in which they occur (Myers, 2006).

- IFM helps communities find cost-effective approaches to preventing damaging fires and maintain desirable fire regimes. When fires do occur, IFM provides a framework to:
- evaluate whether the effects will be detrimental, beneficial or benign;
- weigh relative benefits and risks; and
- respond appropriately and effectively based on stated objectives for the area in question.

IFM takes into account fire ecology, socio-economic issues and fire management technology to generate practical solutions to fire-related threats to biodiversity (Figure 1).

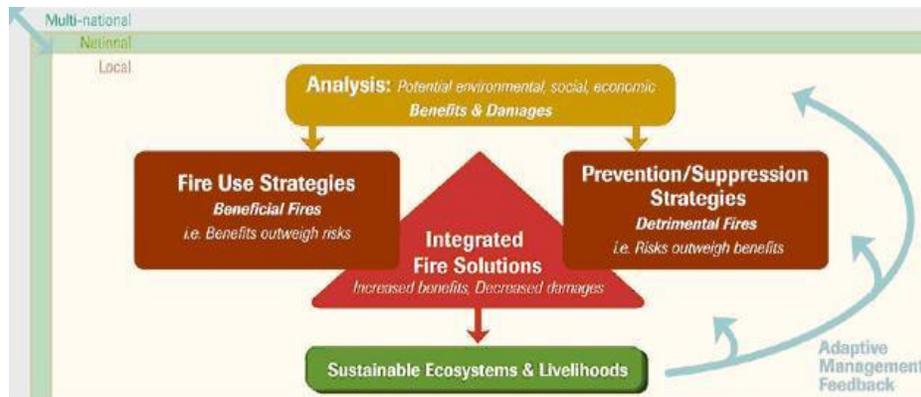


Figure 1. Integrated Fire Management Flow Diagram (Myers, 2006)

TNC's approach to IFM includes eight fundamental steps (Myers, 2006). These eight steps can be adapted and incorporated into workshops designed to develop and implement IFM approaches in ecosystems that are fire-dependent as well as those that are fire-sensitive. Fire-dependent ecosystems are defined as those where fire is essential and the species have evolved adaptations to respond positively to fire and to facilitate fire's spread (vegetation that is fire prone and flammable). These systems are often referred to as fire-adapted or fire-maintained ecosystems. Fire-sensitive ecosystems are defined as ecosystems largely composed of species which have not evolved with fire as a significant recurring process. Species in these areas lack adaptations to respond to fire and mortality can be high even when fire intensity is very low. Vegetation structure and composition tend to inhibit ignition and fire spread. Under natural, undisturbed conditions, fire may be such a rare event that some of these ecosystems could be considered fire-independent.

1. Assessment & Analysis of Situation & Issues

Effective analysis of a given situation is the key to successfully integrating ecology, social issues and appropriate fire management technologies. Identifying what role fire plays in the cultural, economic and social context of various stakeholders is critical in developing this understanding. Questions that should be asked when conducting such an analysis include:

- What is the ecological role and impact of fire in a given area?
- What is the social, cultural and economic context in which fires are occurring?
- Who is doing the burning and why?
- How are they burning?
- What are the characteristics of the fuels in the area and how does fire behave in them under different burning conditions?
- What other factors or threats are exacerbating the fire problem, such as land tenure issues, illegal logging, invasive species or climate change?

2. Fire Management Goals & Desired Ecosystem Condition

It is necessary to identify desired future conditions and establish fire management goals that will achieve those conditions in order to minimize conflicts and identify common and realistic goals. The answers to the following questions will lead to better fire management planning, community programs and decisions on individual fires:

- What role should fire be allowed to play in the landscape?
- Are there land uses or other constraints that limit fire from playing an ecologically appropriate role?
- How and where should fires be constrained?
- Should some fires be purposely ignited and who should do that?
- What mix of fire use, prevention and suppression strategies should be utilized?
- How will local communities be involved?

3. Laws, Policy & Institutional Framework

In addition to an institutional framework that embraces the concept of IFM there needs to be supportive laws and policies in place. To ensure adequate dissemination and implementation ecological and social information must be incorporated into fire management curricula at universities, technical schools and professional training programs.

4. Prevention & Education

Fire is commonly used by rural populations in Asia Pacific countries as a land management tool because it is cheap, simple to apply and is sometimes the only option available for people with little or no income (IUCN, 2002). It is necessary to understand the ecology of fire in a particular landscape in order to make assessments as to whether people are burning too much, too little or inappropriately to meet both conservation goals and to maintain the ecosystems on which communities depend. Identifying and understanding local needs as well as the ecological constraints of an area will lead to the design and application of more effective fire management programs.

