USDA FOREST SERVICE
International Programs

Addressing the Four Threats in an International Context

Fire and Fuels

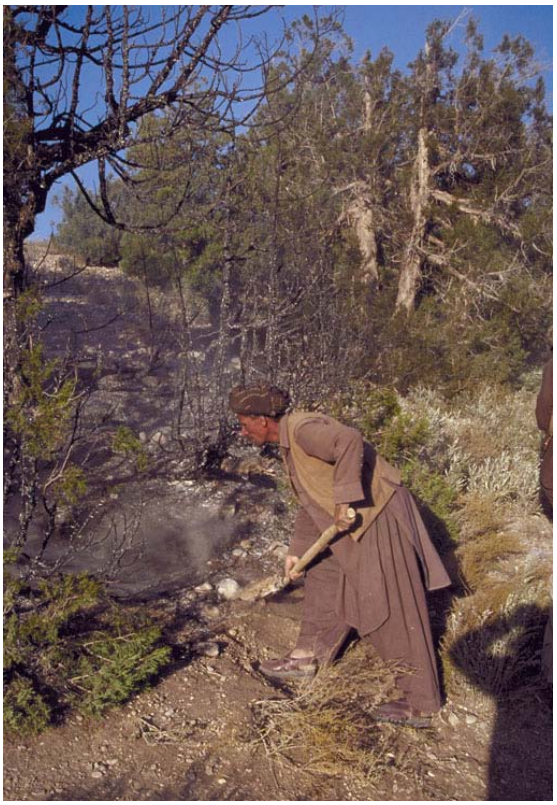
Introduction

Fire and fuels build-up is one of the four threats that the Chief of the Forest Service has identified as the main challenges to the management of national forests and grasslands in the United States.

Increasing population and demand for resources have led to changes in frequency and severity of wildfires that can affect not only our nation's public and private forests but can also cross international boundaries.

Through International Programs, Fire and Aviation, and other government and nonprofit partners, the Forest Service is working to define and address fire and fuels issues in an international context. Our work focuses on sharing domestic experiences with international partners and learning from the experiences of countries that are addressing similar issues.

This paper describes the international scope of the fire and fuels threat, the actions currently being taken by the Forest Service and others internationally to address the problem, and options for future action that can be taken both globally and domestically.



Indian Juniper Wildfire. Photo by William Ciesla, forestryimages.com.

Scope of the Fire and Fuels Problem

Global extent of wildland fire

Worldwide, a forest area more than half the size of China burns each year (TNC 2003). Of the 1.8 billion hectares (ha) (4.4 billion acres) of tropical forest worldwide (FAO 2001), an estimated 300 to 400 million ha (750 million to 1 billion acres) are affected by wildfire annually (Rosenzweig et al. 2003).

In recent years, wildfire has been more frequent, intense, and extensive, mostly because human activities over the past 100 years have altered the fire regimes under which forests developed.

Primary reasons why fire regimes are changing

Human activities that change the character of vegetation are the primary cause of altered fire regimes. For instance, in fire-adapted forests, human exclusion of small periodic fires over the past 100 years has greatly increased the amount of wood fuel available for current wildland fires. In fire-sensitive forests, logging activity that opens the forest canopy can dry out moist forests, which makes them more susceptible to ignitions.

People can also alter fire regimes through deliberate or careless ignitions. The UN Environment Program (UNEP) estimates that perhaps 90% of fires globally are caused by human activity (Levine et al. 1999). In 2003, 95% of the fires that beset Europe were caused by intentional or careless human activities, and many of these fires were the result of arson (Economist 2003). Agriculture practices (such as slash-and-burn rotations), mechanical timber harvest, and recreational visitors all can serve as accidental ignition sources for wildfire.

Fire-adapted and Fire-sensitive Ecosystems

- **Fire-adapted** ecosystems are those in which seasonally dry periods and lightning have resulted in the regular natural occurrence of fire. In these systems, problems exist where management and fire-suppression activities have reduced fire occurrence and led to an unnatural build-up of fuels, consequently increasing the risk of catastrophic fire.
- Change has also occurred in **fire-sensitive** forests, where fire historically did not play a significant role in the forest development. In these systems, unsustainable logging practices and agricultural conversion have opened the forest canopy, allowing moist forests to dry out. Combined with human ignition sources, these forests then become prone to uncharacteristically widespread forest fires.

