UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

INTERNATIONAL FOREST FIRE NEWS

No. 8 – January 1993

UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

INTERNATIONAL FOREST FIRE NEWS

CONTENTS

International Forest Fire New is prepared on behalf of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training and its secreatariat, the ECE/FAO Agriculture and Timber Division. Copies are distributed and available on request from:

ECE/FAO Agriculture and Timber Division
Palais des Nations
CH-1211 Geneva 10
Fax: + 41-22-917 0041

The publication is edited by:

Johann Georg Goldammer
Fire Ecology & Biomass Burning
Research Group (Max Planck Institute of Chemistry)
c/o Freiburg University, Bertoldstr. 17
D-W- 7800 Freiburg

Fax: +49-761-203 3731
Phone: +49-761-203 3757
Telex: 41 87 674 mpch d

Call for contributions: Readers of the International Forest Fire News are warmly invited to send written contributions to the editor at the above address. These may be in the form of concise reports on activities in wildland fire management, research, public relation campaigns, recent national legislation related to wildfire, reports from national organizations involved in fire management, publications, personal opinions (letters to the editor). Photographs (black and white) and graphs, figures and drawings (originals, not photocopies, also black and white) are also welcome.

The deadlines for submitting contributions to the biannual issues are: **15 May and 15 November.**

The International Forest Fire News is produced under the sponsorship of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training and with the co-operation of:

The International Union of Forest Research Organizations (IUFRO)
Subject Group S.1.09 Forest Fire Research

and:

The International Association of Wildland Fire

EDITORIAL

The first discussions on a newsletter on forest fires for Europe were initiated in 1981 in Warsaw where the first ECE/FAO/ILO *Seminar on Forest Fire Prevention and Control* was convened. The host of this first pan-European fire meeting was the Government of Poland. In Warsaw we began think about possibilities to communicate within the community of wildland fire scientists and managers. There for the first time I met Tim Peck, the Chief of the Timber Section of the ECE/FAO Agriculture and Timber Division and convenor of this meeting. At that time I didn't know too much about this international body, its function and working procedures. Obviously Tim was the one who had responsibilty. I began to think about what "Tim's organization" could do to assist the European fire researchers and fire managers to come together. One of the opportunities would be a newsletter to be circulated through the mechanisms of the United Nations system. This would facilitate the contacts between East and West, regardless of possible bilateral "problems" arising between individual countries. The conclusions of the Warsaw seminar had been quite vague. One of the priority recommendations was to *"organize a systematic arrangement for the exchange of information between countries on new developments in ground and airborne equipment for the protection of the forest against fire".*

The mechanisms built into the United Nations system provide all kinds of insurances against hasty decisions. The establishment of a new UN organ is one of the matters which by its nature is quite a slow process. The ECE member countries must agree on a recommendation which then will be implemented through the established procedures. Since the next seminar on *Methods and Equipment for the Prevention of Forest Fires* took place only in 1986 in Valencia, Spain, these five years had to be utilized to develop ideas about most appropriate communication mechanisms. Valencia then was the opportunity to take off with our ideas.

One of the outcomes of the Valencia seminar was a recommendation to improve the exchange of fire-related information by *"the publication at regular intervals by an appropriate international body of a journal, newsletter or newssheet containing articles by institutions and individuals, abstracts of such articles and research related to forest fire prevention and control... ".* In May 1987 we were ready to go. Tim Peck mailed a circular letter of invitation to all participants of the Valencia seminar and asked them to contribute to a trial newsletter. The response to his request landed on my desk - I had been appointed editor of the upcoming newsletter. The trial issue was distributed in February 1988, and the results of an attached enquiry were overwhelmingly positive. **International Forest Fire News (IFFN)** took off on a regular (biannual) base in 1989.

Like the establishment of procedures to collect, publish and disseminate statistical data on forest fires within the ECE region, Tim Peck was the driving force in the *Palais des Nations* in Geneva to help establish IFFN. Without him we wouldn't have made it. The establishment of the the newsletter and the subsequent day-to-day business in editing IFFN and keeping alive other fire-related activities of the ECE/FAO Agriculture and Timber Division require regular conversation. Tim and I exchanged myriads of phone calls and faxes, we met either in Geneva, in Freiburg, or we had night-long conversations during the seminars or whenever we met elsewhere.

Tim Peck is going to retire by end of January 1993. This is sad news. Because a charismatic and very energetic personality is going to leave a challenging professional environment in international forestry.

On behalf of the readership of International Forest Fire News I want to take this occasion to congratulate and thank Tim Peck for the enormous energy he has invested to bring together foresters - managers and scientists - from all over the world, and especially those who are responsible for managing forest and other wildland fires. Tim's openness toward countries outside of the ECE/FAO region allows us to realize our vision to better understand and to deal with the world of fire.

The good news is that Tim is leaving behind a very good team of colleagues who will be carrying on enthusiastically where he is leaving off. In a recent letter he asks us to continue to give them the same encouragement we had given to his group in the past. This is what the contributors to this newsletter and the editor certainly will do.

Johann G. Goldammer

COUNTRY NOTES

AUSTRALIA

Statement on the Issue of Prescribed Burning and Smoke

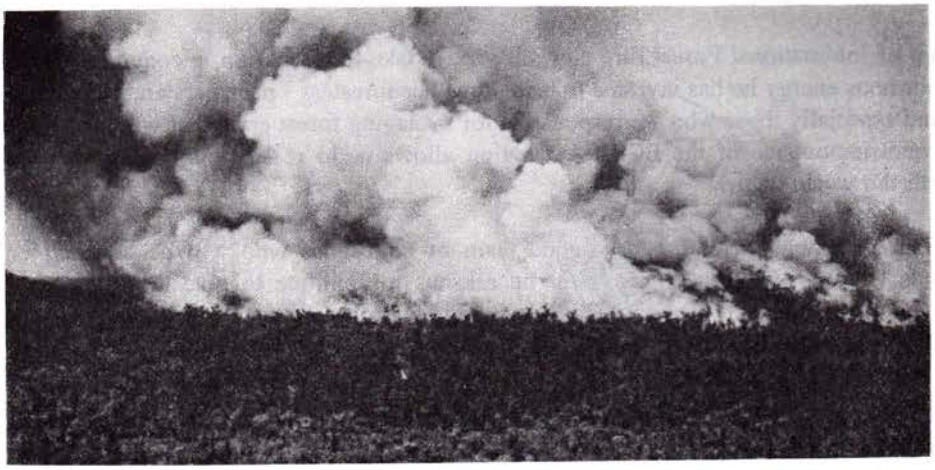
The statement was adopted by the **Australian Association of Rural Fire Authorities (AARFA)** as a national policy on the issue of prescribed burning and smoke (at the 9th National AAFRA Conference held in Victor Harbor, South Australia, 12-13 May 1992):

For several million years fire has been an important environmental factor in the ecology of Australian vegetation communities. There have been wide fluctuations of climate and associated vegetation types - ranging from moist-temperate or tropical rainforests, to dry sclerophyll vegetation. During periods when dry sclerophyll vegetation has dominated, evidence from charcoal in sediments indicates the occurrence of periodic fires. Natural ecosystems are adapted to particular fire regimes. With the coming of the aborigines some 25,000 to 40,000 years ago, natural fire patterns changed. The aborigines were nomadic hunters and food gatherers and moved regularly about the countryside in small tribal or family groups. They often practiced "fire-stick farming" - the deliberate and systematic lighting of the vegetation in consecutive sections over a cycle of years - to facilitate hunting and food gathering. This extensive and frequent use of fire by aborigines led early explorers and pioneers to refer to Australia as the "Smoky Continent".

When Europeans came to Australia the consequent changes in land use had an immediate effect on this fire pattern. In many parts of Australia the cessation of aboriginal annual or biennial burning was immediately followed by an increase in the height and density of both the understorey and overstorey vegetation, and a change in many fuel types from a grass dominated fuel to one dominated by litter and shrubs. As a result of this increase in fuel load, periodic fires lit naturally by lightning, or accidentally or deliberately for clearing, grazing or prospecting were intense and destructive. Land holders and forest managers learnt that periodic fuel reduction burning reduced the natural build-up of litter and made the control of wildfires easier, improved the safety of their community and protected their farms and forests.

Today landholders, fire brigades and Government agencies responsible for the management of public land use, prescribed fire for the protection of human life, private property and assets from wildfire; for habitat and ecological management; and for forest regeneration.

Smoke from vegetation fires is a product of a natural process and, in dry periods, a natural part of the atmospheric environment in the same way as is dust during droughts or sandstorms in the desert. The products of burning vegetation, whether by a wildfire or a prescribed fire, are mainly carbon dioxide and water with trace amounts of carbon monoxide, ozone and methane, and minute traces of nitrous oxides and a great variety of hydrocarbons in the form of gases, oils, tars or carbon based particulates (the latter of which are "recognised" as smoke). Smoke from wildfires is accepted by the community, however smoke from prescribed fires needs to be managed, in order to address community concerns, particularly reduced visibility, perceived health hazards and contribution to the greenhouse effect.



Smoke from an experimental fire in Australia's eucalypt forest: a source of controversial debate on air quality aspects of prescribed burning (Photo: C.S.I.R.O.).

This AARFA statement addresses the issue of prescribed burning and smoke, and recognises that:

1. Each year in Australia weather conditions occur under which, given sufficient fuel, wildfires can be impossible to control.

2. Under extreme conditions, uncontrolled wildfires have the potential to burn extensive areas, cause enormous damage to people, communities, property, private and public assets; crops and farmland; forests, fauna and vegetation communities; and catchment values, as well as generate enormous quantities of smoke.

3. The speed and intensity at which a wildfire burns is related to the quantity and arrangement of accumulated dry litter or other fast-burning fuels. In most ecosystems accumulated fuel loads can be safely and effectively reduced by prescribed burning.

4. Managers of public land and owners of private property have a statutory and/or duty of care responsibility to carry out appropriate works which reduce the occurrence and spread of wildfires, and protect life, assets and ecosystems.

5. There is conclusive evidence gathered throughout Australia to indicate that fuel reduced areas temper erratic wildfire behaviour, reduce the incidence and occurrence of spotting and provide a safe working place from which successful wildfire suppression action can be based.

6. In appropriate vegetation types prescribed burning is regarded as the most efficient, ecologically suitable and economic method of reducing fine fuel loads over large areas.

7. Public land managers and private property owners have a responsibility to ensure that prescribed burning is strategic, timely, appropriate and correctly applied.

8. Fuel reduction by low intensity prescribed burning can be most safely carried out under stable atmospheric conditions. However these conditions provide an atmospheric "lid" over the fire, often resulting in smoke build-up at the time of or after the conduct of a burn.

9. Smoke particles absorb and scatter light thereby reducing the contrast between an object and its background, and affecting the human perception of colour. This reduced visibility may cause safety hazards at airports and along roads, and loss of aesthetic landscape values.

10. There is a perception in the community that prescribed burning smoke can cause a negative impact on quality of life issues. No conclusive evidence is available to support this contention, and there are no medically established standards which define concentrations of smoke or durations of exposure which may cause short- or long-term health effects.

11. Prescribed burning, and any associated smoke, is an infrequent occurrence of short duration. By contrast, industry and vehicles generate smoke and other chemical emissions daily, all year-round with significant negative effects on health.

12. Fire is a natural process in the carbon cycle. The carbon released through burning is taken up again in the process of plant growth and litter accumulation. The contribution of forest fires to the increase in atmospheric carbon dioxide concentration is ultimately related to any long-term change in standing biomass in the forest. Thus if mature forests attain their pre-fire or pre-harvesting biomass in subsequent rotations, then the contribution made to an increase in atmospheric concentration of greenhouse gases, and the greenhouse effect would be small.

    Repeated high intensity wildfires can dramatically reduce the amount of biologically stored carbon (for example the degrading of tall forests to scrub or grasslands, and deep peats or organic soils burning under drought conditions) whereas low intensity prescribed burning only consumes the fine surface fuels, about a tenth of the biomass consumed by wildfires.

The key role of fuel reduction by low intensity prescribed burning is therefore to reduce the frequency and extent of summer wildfires, it also has the effect of preserving or increasing the total biomass in the forests, both important in maintaining balance within the carbon cycle.

