UNITED NATIONS
ECONOMIC COMMISSION FOR EUROPE

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

INTERNATIONAL FOREST FIRE NEWS

No. 9 — July 1993

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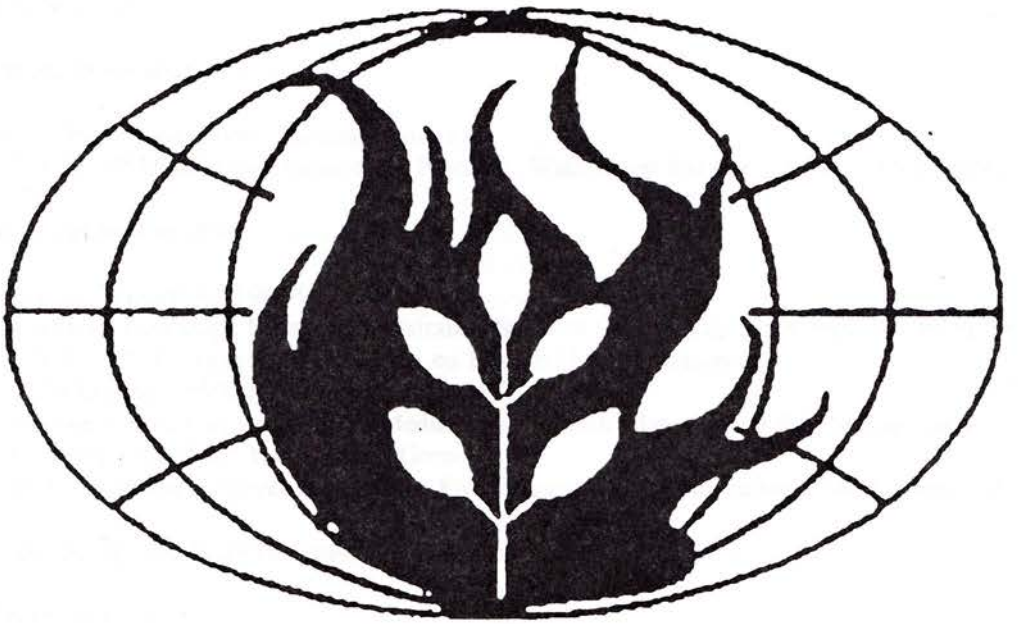

INTERNATIONAL FOREST FIRE NEWS

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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 relations 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 in cooperation with:

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Subject Group S.1.09 Forest Fire Research

and
The International Association of Wildland Fire

EDITORIAL

From its start in 1988 International Forest Fire News (IFFN) has been a joint effort with IUFRO's Forest Fire Research Group (S.1-09). In 1992 an agreement was made with the International Association of Wildland Fire (IAWF) to cooperate in the exchange of information. Members of IAWF receive a copy of IFFN, and IAWF provides its **HotSheet** newsletter to all of those subscribers of IFFN who are not members of IAWF. These procedures got somewhat mixed up in early 1993, and some IAWF members didn't receive a copy of IFFN No.8 (January 1993). Sorry for these teething troubles. HotSheet Vol.2 No.2 will be mailed to all IFFN subscribers.

Under the section "News from Fire Research" the readers will now find a more continuous exchange of information on fire research under the umbrella of the International Geosphere-Biosphere Program (IGBP). A basic outline of the structure of IGBP's fire research activities had been given in the previous two issues. Starting with this issue there are extracts from project planning and evaluation procedures of the research efforts of the IGBP/IGAC experiment **Impact of Biomass Burning on the Global Atmosphere** ("Biomass Burning Experiment [BIBEX]"). Once more, this will foster international cooperation in fire research.

Good News for the non-English speaking fire community: Besides the original English version and its extracted Spanish version "**Noticias del Mundo**" (prepared and distributed by ICONA, Spain), IFFN is now available in French and Russian. Starting with the January 1993 issue IFFN will be translated into French by Forestry Canada. The distribution of the French issue will be lagging behind the English version a couple of months. The translation into Chinese will start with this issue.

Subscribers of IFFN who wish to receive the French version should indicate this on the reply form attached to this issue !

The Russian version of IFFN is produced by *Avialesookhrana*, the Russian Forest Fire Protection Association, and distributed on request within the CIS.

Thanks to all cooperators in this five-language endeavor: Ricardo Velez (Spain), David Drake (Canada), Eduard Davidenko (Russian Federation), Xueying Di (Chinese), Wolfgang Ortloff, editorial assistant at Freiburg University, and, last but not least, Tim Peck, retired Director of ECE/FAO Agriculture and Timber Division, serving as the English-language back-up.

Johann G.Goldammer

Coming Next (IFFN No.10, January 1994)

The next issue will cover another special report on the Russian Federation (exchange of fire management personnel with the U.S.A., new technological developments in aerial forest fire fighting, fire problems in forests contaminated by radionuclids, and a detailed report on the first phase of the Fire Research Campaign Asia - North [FIRESCAN]), a country report on fires in Bhutan, and other interesting news from all over the globe.

COUNTRY NOTES

ARGENTINA

***Forest Fire Research in the Patagonia Region, Argentina* - "Andino-Patagonico"**

The native forests of Patagonia (Argentina) are located east of the main Andean divide along the Cordillera in a narrow, partly continuous strip which is approximately 30 - 80 km wide and more than 2000 km long. The forests cover an area of approximately two million hectares and are distributed over the five provinces Neuquén, Rio Negro, Chubut, Santa Cruz and Tierra del Fuego. The Andean ridge creates a climate divider east of which the drying effect of Foehn winds lead to a sharp decrease of precipitation from West to East. For instance, the amount of precipitation dwindles from 4,000 mm in the high altitudes to 250 mm in the vicinity of Esquel (Chubut) which is located in the Andean foothills.

The climate diagram of Esquel (Fig.1) illustrates the extreme precipitation deficit, especially during the summer months. There are often several months of dryness between the individual rainfall events. In 1987, for instance, 59 days were without precipitation. Furthermore, the region is subjected to the strong Patagonian winds.

These climatic conditions lead to extreme wildfire risk in the whole region. The forest fire season starts in October during which thousands of hectares of 'matorral' (shrubland) are often burned within a few days. Most of the large forest fires occur in the month of February (Fig.2). The frequency correlates with the climate diagram shown in Figure 1. In autumn, which normally represents a low in the fire season, fires can be found in the forests of *Nothofagus pumilio*. These native forests store immense amounts of decaying and partly dead timber ($>$ 100 t/ha). The relative moisture content of this thick material reaches a critical value of less than 20 percent only after a long period of dryness.

Organic material accumulates in all types of vegetation. The process of humification through microorganisms is slowed down because of the dryness in the summer and the coldness in the winter. While the grasslands have accumulated about 12 t/ha of dead organic matter after 15 years of non-grazing, the humus layer in the forested areas may reach 30 t/ha or more.

One would have expected a certain adaptation of the endemic vegetation towards forest fires; at least in a few species. However, this is not the case. Especially towards the borders of the prairie, the forest fires cause either total damage or prolong the recovery and succession process immensely. A reason for this could be that natural fire causes account for less than one percent of all fire starts. Lightning storms are extremely rare, although a slight increase has been detected over the past years. The main origin of forest fires remains human. The break-down of forest fire causes is shown in Figure 3. The settlement of the region by European immigrants, which began about 100 years ago, was associated with large forest fires. Hundreds of thousands of hectares of forest disappeared in this way along the prairie, especially in the frontal Cordilleran. Today, tourism contributes to the fire-caused losses.

The climatic conditions in the three northern provinces of Patagonia are similar which can result in concurrent, large forest fires. The largest wildfires destroying over 25,000 ha of forest were registered in 1987. Cooperative support during such catastrophic fires is not achievable. However, the average fire season is not quite so spectacular. Statistical data of the extent of forest fires (excluding grass and shrub vegetation) in Chubut Province are given in Figure 4.

Over the past ten years 25,000 ha of forest have been destroyed by fire in the province of Chubut. The smaller forest fires which make up the majority of all fires (71%) affected only 1,200 ha. Large forest fires represented by only five percent of all the fires devastated 75 percent of the area (Fig.5). The number of forest fires has increased steadily. It tripled over the last ten years.

Approximately 200 people are employed in the vast, thinly populated areas to fight fires during the fire season. They are often not adequately equipped for fighting the fires on the ground. The efficiency not only suffers from the lack of personnel, but also from the low standard of infrastructures (including vehicles and roads), and inadequate communication systems as well as the lack of aerial support.

Fig.1. Climate data (average of the past 50 years) of Esquel, Chubut Province, Argentina.

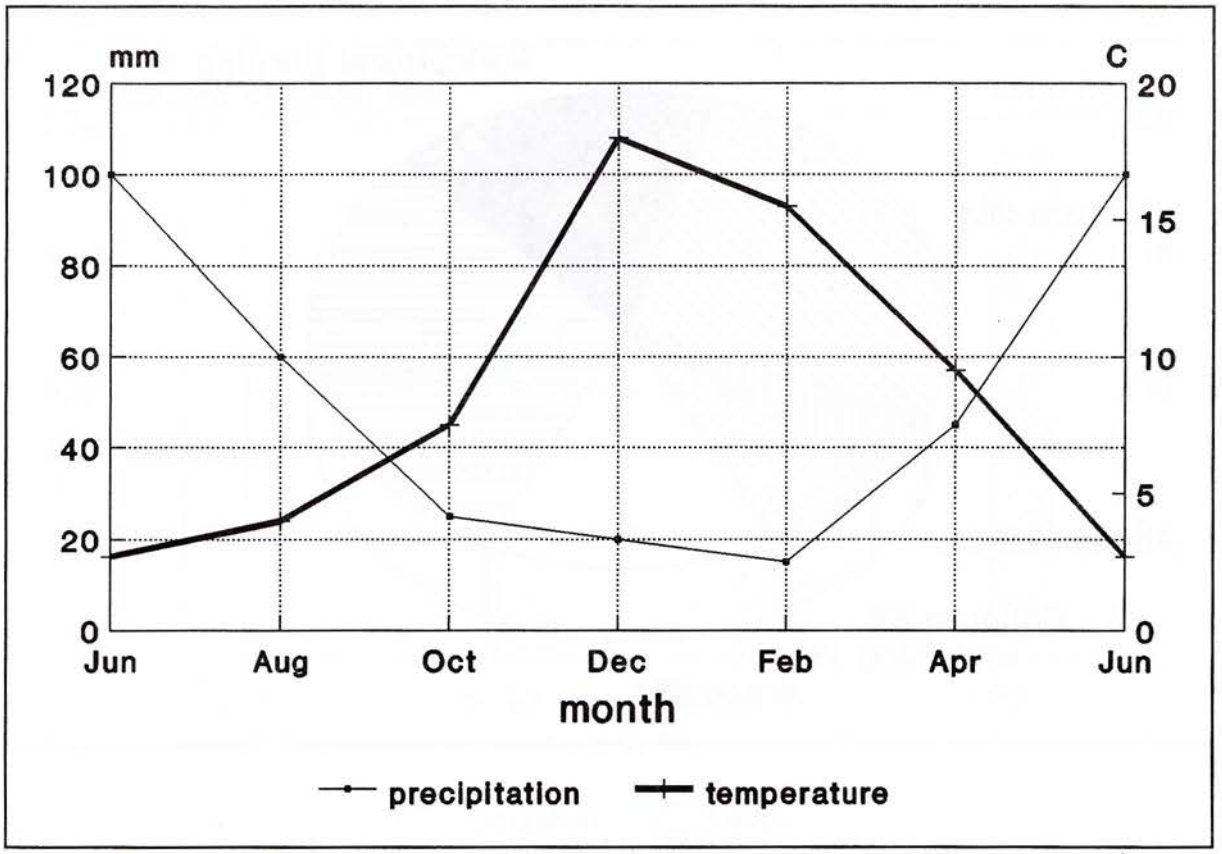


Fig.2. Annual distribution of forest land affected by fire during the period 1984-1991, Region S.C. de Bariloche, Argentina.