5. Fire Use

This step aims at gathering and disseminating information so that fire managers can make informed decisions on the ground. Fires can be both beneficial and detrimental depending on how, where, when and why they are burning. In order to make decisions that maximize potential benefits and minimize damages, a good understanding of local ecology, fire behavior and the variables that determine that behavior is essential.

6. Preparedness and Response

This step involves the development of information to assist managers to prepare and respond appropriately and effectively to planned and unplanned fire occurrences. Fire management invariably involves preparedness and response capability to deal with emergency situations. Fire events can be better anticipated and better decisions made when fires do occur if information about fires that have occurred in the past, ignition sources and the need and propensity of certain vegetation types to burn is known to managers.

7. Restoration, Recovery, & Maintenance

The objective of this step is to gather information needed to deal with a post-fire environment. Post-fire recovery and restoration efforts are frequently poorly designed, ineffective and costly. They can be better designed by incorporating ecological knowledge of the burned vegetation and its recovery potential.

8. Adaptive Management, Research & Information Transfer

This final step ensures that active learning will constantly occur and refine the management of fire in the region. This is extremely important because many IFM decisions will be made with incomplete knowledge and limited experience. It is important then to ensure that there exists an adaptive management framework through which continual improvement and adjustments can be made. Current plans and actions should be based on existing knowledge and inferences derived from the initial situation analysis (Step 1). The effects of those decisions must be monitored, and it is those monitored trends that will inform future management actions along with the incorporation of new knowledge. Effective mechanisms need to be in place that will facilitate review of implementation strategies, and translation and dissemination of technology, information and new knowledge.

Workshops

Examples of successful implementation of IFM can be found in the United States, Latin America and the Caribbean. A model being used in the United States is the US Fire Learning Network (USFLN) which is a joint project of TNC's Global Fire Initiative, the United States Department of Agriculture (USDA) Forest Service and the United States Department of the Interior. The USFLN engages dozens of multi-agency, community-based projects in a process that accelerates the restoration of landscapes that depend on fire. Network projects cover nearly 29 million hectares operating at local, regional and national levels. A primary objective of the USFLN is to develop strategic actions to overcome barriers to implementing ecologically appropriate fuels reduction and restoration projects.

In cooperation with country programs and regional partners, the Latin American and Caribbean Fire Learning Network (LACFLN) engages more than 50 NGO's and government partners in 16 countries in Latin America and the Caribbean. Working thru the LACFLN, TNC's Global Fire Initiative is able to actively promote an IFM approach that includes influencing multi-lateral and national fire related policies across the region as well as increasing capacity for fire specific training, education and comprehensive planning.

To achieve their objectives the USFLN and LACFLN apply a methodology that incorporates landscape specific workshops designed to increase collaboration, and the capacity of partners to restore and conserve fire adapted ecosystems at a landscape scale.

An important distinction to be made between the two models is that the USFLN operates in an environment in which partnership agreements exist that provide funding for multiple sequential workshops on a given landscape. This is not the case for the LACFLN and as such each landscape typically conducts one initial workshop with a key objective to develop landscape-specific, comprehensive fire management plan.

There are many similarities between the Latin American-Caribbean and Asia Pacific regions in terms of existing capacity and availability of resources for the implementation of IFM. Therefore a methodology to establish and implement an IFM approach on specific landscapes within the Asia Pacific region is proposed here that is similar to that used by the LACFLN

The following is a brief description of how a FLN model used in Latin America and the Caribbean could be applied to a network of landscapes across the Asia Pacific region. It is based on that programme's successes in achieving tangible progress in abating fire-related threats to nature and people.

A single workshop incorporating many of the 8 fundamental steps necessary to achieve the successful implementation of IFM (Myers, 2006) would be conducted on selected landscapes within the Asia Pacific region. Desired outcomes from workshops would include the development of regionally relevant and appropriate approaches to IFM that could be successfully implemented given available resources and capacity. More specifically, these approaches would be captured in the form of comprehensive fire management plans specific to each of the identified landscapes. The development of these management plans would be a key objective and deliverable of each of these workshops.