In the light of the above statements, AARFA advocates that:

(i) Wildfires and smoke be recognised as inevitable and natural parts of the Australian environment.

(ii) Low intensity prescribed burning be recognised as one of the most important tools available to land managers for protection from and the safe and effective control of wildfires.

(iii) In appropriate vegetation types, prescribed burning be recognised as an efficient, ecologically suitable and economic method of reducing fine fuel loads over large areas.

(iv) Public land managers and private property owners accept their responsibility to provide fire protection to the community and its assets and use prescribed burning as a tool to achieve this objective.

(v) Research be carried out on smoke from prescribed burning to determine its "finger-print" and thereby its effect on urban atmospheric quality.

(vi) Computer modelling and back-tracking techniques be used to predict whether prescribed burning smoke will accumulate in and around major cities, airports, tourist and visitor points and other major smoke sensitive areas. These models be used to determine if burning at other times of the year, or other burning strategies will minimize the impact of smoke accumulations.

(vii) Co-operative interaction be developed and encouraged between appropriate fire and environment agencies regarding the ongoing collection and dissemination of information on the quality of life impacts of prescribed burning smoke.

(viii) Co-operative interaction be developed and encouraged between appropriate fire and environment agencies to establish realistic and measurable standards for and acceptable quantity of smoke in the atmosphere, so that land managers can undertake prescribed burning operations within those standards.

(ix) Co-operative arrangements be made with agencies such as the Bureau of Meteorology and the Environment Protection Authority in each state to assist public land managers and private property owners to achieve their statutory and/or duty of care responsibilities in an environmentally and socially acceptable manner.

(x) Appropriate smoke management guidelines be developed and applied to the development of prescribed burning strategies.

From: John B.Barclay
Executive Officer, Australian
Association of Rural Fire Authorities

Address: 7 Hyton Crescent
AUS-Croydon, Victoria 3136

Phone: +61-3-723-6677
Fax: +61-3-723-8166

The 1991/92 Fire Season in Victoria

In Victoria the 1991/92 fire season was quiet with 14,000 ha burnt, being only 10% of the 10 year average. The 1992/93 fire season commenced late, in December.

The Department of Conservation and Natural Resources has implemented, along with almost all bushfire agencies in Australia, the Australian Interagency Incident Management System (AIIMS), to assist in managing fire incidents which involve multiple agencies.

Other activities have included:

- classifying fire hazard. especially bark and shrub fuels in relation to a recognised scale of difficulty of fire control;
- developing fire equipment, including aerial incendiary devices, foam proportioners, and a fuel moisture meter;
- developing prescriptions for reducing fuels in young eucalypt regrowth where the understorey fuels are elevated and hazardous;
- studying the effects of fuel reduction burning on the ecology of forests (plants, animals, nutrients etc.);
- automating the transfer of infrared data from the Department's multi-spectral scanner to fire headquarters in real time.

From: Andrew Wilson
Senior Fire Research Officer

Address: Fire Management Branch
Department of Conservation and Natural Resources
P.O. Box 41
AUS-East Melbourne, Victoria 3002

Fax: +61-3-6289454

CHILE

Forest Fires: An Evil that Chile Controls

The surface area affected by forest fires in Chile diminished by 62 per cent in the season that ended in May this year. The result is a distinct reflection on the efficiency in combating these disasters.

Effectiveness: This concept can serve to summarise the work of the Fire Control Department of the National Forestry Corporation (CONAF) during the last forest-fire fighting season. The greatest achievement was having managed to reduce the surface area affected over the season, which runs from November to May, by 62 per cent, from the five-year period average of 63,530 hectares to only 24,153 hectares.

For the head of the Fire Control Department, Miguel Angel Ahumada, the outstanding thing about this success was that *"the affected area was reduced despite the level of occurrence of forest fires having remained unchanged. The five-year period average was 4,835 fires and last season there were 4,786. This is clear proof of efficiency in combating forest fires"*. Another point that Miguel Angel Ahumada stressed was that the reduction of the surface area affected by forest fires in the country meant that there had been a drop in the average hectares per fire. The average, which had been 13.14 hectares per fire, dropped to 7.47 hectares per fire for the season that ended last May. For all the members of CONAF's Fire Control Department, this figure is truly a historic landmark.

"When taking stock", Ahumada said, *"one cannot ignore that the improved work of the fire-fighters, who are the ones that achieve these results, was favoured by the quality of the clothing having been maintained and the improvement in some equipment , such as for example boots as well as camp installations. In the safety aspect, the use of a double-filter mask should be highlighted"*. As regards the equipment the fire-fighters work with, he indicated that the most important feature of thee season was the contracting and operating of the Bell 205 A-1 Helitanker helicopter, which was a valuable contribution in Region VIII. In addition, a communications network was implemented that made it possible in coordination with the other seven existing helicopters in other regions, to be prepared to face any high-risk emergency, as concerns forest fires, that should arise in this country.

Prevention: One aspect that was reinforced last season, with positive results, was prevention. *"Based on the fact that one hundred per cent of the forest fires are caused by man, it was essential that greater efforts should be thrown into working on the occurrence of fires. The end objective is to achieve an ostensible reduction in fire-occurrence levels"*, Ahumada explained. And a clear proof that this statement was put into practice was that CONAF, exerting a great effort, substantially increased its prevention budget.

Fig.1. Prevention and efficiency in combating forest fires were the essential elements of the success achieved in the recent season, during which the affected surface area was reduced. Outstanding in the prevention were the motocyclists (source: Chilean Forestry News)

One variable that the head of CONAF's Fire Control Department did not obviate, in the good results achieved last season, was the coordination with the forestry companies which, through their own Prevention Programmes, have high-level brigades and equipment for fighting forest fires. Miguel Angel Ahumada ended by saying that *"the existing understanding enabled an optimum use of each available resource. We hope to keep on this path of teamwork, particularly as concerns prevention, a topic we feel the same way about".*

From: Chilean Forestry News (August 1992)

Tab.1. Summary of wildfire occurrence and area affected by fire in Chile during the period 1986-1991. Source: Fire Control Programme Statistical System, CONAF

Season	Number of Fires	Affected Surface Area (ha)				Average ha/fire
		Plantations	Natural Vegetation	Others	Total Affected	
1986-87	5,141	10,191.42	78,824.94	-	90,016.36	17.51
1987-88	4,888	18,751.99	48,000.50	-	66,752.49	13.66
1988-89	4,832	5,168.96	75,187.92	6,707.81	8,064.69	18.02
1989-90	4,088	2,399.98	16,316.94	3,892.94	2,609.87	5.53
1990-91	5,224	5,941.02	35,037.07	10,230.50	51,208.59	9.30
Totals	24,173	42,453.37	254,367.37	20,831.26	317,652.00	
Average Period	4,835	8,490.67	50,873.47	4,166.25	63,530.40	13.14
1991-92	4,796	1,866.00	19,782.55	2,504.61	24,153.16	7.47
Percentage Variation	-1%	-78%	-61%	-40%	-62%	-43%
Absolute Variation	49	6,624.67	31,090.92	1,661.64	39,377.24	5.67

GREECE

Establishment of the first Forest Fire Research Laboratory in Greece

The first forest fire research laboratory in Greece has been established at the Mediterranean Agronomic Institute of Chania (M.A.I.Ch.), in August 1992. In addition to complete instrumentation for field measurements of fuel, weather, topography and fire behaviour parameters for monitoring wildland fires in the field, the laboratory is equipped with a series of high - precision apparatus widely used in fire research such as digital data loggers, thermocouples, radiometers, bomb calorimeters, drying kilns and combustion chambers. Also, there is a computer network where statistical analysis of forest fire data is conducted and simulation techniques and operations research methods are applied in order to study forest fires. The laboratory is partly funded by the European Economic Community (EEC). The scientist responsible for the Laboratory is Dr. A.P. Dimitrakopoulos, who studied forest fire science in the USA.

The Director of M.A.I.Ch., Mr. Alkinoos Nikolaidis, mentioned at the opening ceremonies that the first Fores Fire Research Laboratory in Greece opens wide horizons for research and analysis on the crucial problem of forest fires in the Mediterranean Region. Since M.A.I. Ch. is an educational institute for post-graduate studies, interested graduate students from all disciplines wishing to conduct graduate studies on forest fire science should apply to the following address:

Forest Fire Research Laboratory (Attn. Dr. A.P. Dimitrakopoulos)
Mediterranean Agronomic Institute of Chania
P.O. Box 85
Alsyllion Agrokipiou
GR-73 100 Chania

Phone: +30-821-81153
Fax: +30-821-81154

The 1992 Forest Fire Season in Greece

Unlike 1991, Greece had a very "hot" and prolonged fire season during 1992. Up to the end of September, 1815 fires burned 42,000 ha out of which 12,000 ha approximately were high forest. During the same period last year (1991), 791 fires burned 11,800 ha. Thus, on the average, the area burned per fire was 21.3 ha in 1992 as opposed to 14.9 in 1991. The remarkable difference is attributed to heavy spring and summer rainfall during 1991. Also, a new law that permits the former owners of abandoned agricultural fields which have been forested over many years to reclaim them from the State is assumed to have had a very significant effect on the wave of forest fires that swept through Greece during 1992.

The Aegean islands and the Attica peninsula paid the heaviest toll. The fire season started with a 500 ha fire on Lesbos Island and ended on 2 October with a huge 4000 ha fire on Rhodes Island (set accidentally by an apiarist) which burned most of the forests at the southern end of the island and during which a firefighter lost his life. Rhodes forests were also burned 1985 and 1987, causing an extreme ecological loss and a heavy impact on island tourism.

The largest fire of the season was a proven case of incendiarism on the Attica peninsula which burned during 4-5 September, started near Kiourka village, and caused panic in the heavily populated area. Great publicity was given to this fire and the Prime Minister himself was involved in the fire control efforts and rehabilitation of the burned area.

From: Alexander P.Dimitrakopoulos

Address: University of the Aegean
Department of Environmental Studies
17 Karadoni Str.
GR-81 100 Mytilene

INDONESIA

Long-Term National Integrated Forest Fire Management Programme Initiated at Bandung

The highest wildfire risk in the whole of Indonesia's forest lands is related to cyclic droughts which lead to an increasing flammability of forest ecosystems. The most severe droughts are connected to the "El Niño - Southern Oscillation" (ENSO) event. The shifting of the West Pacific low pressure (that usually brings rain over insular SE Asia) towards the date line is one of the consequences of a complex pattern of sea temperature changes in the Pacific. Thus, if an ENSO occurs, the general weather pattern over Indonesia tends to be characterized by high pressure and little to no precipitation. ENSO events have been recorded in intervals of ca. 5 years and pretty much explain the cyclic drought phenomena in the country. It is assumed that extreme ENSO events (with subsequent very extended, extreme droughts) may occur ca, every 100 years.

The worst ENSO-caused drought was recorded in 1982-83. The year 1982 brought rains much below average amount of rainfall between July and October. Very little rain came in November-December 1982, and an unusual drought continued between January and April 1983.

This second phase of the drought was most critical. Natural untouched forests as well as exploited forests and other vegetation became extremely subjected to drought stress with consequently increased flammability. Fires escaping from slash-and-burn sites and from other fires then affected an area of more than 3.5 million hectares in East Kalimantan alone, totalling ca. 5 million hectares in the whole dought-affected lands of Eastern Borneo (including Sabah and Sarawak). The 1987 ENSO event again brought drought and forest fires, but less area of forests was affected by fire.

Slash burning and shifting agriculture fires are important sources of atmospheric pollution. Smoke management will be an important element of an upcoming fire management strategy in Indonesia

Nearly ten years after the 1982-83 fires the sky over Southeast Asia was darkened again. An extended inversion layer over the region trapped the smoke which came from a variety of fires in the region, especially from forest conversion fires, escaped slash-and-burn agriculture fires, and other agricultural burnings. In September/October 1991 the smoke layer developed to such an extent that airports in Borneo had to be closed

down, and even air traffic safety at the international airport of Singapore was affected although the traffic did not have to be closed down.

These fires of 1991 have drawn serious concern and gained much international attention. Following an appeal of the President of the Republic of Indonesia, international organizations and individual governments expressed their willingness to assist the Indonesian Government in developing and implement a National Integrated Forest Fire Management System.