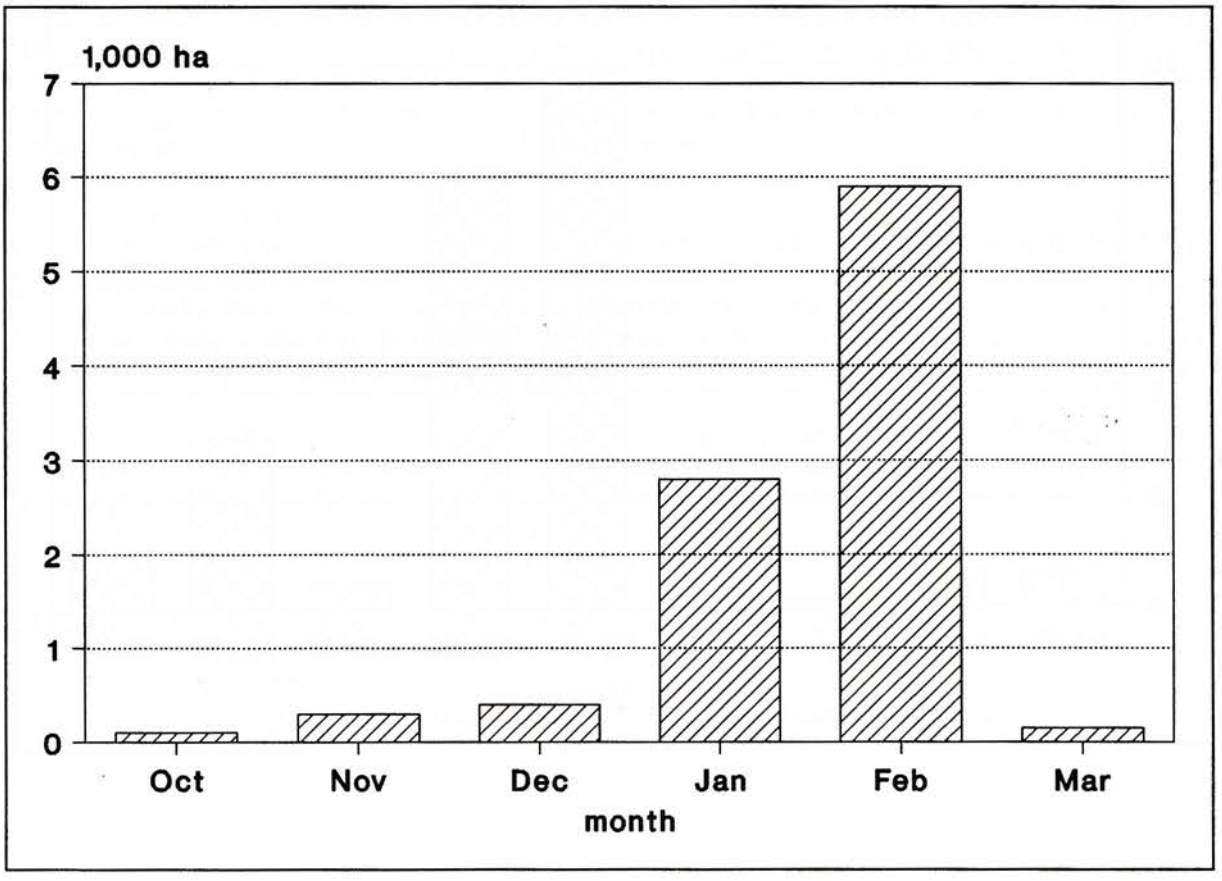


Fig.3. Causes of forest fires, Region S.C. de Bariloche, Argentina.

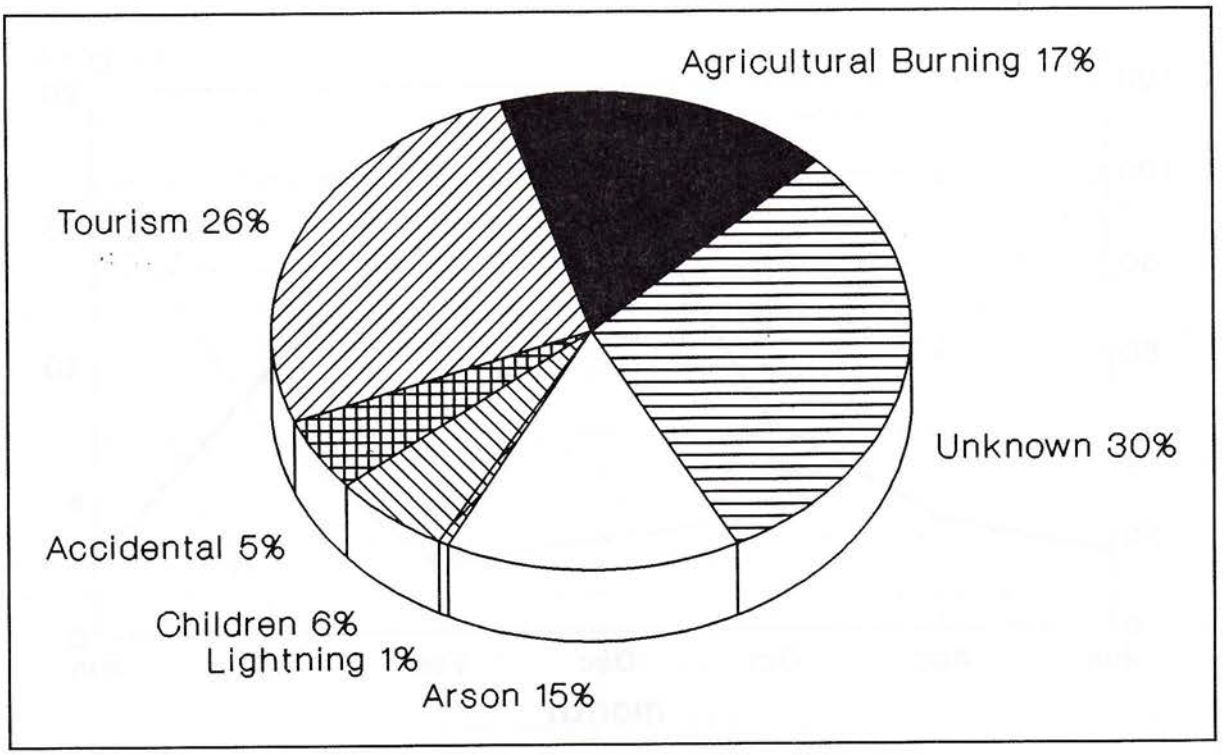


Fig.4. Forested area affected by fire between 1982 and 1991, Province of Chubut, Argentina.

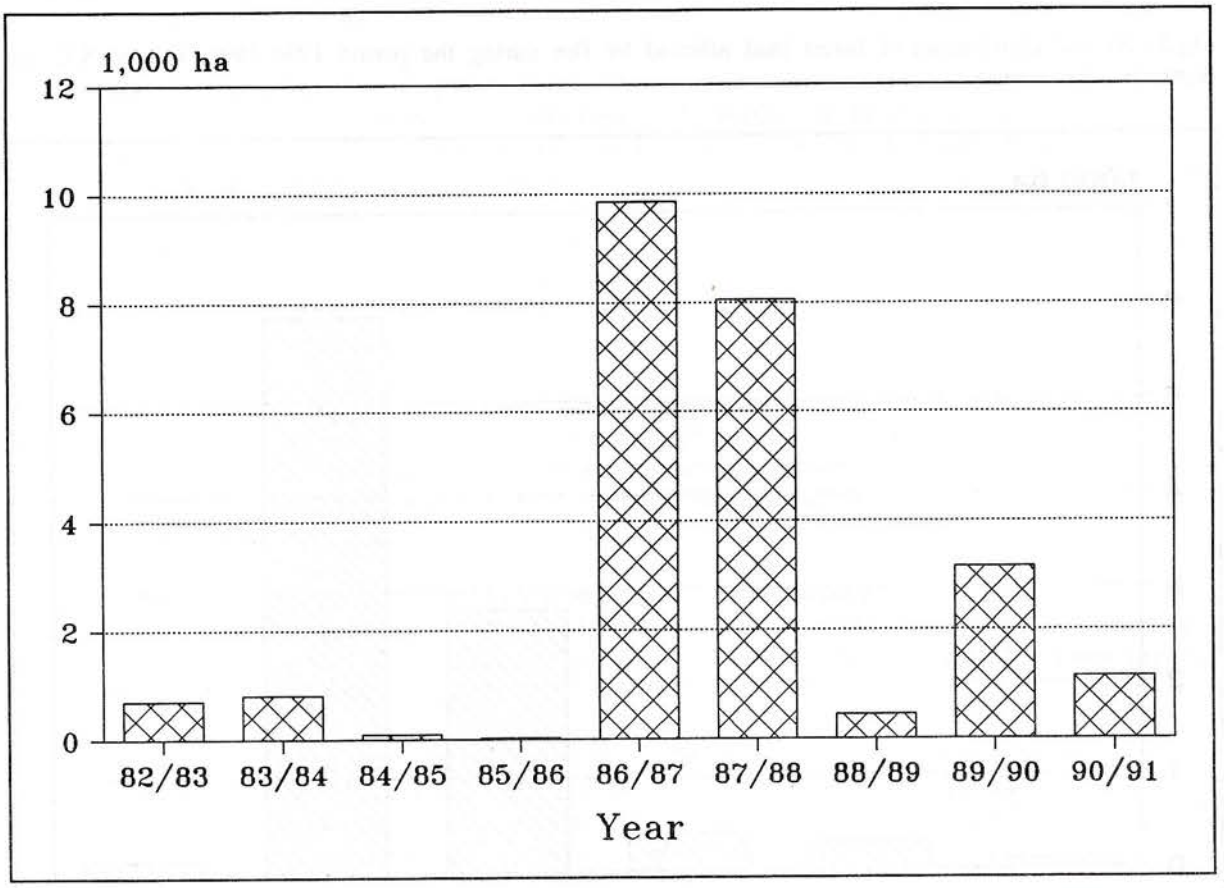
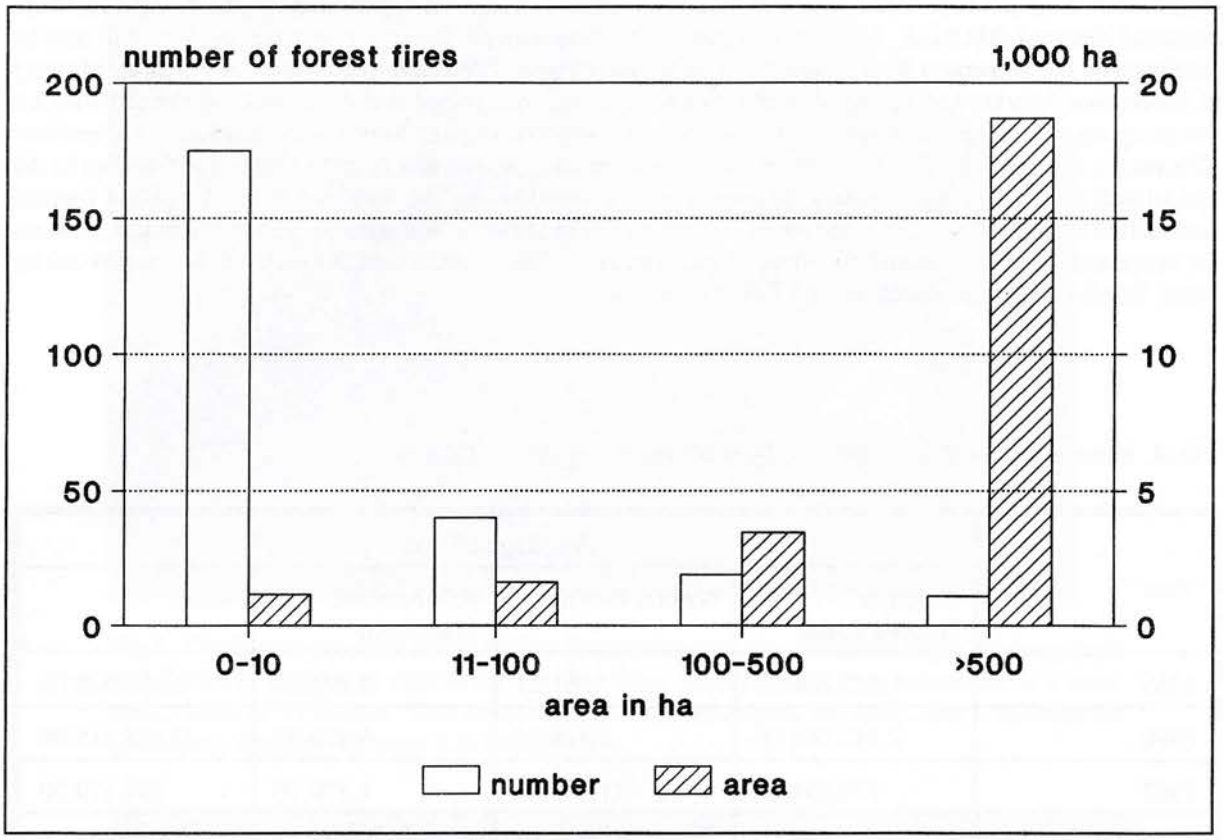


Fig.5. Number of forest fires and area affected by fire during the period 1982-1991, Province of Chubut, Argentina.