It is important to note that there are challenges in transferring experiences from different ecological and social contexts to new locations both politically and technically (Mayer, 2001). To address this issue the proposed community-based fire management (CBFiM or IFM) workshops would be designed to identify, assess and analyze local and regional issues with regards to conservation and fire management in the Asia Pacific region (step 1 of TNC's 8 fundamental steps to incorporating IFM). This would in part be accomplished by combining elements of the LACFLN IFM workshop model with an existing CBFiM - IFM workshop format that is currently being sponsored and conducted by the Food and Agriculture Organization of the United Nations (FAO) and TNC. Two of three scheduled TNC-FAO workshops have been held in Africa and Latin America since 2004 and the third will be conducted in East Kalimantan, Indonesia in late 2007.

Specifically the purpose of the Indonesian workshop in 2007 will be to synthesize information and experiences about community-based fire management in Asia-Pacific, and to discuss how community-based approaches to fire prevention, fire suppression and fire use may be integrated into local, national and international fire management efforts to address forest and vegetation fire threats. The workshop will place particular emphasis on community-based programs associated with protected natural areas, conservation zones, and other types of forests reserves, and on programs associated with general forest and fire management. Participants will

include fire practitioners and resource management professionals from around the region.

Use of relevant aspects of the FAO-TNC CBFiM - IFM workshop format in the Asia Pacific region can serve as a framework that will also allow the incorporation of a number of approaches used in the LACFLN model. If considered as a first step in implementing IFM, workshops conducted across pilot landscapes could provide a forum for relevant training, cross-landscape information transfer, and learning and discussion of effective strategies that are implemented in each of the landscapes. During this process these landscapes will become catalysts for further dissemination and implementation of IFM concepts across the Asia Pacific region. The practicality of conducting subsequent workshops and trainings with a focus on implementation activities will be based on capacity, availability of funding and the level of collaboration and support between potential partners.

Partners/Collaboration

IFM by its very name implies collaboration, and collaboration is essential for the development of strong and effective partnerships. Collaborative partnerships with communities, the private sector, conservation NGO's, governments and their affiliated agencies can provide the knowledge, resource and other inputs that are necessary for successful IFM implementation. This section describes how an already existing partnership could be used, and strengthened by, facilitating an integrated approach to fire management in the Asia Pacific region. The partnership example used is the Asia Forest Partnership (AFP) which is a Type II Partnership. It should be noted that other collaborative partnerships also exist, and could be similarly used to achieve mutual goals for IFM, biodiversity conservation, economic development and community protection.

Type II Partnerships are an innovative form of environmental governance that was introduced at the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002. The partnerships are designed to take action on sustainable development issues through voluntary partnerships rather than addressing those issues through treaties or agreements (Wilson, 2005). These partnerships are not intended to substitute existing commitments made by governments but rather to serve as mechanisms for the delivery of globally agreed upon commitments such as the United Nations Conference on Environment (UNCED) Agenda 21 and the United Nations Millennium Development Goals. This is accomplished in part by mobilizing the capacity for producing action on the ground.

Type II Partnerships aim to integrate the economic, social and environmental dimensions of sustainable development in their design and implementation and are consistent, where applicable, with sustainable development strategies and poverty reduction strategies of the countries, regions and communities where their implementation takes place (Kara, 2002). In addition, Type II Partnerships use a multi-stakeholder approach and involve a range of significant actors in a given area of work. These types of partnerships are invariably arranged among any combination of partners, including governments, regional groups, local authorities, non-governmental actors, international institutions and private sector partners (*Id.*).

The Asia Forest Partnership (AFP) is one of approximately 220 Type II Partnerships launched at the WSSD in 2002. The AFP promotes sustainable forest

management in Asia and is an example of a voluntary, multi-stakeholder initiative aimed at achieving sustainable development outcomes. AFP currently has 14 governments, 8 Intergovernmental Organizations, and 2 NGOs as its partners. TNC, the Governments of Japan and Indonesia, and the Centre for International Forest Research (CIFOR) serve as leading partners. The AFP aims to address five urgent issues: governance and law enforcement; capacity-building; illegal logging; forest fires; and rehabilitation and reforestation. The partnership acts as a catalyst for existing initiatives within the region by increasing synergies and reducing duplication of those initiatives. The partnership also identifies areas where new programs are needed, harmonizes existing initiatives and develops new standards and laws for the region.

Forming effective partnerships in the Asia Pacific region with entities such as AFP will promote the IFM approach and maximize resource potential in terms of available funding, equipment, technology, and capacity-building. This will facilitate development and implementation of aspects of comprehensive IFM plans for selected landscapes within the region. In addition, broad partnerships will provide a vehicle for the transfer of IFM concepts and information across geographic and political boundaries in the Asia Pacific region.