For this purpose, the National Planning Agency (Bappenas) assisted by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) held an International Workshop on Long-Term Integrated Forest Fire Management, on 17-18 June 1992, in Bandung.

Participants of this workshop were representatives of

- Indonesian agencies and organizations, including the private sector, concerned with forest fire management;

- International development organizations;

- Embassies and their related bilateral development agencies.

The objectives of the Bandung Workshop were:

(1) to provide all parties represented in the workshop with comprehensive information on the present status and problems in the field of forest fire management in Indonesia;

(2) to introduce a framework which can assist to guide and coordinate international assistance;

(3) to provide an opportunity for potential international partners to express their interests and ideas with respect to a cooperation in the development of a functioning Long-Term Integrated Forest Fire Management System in Indonesia;

(4) to discuss follow-up procedures of this international workshop.

In order to facilitate the process and to increase the efficiency of the International Workshop, important information inputs had been prepared by Indonesian and international experts and other competent sources of information at a Preparatory Workshop which was held on 13-14 February 1992 in Ciloto (West Java).

The predominant results of the preparatory workshop were the elaboration of (1) a comprehensive situation analysis on the present status of forest fire management in Indonesia, and (2) an outline of components and related fields of activities which need to be considered and implemented to fully develop a functioning Integrated Forest Fire Management System suitable for the natural and socio-economic conditions of Indonesia.

Five components and their related fields of activities had been identified:

- Legal basis and organization
- Fire prevention incentives and disincentives programmes
- Vegetation management
- Pre-suppression
- Fire suppression

Based on the components and their related fields of activities, a framework for specifying present and future activities of Indonesian agencies, organizations and the private sector and international partners in integrated forest fire management was developed. This framework in the form of a matrix, which had been made available to all parties invited to the International Workshop, served to

- document present activities of Indonesian agencies, organizations and the private sector and international partners (before the International Workshop);

- facilitate orientation of potential international partners to preliminarily determining their interests for cooperating in the future development of forest fire management in Indonesia (before and during the International Workshop);

- coordinate Indonesian and international contributions to the programme (during and after the International Workshop).

The International Workshop was attended by representatives of various Indonesian agencies, organizations and the private sector and representatives of 10 international organizations and individual countries.

A comprehensive discussion of the situation analysis and the outline/structure of components of a Long-Term Integrated Forest Fire Management System for Indonesia and their related fields of activities was followed by exchanges of ideas and discussion of international contributions to the fire management sector. Ongoing and planned international contributions as well as indicated fields of interest (possible but not yet committed contributions) were then identified and filled into the matrix of fields of activities.

The results of the discussions and recommendations of the workshop are summarized as follows:

(1) The development of a Long-Term Integrated Forest Fire Management System for Indonesia is recognized as a field of high priority in order to protect natural, socio-economic and human resources from the detrimental effects of fires.

(2) A basic and most critical task will be to provide the necessary legal and organizational base within the existing structures (Government administration, private sector) in order to strengthen or to create (where not yet available) the fire management capabilities.

(3) International contributions are essential (1) to secure the introduction of fire management methods and technologies as developed in other countries and adapted to the requirements of the Indonesian situation, and (2) to provide the funding necessary to build up expertise and infrastructures that will secure the most time-efficient build-up of fire management capabilities in the most critical areas.

(4) Both the national (Indonesian) and international activities require a high degree of coordination because of the multi-sectoral approach and the multitude of international partners involved.

(5) In order to ensure the efficient realization of the required activities a National Fire Management Coordinating Committee needs to be established as a follow-up step.

Immediately after the International Workshop the National Development and Planning Agency (Bappenas) called a meeting at which a National Fire Management Coordinating Committee was established. The preliminary objectives of the committee, now headed by Mr.Herman Haeruman (Bappenas), are:

(1) to establish a national platform for the development of a Long-Term Integrated Forest Fire Management System;

(2) to ensure an intersectoral approach in which all Government authorities, other organizations and the private sector will participate;

(3) to coordinate international support for the establishment of the fire management system in order to avoid duplication of activities and investments and to optimize the efficiency of contributions; international partners shall be consulted for coordinating activities; and

(4) to develop the legal and organizational structure of a permanent body, e.g. a National Forest Fire Management Agency, which will ensure the efficiency and future continuity of this national program.

Meanwhile the first programmes conducted in cooperation with various international partners are underway. During the months of July to October 1992 several international missions were conducted to elaborate fire management projects. For the German Agency of Technical Cooperation (GTZ) and under the lead of the Fire Ecology Research Unit (MPIC/Freiburg University) the fire consultants Stewart Pickford and Richard White prepared a comprehensive investment plan for the establishment of a functional fire management organization in East Kalimantan. As an immediate stop-gap measure fire management training of key personnel was conducted through the US Forest Service. The fire management consultant Douglas Bird prepared the necessary planning steps for an FAO project in East Java. The Commission of the European Community intends to support fire management in Sumatra. The United Kingdom is contributing with the establishment of a national radio communication network, a component crucial for the success of this tremendous endeavor.

From: Johann G. Goldammer (address on cover page)

ISRAEL

A Fire Danger Rating System for Israel

Background: In 1989 a team of experts from the U.S. Forest Service visited Israel to study the forest fire Management situation here and make recommendations for the establishment of a forest fire danger rating system along the lines of the system in operation in the U.S. As a result of this, a joint team from Israel's Forest Department and Meteorological Service was sent to the U.S. to learn about their National Fire Danger Rating System (NFDRS) and consider how it could be adapted for use in Israel. As one outcome of this team's concluding recommendations, a project was started to develop a fire danger rating system for Israel. This project is headed by a research meteorologist and funded by the Forest Department.

Initial Efforts: During the first stage of the project, historical weather and fire occurrence data were collected. At the same time, the NFDRS computer program which calculates fire danger indices was obtained and the literature of this system was studied.[1] The objective in mind was to adapt the program for use in Israel. Our efforts were given a significant push forward by the timely visit of two American Fire Weather Meteorologists who greatly aided us in clarifying our objectives and priorities. Their observations concerning some unique aspects of fire weather in Israel were also very valuable. During the second stage, an Israeli Fire Danger Rating System was developed whose main characteristics are outlined below. Summer 1992 has been this system's "check-out" fire season.

The System: Danger ratings are calculated on a regional basis, Israel being divided into seven regions. Each region has roughly homogeneous climatic and physiographic features. Up to three meteorological stations were chosen as being representative of each region.

Observations from these stations are transferred daily from the Meteorological Service's mainframe computer to the PC/AT 386 on which the danger rating system operates (Fig.1). The transferred data are reformatted into a weather file which fits the input requirements of the NFDRS program which calculates fire indices.

---

[1] **References**:

Bradshaw, L. S., J.E.Deeming, R.E.Burgan and J.D.Cohen (comps.) 1984. The 1978 National Fire-Danger Rating System: Technical Documentation. USDA For.Serv.Gen. Tech.Rep.INT-169.

Burgan, R.E. 1988. Revisions to the 1978 National Fire-Danger Rating System. USDA For.Serv.Res.Pap.SE-273.

Also required by the NFDRS program is a file containing the site data (altitude, slope, aspect, fuel type, etc.) for each of the representative meteorological stations. The indices produced are both displayed graphically and stored for further analysis. The graphic display also shows indices calculated on the basis of 24-hour and 46-hour forecasts. The two main indices utilized by us thus far are the ignition component (IC), which reflects the ease with which fuels can be ignited, and the burning index (BI), indicating the severity of fires once they occur, both in terms of spread rate and intensity. Running the program on about ten years of historical data allowed for the regional determination of index threshold values for three levels of fire danger (low, medium, high). Forecasted fire danger levels are transmitted (by fax) from the Meteorological Service to the Forest Department, Fire Fighting Center, and the National Fire Brigades Commissioner. Within the Forest Department the three danger levels are the basis for determining the size of stand-by initial attack crews and the positioning of fire trucks and other equipment.

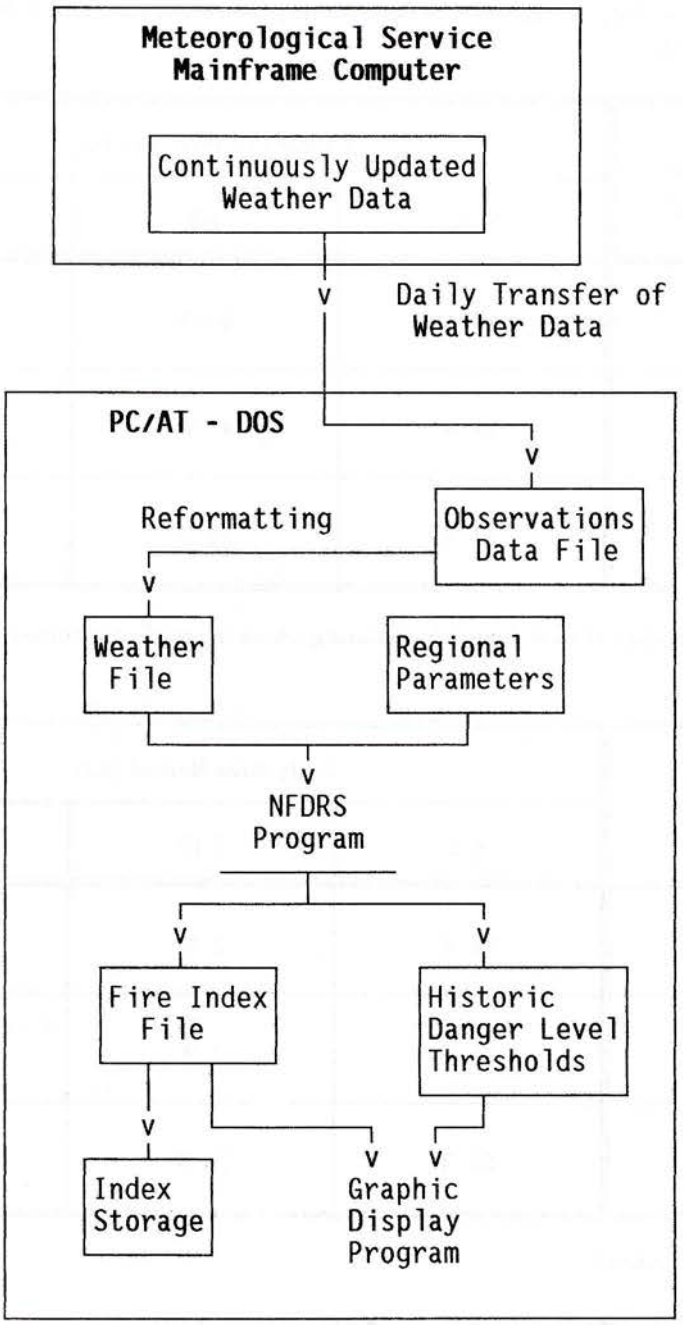


Fig.1. Fire Danger Rating System Flow Diagram

Long-term Support: The budget for the system's operation and maintenance is expected to be provided jointly by the Forest Department and the Ministry of the Interior (responsible for fire brigades). In order to create a permanent position of fire weather meteorologist, an "agricultural desk" was created within the Meteorological Service. This position combines the functions of agricultural meteorologist in the winter (e.g. freezing forecasting) and fire weather meteorologist during the fire season. This insured the financial support of a third body, the Ministry of Agriculture.

First Season Results: Preliminary analysis comparing the system's danger ratings with data on actual fires (Tab.1,2) indicates that the system can provide an extremely useful indication of fire occurrence and severity. We hope in the coming seasons to "fine tune" the system, in accordance with accumulating experience.

Tab.1. Percent of the total days at each danger level during which the number of fires indicated occurred (Judea Mountains Area, Israel).

Ignition Component (IC) Danger Rating	Number of Fires per Day		
	None	1-3	>3
Low (61 days)	90 %	10 %	
Medium (85 days)	48 %	47 %	5 %
High (24 days)	17 %	71 %	12 %

Tab.2. Percent of the total days at each danger level during which the total area burned was as indicated (Judea Mountains Area, Israel).