Project Goal

Under the impact of the destruction of the native forests (not only through forest fires) the forestry centre CIEFAP (Centro de Investigacion y Extension Forestal Andino Patagonico) was founded in January 1990. It is financed by the three provinces of Patagonia, and the National Universities of Patagonia and Comahue and also receives development funds from Germany (GTZ). The main objectives of the institute are broad research subjects, one of which is forest fires. The main research objectives are:

A) Fire ecology of the native forests of *Nothofagus pumilio* and *Austrocedrus chilensis*. One main topic is the regeneration of the forests after fire.

B) Fire Management: The main emphasis here lies in the study of prescribed burning for wildfire hazard reduction (fuel reduction), mainly in pine plantations.

C) Increasing the efficiency in fighting forest fires in the region Andino-Patagonico. This includes topics such as public relations, the organization of courses, introduction of forest fire management maps and the improvement of fire detection. Additional goals are the development of a fire danger rating system and fuel models.

At this time only 35,000 ha are planted with pine species. The potential area for plantations is estimated to be 2.5 million hectares in Patagonia alone. Forest fires are going to gain in significance even if only a part of the potential plantation area will be afforested. Are the large fires still to come?

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Improving the National Wildland Fire Statistics of Argentina

Argentinian wildland fire statistics in the past years were systematically collected by the former **Instituto Nacional Forestal (IFONA)**. After the reorganization of the national forestry authorities this task will now be continued by the **Secretaria de Agricultura, Ganaderia y Pesca, Dirección de Producción Forestal** (Ministry of Economics, Works, and Public Services). Since it has been recognized that these wildland fire statistics are not complete, the Ministry of Agriculture, in close cooperation with the Max Planck Institute for Chemistry (Germany), Fire Ecology Research Group, has now started a new initiative to collect more reliable data in the agricultural sector. In 1993 a nationwide enquiry was launched among the members of the Rangeland Owners Association of Argentina. The objective of this enquiry is to obtain information on burning practices (reasons for rangeland burning, seasonality, extent of burning, etc.). The evaluation of the data will be carried out by Omar Tesolin and Hugo Zucchini, and J.G.Goldammer.

Tab.1. Summary of land areas affected by wildfires in Argentina, 1985-90.

Year	Vegetation Type			
	Chaparral Grazing Lands	Natural Forests	Reforestation Plantations	Total
1985	1,061,896.00	951.21	2,698.00	1,065,545.00
1986	2,140,061.00	1,878.14	6,176.00	2,148,115.00
1987	770,894.00	31,915.00	1,370.00	804,179.00
1988	1,534,682.00	217,769.50	6,550.00	1,759,001.50
1989	759,383.49	3,486.78	4,054.60	766,924.87
1990 *	51,572.13	3,324.50	11,877.00	66,773.63
Total	6,318,488.49	259,325.13	32,725.60	6,610,339.00

The statistics were compiled by Mr.Omar Tesolin, at the former Instituto National Forestal (IFONA).

* The 1990 data are incomplete.

Contact for Argentina's fire statistics is:

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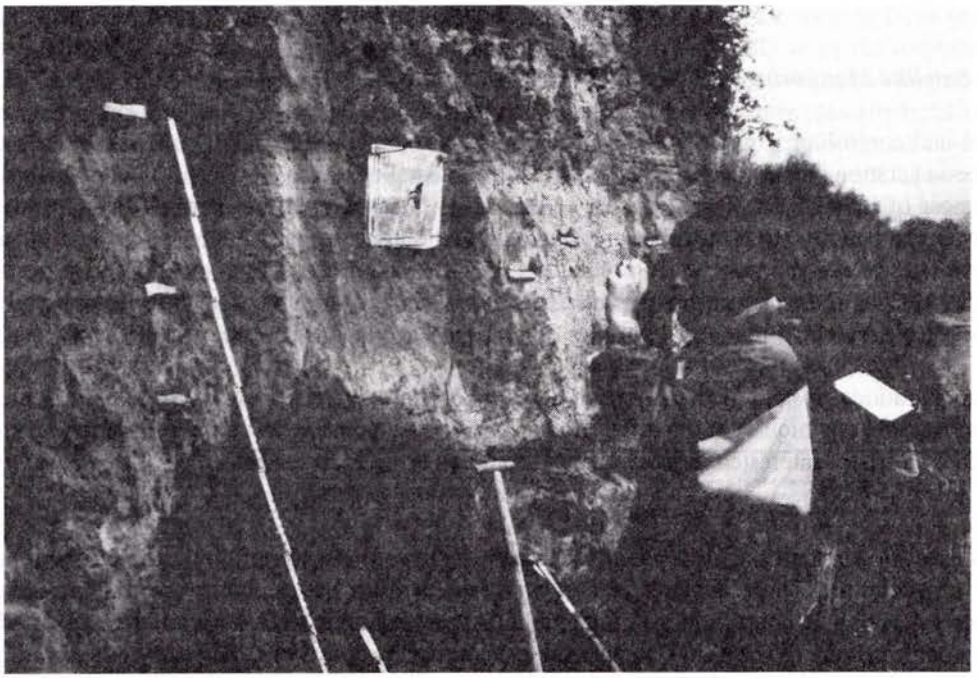

Fig.1. Fire history research in the Andino-Patagonian *Nothofagus* forests: Paul Cwielong (left) and Norberto Rodriguez recovering charcoal from ancient forest fires embedded in a river bank, South of El Bolsón. This research is in cooperation with the Max Planck Institute for Chemistry, Germany (Photo: J.G.Goldammer).

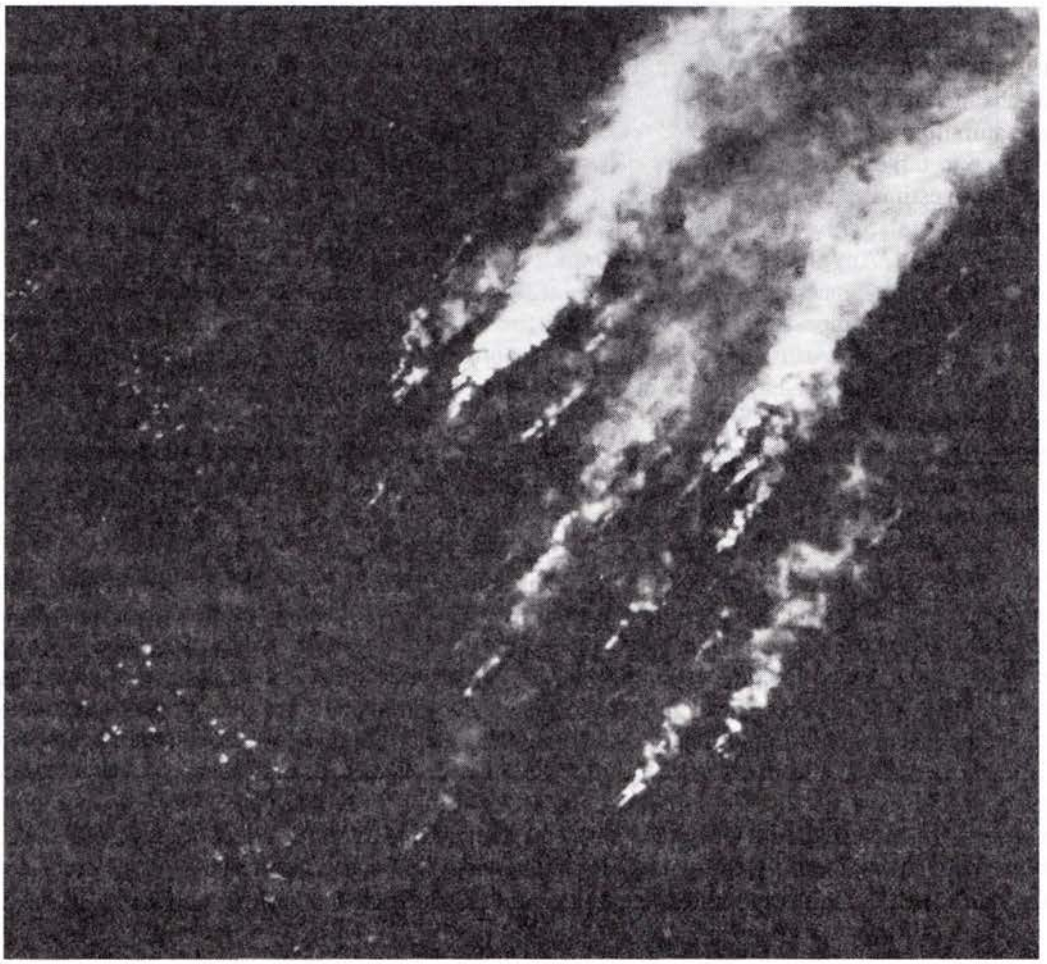

Fig.2. Wildfires burning in Argentina - as seen from Space Shuttle (Mission No. STS41, Reference Number 86-54). Courtesy: NASA.

BRAZIL

Operational Satellite Monitoring of Fires in Brazil

Fire detection and control are complex tasks in Brazil. The country has old and popular established traditions of burning the vegetation whenever possible, weak environmental concerns, and little or nor capability of fire detection in most of its territory (8 million km^2). Among its main uses, fire is normally employed to renew pastures all over the country, to clear felled trees and shrubs in areas of new deforestation, and in sugar cane plantations prior to manual harvesting. A pronounced dry season of about four months in the southern and central regions during the austral winter create very favorable conditions for the wide spread use and propagation of fires. Natural fires (e.g. lightning fires) represent a negligible fraction of fire events.

Since 1987 an operational system of fire detection based on orbital remote sensing has been used in Brazil. This report summarizes the technique used and the products available, pointing to its main advantages, limitations and future needs. Readers interested in more details should be directed to the references listed at the end of the text.

The satellites used for fire detection and monitoring are the NOAA-series meteorological satellites of polar orbit (~98°, 840 km altitude). There are always two of these satellites in operation, resulting in at least four overpasses per day for any tropical regions of the globe. At present, four NOAA satellites can be used (NOAA 9-12) and an additional one (NOAA-13) is expected to be in use by July 1993. The early afternoon images (at 2 p.m. local solar time) are particularly used for fire monitoring because most fires lit around noon are still active during the satellite pass. Each image covers a ground strip of about 2,500 km oriented in the SSE-NNW direction for day-time ascending passes, or NNE-SSW in night-time descending passes. The length of the strip is about 4,000 km, centered in the latitude of the receiving station. Such wide-area coverage in a short time interval (14 minutes) available a few times per day is the main advantage of these satellites in fire detection. No cost or restrictions exist to receive these AVHRR images/HRPT mode. Accredited commercial complete receiving stations have been sold for less than US$100,000; ones of 1/10 of this price are currently offered!

The detection of fires relies on the picture elements (pixels) of the image above a certain threshold in the thermal channel 3 (3.9 μm) of the 4-channel AVHRR sensor aboard the NOAA satellites. This channel, with nominal saturation at 43°C, was designed for ocean and temperature measurements. Nevertheless, it is the most sensitive one to targets with temperatures of vegetation fires. Its signal, therefore, can be used only to detect fires but not to estimate their temperature or size. Hot targets like cities of dense construction or exposed soils under a hot sun are seen by channel 3 with much lower temperatures than active fires and are not erroneously mistaken with them. Any fire front with ca. 50 m or more will be detected by channel 3, and will be indicated by at least one pixel. Since the size of a pixel is at least 1.1 x 1.1 km, area estimates of fire fronts for field operations planning is impossible. The precision of fire detection is one pixel, which at nadir is $\pm$ 500 m; at the edges of the image, because of pixel geometric distortion, it may reach $\pm$ 3,000 m. A major constraint is caused by sun glint in water bodies and in very reflective hot exposed soils in particular cases of sun-target-satellite geometry. In Brazil this problem was greatly reduced by using always the most west pass of the satellites for the region of interest. When this pass occurs the sun is at a lower angle for that region and the soil temperature has decreased in relation to the previous pass which was ca.25 degrees eastward, highly reducing the chances of sun glint.

Two types of products are made and operationally distributed in Brazil by the National Space Institute (Instituto Nacional de Pesquisas Espaciais - INPE), which receives the NOAA images and processes them on real time. The first one is directed to those with operational needs of fire detection and fighting, like organizations in charge of protected areas or commercial forests, and environmental agencies. A special image processing software coupled with a geographical information system identifies all "fire pixels" in the images received, determines their geographical coordinates, selects those in each individual area of interest, and prepares and sends a telex message to specific users. Within about 30 minutes of the satellite pass individual users have at their telex machines a list of geographical coordinates of the fires detected in their own regions. Telex transmissions are preferred to avoid noise problems found in regular fax/phone lines. Until 1992 only the afternoon satellite passes were used on a regular basis, with night and early morning passes processed only on special request; in 1993 an early morning image should also be included in the monitoring.