IFM Pilot Landscapes

IFM concepts and principles can be applied in various countries within the Asia Pacific region through the establishment of pilot landscapes or anchor sites (Figure 2). These sites will represent a variety of land use practices, ownership patterns and social-ecological issues that could be considered when developing ecologically appropriate fire management methodologies. The selection of pilot landscapes will ultimately be determined by ecological and social contexts, and the needs of partners participating in and funding the network.

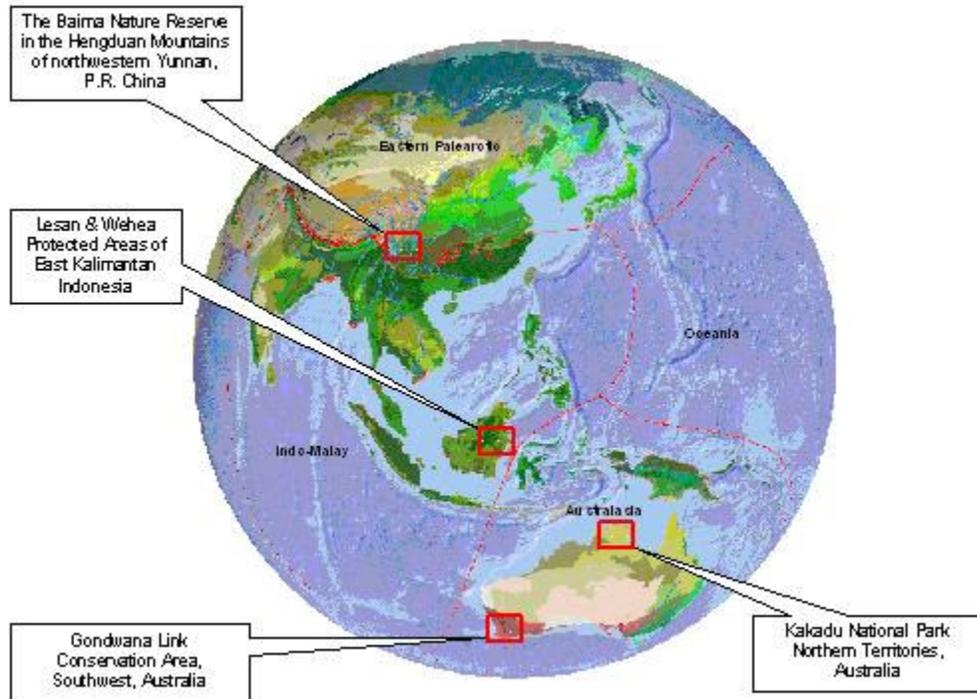


Figure 2. Location of potential IFM pilot landscapes in the Asia Pacific region. The location of these projects is for illustrative purposes only.

The following are examples of potential IFM pilot landscapes located in Australia, Indonesia and China. These are countries located in the Asia Pacific region where TNC is currently working to protect ecologically important lands and waters for nature and people.

Australia (South-western Australia and Northern Territories)

Gondwana Link is located in the southwest corner of Australia and is one of the country's largest conservation projects. TNC, in partnership with local, regional and national groups is working to reconnect and restore a 620-mile swath of native bushland from the desert edge of Australia's Red Centre to the tall-tree forests of the southwestern coast. In doing so, entire ecosystems, and the fundamental ecological processes that underpin them, will be restored and maintained. The project area contains 25% of the country's plant species and a diverse population of fauna. Two-thirds of the vegetation in southwestern Australia has been cleared due to post-war government policies in an effort to transform the southwest corner of the continent into a major grain exporter. Clearing was the first wave of destruction followed by fragmentation, salinity, invasive species, and more recently, climate change. These changes in land use activities have significantly altered the historic fire regime of this region of Australia over time.

Kakadu National Park located in the Northern Territory is a unique example of a complex of ecosystems, including tidal flats, floodplains, lowlands and plateaux, and provides a habitat for a wide range of rare or endemic species of plants and animals.

It has been inhabited continuously for more than 40,000 years and evidence suggests that Pleistocene Aborigines developed fairly sophisticated fire management techniques at an early stage that were practiced until quite recently (Jones, 1975). During that period anthropogenic fire frequency kept forests clear of brush, favored grazing kangaroos, and prevented the accumulation of fire potential. This resulted in fire intensities that were kept low. European settlement began in the late 18th century and changed the situation. Most significantly, bushfires increased in intensity and Aborigines pyro-ecological knowledge was almost forgotten (Goldammer 1990; Goldammer & Jenkins 1990).