Burning Index (BI) Danger Rating	Daily Area Burned (ha)		
	≤1	2-10	>10
Low (48 days)	98 %	2 %	
Medium (99 days)	85 %	7 %	8 %
High (23 days)	60 %	26 %	13 %

From: John Woodcock

Address: Land Development Authority
Forest Department
P.O.Box
Kiryat-Hayim 26103
ISRAEL
Fax: +972-4-411971

ITALY

A new Forest Fire Management Plan in Piemonte Region (North Western Italy)

Piemonte region covers an area of about 25,000 km^2 and has 750,000 ha of forests. A new triennial fire management plan has been developed during 1992; the plan is based on fire severity and fire danger zoning. Through the employment of fire behaviour prediction models, fire prevention, presuppression and suppression activities have been defined for every type of zone. The fire management plan has been developed by G.Bovio, A.Camia and A.Nosenzo, Department of Agronomy, Silviculture and Land Management, University of Torino.

From: Prof. Giovanni Bovio

Address: Dipartimento di Agronomia, Sylvicultura e Gestione del Territorio
Università di Torino
Via L. Da Vinci, 44
I-10095 Grugliasco (Torino)

POLAND

Call for Assistance: Poland Faces the Consequences of the Worst Fire Season for 50 Years

Spring and summer of 1992 were the period of the biggest forest fire disaster in Poland during the last 50 years. In this period the extent of forest fires exceeded several times the average forest fire burden of the last 50 years. The area of forests affected by fire in 1992 was ca. 43,000 ha. For the first time for several years large forest fires were encountered. Four large fires were in the range of 3,000 to 9,000 ha. This was a consequence of the extreme drought and wildfire risk during the Summer of 1992 which affected the whole of Northern Europe.

The environmental and economic consequences are severe: Air pollution, disturbance of watersheds, secondary pests in fire-damaged forests, economic losses due to premature harvest, increment reduction, damaged timber, etc. Furthermore, high costs are involved for restoration of burned forests. These activities will require 2-3 years. Polish forestry intends to purchase special equipment for salvage logging (including debarking) and transport. Purchase of these equipment requires large expenditures, a difficult task in the light of the actual financial situation of forestry in Poland. The required share of the state budget in financing these expenditures may be insufficient. **Polish forestry units therefore require external assistance to accomplish this huge task.** Foreign assistance, in form of technical or financial aid, is urgent and may help to mitigate the overall losses the forests of Poland suffered in 1992.

From: Jan Smardzewski
Director, Department of Forestry

Address: Ministry of Environmental Protection,
Natural Resources and Forestry
ul. Wawelsky 52/54
PL-00-922 Warszawa

Remarks from the Editor:

In December 1992 I visited the fire-damaged pine forests in the State of Brandenburg (Eastern Germany). This state suffered the worst fire season for ten years. More than a thousand fires destroyed ca.1,400 ha of pine forests. Infestation by insects (*Phaenops* species) is now rapidly spreading into the surrounding unburned forests. A similar situation is developing in Poland on the fire-damaged area of 43,000 ha, especially on the large burns. A fast response in salvage logging and restoration of burned forests is required. Poland urgently needs support from its neighbours.

RUSSIAN FEDERATION

"Avialesookhrana" - The 1992 Fire Season in the Russian Federation

Aerial forest and deer pasture fire protection in 1992 has been conducted on more than 827.3 million ha of the territory of the Russian Federation. The ***Avialesookhrana*** Production Association consists of the 19 Aerial Fire Centres which are subdivided into 352 operational divisions. Up to 830 aircraft have been envisaged to be leased for aerial operations. In 1992 686 flying forest fire observers provided fire detection, suppression and other services in accordance with their duties. Due to the lack of financial resources the total number of smokejumpers and helirapellers had been reduced to 6400. According to operational data on the 1st of November about 25,000 fires on an area burning of 580,000 ha occurred in the forest of the Russian Federation. The most severe fire situations arose in the Middle and Western parts of European Russia. In the Moscow region, for example, 50-60 fires occurred daily in August.

Some Western areas of the former USSR, such as Belarus, the Baltic states and the westernmost parts of Russia (Kaliningradskaya Region) experienced very dry weather, and thus a great number of forest fires. During the 1992 fire season the number of fires increased by 37.7 % and the area burned decreased by 38.0 % compared with the average over the last 5 years. The average area per individual fire was reduced from 61.5 ha to 23.8 ha. 447 wildfires were registered as large fires ("large fire" = area burned > 200 ha in aerial protection zone and 25 ha in the ground zone).

The distribution and number of large fires throughout the ***Taiga*** forests were as follows: Irkutsk Region (65), Krasnoyarsk Region (47), Yakutsk Region (32), Buriatia Region (32), Sankt Petersburg Region (69) (see also fire distribution map, Fig.1).

Particular attention in Russia is given to the protection of forests in the Baikal watershed. In 1992, in the Baikal region, an area of 18.4 million ha was under aerial and ground control. The number of airborne personnel reached over 600 firefighters. During the 1992 season 518 wildfires occurred in the region, burning 8,872 ha or 17.1 ha per fire (5-year area average per fire: 39.5 ha). Experimental work involving prescribed burning for fire hazard reduction was conducted on a forested area of ca. 200,000 ha.

One of the weaker points of the Russian forest fire control system is the rather limited experience in production and utilization of airtankers. In the 1992 fire season four AN-26P aircraft were tested in fire fighting operations in Sibiria (tank capacity 4,000 litres). One small AN-2 aircraft equipped with a 1,000 litre tank was tested in areas contaminated by radionuclides from the Chernobyl Nuclear Power Plant accident (see also contribution by Dusha-Gudym, International Forest Fire News No.7, August 1992).

A few experimental flights with IL-76 (40,000 litres) aircraft were carried out this summer and a decision was made to produce several more models for the 1993 season. The initial results of the tests raise our hope in the widespread application of airtankers in future. But at the same time we must make efforts to develop a network of retardant bases. In this case the experience of western agencies would be very much appreciated.

In the last two years we have tested an airborne aerosol generator for seeding clouds to draw rain on burning areas. The results were positive. Our system of radiocommunication is to be improved. That is why we have conducted experiments using satellites at a distance of more than 3,000 km. ***Avialesookhrana*** has significant experience in the conversion of military hardware into forest fire fighting equipment. This task is being conducted jointly with Russian research institutes. Such activities are considered to be quite promising (see also special coverage on forest fires in the Russian Federation, International Forest Fire News No.6 (January 1992).

The last fire season, especially during its first half, was burdened by the economic problems of our country. In spite of this, the government did allocate some financial resources, providing ***Avialesookhrana*** with its minimal needs. In the second half of 1992 additional funds were provided for leasing aircraft and firefighting equipment procurement. This allowed us to carry out inter-regional movements of overhead personnel to hot spots. There were 52 operations carried out with a total of 1,470 airborne personnel transported directly to fires. Despite the shortage of resources the Aerial Forest Fire Protection Service of Russia is projected to finish the year with satisfactory results. Big catastrophic fires have been prevented thanks to the well organized fire

control system. There have been no reported deaths caused by forest fires and no homes or other facilities have been reported as being burned. In conclusion, it is important to note, that the only agency in Russia for aerial forest fire protection is ***Avialesookhrana***.

From: Alexander I.Beliaev
Eduard P.Davidenko

Address: P.A. Avialesookhrana
Gorky Sreet, 20
141200 Pushkino, Moscow Region
RUSSIAN FEDERATION

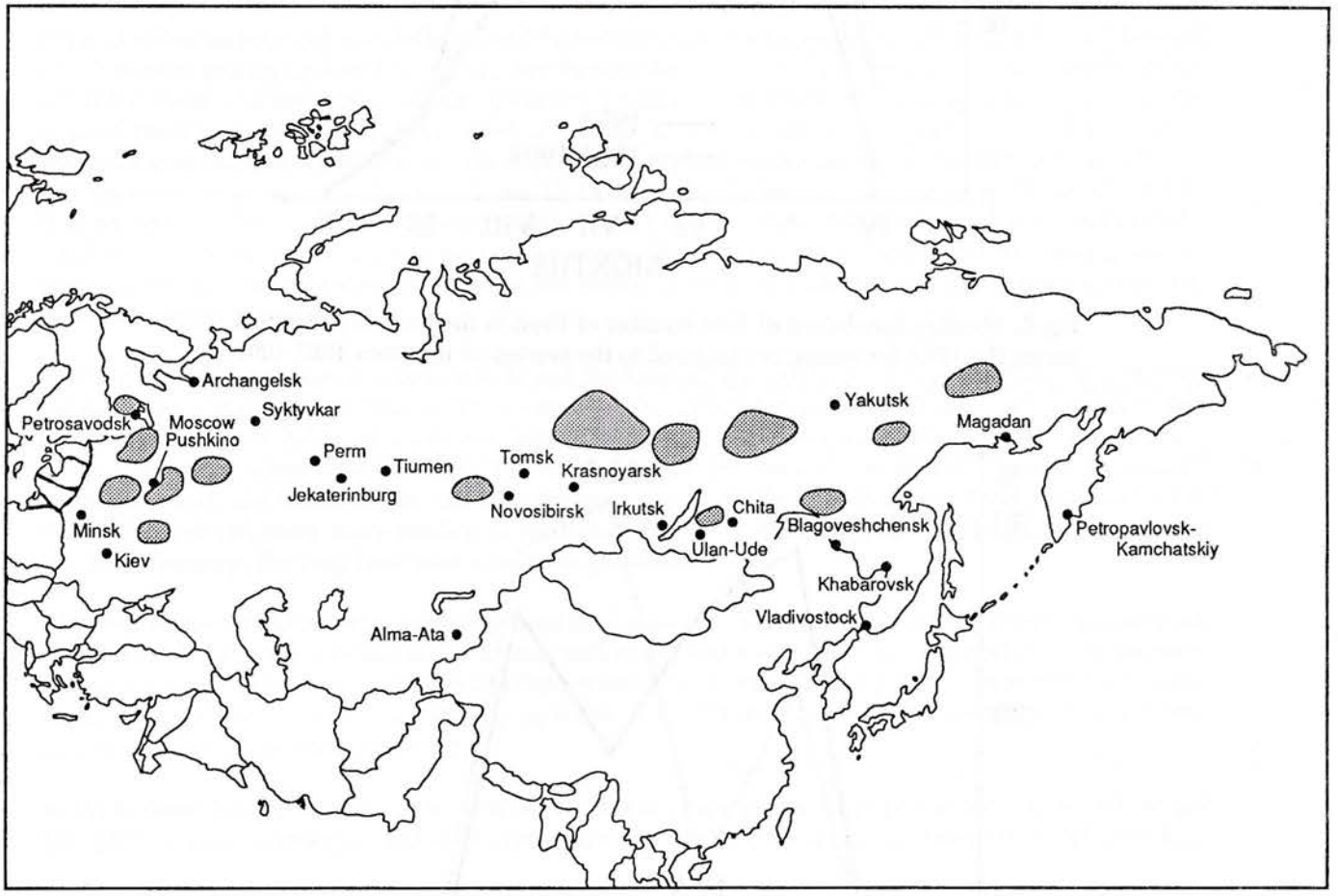


Fig.1. Map of the Commonwealth of Independent States (CIS) showing the locations of the Aerial Fire Centers of *Avialesookhrana* and the locations (shaded areas) of thr main large fires during the 1992 fire season.

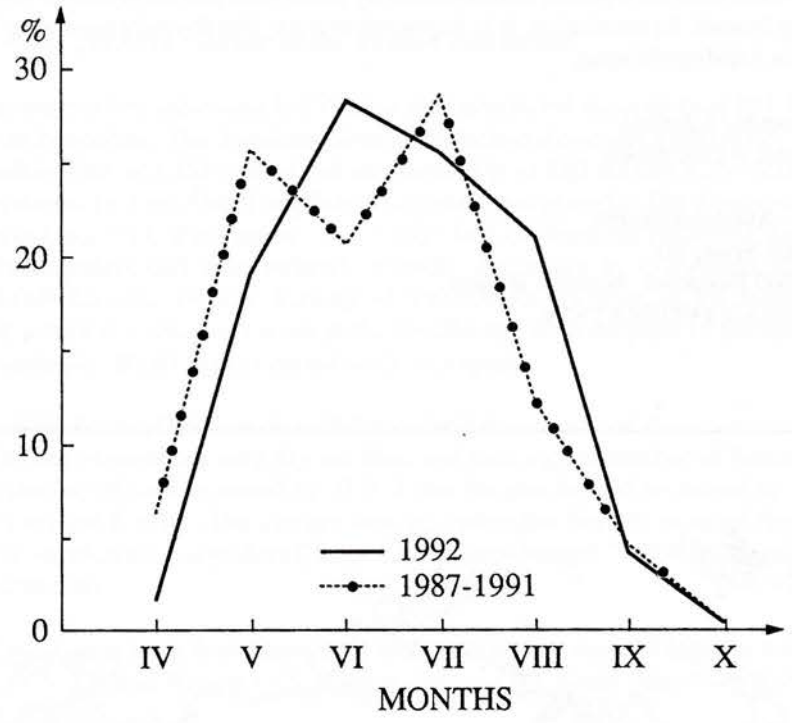


Fig.2. Monthly distribution of fires (number of fires) in the Russian Federation during the 1992 fire season as compared to the average of the years 1987-1991.