Climatic events can complicate fire management by further altering the conditions under which forests developed. Some climate cycles, including El Niño/La Niña and others, are predicted to become more frequent and more extreme with global climate change. These events can contribute to large-scale wildfires that overwhelm local fire-fighting capacity. For example, in Indonesia and other Southeast Asia nations, El Niño years (such as those in 1997–1998) can result in severe drought, which when combined with human ignition sources results in huge areas of tropical forest fire.

Effects of altered fire regimes

Altered fire regimes in forests are a problem because they:

- Threaten human safety,
- Endanger ecosystems and species,
- Damage communities adjacent to the forest, and
- Contribute to global change by releasing stored carbon into the atmosphere.

The effects of altered fire regimes are being felt in every region of the world. For example,

- In Central America, altered fire regimes are causing increasingly severe fires that disrupt the pine forest and savannah ecosystems and negatively affect neotropical migratory birds.
- In Brazil, forest clearing for conversion to agriculture is drying out the tropical forest, which allows land-clearing fires to expand into wildfires. In the Amazon, roughly 20,000 fires begin per month during the fire season, with land conversion at the forest frontier being the primary factor.

- In central Africa, forestland is being cleared at a rapid rate through slash-and-burn agriculture and escaped fires. Results include a profound impact on communities that rely on the forest for food and economic development, and considerable damage to the remaining forested ecosystems of the Congo Basin.
- In Russia, fires occur at a massive scale. In 1998, for example, one single complex of fires burned almost 5 million acres (twice the amount burned in the whole United States that year), resulting in fragmentation of the boreal forest habitat for endangered species such as the Siberian tiger.
- The carbon burned and released from the Indonesian fires in 1997–1998 is estimated to equal 40% of the total carbon released from fossil fuels in a year.

Bulgarian firefighter on the dozer line. Photo by Bob Becker, USDA Forest Service.

Lack of reliable information about global wildland fire

Despite the escalating worldwide threats to ecosystems, communities, and global climate from increased incidence, extent, and severity of wildland fire, we lack accurate and timely information about the number of fires, area burned, and biomass consumed annually at national, regional, and global scales. Social economic and environmental costs of these fires are also unknown (Truesdale and Goldammer 2003).

Links and Lessons: Policy Forums and Projects Addressing Fires and Fuels

International Programs facilitates Forest Service participation in numerous efforts to address the fire and fuels issue—such as policy forums, cooperative agreements, and technical cooperation with other agencies, nations, and organizations. We link Forest Service managers to international networks, tools, and resources that can help them address fire management issues at home through lessons learned abroad.

Bilateral technical cooperation

International Programs cooperates with partners such as the U.S. Agency for International Development (USAID) to implement targeted programs in specific countries, through such activities as the following:

- Extensive work in Mexico to build capacity in fire suppression, interagency cooperation, and ecosystem restoration.
- A partnership with the Brazilian government to study and research several aspects of fire management. Studies are underway to assess air quality deterioration from forest fires, to map the extent and severity of wildfires through the use of remote sensing imagery, and to model the effects of deforestation on the extent and severity of forest fires.
- Collaboration with the government of Ghana to provide tools to stem destructive wildfires and increase the government's capacity for fire and land management.
- Participation in the Strengthening Fire Management Program developed in the aftermath of the 1997–1998 El Niño event, which sparked fires and haze worldwide. Through this program the Forest Service has provided technical assistance and training to increase local fire management and suppression capacity in Indonesia and other Southeast Asian countries.
- A new program for fire management and capacity building in Kenya.
- Incident command training to Russia, Indonesia, Brazil, India, and Bulgaria to strengthen those nations' abilities to respond to a wide range of natural and human-caused disasters.

Cooperative firefighting agreements

The United States has established cooperative firefighting agreements with Canada, Mexico, Australia, and New Zealand. These agreements allow the sharing of fire suppression resources, such as aviation assets and ground crews.

Multilateral policy forums

International Programs helps facilitate travel and participation of Forest Service staffs in a variety of forums, working groups, and activities related to fire and fuels, such as the following:

- The UN International Strategy for Disaster Reduction Inter-Agency Task Force has a wildland fire working group, which helps organize wildland fire conferences and summits, such as the 3rd International Wildland Fire summit held in October 2003 in Australia. The conferences bring together thousands of wildland fire managers and researchers to share knowledge and experiences. Intergovernmental summits following the conferences serve to advance international cooperation in addressing the issue.
- The UN is also involved in the fire and fuels issue through the Food and Agriculture Organization's (FAO) *Global Forest Fire Assessment* reports, produced in concert with the Global Fire Monitoring Center (GFMC). The most recent report was published for 1990–2000; a new report is scheduled for 2006.