This fire monitoring system is operational on a daily basis in Brazil for six months, from 1 June until 30 November. The size of the areas monitored varies according to the users needs, ranging from small ones with just a few km^2 to those of large states of many thousands of km^2. Users usually relay the locations of the fires received by telex to fire brigades in the field by radio. Fire fighting brigades which checked hundreds of the fires detected by this satellite system reported that ca.98% of them were correctly identified; the remaining 2% were never reached because of logistical problems. In relation to other sources of information on fires, like calls from the public, park guards, aircraft pilots, the satellite detection accounted for ca.96% of all fires detected. For statistical and control purposes, the system also generates a monthly statement for each area monitored, indicating the total number of fires detected each day.

A second operational product of the system gives an estimate of fire distribution and density for the country with cumulative weekly and monthly data obtained from the daily image processing. Fire pixels are counted in

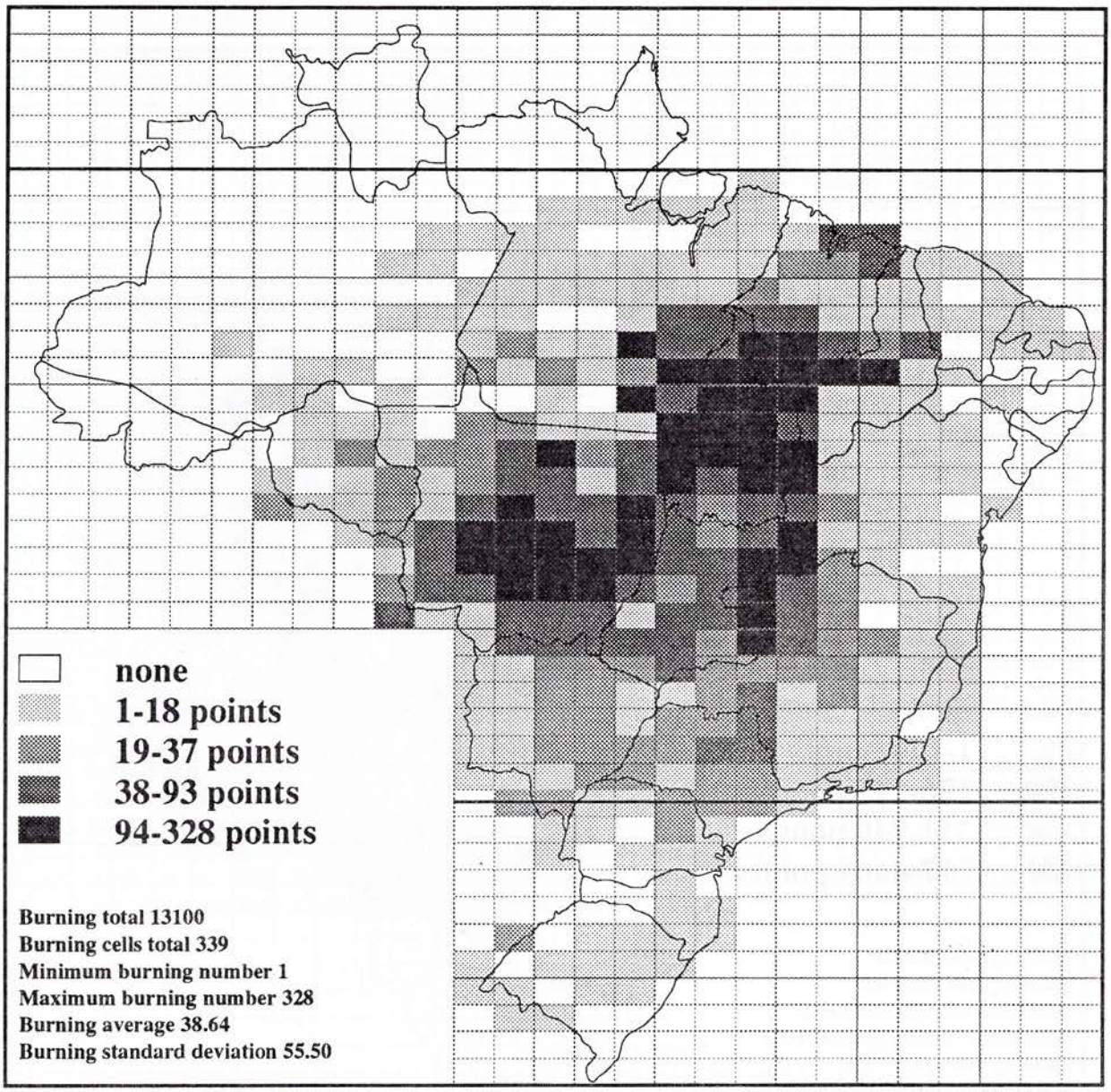

Fig.1. Fire activities in Brazil during July 1992 as recorded by NOAA satellite data. Source: National Institute for Space Research **INPE**, Sao Paulo, Brazil.

grid cells of 0.5° of latitude by 0.5° of longitude and sent every week to users by E-mail. Three matrixes of data are produced and sent: the first contains the number of fire pixels detected in each grid cell during the week; the second contains the number of times each cell was imaged by the satellite; and the third has the average number of fire pixels in each grid cell. The E-mail file containing the three matrix has ca.70 Kbytes. Users of these weekly products include newspapers that publish maps of fire density in the country or in specific states, and different scientific groups interested in studies on vegetation, atmospheric chemistry and climate modelling.

The two figures show an example of maps made from such matrixes for the months of July and August 1992. The month of August, which includes the peak of the fire activity, had over 100,000 fires, while July, still at the beginning of the fire season, had only 15,000 fires detected by satellite. The highest density of fires is found along the current south limit of the Amazon forest. This is a region subject to intense deforestation through fire. The vegetation is cut at the end of the wet season or start of the dry season, and then left to dry for one or two months. Fire is used to burn the dead organic matter and will be used in the same place for many years until all organic matter from the original forest is consumed.

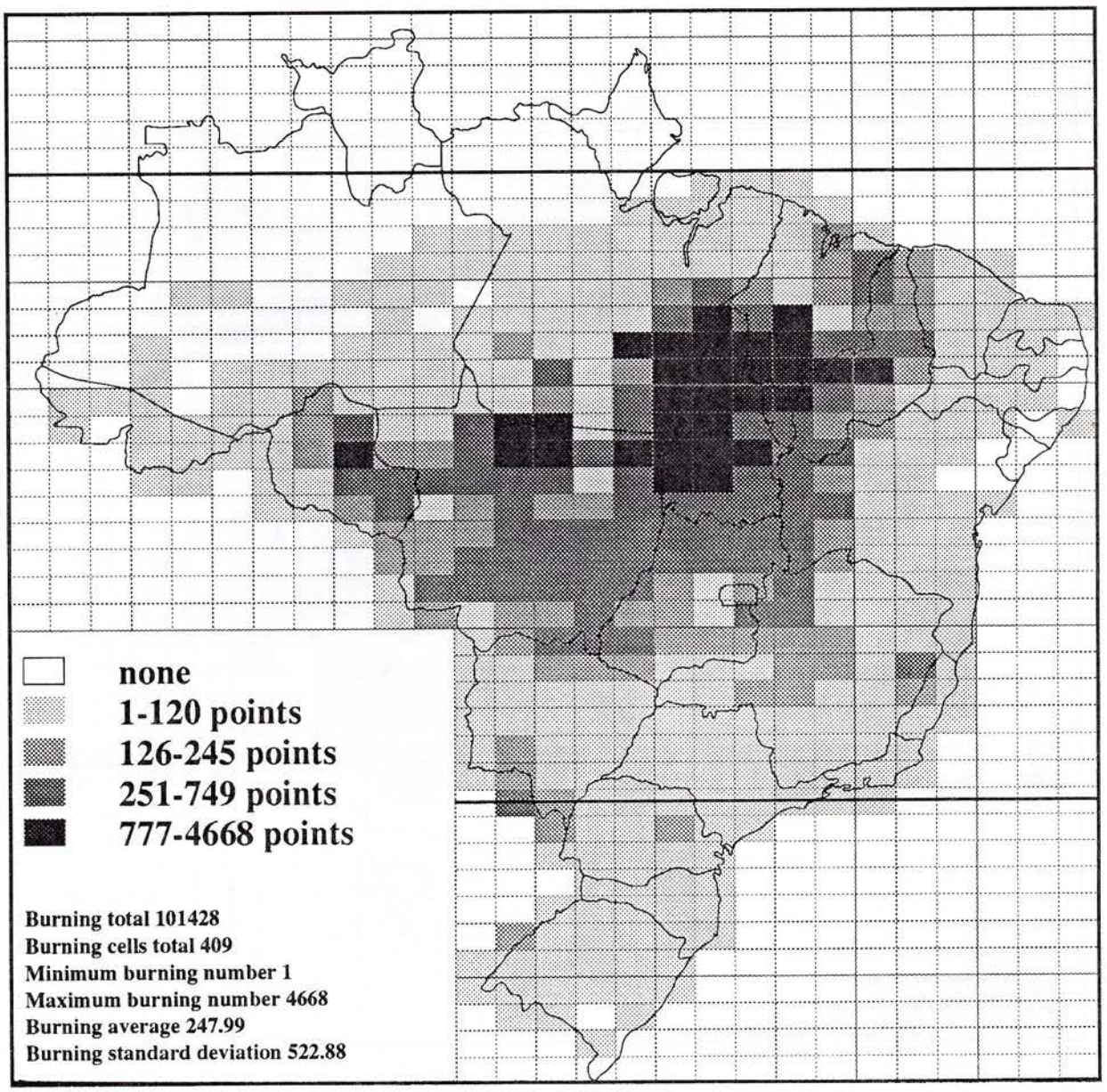

Fig.2. Fire activities in Brazil during August 1992 as recorded by NOAA satellite data. Source: National Institute for Space Research **INPE**, Sao Paulo, Brazil.

Although restricted by the Brazilian government, deforestation and the associated burnings are extremely difficult to control in such extensive and inhospitable regions. The control has been made in recent years largely based in the satellite detection technique described above: helicopters stationed in the region have been directed to the geographical coordinates of the fire pixels in AVHRR's channel 3 images. This enabled the Environmental Institute of Brazil to enforce existing legislation on fires and deforestation with millions of dollars in fines imposed on law offenders. In fact, AVHRR images in 1987 were responsible for showing the scientific community and the public in general that biomass burning in Amazonia was taking place at unprecedented rates and out of control.

Without discussing extensive existing field and validation work or theoretical considerations, the following pros and cons of the AVHRR detection of fires are listed:

Main advantages

- methodology of detection regular and uniform
- use of satellite data not restricted, costs are less than other images
- four images daily anywhere in the globe, at least
- coverage ranging from few to millions of km^2
- precise location of fires for fire control purposes
- fast acquisition and distribution of information on fire locations
- simple detection principle, field proven
- products of simple output
- answers individual needs of different users
- fast, simple and diversified delivery of products
- low product cost for users

Main limitations

- no detection of fires not active during the satellite time overpass
- no detection of fire fronts smaller than ca.50 m
- obscuring clouds (but not smoke) in the fire-satellite line-of-sight
- no detection of fires not reaching the canopy
- solar reflection in a few cases
- very coarse estimate of area in fire
- misses advance of fires between consecutive images

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PEOPLE'S REPUBLIC OF CHINA

The 1992 Forest Fire Season

China had more forest fires in 1992 than during the previous years. By the end of 1992 there were 8,727 recorded forest fires, 4,514 of which were warning fires and 26 big fires. No "large" (see below) fire was reported. The total number of fires increased by 48% compared to the 5,899 fires recorded in 1991.

The fire classification according to the Forest Fire Prevention Act of China is as follows:

Warning Fire:	less than 1 ha	Fire:	1 - 100 ha
Big Fire:	100 - 1000 ha	Large Fire:	1000 ha and more

In 1992 the total damaged forest area was 55,805 ha which is 2.5 times that of 1991 and an 35 % increase compared to the four year average of 1988-1991. The region with the largest burnt area was Heilongjiang Province where in 1987 a large fire had burned 1,3 million ha, damaging 870,000 ha of forested land, three towns, 10,081 homes, and resulting in 193 fatalities.

The **Fire Occurrence Rate** (fires per 0.1 million ha of forest) in 1992 was 6.8. This is a decrease of ca.12% as compared to the 1988-1991 average of 7.7 fires.

Fire Damage Rate (total burnt forest area : total forest area) in 1992 was 0.43‰, while the four year average of 1988-1991 was 0.32‰.

Forest Fire Control Rate (area of timber land burned per fire) in 1992 was 6.4 ha. This corresponds to an increase of 52% as compared to the 4.2 ha which was the four-year average for 1988-1991.