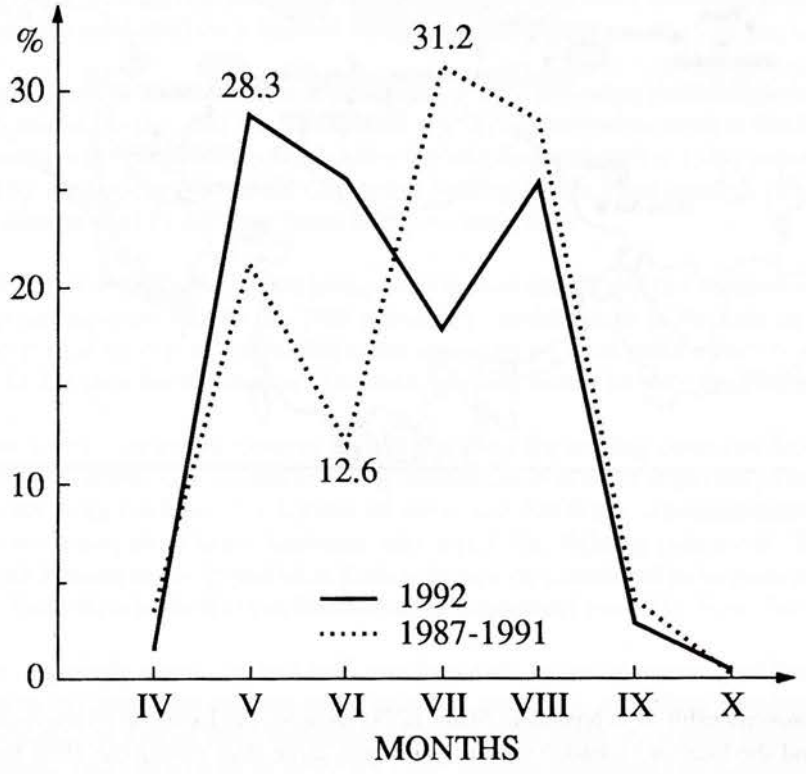


Fig.3. Monthly distribution of area burned in the Russian Federation during the 1992 fire season as compared to the average of the years 1987-1991.

SWEDEN

Hot and Dry Summer in Sweden

The spring of 1992 in southern Sweden did not suggest anything else than yet another wet and rainy summer. In April the highest precipitation for more than 100 years was recorded at several stations. Low pressures kept coming in with some rain every other day. Then suddenly the trend was broken around 14 May as a high pressure system established over Scandinavia. The high pressure proved to be unusually stable for this part of the world, and soon farmers were starting to complain about the drought. People were also becoming increasingly aware of the rising fire danger, but surprisingly few fires were reported.

Then within a couple of days in the second week of July, two fires got out of hand and for several days forest fire fighting got a tremendous coverage in the national media. By international standards, however, these fires were rather modest. The worst in terms of fire behaviour and property lost was a fire burning in pine forest on the eastern side of the Baltic island of Gotland. It was first observed at two o'clock in the morning, was attacked within an hour and was declared dead by noon when less than two hectares had been burnt. The wind was, however, picking up speed, and as the fire fighters started to leave the area they observed smoke further out in the forest. For three hours the fire spread over relatively flat terrain and homogeneous vegetation. The head of the fire travelled at a mean speed of around 22 m/min, mainly as a surface fire, but crowning whenever there was sufficient undergrowth of juniper and spruce among the pines. Spotting distances of up to 400 meters were documented. The wind was 12-15 m/sec during the run, and we have calculated the Fire Weather Index of the Canadian fire danger rating system to have been 56. The fire was not contained until the third day, but winds were only around 5 m/sec during the second and third days, and the burning was no longer aggressive. On the second day another fire started in Southern Småland, burning mainly over a dwarf-shrub covered mire complex.

The Gotland fire eventually covered 1100 ha and the Småland fire 2000 ha. This makes these fires the two largest for several decades in Sweden. The drought in 1992 affected also the Baltic states, where several fires were burning in early July. The total burnt area in Sweden up to mid August 1992 was 5800 ha, the highest figure since 1959, when 9000 ha burnt. The worst fire year this century was in 1933, with approximately 30,000 ha burnt. But as late as the mid 19th century much of the forest in Northern Sweden still had a fire cycle of around 100 years, corresponding to more than 100,000 ha burnt per year on average. In the southern half of the country, fire may have been even more prevalent.

The main reason behind the relatively small burnt area in Sweden in recent years is the well developed network of forest roads, allowing very fast access to fires with pumps and hoses. It is very rare that fires burn for more than a few hours. The result is that fire fighters today usually have little experience with forest fires, and particularly big ones. They rely exclusively on water, delivered from hoses or from helicopters, which may present problems once a fire grows big.

At the Gotland fire, the only effort to burn out fuel ahead of the advancing front was done by an old, retired firefighter on his own initiative, and this helped save a small farm, lying in the direction of the head of the fire.

A few months after these fires of 1992, it is evident that they have activated an intense discussion on forest fire fighting and also of the role of fire in our ecosystems.

Fire Ecology Course in Sweden

In contrast to many other countries within the boreal and subboreal region, Sweden today has very small problems with forest fires, despite the unusual size of the fires of 1992. In fact, fire protection has been successful to such a degree that the lack of fire creates problems for nature conservation. In former times fire was the main disturbing agent and many plants and animals were adapted to fire.

To meet a growing demand for basic knowledge about fire ecology and the use of fire, a two day course was held at the Swedish University of Agricultural Sciences in Umeå, Northern Sweden. For several years there has

been more and more talk about the need to start using fire as a management tool in nature reserves that had been structured earlier by repeated fires, but nothing has been done so far on the ground. Forest managers on the other hand are eager today to adjust forestry practices to the former patterns of natural disturbance. The use of prescribed fire is one of the ways to achieve this. Until the late 1960s prescribed fire was extensively used for site preparation, but today most of the experienced people have gone.

Thirty people from Sweden and Finland attended the course. They were a mix of company foresters, nature conservation officials and officials from the forest extension service. Lectures were given on forest history, cultural aspects of fire, fire behaviour, the effects of fire on plants, fire dependent insects, and legislation. At an evening workshop people had to solve one of two tasks: a plan for prescribed burning in Björnlandet National Park or a plan to use fire for integrated nature conservation and site preparation on commercial forest land. One day was dedicated to field exercises. Fire behaviour in various fuels was demonstrated on small plots, and waterbombing with a helicopter was shown. Thanks to suitable weather a larger burning operation could also be undertaken. A pine-dominated piece of forest, surrounded by good fire breaks on three sides, was burnt over. The course will be given again in early summer of 1993, this time with particular emphasis on the situation in the southern half of Sweden.

From: Anders Granström

Address: Department of Forest Ecology
Swedish University of Agricultural Sciences
S-901 83 Umeå

ZIMBABWE

The Drought of 1992 and its Consequences

At Chimanimani, in Zimbabwe's Eastern Highlands, we have just experienced the worst forest fire in this country's history. On Sunday 20th September 1992 a fire started which burnt out, during four days, over 2,500 ha of land comprising 1300 ha of pine, wattle and eucalypts: add to this an area of *Brachystegia* (natural) woodland of ca. 800 ha and about half this area of natural/unimproved grazing land. Trees of all ages, mostly mature, were affected on two neighbouring properties.

The losses caused by the fires are estimated at Z$ 3 million with the cost of fire fighting put at Z$ 500,000. At one stage the fire front stretched for over 15 km and spotted up to 7 km from the primary fire. Prolonged dry conditions had generated a Keetch-Byram Drought Index figure of 735 which, incorporated into the locally computed Fire Danger Estimate of 71 produced a figure for that day of 79. Because of the extreme weather conditions, single digit humidity plus high winds and ambient temperatures, we think that this figure was low and should have been, maybe, 10 points higher: this variation suggests further refining of our forecast system may be needed. Fire fighters came in by air and road from as far away as Harare (400 km) and Mutare (150 km), adding to a ground fire-fighting force which peaked at 2000 people.

The behaviour of the fire puts into question the whole current concept of our fire protection measures; we may have to discard presently held theories for a few years until conditions become more manageable. The sacrificial back-burn was often the only effective way of containing the fire which was finally extinguished after two weeks, but only after the advent of more moderate, and moister weather. Many lessons were learnt which we hope will never need to be put into practice.

From: Frank Elias
Chairman, Chimanimani
Fire Protection Committee

Address: P.O. Box 19
Chimanimani, Zimbabwe

NEWS FROM FIRE RESEARCH

Satellite Monitoring of African Savanna Fires

African savannas consist primarily of a continuous layer of grass interspersed with scattered trees or shrubs, and cover approximately 10 million km^2 in tropical Africa, extending from 15° N to 25° S latitude. Savanna burning predates the presence of humans in this region, the result of frequent lightning storms, but the extent and frequency of burning has increased dramatically due to human presence and population pressures. Although some burning takes place throughout the year, the greatest frequency of fires occurs during the dry period. This means most savanna burning north of the equator takes place between December and February, while burning south of the equator occurs approximately six months later. Quantifying the extent of burning over a continent where burning is a way of life and few official records are kept is a formidable task, and there is a great deal of uncertainty about available statistics. The use of satellite imagery is essential for the determination of the timing and geographical distribution of African savanna burning. Defense Meteorological Satellite Program (DMSP) night-time visible low-light satellite imagery has been used to monitor the seasonal distribution of African savanna fires. Visible wavelength light from fires was identified and mapped on a monthly basis for two years. With the analysis of the two study years, and from space and ground-based observations during other years, the identified seasonal burning patterns vary little. Inter-annual variances were attributed to varying precipitation patterns. Regions with a high frequency of savanna fire occurrence did not vary at all in different years. Based on the DMSP imagery, it is important to note that there is a great deal of fire activity well into the night. Savanna fires, once started, are often left to burn uncontrolled and the occurrence of fires is probably not strongly diurnal. More details of this study can be found in the October 29, 1992, issue of *Nature* (*D.R. Cahoon, B. Stocks, J.S. Levine, W.R. Cofer and K.P. O'Neill 1992. Seasonal distribution of African savanna fires. Nature 359, 812-815*).