- The Forest Service is engaged in the Fire Management Working Group of the North America Forest Commission (composed of Mexico, United States, and Canada), which has trained firefighters and fire researchers to jointly address issues of common concern and to respond cooperatively to wildfires using the Incident Command System. Through this mechanism, and in combination with nonprofit partners such as The Nature Conservancy, workshops on determining fire history have been held throughout Mexico.
- The Global Observation of Forest Cover/Global Observation of Land Dynamics (GOFC/GOLD) program, part of the Global Terrestrial Observing System (GTOS), offers a forum to begin development of comprehensive in-situ or remote sensing systems for monitoring and tracking global wildland fire.
- The Forest Service actively collaborates with The Nature Conservancy's Global Fire Initiative, both domestically and abroad. Through International Programs, Forest Service experts and managers work with government and nonprofit partners to provide technical assistance on restoring fire-adapted ecosystems via the Latin America Fire Management Network. Workshops on the management of fire-adapted pine forests have been attended by resource managers from Belize, Honduras, Dominican Republic, Brazil, Mexico, and the United States.

Wildfire can cause problems with smoke and visibility that cross international borders and effect entire regions. Photo by Dale Wade, www.forestryimages.com.

Key Policy Issues, Opportunities, and Steps Forward:

Guiding principles for wildfire management

The general *Guiding Principles for Wildland Fire Management* established at the 2003 International Wildland Fire Summit (Hamilton et al. 2003) propose that:

1. Land and resource management objectives should be consistent with the natural fire regime.
2. Fire management should be based on a holistic approach including fire protection planning, prevention, mitigation, suppression, and rehabilitation.
3. Fire management activities should be safe and cost-effective and support sound resource management.

A number of issue-specific guidelines and recommendations also were presented at the 2003 summit, including guidelines for international cooperation, fuels management, and environmental care in fire management activities (Hamilton et al. 2003). Other organizations, such as the International Tropical Timber Organization, have also developed principles for wildfire management (ITTO 1997). Opportunities exist for these guidelines to be shared, adopted, and analyzed.

Global adoption of the Incident Command System

Another outcome of the 2003 summit is that the Incident Command System has been adopted as the standard for wildland fire incident management. This will provide a strong common basis for incident management and facilitate international and interagency cooperation and exchange (Truesdale and Goldammer 2003).

Cooperative learning

International Programs supports cooperative learning opportunities such as The Nature Conservancy's (TNC) Fire Learning Networks, which bring together community leaders, experts and scientists, land managers, non-governmental organizations (NGOs), and policy makers to share lessons learned and find solutions to common problems. Regional Wildland Fire Networks already are in place but opportunities exist to strengthen them by catalyzing new groups, consolidating similar groups, and increasing information sharing, capacity building, and cooperation within and between networks.

Better monitoring and data collection

Further development of the GOFC/GOLD program would provide better data on the frequency and extent of wildland fire and improve the available information on changes in global carbon storage and fluxes affected by fire. Linking these activities to international efforts that build and strengthen an international framework for earth observation could provide additional political support and resources towards the effort. Participation of USDA Forest Service experts in interagency and international Group on Earth Observation (GEO) meetings will help ensure that fire data and measurements are included in the global earth observation system.

Technical cooperation and capacity building

Technical assistance in fire and fuels management has been identified as an important factor for improving the global outlook on wildland fire. Many nations struggle to build sufficient human and technological capacity to effectively address fire prevention, mitigation, suppression, and restoration needs. The USDA Forest Service has many of the world's leading experts in fire and fuels management, with valuable experiences and knowledge to share in addressing the global wildland fire issue—a link that can be facilitated through International Programs.

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For More Information

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Websites:

- The Global Fire Monitoring Center <http://www.fire.uni-freiburg.de/>
- The Group on Earth Observations & Earth Observation Summits, <http://earthobservations.org/>
- The Nature Conservancy Global Fire Initiative, <http://nature.org/initiatives/fire/>
- USDA Forest Service International Programs Fire Projects, <http://www.fs.fed.us/global/topic/welcome.htm#1