Analyzing the fire causes

Out of the 8,727 forest fires the causes for 7,219 of these fires have already been determined (i.e. 82.7 %). Of the known fires, based on reports from the Chinese provinces, 3,359 fires were caused by escaped management fires in the forestry and agriculture sector. 3,581 fires were caused by activities not related to land use, for example, smoking, burning paper for burial rituals, children playing with fire. There were also 49 fires set by arson and 166 by lightning. The fires occurred almost every month. But the fire peak appeared mainly in February, April and November: the figures being 1,899, 1,458, and 1,230 respectively.

The most accidental situation occurred in northeastern China, outside the fire season. There are two fire seasons in this region, the first from March to June, the second from September to November, yet in July of 1992 the region experienced an unseasonably high number of fires. In the Province of Heilongjiang 212 fires broke out in July accounting for 78.2 percent of the year's total 1271 fires. 80 of these fires were caused by lightning that struck the region more than it had any time in the past half century. In analyzing this special phenomenon, we concluded the abnormal climate conditions to be the key factor. In the middle of June in the northeastern part of China, several weeks of rising temperatures turned every thing on the ground green. Then a large-scale heavy snow storm suddenly covered the regenerating forest region and all living grass on the ground was killed. Immediately after the snow had melted the grass turned yellow. A high pressure system subsequently moved in and brought sunshine and dry weather conditions. The forest fuels which two weeks before had been green and low hazard now became dangerous. A summer thunderstorm hit the area and lightning fires put the off-duty fire prevention officer and fire brigade back on alert, keeping them busy controlling fires during the period when they normally could enjoy a good rest.

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CROATIA

Forest Fires in Croatia - A Permanent Danger

Forests and other wooded land cover about 35% (ca. 2,458,000 ha) of the total land area of Croatia. In terms of phytogeographic diversity there are two forest regions: Euro-Siberian and Mediterranean. The Mediterranean forest region covers 43% of the total forest area. Forest fire occurrences, affected area and related damages are closely connected to our Mediterranean forests and their degraded stages (maquis, coppice, garrigue, brushwood). 94% (ranging from 89 to 99%) of the total area affected by fire was in the karst region (Tab.1 and 2). The forest fire season has two peaks. The first one is between March and May. In this period forest fires are mainly a direct consequence of agricultural waste burning without taking the necessary precautions on non forest land. The second peak (time of large fires) coincides with extreme weather conditions and high tourist frequency (Tab.3).

According to forest fire data of the last 20 years we can say that 99,9% are due to human activities, but about 50% are ascribed to unknown or doubtful causes. Since the beginning of data recording (1971) there was a negative difference between burnt and afforested and reforested areas on karst. The problem is especially expressed in the areas of high fire risk where fires are very often repeated at short intervals on the same areas and usually after the third time the area becomes incapable of natural reforestation. What worries us is the fact that we have not managed to reduce either the number of fires or an average burnt area per fire. The last decade was characterised by an increased number of fires and burnt area (Table 4). During the period 1971-1990 there was permanent recording of forest fire data. The gap in data recording for years 1991 and 1992 was due to war. There were several fires set by the occupiers but because the areas are still occupied, it is not possible to determine the consequences.

Tab.1. Burnt area according to main vegetational types during the period 1986-1990.

Year	Burnt Area (ha)						Total
	Conifer Forests	Broadleaved Forests	Brush-wood	Maquis	Garrigue	Others*	
1986	595	562	90	941		1,093	3,281
1987	627	1,175	202	277	572	682	3,535
1988	4,490	1,755	289	3,956	333	4,101	14,924
1989	763	2,479	117	197	94	698	4,348
1990	3,227	12,413	2,305	1,205	965	3,835	23,950
Total	9,702	18,384	3,003	6,576	1,964	10,409	50,038

* Others: pasture land, abandoned agricultural land

Tab.2. Forest fires on karst in comparison to total fires in Croatia during the period 1986-1990.

Year	Karst region		Average ha/fire	Burnt area in Croatia (ha)	Karst ratio (%)
	Burnt area (ha)	No. of fires			
1986	3,178	91	35	3,281	97
1987	3,409	81	42	3,535	96
1988	14,821	161	92	14,924	99
1989	3,849	70	55	4,348	89
1990	21,937	266	82	23,950	92
Total	47,194	669	71	50,038	94

Tab.3. Forest fires larger than 500 ha during the period 1986-1990.

District	Burnt area (ha)	Fire started	Duration of fire (hours)	Vegetation type*	Cause
Brač	613	01.09.1886	23	M, MP	Unknown
Dubrovnik	1,175	18.08.1988	24	AP	Agr. waste burning
Dubrovnik	875	18.08.1988	10	AP, M	" " "
Korčula	3,897	24.07.1988	792	AP, M	" " "
Šibenik	1,360	04.08.1988	10	PL	Rubbish burning
Trogir	1,295	16.08.1988	24	PL, M, G, B	Unknown
Zadar	700	04.08.1988	24	AP, M	Pyromaniac
Labin	571	29.01.1989	46	POC, AP	Unknown
Dubrovnik	525	11.07.1990	20	AP, B	"
Dubrovnik	520	22.08.1990	96	AP, M	Lightning
Gospić	700	20.03.1990	120	BP, POC	Unknown
Knin	500	21.03.1990	48	POC	"
Korčula	1,150	23.08.1990	72	M, AP	Electricity lines
Korčula	601	28.07.1990	72	AP	Unknown
Pula	500	20.03.1990	-	AP, MP	"
Split	597	12.09.1990	15	PL	"
Zadar	600	17.08.1990	18	B	Electricity lines

* M = maquis; MP = maritime pine; AP = aleppo pine; PL = pasture land; G = garrigue; B =brushwood; POC = pubescent oak coppice

Tab.4. Number of forest fires and burnt area in Croatia during the period 1971-1990.

Year	Number of fires	Burnt area (ha)	Average ha/fire
1971	447	9,361	21
1972	302	3,341	11
1973	397	7,486	19
1974	323	4,652	14
1975	283	6,204	22
1976	371	7,733	21
1977	159	4,190	26
1978	268	5,202	19
1979	184	8,642	47
1980	261	5,875	23
Subtotal	2,995	62,686	21
1981	265	7,650	29
1982	403	11,184	28
1983	404	18,717	46
1984	275	6,670	24
1985	506	22,157	44
1986	207	3,281	16
1987	171	3,535	21
1988	249	14,924	60
1989	220	4,348	20
1990	869	23,950	28
Subtotal	3,569	116,416	33
Total	6,564	179,102	27

Source: Forest Research Institute, Department of Forest Typology, and Ministry of Agriculture and Forestry.

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SPAIN

The 1992 Fire Season

The year 1992 has been extremely dry, without snow in the mountains and few showers in springtime. Only in June heavy rainfall was registered all around the Peninsula, reducing the risk during the first weeks of the summer. The highest danger was recorded in Valencia, because of several windstorms from the west at the end of July and August and at the beginning of December. The Southwest of the Peninsula showed also extreme danger because of the long drought.

Figures for 1992 compared with the previous years were the following:

	1990	1991	1992
No. of fires	12,474	13,025	15,535
Forest surface	73,305	124,975	36,073
Woodland and grassland (ha)	130,738	123,728	60,994
Total burned surface (ha)	204,043	248,703	97,067

89% of the fires burned less than 5 ha each. The burned surface amounted for the 0,3% of the Spanish forest area, well under the average for the 1980's (0.9%).

During the suppression activities 14 casualties were registered, four in accidents related to helicopter operations in Valencia and Almeria and ten in two groups of five people surrounded by the fire in the Cadiz and Madrid forest areas.

The protection plan against forest fires was developed in 1992 along the following lines:

a) Prevention by three campaigns:

- a general campaign by TV and newspapers, showing every day the danger map
- a rural campaign to spread information among the country people concerning agricultural and grass burnings
- a campaign in the schools by the III National Contest "Everybody against the fire".

b) A programme of subsidies (PAPIF) between 50% and 100% of the investments to encourage patrolling of forest areas, cooperation by volontary people and preventive silviculture.

c) Air operations with 81 aircraft (fixed wing and helicopters) from 50 bases, all funded by ICONA, in cooperation with the 79 aircraft hired by the Regional governments. The ICONA's aircraft flew 6,192 hours, well below the 11,889 hours in 1991.

d) A special plan was designed to prevent large fires by:

- special daily forecasts of the National Weather Institute on situations of extreme fire danger;
- a Seminar on Control of Big Fires with the participation of well known experts from North America, Mr. R. Rothermel, Mr. A. Simard and Mr. J. Moneysmith, along with the Spanish specialists;

- implementation of two special brigades (BRIF), similar to the American "hot shots", with 45 firefighters each. For their training a team of specialists from the U.S. Forest Service arrived during the month of June. The transport to the fires was carried out by two helicopters Mi 8, hired by the Russian Army, including their own crews.

The performance of these brigades (BRIF's) was really bright in the two regions where they were located (Western Andalucia and Valencia). Conclusions of this experience will be transfered in 1993 for the organization of the standard brigades. It was amazing to realize how such useful cooperation was possible for a peaceful purpose having together Americans, Russians and Spaniards. Although cooperation between American and Spanish foresters has a long tradition, Russian military people have not flown over Spain since the end of the Civil War in 1939. The Russians performed very well because they came from the military SAR (Search and Rescue). The helicopter Mi 8 was previously known in Spain because several units were hired by ICONA from Poland for the standard brigades in 1990. The success of the BRIF's was mainly based on the special training they received and on the enthusiastic atittude of the people enrolled, all of them forest workers from the Cuenca and Huelva provinces.

e) The forest fire data bank was updated with new hardware under UNIX, with a new Data Base on INFORMIX for the period 1968-1991 including information on more than 150,000 fires. GPS equipment were extensively used to measure burned surfaces in order to give a fast appraisal of fire damages. Heliborne videocameras were also used to transfer images to the Operation Centres in the Valencia Region.

f) A special cooperation by the Guardia Civil (Rural Police) is being implemented to increase the efficacy in the identification of persons causing fires.

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THAILAND

Forest Fires in Thailand

In the last 30 years large parts of Thailand's forests have been cleared for agriculture. Fire played an important role in this since it had been an agricultural tool for many centuries in Southeast Asia, either to clear harvesting debris or to clear new land. At the same time, legally or illegally, large tracts of forest land were logged. Selective felling altered the forest structure letting herbaceous ground vegetation invade the forest ground. Furthermore, the ethnic minorities in the mountains of the North practice slash-and-burn agriculture which is resulting in the spread of large areas of grasslands.

The prolonged and hotter dry seasons and the reduced rainfall are attributed to forest destruction. The drought and heat, combined with the more open forest structure and the availability of readily combustible herbaceous fuels cause a "fire friendly" environment and thus accelerate and close the destructive cycle of forest fires.

Forest fires in Thailand occur annually during the dry season in the deciduous forests of drier environments but now also moist and evergreen forests are affected, and double burning (burning twice per year) on dry sites has become a regular feature.

The amount and distribution of rainfall strongly affect forest fire occurrence. The monsoon rainfalls in Thailand are strongly seasonal, lasting from about May to October. The dry season can last up to 7 months during which day-time temperature extremes can exceed 40°C. On the Malaya Peninsula the climate is moister and less extreme. In Thailand, annual rainfall varies between 700 mm in inland areas and the North-Eastern plateau to about 4000 mm in coastal areas.

The distribution of forest types closely follows the rainfall distribution pattern. Natural forest vegetation can be grouped into dry, hill and moist evergreen forests types of the moister areas (totaling about 43%) and mixed and dry dipterocarp forest in drier areas, representing 22% and 31% of the forest respectively. The remaining 4% include primarily mangroves and pine forests (RFD, 1992/2).

Fig.1. Freshly burned monsoon forest - a typical scene found throughout continental Southeast Asia during the dry season (Photo: J.G.Goldammer)

Forest Fires and Forest Destruction in Thailand

Forest cover has been halved during the last 30 years, from 53.33% in 1961 to 26.64% (13.67 million ha) in 1991 (RFD, 1992/3; Tab.1). Non-governmental organizations claim that half of the remaining forests are severely degraded and should not be classed forest anymore.

Forest destruction reached a peak between 1976 and 1978 when 2.26% of forest was destroyed annually. It tapered off to an all-time low in 1989 (0.08%) when a logging ban was introduced in response to a series of floods and landslides. Despite the ban, forest destruction has picked up again at an average annual rate of 0.655%. The only exception was the already heavily degraded NE of the country.

On the basis of this information the national forest cover will have reached 25.33% by the end of this year and about 20% in the year 2000. Especially affected will be the central, western and southern areas of the country.