From: Donald Cahoon, J.Levine and W. Cofer and Brian Stocks

Address: NASA/Langley Research Center
Mail Stop 423
USA-Hampton, VA 23681-0001

Forestry Canada
1219 Queen Street East
CDN-Sault St. Marie, Ontario P6A 5M7

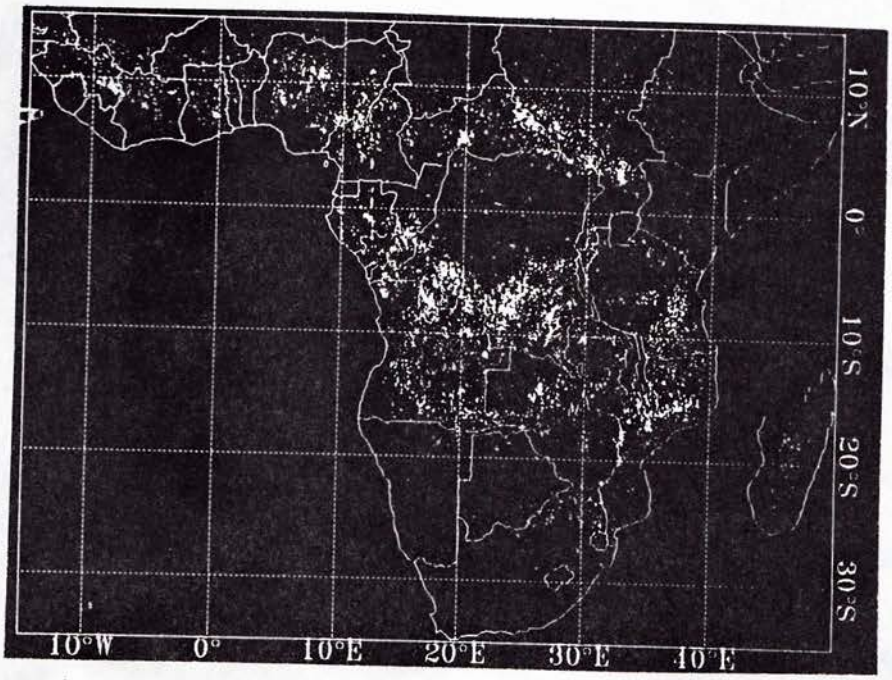


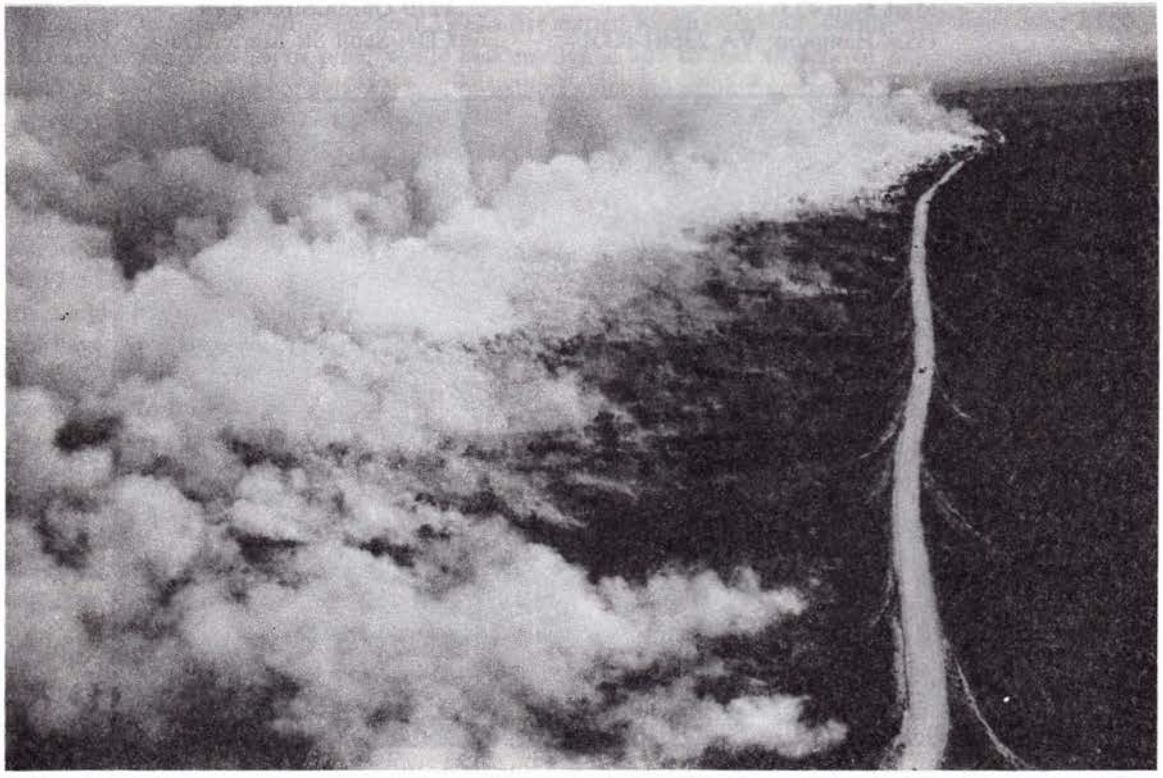
Fig.1. 1987 annual composite of African savanna fires shown by the mapped white dots superimposed over the African continent. The mosaic was produced from DMSP meteorological satellite imagery (see text). Courtesy D.Cahoon, NASA Langley Research Center.

Field Campaign of SAFARI-92 Successfully Terminated

The **Southern African Fire-Atmosphere Research Initiative (SAFARI)** is a component of the **Southern Tropical Atlantic Regional Experiment (STARE)**, an activity of the **International Global Atmospheric Chemistry Project (IGAC)** (rationale and outline of this first intercontinental fire experiment were described in the previous issue of International Forest Fire News, August 1992). The main field phase, in which more than 150 scientists from 14 countries were involved, was operational between August and October 1992. The data collected during SAFARI-92 are now being evaluated. In May 1993 a data workshop will be held in Stellenbosch (South Africa). A symposium in which the first results will be presented to the interested public will be held in Johannesburg on 1 June 1993. For further information on this open symposium contact:

Dr.Janette A. Lindesay
University of the Witwatersrand
Climatology Research Group
P.O.Wits
2050 Johannesburg, SOUTH AFRICA

Phone: +27-11-716-2998
Fax: +27-11-716-3161



One of the two large experimental burns (> 2000 ha) in Kruger National Park as seen from one of four helicopters and fixed-wing research airplanes operating over the fire (Photo: J.Goldammer).

This South African DC-3 was modified as a flying fire laboratory for the SAFARI-92 campaign. Aerosol and trace gas sampling inlets are mounted on top of the cockpit (Photo: J.Goldammer).

New European Research Project on Simulation of Forest Fires

The goal of this European reasearch project is the definition and development of behaviour models for vegetation fires adapted to European conditions.

State of the art

Designed in the early 1970's, the North American BEHAVE model is currently the most frequently used model around the world. Its main limitations are:

- specific to North American conditions,
- based on restrictive hypothesis,
- build on an empirical approach to phenonmena.

Important enhancements are possible, in the light of developments in the last ten years in various domains:

- fluid mechanics (aerology),
- thermodynamics (combustion, heat transfer),
- mathematical models (numerical simulation),
- artificial intelligence (integration of knowledge and skills),
- information management (databases, GIS, remote sensing).

Technical description

This project involves some of the most experienced teams in Europe in the different domains of modeling. It is essential for the success of the project to link all skill domains needed to encompass all phenomena (physics, biology) involved in forest fire propagation.

From a scientific point of view, this project is original due to the association of two complementary research directions:

1. development of a set of specific models, to represent the various physical phenomena involved in forest fire modeling:

   - climatology and small scale aerology
   - behaviour (combustion, heat and material transfer),
   - effects of fighting (fireman, aerial means).

2. management of existing knowledge about identification of current situations, physical phenomena and existing numerical models.

The proposed approach consists of reproducing of the logic used by experts: identification of situations, proposition of a set of hypotheses, choice of pertinent models and application of models. If results do not agree with observations, it will suggest new hypotheses, corresponding to a new combination of models.

The work on this project can be divided into 4 steps:

1) identification of situations:

   - collection of existing knowledge,
   - break down into elementary situations,
   - connection with physical phenomena involved,
   - most influential parameters.

2) modeling: after the collection of existing models, the design of dedicated models will be done in 4 domains:

   - fuel modelling,
   - fire modelling,
   - wind modelling,
   - fire fighting modelling.

3) validation: comparison of results given by models with observations; the validation will be done on:

   - laboratory tests,
   - climatological comparisons,
   - well known past fires,
   - controlled fires,
   - wildfires.

4) integration: all information collected along the three first steps wil be integrated as a common tool for model construction and completed with remote sensing data on several test regions. A graphical user interface will allow efficient development and test of simulations.

From: Daniel Alexandrian
Project Coordinator

Address: Agence MTDA
298, Avenue du Club Hippique
F-13090 Aix-en-Provence

Phone: +33-42 20 12 57
Fax: +33-42 20 16 35

Tab.1. Overview of research institutions, contractors and individual scientists participating in the European Research Project on Simulation of Forest Fires

Participant	Task	Responsible Administrator	Scientist	Country
1) MTDA	Coordinator	D.Alexandrian	D. Alexandrian	F
2) ARMINES	Contractor	J. Vergnaud	J.L. Wybo	F
3) CERMICS	Contractor	A. Ballet	B. Larrouturou	F
4) DIFT	Contractor	N. Baden	E. Pedersen	DK
5) FISBAT	Contractor	F. Prodi	F. Tampieri	I
6) MAICH	Contractor	A. Nikolaidis	A. Dimitrakopoulos	GR
7) Association d'Analyse Spatiale	Contractor associated to 2	C. Voiron	P. Carrega	F
8) GEOIMAGE	Contractor associated to 1	L. Laurore	L. Laurore	F
9) INRA	Contractor associated to 2	H. Bichat	H. Oswald	F
10) Université de Liège	Contractor associated to 2	M. Erpicum	M. Erpicum	B

FIRE STATISTICS

Reliable statistical data on forest and wildland fires from around the globe are increasingly requested by policy maker, managers and scientists. Most of the scientific interest in fire data is related to the question of the contribution of vegetation fires to global budgets of greenhouse gas emissions and other atmospheric phenomena. The lack of statistical data is obvious. In many regions of the world wildland fires are poorly documented.

Besides the regular publication of the **UN-ECE/FAO Forest Fire Statistics** (see previous issue of IFFN, p.29), the ECE/FAO International Forest Fire News regularly publishes statistical information on recent and historic fires. Some of these data are from unpublished materials, e.g. internal reports to governments, statistical yearbooks, and other sources. With the publication of sources (bibliographic information) and hard data (tables with fire statistics) interested parties may gradually compile a data base for further use. In this issue recent news on fire statistics is on methods and standardization of data collection, on a global base, an update of forest fire statistics of the USA, and fire data tables from Algeria, Australia, Austria and Finland (Tables 1 to 6).

Improving the Mediterranean Wildland Fire Data Bases

A **Workshop on the Use of Wildfire Data Bases** has been organized by the **Mediterranean Agronomic Institute of Chania (C.I.E.H.A.M.)**, in cooperation with FAO in the framework of the Intergovernmental Committee on Mediterranean Forestry Questions - **Silva Mediterranea** and held in Chania (Greece), 4-7 November 1991. The workshop was in compliance with Resolution No.3 of the Ministerial Conference for the Protection of Forest in Europe (Strasbourg, December 1990). In the report the forest fire situation and methodology of data collection comprises most Mediterranean countries (Bulgaria, Cyprus, France, Greece, Italy, Morocco, Portugal, Spain, Tunisia and Turkey). The improvement and standardization of data collection are recommended. *(J.G.G.)*

FAO/CIEHAM 1992. Workshop on the use of wildland fire data bases, Chania (Greece) 4-7 November 1991. AFWC/EFC/NEFC Committee on Mediterranean Forestry Questions Silva Mediterranea, 154 p.

USA: Fire Statistics Update

The tables in a recently released publication are compiled wildfire statistics for the 7-years period 1984-1990 as reported to the United States Department of Agriculture, Forest Service, by its field offices, the State Forester (or a comparable state official) of each of the 50 states, the officials of Puerto Rico and Guam, the Department of the Interior and the Tennessy Valley Authority. A summary extract on the number of wildfires and area affected by wildfires between 1984 and 1990 is given in Figure 1 (for easier understanding and standardization purposes the editor converted the area numbers from acres to ha). The data compilation on more than 150 pages does not have a detailed publication reference. *(J.G.G.)*

USDA Forest Service 1992. 1984-1990 wildfire statistics. USDA Forest Service, State and Private Forestry, Fire and Aviation Management Staff, Washington, D.C.