Indonesia (East Kalimantan)

Several partners including USAID and TNC have been working together in the Lesan and Wehea landscapes in East Kalimantan resulting in effective forest management and a reduction in habitat loss and hunting. The partnership has facilitated the development of co-management structures in these sites with the involvement of local district governments and communities. Substantial financial support from local governments is evidence of local commitment to the program and is a model for effective and financially sustainable conservation. To build on this successful effort and to assist TNC in achieving its 2015 Goal to ensure the effective conservation of places that represent at least 10% of every Major Habitat Type on Earth, TNC's Indonesia program protected area strategy has recently committed to effectively conserving 60% (34,938 km²) of montane and lowland forest ecosystems found in the East Kalimantan portfolio.

Dayak is a collective name for indigenous communities in Indonesia and Malaysian Borneo. In East Kalimantan there exist 9 major groups: Kenyah, Punan, Bahau, Benuaq, Bentian, Tunjung, Lundayeh, Penehing and Dayak Pasir. Traditional Dayak communities in East Kalimantan that practice shifting cultivation possess long traditions, customs and extensive knowledge which in combination normally prevent the irresponsible or uncontrolled use of fire (Aspiannur et al., 1997; Colfer, 2001; Colfer and Dudley, 1993; Vayda, 1999). While some accidental wildfires are caused by escaped fires from shifting cultivation activities, the majority of these are started by farmers from non-indigenous ethnic groups (Abberger and Beebe, 1999; Aspiannur and Baraq, 1999; Colfer, 2001). Further, many of the wildfires in East Kalimantan are believed to originate not from local communities but from fires that are used to clear land for large-scale oil palm plantations (Barber and Schweithelm, 2000). Other sources of wildfires in the region are: escaped fires lit to reduce land values (Vayda, 1999; Gonner, 1999); arson, where fire is being used as a weapon (Nicholas, 1999); and fires lit to mask illegal logging (Vayda, 1999).

China (Yunnan Province)

TNC has been working in northwest Yunnan since 1998. The Conservancy has recently prepared a plan for the Chinese government to create 3.4 million acres of nature reserves to protect important animals and plants. The mountainous northwest of Yunnan Province in Southern China is an ecologically and ethnically diverse area characterized by high mountains and deep gorges covered, in part, by indigenous forest containing some of the world's most ecologically diverse and threatened plants and animals. The alpine meadows located in the Baima Nature Reserve in the Hengduan Mountains of northwestern Yunnan provide important habitat for high-

mountain wildlife populations and grazing lands for domestic animals. In addition, these meadows support many rare and endemic species several of which have economic value for horticultural and medicinal uses (Xu and Wilkes 2004). These meadows are particularly vulnerable to inappropriate land use practices and changes in climatic regime. In fact, high altitude alpine meadows are decreasing in extent and being replaced by woody vegetation as forest treelines advance and alpine shrub biomass increases (Bao et al. 2001).

A burning ban was instituted in Yunnan in 1988, primarily for the protection of forest stands. This policy also halted the traditional use of fire by communities to control shrub and tree invasions into alpine pastures important for grazing livestock. The resulting change in fire regime, along with a warming climate, is an important component of the advancing treeline that is currently being witnessed and the establishment of *Larix* seedlings and tall *Rhododendron* above the current treeline (Baker and Moseley 2005).

Conclusions

Fire is not always used in appropriate ways and can often lead to damaged ecosystems and altered fire regimes. Urban development, livestock farming, agriculture, fire and fire suppression, resource extraction and climate change have contributed to the increase in altered fire regimes in the Asia Pacific region. IFM is an approach worthy of careful consideration because neither traditional nor government-mandated practices are sufficient on their own to deal effectively with the complex issue of fire management. IFM also provides opportunities to address issues related to policy, training and education and can foster the use and management of fire that is ecologically, socially and economically beneficial. Existing IFM approaches such as that used by the LACFLN, can be adopted and modified to suit local and regional circumstances in the Asia Pacific region. Lastly, by pooling knowledge, information and other resources, collaborative partnerships like the AFP present opportunities to develop and implement IFM on pilot landscapes in the Asia Pacific region. These landscapes have the potential to become catalysts for further dissemination and implementation of IFM concepts across the Asia Pacific region.

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