In the past concession forestry was assumed as being the main reason for forest destruction. Today, non-concessioned (i.e. illegal) timber harvest, forest fire and encroachment are considered the main reasons of forest destruction. However, encroachment and conversion to agriculture is merely the final result of repeated attack on the forest through timber cutting and burning. Only after removal of the forest vegetation can the land be converted to other uses.

Tab.1. Development of forest cover in Thailand, 1961-1991. The figure 26.67% in 1991 corresponds to ca. 85.4 million rai (=13.67 million ha). Source: Royal Forest Department (1992/3).

Region	Area (km^2)	Forest cover (%)			
		1961	1973	1982	1991
North (N)	169,644	68.54	66.98	51.73	45.47
Northeast (NE)	168,854	41.99	30.01	15.73	12.91
East (E)	36,503	57.98	41.19	21.92	21.07
Central & West (CW)	67,399	52.91	35.56	27.47	24.65
South (S)	70,715	41.89	26.07	23.25	19.02
TOTAL	513,115	53.33	43.21	30.52	26.64

Tab.2. Average annual forest destruction (%) in Thailand in the periods 1985-89 and 1989-91. Source: Royal Forest Department (1992/3).

	Total	N	E	NE	CW	S
1985 - 1989	0.3625	0.57	0.29	0.14	0.17	0.31
1989 - 1991	0.6550	0.91	0.53	0.13	0.45	0.81

Tab.3. Regional and total forest burned over in Thailand in 1992. The extrapolated value is based on the surveyed forest area (compiled by Fire Ecology Research Group on the base of forest inventory data).

Region	Total land area (km^2)	Forested area (km^2)	Area sampled during 1992 inventory (ha)	Burned areas within sampled areas (%)	Extrapolated area burned per year (km^2)
North	169,644.79	77,141	381,445	18.19	14,032
Northeast	168,854.34	21,798	171,328	10.32	2,250
East	36,502.50	7,690	113,529	8.65	2,102
Central	67,398.70	16,616			
South	70,715.19	13,449	91,662	7.62	1,025
Total	513,115.02	136,694	757,964	13.70	18,727

Regarding timber harvesting, in 1991 the country consumed about 3.46 million m^3 of which nearly all was imported. Only 0.23 million m^3 were locally produced and sold. Of this 0.14 million m^3 derived from illegal logging, i.e. 2/3 of all domestic production.

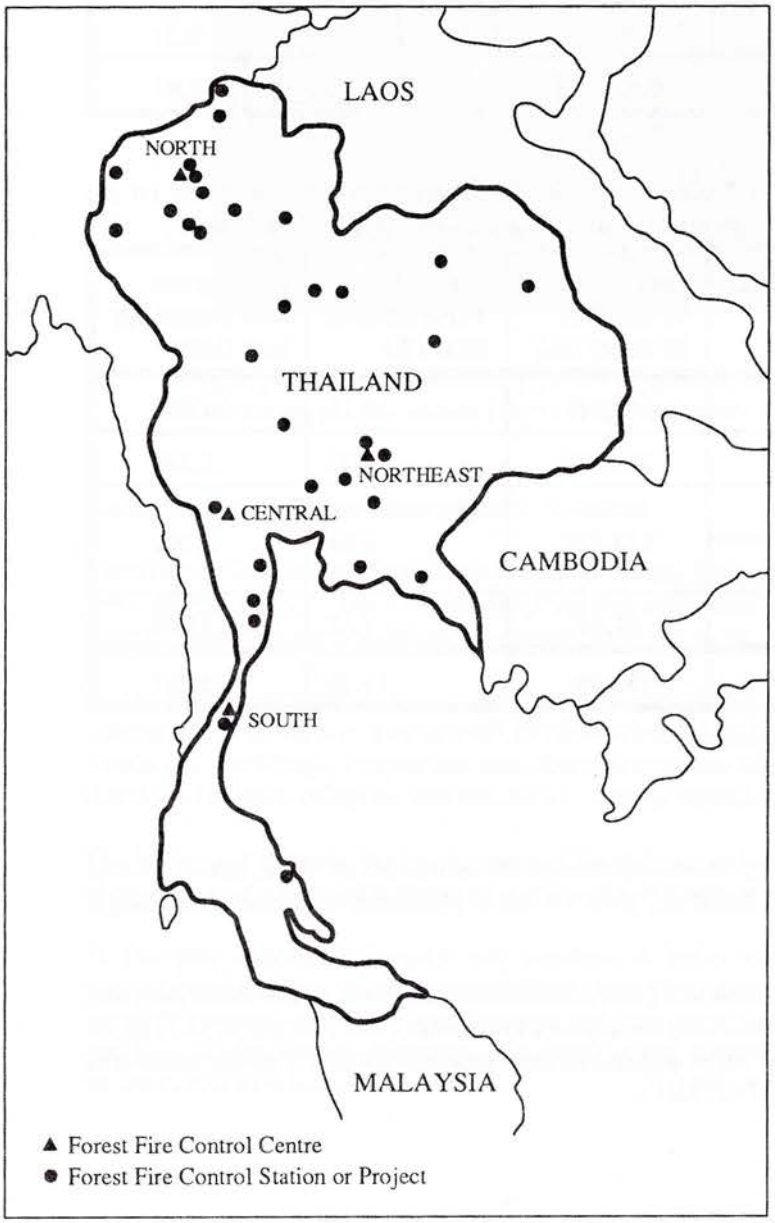
In terms of forest fires, data collected between 1984 and 1986 showed that about 21% of the forest land was affected by fire annually. In 1992 it was about 15%. This corresponds to an area of ca. 1.9 million ha (Tab.3). The majority of the fires occurred in the North. Forest plantations that constitute about 5% of the forest area are twice as prone to fires as natural forests (RFD 1992/1).

In 1990 alone, fires caused losses in timber revenue of 1.2 billion US$. Compared to unaffected areas, an threefold increase in surface runoff and a 3 to 30 fold increase in soil erosion caused losses estimated between 16 to 32 billion US$. Further effects listed include affected scenery and its impact on tourism, greenhouse effects, and effects on wildlife and biodiversity (Kasetsart University, 1991).

People's Attitude to Forest Fires

There is a widespread belief among scientists as well as rural people that Southeast Asia's forests are adapted to regular fires. The long time-span that is involved before changes in the forest structure are visible, getting accustomed to large areas on fire during the dry season and the fact that most fires remain ground fires of low to moderate fire intensity contribute to this belief. However, recent studies have shown that seedlings and undergrowth are usually completely destroyed by fire, sapling growth is reduced by 20-25%, with 40% dying. One to five year old trees have mortality rates of about 20%, as do 80% of the roots near the surface (Kasetsart University, 1991). My own investigations showed seedling survival rates after fires as low as 10%, supporting the above-mentioned findings.

Studies conducted by the Royal Forest Department show that gathering of fuel and non-timber products and burning of agricultural debris are the reasons for about half of all forest fires (25% and 20% respectively). Arson, primarily for speculative reasons is responsible for 19% of fires. Hunting, carelessness and unidentified causes are responsible each for 12% of the fires. No naturally caused forest fires were recorded during 12 years of observation.



Forest fire Control in Thailand

The control of forest fires is the responsibility of the Royal Forest Department, carried out by the **Forest Fire Control and Rescue Bureau** which is split into 4 administrative sections. The bureau maintains 4 upcountry Forest Fire Control Centres as its working units. These centres maintain 34 sub-units, 14 Forest Fire Control Stations, and 20 Forest Fire Control Projects that were initiated by his Majesty the King.

The strategies applied in forest fire control include forest fire promotion campaigns (mobile campaign units, mass-media, school programmes, exhibitions, billboards etc.) and forest fire suppression. Of the total forested areas about 12% (20,000 km^2) are covered by forest fire control, concentrated in the North of the country. The biggest stations control 1,500 km^2, the smallest less than 5 km^2. Of the areas under control only about 0.5% (100 km^2) are affected by fire annually, compared to about 15% nationwide, indicating the success of the fire prevention and control efforts. They include training of staff and local volunteers in fuel management, fire detection and reporting, fire suppression and law enforcement and rescue operations.

A Look into the Future

In the light of continued and accelerating forest destruction and the inability to reforest these areas (less than 25% of the annually destroyed areas can be replanted) fire control has shown to be a successful means to reduce or halt the process. A successful control of fires would remove one of the conditions necessary to convert forest land to other uses. If this can be combined with more effective law enforcement and the development of alternative wood and fuel resources for the local population, the Thai forests have a chance of recovering and surviving.

However, to achieve this the forest fire control measures have to be made a priority and applied nationwide. Fire control efforts have to be coordinated among different institutions and scientifically adjusted to prevailing local conditions. The legal framework has to be adjusted so as to be able to apply forest fire legislation in and outside forested areas. Furthermore, legal adjustments regarding land ownership and user rights outside the forest are necessary to change current short-term oriented land use attitudes towards a long-term oriented and sustainable management.

Sources:

Kasetsart University 1991. Forest fire and its effect on the forest ecosystems in Thailand. Bangkok (in Thai).
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Royal Forest Department 1992/2. Forest statistics of Thailand 1991. Planning Division, Royal Forest Department, Bangkok.
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U.S.A.

CLASS A FOAM IS ON THE SHELF

Information

The National Wildfire Coordination Group Fire Equipment Working Team is producing two series of publications on the use of Class A foam for wildland fire management.

Video

A videotape series introduces the basic principles of foam chemicals, explains the function of mixing and foam generating equipment, and demonstrates suppressive and protective applications. Videotapes that are now available through the Publications Management System are:

INTRODUCTION TO CLASS A FOAM, a brief introduction to Class A foam technology discussing chemistry, generating equipment, and examples of application. 1989, 13:00, VHS only, NFES #2073.

THE PROPERTIES OF FOAM, explains how Class A foam enhances the abilities of water to extinguish fire and to prevent fuel ignition. Basic foam concepts including drain time, expansion, and foam type are presented. 1992, 15:00, VHS only, NFES #2219.

CLASS A FOAM PROPORTIONERS, explains how common mixing systems, including eductors and direct injection devices, add a measured amount of foam concentrate into a known volume of water. Advantages and disadvantages are also discussed. 1992, 23:10, VHS only, NFES #2245.

ASPIRATING NOZZLES, explains how aspirating nozzles work and introduces the variety of nozzles available. 1992, 10:13, VHS only, NFES #2272.

Videotapes that will be available in the near future include:

COMPRESSED AIR FOAM SYSTEMS, explains the basics of compressed air foam systems; discusses options for water pumps, air compressors, and power sources; demonstrates safe operation. Available Spring 1993.

TACTICS I: INDIRECT ATTACK, discusses the primary objective of raising fuel moisture; demonstrates applications for protection of vegetation and structures, and for constructing line from which to burn. Available Fall 1993.

TACTICS II: DIRECT ATTACK, discusses the primary objective of achieving the critical flow rate; demonstrates applications of suppression including flame knockdown, extinguishment, and mop-up. Available Fall 1993.

User Guide

A basic user guide series presents introductory and comprehensive explanations of foam properties, equipment, ground applications, and aerial applications. User guides that are now available through the Publications Management System are:

FOAM VS. FIRE, CLASS A FOAM FOR WILDLAND FIRES, 1992. This 28-page publication explains how to get the most firefighting punch from water by converting water to class A foam. Discusses how and why foam works. Explains drain time, expansion ratio, foam type, proportioning, aspirating nozzles and compressed air foam systems. Also discusses application for direct attack, indirect attack, mopup, structure protection, and safety considerations. NFES #2246.

FOAM VS. FIRE, PRIMER, 1992. This 9-page publication covers the basics of using class A foams and discusses their adaptability to present application equipment. NFES #2270.

The third user guide will address aerial delivery of class A foam including foam properties, and equipment for helicopter and fixed-wing applications. This publication is under development.

These videos and publications can be ordered from the Boise Interagency Fire Center. The estimated price for each videotape is $3.00; each user guide is $.75. To order, provide document name and NFES number and mail or fax a purchase order or requisition to:

Boise Interagency Fire Center
ATTN: Supply
3905 Vista Avenue
USA-Boise, Idaho 83705

Phone: (++1) 208-389-2542
Fax: (++1) 208-389-2573

Training

The Bureau of Land Management is presenting a workshop on Class A Foam entitled "Class A Foams, Generating Systems, and Tactics". The workshop demonstrates the properties of water and foam for fire suppression, examines proportioning and foam generating devices, and describes applications and tactics. Case studies from actual fires are used to suggest tactics for direct and indirect attack, mop-up/overhaul, and structure and resource protection. Instruction is a combination of lecture, hands-on demonstration, and live fire exercises. The next course is scheduled as follows:

19-21 October 1993.

All sessions will be held at the Boise Interagency Fire Center, Boise, Idaho. To place nominations please contact

Ron Rochna, Course Coordinator
Boise Interagency Fire Center
3905 Vista Avenue,
USA-Boise, ID 83705

Phone: (++1) 208-389-2432

A 16-hour Class A foam S-course is also under development for training. The course is expected to combine material from the videos, publications, and workshop exercises to enable students to successfully use foam for fire management.