(Address: 14th and Independence Ave, SW, Washington, D.C. 20250)

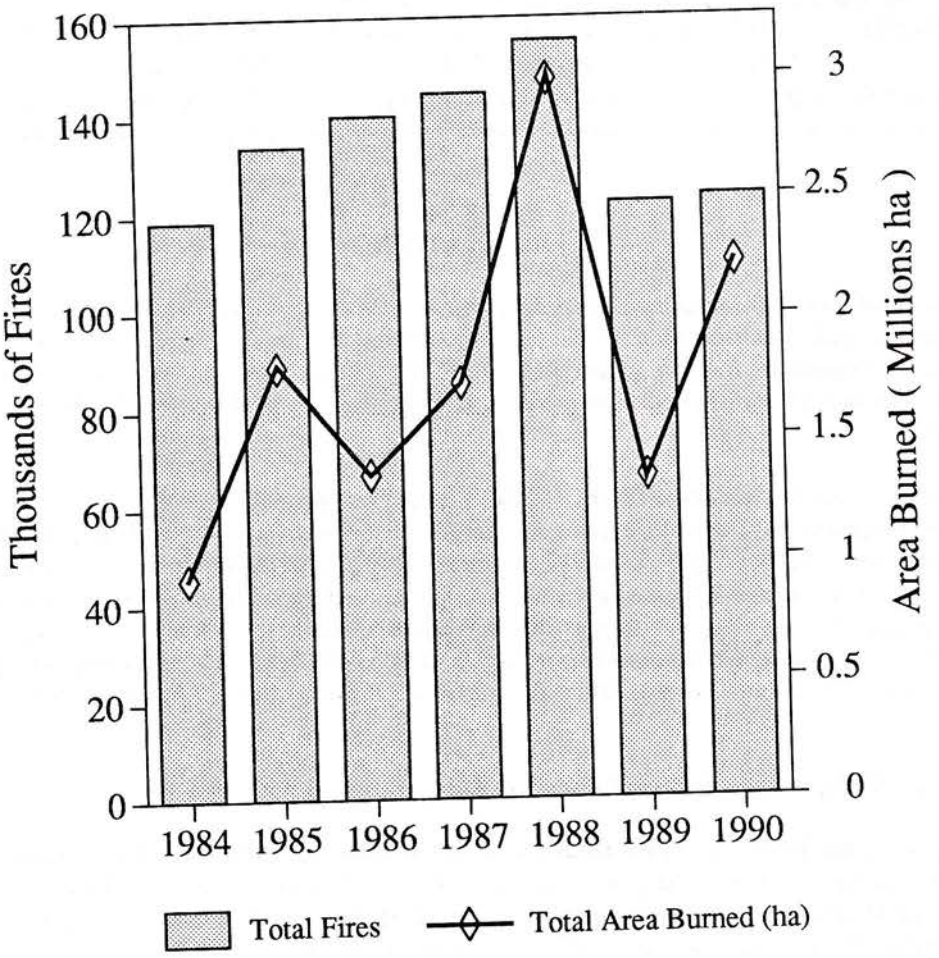


Fig.1. Total number of fires and area burned in the United States of America between 1984 and 1990.

Global Wildland Fire Statistics

In a first attempt to compile global wildland fire data FAO has published the first version of **Global Wildland Fire Statistics 1981-1990**. This first data collection is very incomplete because FAO obviously did not take advantage of fire information available in data banks, literature and libraries of fire research institutions. The collection of data on a global scale requires a different systematic approach. Thus, this first edition must be considered as the beginning of cooperative data collection - and this is why FAO invites interested parties to join this effort. *(J.G.G.)*

FAO 1992. Global wildland fire statistics 1981-1990. FAO, Forest Resources Division, Forestry Department, FO: MISC/92/4, Rome, 48 p.

(Address: Via delle Terme di Caracalla, I-00100 Rome, Italy)

Fire Data Tables

Tab.1. Summary of wildfire occurrence and area affected by fire in Algeria during the decade 1982-91. Source: Ministry of Agriculture, Forest Service, Algiers

Year	Number of Fires	Affected Surface Area (ha)					Average ha/fire
		Forest	Maquis	Brush	Alfa	Total	
1982	638	7,355.59	730.20	1,295.97	-	9,381.76	14.70
1983	990	133,041.00	73,683.00	14,643.00	-	221,367.00	223.60
1984	562	1,754.27	1,175.75	1,801.82	-	4,731.84	8.41
1985	747	1,396.44	804.99	2,453.37	13.50	4,668.30	6.24
1986	1,170	7,916.21	3,980.38	9,635.61	5.55	21,537.75	18.40
1987	1,321	10,438.16	4,431.47	7,620.77	809.96	23,300.36	17.38
1988	1,146	16,740.68	4,742.16	6,224.14	50.82	27,757.80	24.22
1989	595	2,010.43	436.07	790.16	-	3,236.66	5.43
1990	911	20,149.34	5,379.98	2,515.41	1.80	28,046.53	30.78
1991	1,189	6,091.24	3,434.56	3,564.05	86.30	13,176.15	11.08
Total	9,269	206,893.36	98,798.56	50,544.30	967.93	357,204.15	38.53

Tab.2. Summary of vegetation area affected by wildfire in Algeria between 1963 and 1991 (Source: Ministry of Agriculture, Forest Service, Algiers)

Year	Vegetated Land Area affected by Wildfires (ha)
1963	3,923.30
1964	9,385.72
1965	50,624.28
1966	2,503.43
1967	49,561.48
1968	14,549.81
1969	13,314.32
1970	30,438.67
1971	57,835.18
1972	4,097.76
1973	34,530.25
1974	11,002.50
1975	37,331.00
1976	19,945.29
1977	43,947.00
1978	41,551.67
1979	15,662.56
1980	26,944.61
1981	17,361.39
1982	9,381.76
1983	221,367.00
1984	4,731.84
1985	4,668.30
1986	21,537.75
1987	23,300.36
1988	27,757.80
1989	3,236.66
1990	28,046.53
1991	13,176.15
Total	841,716.37

Tab.3. Forest fires in Austria 1990-91 (Source: Federal Ministry of Agriculture and Forestry, Austria)

Province	Forest Area affected in ha		Total Number of fires		Season								Fire Causes									
					Spring		Summer		Autumn		Winter		Lightning		Railways		Negligence		Arson		Unknown	
	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991	1990	1991
Burgenland	35	14	62	32	34	16	8	1	20	15	-	-	-	-	-	-	59	32	-	-	3	-
Kärnten	18	9	20	13	14	6	2	5	1	2	3	-	4	-	2	1	7	8	1	-	6	-
Niederösterreich	47	2	64	6	49	4	10	-	1	2	4	-	1	-	6	1	46	4	-	-	11	1
Oberösterreich	-	-	1	1	1	-	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-
Salzburg	3	1	2	2	2	1	-	1	-	-	-	-	-	-	-	-	2	-	-	-	-	2
Steiermark	21	10	49	7	23	6	1	-	1	-	24	1	1	1	4	-	38	5	-	1	4	1
Tirol	31	6	9	9	4	6	1	1	1	2	3	-	3	-	1	-	3	4	-	-	4	4
Vorarlberg	-	2	4	5	-	1	4	4	-	-	-	-	4	-	-	-	-	-	-	-	-	-
Wien	44	9	10	3	-	3	10	-	-	-	-	-	-	-	-	-	-	-	-	2	10	1
Total	200*	53	221	78	127	43	36	13	24	21	34	1	13	1	13	2	156	54	1	3	38	9

* rounding error

Tabs.4 and 5. Causes, area burnt and estimates of damage of reported fires during the 1991/92 bush fire season in New South Wales (Australia). Source: Bushfire Bulletin Vol.14, No.2 (Department of Bushfire Services and the Bush Fire Control of New South Wales, Australia)

Causes	Number of Fires	Percent (%)
Burning off - legal	1658	14.29
Burning off - illegal	1515	13.05
Lightning	461	3.97
Power lines	187	1.61
Rubbish Tips	196	1.69
Sawmills	37	0.32
Motor vehicles	569	4.90
Farm equipment	186	1.60
Trains	57	0.49
Camp and cooking fires	173	1.49
Domestic and children	404	3.48
Industry	20	0.17
Smokers	105	0.90
Miscellaneous - known	889	7.66
Miscellaneous - unknown	4360	37.57
Incendiarism	788	6.79
Total	11,605	100.00

Area	Number of Fires	Area burnt (ha)	Estimate of Damage * (AUS $)
Area specified in Schedule 3 of the Bush Fires Act, 1949	10,060	449,800	51,173,000
Outside the area specified in Schedule 3 of the Bush Fires Act, 1949	1,545	50,600	19,421,000
Total of the whole State	11,605	500,400	70,594,000

* This damage includes:
(a) destruction of 731 livestock;
(b) loss of 130,165 ha of crops and pasture;
(c) destruction of 172 ha of Forestry Commission pine plantation;
(d) destruction of 322 km of fencing; and
(e) damage to or destruction of 600 dwellings and buildings.

Tab.6. Number of forest fires and area burnt in Finland 1952-90. Source: Ministry of the Interior (reproduced from the Yearbook of Forest Statistics 1990-91, The Finnish Forest Research Institute).

Year	Number of Fires	Burnt Area (ha)
1952	299	764
1953	216	8,955
1954	258	658
1955	636	1,579
1956	453	1,672
1957	348	2,762
1958	371	920
1959	1,419	10,662
1960	628	23,872
1961	245	798
1962	117	241
1963	717	1,083
1964	636	1,092
1965	517	941
1966	347	1,100
1967	360	561
1968	467	835
1969	911	3,871
1970	550	3,024
1971	557	762
1972	581	1,032
1973	1,095	1,301
1974	331	450
1975	601	719
1976	510	543
1977	296	345
1978	491	801
1979	430	544
1980	694	774
1981	171	202
1982	504	513
1983	271	100
1984	464	301
1985	502	238
1986	717	367
1987	285	153
1988	621	289
1989	617	516
1990	571	433

RECENT PUBLICATIONS

Fire in South African Mountain Fynbos

This book presents a comprehensive account of a pre- and post-fire study in a South African mountain fynbos ecosystem. The study site at Swartbsokloof is one of a group of important long-term sites selected as representative of the world's Mediterranean-type ecosystems. The book addresses the interactions between climate and structural features of the vegetation, with particular emphasis on how these determine the incidence of fire. The effects of fire on the vegetation are examined at the level of individual species and communities. Special attention is given to the role of fire in determining community boundaries, notably those between shrublands and forest patches, and in governing invasion of fynbos by alien trees and shrubs. Detailed autecological studies address the life histories of selected shrubs and geophytes. The response of small mammals and ants to fire is examined, as is the role of these fauna in structuring the regenerating vegetation. A chapter is devoted to the response of micro-organisms to fire. At the ecosystem level, the effects of fire on the catchment chemical balance, hydrology and streamflow are examined. These results are used to address questions on resilience, and on the sustainability of fire management in fynbos ecosystems. Throughout the book, emphasis is placed on comparison with other Mediterranean-type ecosystems.