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ZIMBABWE

Fire and the Forest

The state forest boundaries on the Kalahari Sands (KS) of northern Matebeleland, Zimbabwe, encompass an obviously very variable vegetation cover extending from Victoria Falls in the west to Mafungabusi in the east and to Chesa in the south east. Forest Management attention has been concentrated upon the commercially exploited timber species mkusi (Zambezi Teak, *Baikiaea plurijuga*), mtshibi (*Guibourtia coleosperma*), and in the last 30 years, mukwa (kiaat, *Pterocarpus angolensis*). Areas of mkusi in particular were the prime purpose for placing extensive areas under State control. Variation in topography, geomorphology, rainfall and frost are major determinants of the vegetation growing on a given area, vegetation then modified in structure and composition by man's logging and other activities such as hunting, ranching and farming, and by the timing and frequency of dry-season fire.

Vegetation maps in varying detail are available for each forest. These should be used to delineate acceptably homogenous areas for which specific management objectives can be defined, and thus to which appropriate treatments can be applied. A generalized summary of the vegetation comprising the Forest Estate is presented in Figure 1. Potential fire management is then immediately apparent.

Fire

There is more than enough visual and experimental evidence of detrimental effects of fire in general upon woodland and forest intended for harvestable mkusi and its associates. Even one hot season fire, with an adequate weight and depth of fuel, may destroy perhaps 100 to 200 years' accumulated growth in commercial terms: not the forest vegetation as such, for most of this will coppice, and in a century or two will be restored. Thus it is essential that mkusi be protected from uncontrolled or wildfire.

On the other hand, natural (lightning-caused) fire has been a component of the veld for millennia, interspersed with the accidental or deliberate hunting fires of the original nomadic residents. There is a belief, to which I subscribe, that the rare to occasional fire in the late hot to early rainy season reaching aerially destructive proportions only in relatively small areas or patches of, say, 0.01 ha to a hectare or two before being extinguished by accompanying rain, is essential to the regeneration of the woodland or forest by thinning out competing vegetation. This will effectively reduce moisture competition and possibly increase light levels at or near ground level, thereby allowing either seedlings to establish and/or enabling established but effectively dormant rootstocks to grow up into the canopy. This fire I term a silvicultural fire.

Large-scale natural fires, apparently as devastating as those now caused frequently by man, have also undoubtedly occurred but scrutiny of available meteorological records suggests that the coincidence of heavy rainfall seasons to provide the fuel loadings, "black" radiation frosts to provide fuel depth, and dry lightning storms to provide ignition, occur at intervals of two or more decades. Small "patch" fires suggest an uneven-aged (or uneven-structured) forest, and large fires an even-aged (or even-structured) forest.

Management Implications

In summary, the Objects of Forest Management set out by F.B. Armitage in 1961 are directed towards the principal object of maintaining a tree cover over all forest or potential forest sites to protect the soil and ameliorate the climate. While placing the main emphasis upon the production of commercially exploitable species on a sustainable yield basis, increased total productivity by developing the use of minor forest products, applying multiple land use principles where feasible, and maintaining or increasing the soil and water conservation and amenity value of the forests, are also stipulated. The prevention, or specified application, of fire is a major tool in the hands of the forest manager.

The risk of wildfire can be reduced greatly by a carefully planned, vigorous and consistently applied extension programme such as that designed for the now-defunct Agricultural Unit. This implies active sincere adherence to a long-term programme of holistic resource management such as that propounded by Alan Savory. Today, forest occupants and neighbours - the major risk - are as integral a part of the forest ecosystem as the plants and animals.

The hazard can be reduced in two ways - by burning or by physical removal. To use fire protection in mkusi woodland is a contradiction. For mkusi, fire is for silviculture, not for protection. Therefore in areas designated for mkusi, the fuel load needs to be physically removed. The only feasible large-scale technique is herbivory by larger mammals.

Wild herbivores, which have a valuable contribution to make but are sensitive to habitat changes, may of necessity be low in numbers and therefore in reduction effect, and difficult to manipulate. Domestic herbivores, i.e. cattle and goats, can be manipulated with relative ease and are readily harvested.

It is obviously impossible to stock all mkusi areas with cattle at a rate to reduce the fuel hazard to tolerable levels every fire season because of the large fluctuation in food (grass growth) with varying rainfall. It is completely feasible to carry sufficient cattle to concentrate in order to render designated areas fuel-free, such as high risk zones, to create fuel breaks, or to disperse through areas for acceptable fuel reduction. Control can be by herding rather than by capital investment in fencing; watering and handling facilities can be portable not permanent. These are economic, logistical, decisions.

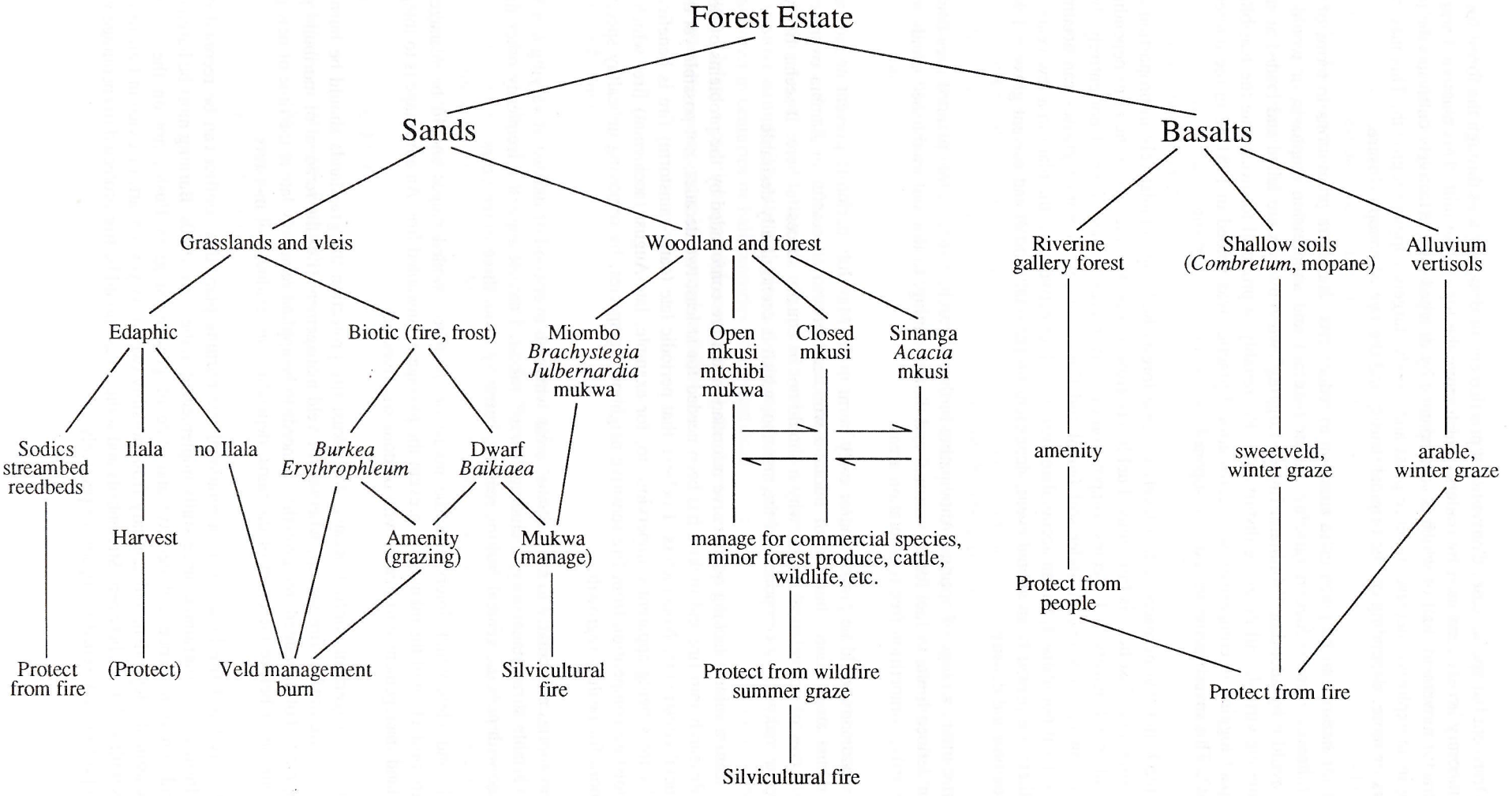

Fig.1. The Forest Estate: a summary of its vegetative resources or components, potential use and fire management.

Logging is a transient but special case. Conventional practice entails dragging logs through the forest for up to 100m to a temporary access road used by trailers, which move the logs to the mill. This massive disturbance by repeated tractor movement, half of which is accompanied by dragged logs, effectively cultivates the logged area resulting in an explosive increase in dense grass and woody (largely coppice) regrowth. This may persist 10 to 20 years or more, depending on the original density and the rate of canopy closure.

While this major hazard can be given extra attention to reduce risk, and extra precautions in terms of more intensive fuel breaks, fuel reduction (grazing and/or herding) and suppression emphasis, it would seem preferable to avoid it by adopting "Minimum Impact Logging" whereby logs are felled and loaded at stump, thereby eliminating virtually all dragging disturbance. Regrettably, a proposal to investigate the feasibility of minimum impact logging in comparison with conventional practice was vetoed in 1981/82 in the interests of "instant profit". This investigation should be re-opened.

Incidentally, the belief that herbaceous fuel levels in these forests build up cumulatively in proportion to the number of seasons since last burn is fallacious. Fuel levels grow to a peak at the end of the rains depending on seasonal rainfall, plant density and species composition of a given area. Fallen litter, if not entirely, breaks down in the following rainy season under soil faunal and floral activity. Perennial grasses can accumulate moribund material if not utilised, but an accumulated excess will effectively kill the plant in a few years. Fuel loadings are therefore primarily an annual event, dependent on seasonal rainfall and current grass and woody species composition and density.

Silvicultural fire offers a range of options. Anticipating further research, I suggest that planned fires could be applied within defined limits to fuel loads, seasonal and diurnal timing, to thin out established stands and to create, temporarily, competition-free regeneration areas.

The miombo woodlands could be grazed and/or early-burnt in the May-July period to prevent or reduce fire passage into mkusi areas. Early burning of miombo woodland proved successful in Zambia over several decades, and I know of no technical reason why it should not be equally successful here. It seems likely that fire would favour mukwa as a component of the miombo, which is economically desirable.

Mukwa areas seem a subject lacking quantitative information and are confounded by the problems of decline and dieback. Research into fire and mukwa has been needed for at least two decades; not possible yet due to staff and financial constraints. Nonetheless, I believe that periodic late (early-rainstorm) fire is beneficial to mukwa, healthy trees being apparently impervious to, for example, late-August (accidental) fire, which may also reduce moisture competition from fire-sensitive neighbouring species, by removing unhealthy specimens and making room for healthy regrowth.

This suggestion applies particularly to the "isibabe" areas where an overwood of mukwa of varying density is found over a variable shrub understory, including "dwarf" mkusi. I cannot suggest a frequency other than a possible linkage with periodic general fruiting seasons, currently about three to ten years.

The grasslands and vleis which intersperse the mkusi or miombo wooded ridges should be managed to complement fire protection of the mkusi, i.e. prevent the passage of unwanted fire. An advantage is to integrate vlei and grassland management into that of wild or domestic livestock.

Again, there is a management conflict because for mkusi fire protection the grasslands should be burnt off relatively early before the hot fire season, whereas for veld management (i.e. the removal of moribund grass and/or the suppression of unwanted tree growth) fire needs to be applied relatively late at the time of new grass flush. This occurs at or before the onset of the rains, depending on residual soil moisture.

By combining early burnt fire breaks with a rotational late burning plan, this conflict can be reconciled, as proved by the Insuza Vlei programme successfully implemented in the early 1980s. Burning must be based upon vegetation condition (senescence and density) and state of growth (at grass flush), not on the calendar. Frequency is seasonally dependent and can vary from possibly two to six years apart, or twice in four to twice in twelve years with variations between. Streambeds and sodic areas should be fire-protected to encourage water holding and to protect very sensitive topsoil respectively.

Peat beds (*Phragmites*) must be protected. In a dry rainfall cycle these can, and do, catch fire and burn underground creating a sterile dust-bowl. The most prominent example is the Dete Vlei below the Hwange Safari Lodge, but the Jijima (Lugo Ranch) and Tobotobo (Eland Blocks) vleis are others.