With the integration of fire ecology at various levels (population, community, ecosystem) the editorial team under the lead of Brian van Wilgen has set a pioneering example of "predictive ecology". The spin-offs of the findings are a provocative challenge to ecosystem managers and those who are responsible for setting priorities in land-use and conservation policies. Successful preservation of the mountain fynbos with respect to biodiversity and functions as water catchment sites requires substantial inputs in maintaining fire regimes and controlling of invading alien plants. These investments seem to be endangered by changing government priorities. The authorities responsible for South Africa's land management are advised to carefully read the findings of this book. *(J.G.G.)*

B.W.van Wilgen, D.M.Richardson, F.J.Kruger and H.J. van Hensbergen (eds.) 1992. Fire in South African Mountain Fynbos. Ecosystem, Community and Species Response at Swartboskloof. Ecological Studies 93, Springer-Verlag, Berlin-Heidelberg-New York, 325 p., illustrated (ISBN 3-540-53301-X)

Fire in Tropical and Subtropical Forest Ecosystems

Feuer in Waldökosystemen der Tropen und Subtropen <Fire in Ecosystems of the Tropics and Subtropics, in German> is a comprehensive summary of the role of fire in the tropical and subtropical biota. The volume is based primarily on the expertise the author collected during more than 10 years of fire research and development work in tropical Asia and Latin America. In order to obtain a complete picture of tropical and subtropical fire ecology, the author has evaluated and incorporated numerous scientific sources as well as reports and observations from all over the tropics of Asia. The monograph embraces the paleo-fire ecology and biogeography of fire in the tropics, the historical and present fire regimes, and the role of fire in regional and global atmospheric chemical and biogeochemical processes. The book also elaborates on fire management options and is therefore of interest not only for ecologists but also for the tropical land manager, especially in the tropical forest and savanna biomes. Study of this book eludicates that fire is an old natural phenomenon and an old cultural practice in tropical land management, and that with the help of fire productive vegetation of high sustainability and carrying capacity has been created. In the context of population explosion in the tropics, and in the light of changed land-use practices, fire is becoming a more and more detrimental factor in environmental degradation. *(K.F.W.)*

J.G.Goldammer 1993. Feuer in Waldökosystemen der Tropen und Subtropen. Birkhäuser-Verlag, Basel-Boston, 251 p., illustrated (ISBN 3-7643-2813-4)

Fire and Vegetation Dynamics: The Boreal Forest

The hypothesis of the author of *Fire and Vegetation Dynamics: Studies from the North American Boreal Forest* is that ecologists often do not consider in any technical detail how forest fires produce effects on individual plants and on plant populations. Consequently, he considers the causal connection between the behaviour of fire and its ecological consequences is poorly understood. With his book Edward A. Johnson intends to correct this deficiency by assembling the relevant studies of fire intensity, rate of spread, fuel consumption, fire frequency and fire weather in North American boreal forest. His central thesis is that the North American boreal forest has at least four wildfire characteristics that are important in understanding the dynamics of its plant populations: the large size of the burns with respect to dispersal distances, the short recurrence time of fire with respect to tree lifespans, the high mortality of plants due to the predominance of crown fires, and a good germination surface due to the large area of forest floor which is covered by ash. *(J.G.G.)*

E.A.Johnson 1992. Fire and Vegetation Dynamics: Studies from the North American Boreal Forest. Cambridge Studies in Ecology. Cambridge University Press, 129 p. (ISBN 0-521-34151-5)

Proceedings of the Fire/Meteorology Workshop, Rabat, November 1991

"Météorologie et incendies de forêts", the proceedings of a workshop on use of meteorological information in forest fire management held in Rabat, Morocco, 25-30 November 1991, has been published and is available for distribution. This workshop was organized by the National Weather Service of Morocco and the World Meteorological Organization (WMO) in technical collaboration with the Forest Resources Division, Forestry Department, FAO. Copies of the proceedings are available from:

D. Rijks
World Meteorological Organization
41 Guiseppe Motta
Case Postale 2300
CH-1211 Geneva 2

or

W.M.Ciesla
Forest Protection Officer
FAO, Forestry Department
Via delle Terme di Caracalla
I-00100 Rome

FOREST FIRE MANAGEMENT TRAINING COURSE

Cyprus: Forest Fire Management Training Course, May-July 1993

Introduction

Fire is the worst enemy of the forest and constitutes the biggest obstacle for efficient management of the forests in most countries of the Mediterranean region. Forest fire problems must be correctly assessed and efficient protection must be organized. For this reason the prevention of forest fires is considered a factor of high importance for the conservation of the forests. Aware of these needs the Cyprus Forestry Department is organizing a short training course in "Forest Fire Management."

The course will be held at the Cyprus Forest College situated at the Prodromos village in the midst of the Troodos mountains with an elevation of 1.370 m a.s.l. The course, commencing each year in May, will last 12 weeks. Successful participation in the course leads to a Certificate in Forestry.

Provisional Training Programme

Week	Study Programme
1	Arrival in Cyprus. General introduction to fire protection.
2	Kind and causes of forest fires. Hazard factors, damage and injuries caused by fires.
3	Prevention, detection and extinction measures adopted in Cyprus. Fire control plan. Fire danger.
4	Methods of fire fighting under Cyprus conditions. Personnel, equipment and tools used. Transportation and communication systems.
5	Silvicultural measures. Prevention campaigns, Forest legislation and policy.
6	Attachments to forest divisions. Field trips and discussion. Organization structure.
7	Attachment to Nicosia/Larnaca division. Visit to the Telecommunications and Engineering section. Fire control room.
8	Application of water in fire fighting. Fire fighting equipment. Water sources.
9	Field trip for the preparation of a fire protection plan of a specific area.
10	Attachment to Troodos division to study and discuss the structure for the protection of forests of special recreational and ecological value.
11	Collection and analysis of data for the preparation of a fire protection plan for a specific area.
12	Preparation of a written report, submission and evaluation of report. Presentation of certificates.

Teaching Methods

A range of teaching techniques ranging from lectures, practical classes, field trips and attachments will be employed to achieve the course aims.

Admission Requirements

The course with its practical orientation will also suit those with a theoretical background who wish to enhance their practical experience. Candidates for this course should

(a) possess a technical qualification in forestry or related subjects (agriculture, wildlife management, resource management etc.) at certificate/diploma or degree level;

(b) have more than one year of field experience in forestry after basic training;

(c) be competent in both spoken and written English.

Accommodation, Costs and Registration

In single study bedrooms while at the college and hotels and forest stations while away from the college. Total payment fees are £ 2,925. This includes the costs of tuition, study trips, attachments, training materials, room and board, medical care, weekly allowance and clothing, establishment and departure allowances. Completed application forms should be submitted by the end of April 1993. To receive an application form for the course, write to:

Forestry Department
Ministry of Agriculture & Natural Resources
Nicosia
CYPRUS

Phone: +357-2-450168
Fax: +357-2-451419
Telex: 4660 MINAGRI CY

MEETINGS HELD IN 1992

FRANCE

International Fire Workshop in Banyuls-sur-Mer (21-25 September 1992)

An international workshop was held in Banyuls-sur-Mer in September 1992. It was jointly organized by L.Trabaud (C.N.R.S.) and R.Prodon (Université Paris VI) and sponsored by the European Community.

Its title was "The Role of Fire in Mediterranean Ecosystems". About sixty researchers, teachers, technicians and environment engineers attended this meeting. They came from several countries of the Mediterranean Basin: Portugal, Spain, France, Italy, Greece, Turkey, Israel, but also from the Netherlands (a team working in the French Eastern Pyrénnées) and Australia. Each session was introduced by a key speaker. The topics were:

- Plant community dynamics after fire;
- Influence of fire on plant populations and organisms;
- Influence of fire on animal communities and populations;
- Effects of fire on physical and chemical properties of soil.

As the organizers had put an emphasis on the character of "Workshop", sessions were working moments during which only results from field or laboratory research were presented. Comments and debates followed each presentation. The meeting was reserved for specialists working on the subject. Technical discussions concerned only original scientific results, a reason to keep the number of persons small to allow efficient debate. Many of the teams are already actively working together and will continue. The proceedings of the workshop will be published.

From: Louis Trabaud

Address: C.E.F.E./C.N.R.S.
B.P.5051
F-34033 Montpellier Cedex 1

MEETINGS PLANNED FOR 1993

AUSTRALIA

Landscape Fires '93 - Australian Bushfire Conference, 27-29 September 1993, Perth (Western Australia)

A three day conference focussing on recent developments in Australian wildland fire science will be held in Perth, Western Australia from 27-29 September 1993. The theme for the Landscape Fires '93 conference is **Forging links between fire behaviour and fire ecology**. Invited speakers will present papers addressing six themes:

- new developments in fire danger rating and fire behaviour modelling
- fire measurements for fire ecology studies
- bushfire emissions
- bushfires and the urban interface
- fire-induced landscape mosaics
- fire/plant/animal interactions

Facilities will also be available for displaying posters. Following the conference there will be an optional one-day field trip to examine fire management issues in the coastal sandplain area north of Perth. The trip will focus on fire management in *Banksia* low woodlands and coastal shrublands, and will include a visit to the spectacular Mount Lesueur National Park.

Conference registration papers can be obtained by writing to:

Landscape Fires '93
c/o CALM Science and Information Division
Manjimup, W.A., 6258, Australia

For further information contact the following address:

Lachlan McCaw
Department of Conservation and
Land Management Research Centre
AUS-Manjimup, W.A. 6258

Phone: +61-097-711988
Fax: +61-097-712855

U.S.A.

Call for Papers: 12th International Conference on Fire and Forest Meteorology
26-29 October 1993, Jekyll Island, Georgia

The Twelfth International Conference on Fire and Forest Meteorology will be held 26-29 October 1993 at the Clarion Resort Buccaneer, Jekyll Island, Georgia. A barrier island off the coast of Georgia, Jekyll is located 65 miles north of the Jacksonville, Florida International Airport and 55 miles east of the Okefenokee National Wildlife Refuge.

The early 1990's have seen the emergence of an environmental paradigm in forest research. In 1990, the National Research Council published, "Forestry Research, A Mandate for Change". In 1991, the Ecological Society of America published, "The Sustainable Biosphere Initiative: An Ecological Research Agenda". In 1992, the UN Conference on Environment & Development produced the Rio Declaration, a Climate Change Agreement, and a Statement of Forest Principels. The U.S. Forest Service adopted a policy of ecosystem management.

Underlying all of these documents is a growing concern about the role that ecological processes play in shaping patterns of diversity at different scales of time and space. Fire and meteorology are two of the most important ecological processes that shape the landscape. Thus the theme of the conference is

Fire, Meteorology and the Landscape.

Papers are solicited in the areas of fire and/or meteorological research in climate change, biodiversity, ecosystem management, landscape ecology, and the wildland-urban interface. Contributions are solicited on traditional subjects such as fire behaviour, fire meteorology and climatology, smoke management, and effects of fire on air, soil, water, and vegetation.

Sessions will be structured to permit both oral and interactive poster presentations. Papers will be published in proceedings without reference to method of presentation. Abstracts of 250 words or less must be submitted no later than **1 April 1993**. You may indicate a preference for either an oral or interactive poster presentation. The organizing committee will make the final choice. Authors will receive notification of acceptance and instructions for preparing camera-ready papers on or about 15 May 1993. Final papers are due at the conference.

Please send the title and abstract along with the address and telephone number of each author to:

Jack Cohen, Jim Saveland, or Dale Wade
USDA Forest Service
Southern Forest Fire Laboratory
Route 1, Box 182 A
USA-Dry Branch, GA 31020

Phone: +1-912-744-0252
Fax: +1-912-744-0286

Fire in Wilderness and Park Management: "Past Lessons and Future Opportunities"
30 March - 1 April 1993, The University of Montana, Missoula, Montana

Maintaining the primeval character of wilderness and national parks with fire as a natural process remains controversial. How can fire be allowed to play its natural role without unacceptable consequences? In 1983, a major symposium in Missoula on wilderness fire gave impetus to wilderness fire management programs. In 1988, extensive fire in wildernesses and national parks brought national attention and concern to the problems of meeting wilderness goals with fire.

This symposium, one decade after Missoula's first major wilderness fire conference, examines past lessons and future opportunities. The purpose of this symposium is to increase knowledge and awareness among wilderness managers, fire managers, and the general public of the issues, problems, and capabilities surrounding attainment of wilderness objectives with fire management programs. Managers, educators, researchers, and others interested in how fire can be managed to meet wilderness and natural area goals will want to reserve the dates of 30 March - 1 April 1993, on their calendars for this "must attend" conference.

Symposium Sponsors

* USDA Forest Service
* Bureau of Land Management
* National Park Service
* US Fish and Wildlife Service
* National Wildfire Coordinating Group
* The Wilderness Society
* Renewable Natural Resources Foundation
* Society of American Foresters
* The University of Montana

Call for Poster Papers

Poster presentations are invited on the general topic of fire in the management of designated wildernesses, wilderness-type parks, reserves, refuges, and natural areas. Posters may present research results, research applications, or management actions.

Appropriate **research posters** would present, for example, results and application of natural ecosystem-related biodiversity, fire climate, fire regimes, fire behaviour, fuels, and fire use.

Management-related posters may cover the range of natural area fire management including programs, inventory, data analysis, plans, fire suppression, prescribed fire, fire monitoring, fire-related visitor safety, and individual fire situations.

Simple pictorial displays as well as those using computers, videos, or other electronic audio-visual equipment are acceptable providing they can fit in a standard poster area and will not disrupt adjoining poster presentations. Poster papers will be published in the symposium proceedings.

Information on participation conditions and registration can be obtained from:

William C. Fischer
Intermountain Fire Sciences Lab.
P.O. Box 8089
USA-Missoula, MT 59807

Phone: +1-406-329-4805.

Printed at United Nations, Geneva
GE.93 45032–February 1993–640