The basalts which fall outside the forest property and fire management must complement protection of mkusi. Complicated by forest occupancy, in general terms the riverine gallery forest should be protected from both fire and people. The skeletal rocky soils of the slopes, plus the pockets of alluvium and vertisols of the valley floors, offer sweet grazing (grasses which retain their crude protein levels in the dry season), invaluable in the winter dry season, together with mopane and other valuable browse species which should similarly be protected from wildfire.

Arable areas require little comment other than as a source of accidental fire when "burning" gardens. Efficient extension is the solution here.

Conclusion

Despite the evidence of increasingly poor fire protection records from the last few years, I do not share the view that fire protection of mkusi to ecologically acceptable levels is virtually impossible. With positive commitment to the Objects of Management, careful consideration of the resources of the Forest Estate as a whole, and thoughtful planning so that these resources are integrated both ecologically and economically, I am still convinced that the indigenous State Forest can be managed (cost-) effectively for the purposes for which they were demarcated.

People and domestic livestock are critical components of the management system. I have recently become aware of an attitude of negative economic pessimism which seems to have influenced indigenous State Forest management for at least the last 20 years. Time appears to be a major mental stumbling block in adopting a more positive attitude. That the indigenous forests are a slow growing community in which change and growth are measured in centuries or half centuries rather than decades, or even years, must be clearly understood and accepted. Unless a positive approach incorporating the patience entailed by these time scales is adopted, I believe effective management is doomed to failure.

Acknowledgements

There is little, if any, originality in the above and I acknowledge the many colleagues and friends who have contributed their thoughts and experience over the last thirty years: Denys Fanshawe, the late Paddy O'Dare, Jimmy Sharp, the late Ian Farquhar, John Rushworth, the late Bill Rainford and Peter Butler, come immediately to mind, but there are many others. Also, my sincere appreciation of Jonathan Timberlake's editorial help and criticism. The interpretation (and errors!) are mine.

From: G.M. Calvert

Address: Matopos Research
Ministry of Agriculture, Zimbabwe
Private Bag K 5137
ZW-Bulawayo

NEWS FROM FIRE RESEARCH

IGBP/IGAC Biomass Burning Experiment: Impact on the Atmosphere and Biosphere (BIBEX)

Minutes (extracts) of the meeting of the Coordinating Commitee, Victoria Falls (Zimbabwe), 4 June 1993

The BIBEX group was convened at the occasion of the Joint IGBP START/IGAC/GCTE/DIS/GAIM Workshop on "African Savannas and Global Change: Interactions of Land Use, Climate, Productivity and Emissions", held in Victoria Falls, 2-5 June 1993. The main aim of the meeting of the BIBEX Steering Committee was to discuss and further plan the follow-up activities of the 1992 SAFARI field campaign.

In accordance with the discussions during the SAFARI-92 Data Workshop in Stellenbosch, South Africa, (27-29 May 1993) and the SAFARI Symposium held at CSIR Conference Center in Pretoria (1 June 1993) it is planned to conduct an airborne follow-up component over Southern Africa in early 1994 (first half of April). This mission will investigate the atmospheric background during the non-fire season and relate this to the fire-oriented data set of SAFARI-92.

Following groups and/or individuals expressed their intention to participate in the 1994 activities:

Jonnalagadda (Zimbabwe): Conduct ground measurements of ozone, SOx, and NOx in Zimbabwe.

Meixner (Germany): Conduct biogenic emission measurements in Zimbabwe.

Ward (USA): Burning experiments will be conducted possibly during the early fire season (May-June), in Zimbabwe.

Frost (Zimbabwe): Offers support for aerial component of 1994 activities.

Justice (USA): No post-SAFARI-92 activities planned for 1994. He indicated that the full subcontinental fire data set will be available by end of 1994. This will be used for validating the Vegetation Fire Information System (Dahlem Model).

Following persons will coordinate focal points for 1994 activities:

Meixner: soil fluxes
Ward: fire experiments
Andreae: aircraft campaign
Diab: meteorology

Setzer strongly supported the idea to establish an operational fire detection system for the region as being used in Brazil.

Andreae then explained the intention to have a large-scale fire-related campaign on the subcontinent in 1995, desirably with the NCAR C-130. The discussion resulted in supporting the idea to link SAFARI-1995 with the 1995 **Smoke, Clouds, Aerosols, and Radiation Experiment (SCAR)** activities in Brazil (NASA/INPE).

It was agreed that ground studies should concentrate on the Miombo-Dombo vegetation complex. **Frost** will seek support by a Dutch development project operational in Mongu. The South African Meteorology Community is urged to establish contacts with Zambian Meteorlogy.

Frouin indicated his interest to conduct ground-based measurements of aerosol characteristics (photometers, polarimeter, Michelson interferometer). The aerial component would consist of the Polarization and Directionality of the Earth Reflectance (POLDER) instrument.

Parties interested in the 1994-95 campaign should attend the next SAFARI Workshop to be held the weekend before the AGU meeting in San Francisco (1st weekend of December 1993). All interested parties should submit a 1 page summary for preparation of the SAFARI-94 booklet (as soon as possible).

Upcoming Campaigns: **Goldammer** reported about ongoing and upcoming BIBEX activities:

Boreal Ecosystems: The first active field experiment of the **"Fire Research Campaign Asia - North" (FIRESCAN)** will be conducted in tandem with the conference "Fire in Ecosystems of Boreal Eurasia", 28 June to 12 July 1993, Krasnoyarsk, Russian Federation. This first campaign will be of limited scale. About 22 scientists from outside Russia will participate. (The campaign has been implemented meanwhile; see photo below and a more detailed report in the next issue of IFFN.)

Groups and individuals are invited to join follow-up activities which are planned for the next 5-year period. Convenor is J.Goldammer. Counterparts in Russia are coordinated by the Russian Academy of Sciences, Siberian Branch, Institute of Forest and Wood, Forest Fire Laboratory, Krasnoyarsk. Main interest of upcoming research will be the investigation of fire-emitted aerosols. A relevant research contract was signed by the Max Planck Institute for Chemistry (Mainz, Germany) and the Russian Academy of Sciences, Forest Fire Laboratory Krasnoyarsk, Russian Federation).

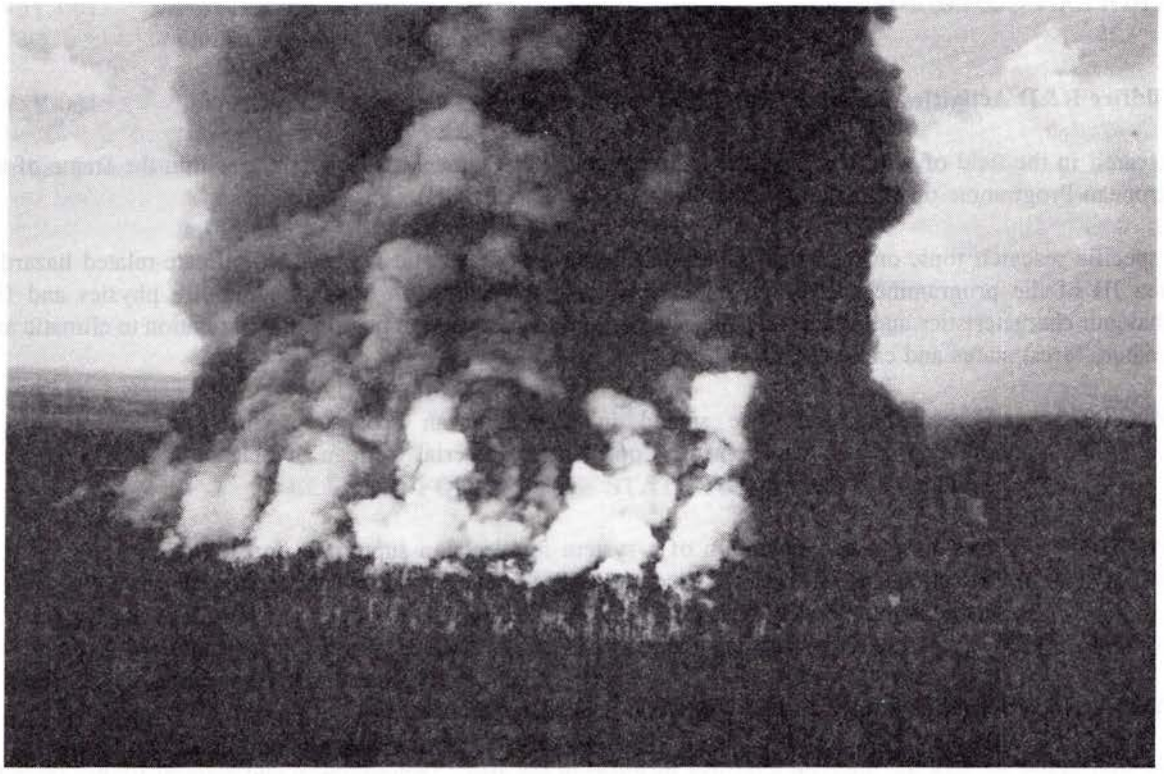

Fig.1. Aerial view of the **Bor Forest Island Fire**, the core experimental fire of FIRESCAN. The fire was set on 6 July 1993 in the North of Krasnoyarsk Region, Russian Federation (Photo: J.G.Goldammer).

Tropical South East Asia: The **"South East Asian Fire Experiment" (SEAFIRE)** is under preparation. It will have three burning foci: Forest conversion fires (mainly in Indonesia and Malaysia), monsoon forest fires (deciduous forests of mainland South Asia, focus in Viet Nam, Thailand and elsewhere), and rice straw burning. The link to the Australian fire theatre will be sought. Overall centre of activities will be Indonesia. Convenor of activities is J.Goldammer. Main activities will start in ca. 1996-97. Interested parties should start preparation of experiments (e.g. through building up contacts with partner institutions in SE Asia) as soon as possible.

Remote Sensing of Fires

Another BIBEX meeting focused on remote sensing component of its activities. It was held on 3 June 1993, at Victoria Falls. In this meeting all participants strongly supported the wish for future cooperation in remote sensing of vegetation fires. This has to be seen in the light of the building up of the global Vegetation Fire Information System as conceptually developed by the Dahlem Workshop on Fire in the Environment, Berlin 1992.

The CEC project proposal on Fire in Global Resource and Environmental Monitoring (FIRE) should be further developed in conjuntion with BIBEX activities. J.P.Malingreau will issue invitations for a FIRE planning meeting in late 1993.

From: Johann G.Goldammer, Rapporteur

EUROPEAN COMMUNITY

Wildfire R&D Activities under the EPOCH Programme

Research in the field of wildfires is supported under the 2nd Framework Programme within the frame of the European Programme on Climatology and Natural Hazards (EPOCH).

A specific research topic on wildfires is included in the area "Climatic impacts and climate-related hazards" (area III of the programme). Research under this topic is focused on understanding fire physics and fire behaviour characteristics and forecasting fire severity and fire prevention possibilities in relation to climatic and weather, forest status and causes of fire.

EPOC-0020- Forecasting forest fire spread in Mediterranean ecosystems for fire prevention and management. Coordinator: Imperial College of Science - London (F.C.Lockwood)

EPOC-0040 Design and demonstration of a system for decision support in forest fire detection and prevention. Coordinator: ARMINES - Ecole Nat. Sup. de Paris-Valbonne (J.L.Wybo)

Wildfire R&D Activities under the ENVIRONMENT Programme

Research under the specific topic on wildfires included in the area "Technological and Natural Risks" (area lV of the programme) is aiming at understanding the factors, natural and human, favouring or hindering the occurrence and frequency of fires in order to develop suitable means for forecasting, prevention and risk management. Research in this field expands the activities undertaken under the EPOCH programme and is focused on the:

- study of the factors that control fire ignition and spreading and their interactions with other abiotic or biotic factors;
- study of relations between aspects of fire regime (intensity, seasonality, spatio-temporal distribution, etc.) and potential change of fire regimes due to climatic change;
- improvement of fire behaviour modeling with the development of models applicable to various landscapes, coupling them with GIS and remote sensing techniques to estimate fire risk and to assist in fire management;
- study of the long term consequences of fires on ecosystem and landscape structure. Study of the interactions between landscape structure and fire, in particular, the effect of fires on the homogenization of the landscape;
- study of contribution from fires to the biogeochemical cycles of greenhouse gases;

- assessment of the advantages and disadvantages of fire practices associated with land-use (clearing, stubble burning, vegetation management, etc...) either for fire hazard reduction or for conservation purposes in Mediterranean landscapes;
- development of techniques and technological means for early and remote warning systems to operate in complex terrains, forecasting of fire spread, and rehabilitation.

Sixteen proposals have been submitted in the field of wildfires following a call for proposals for the Environment Programme. Four of these proposals concentrated on the physical aspects of wildfires and fire behaviour modelling, four on fire impacts on soil and vegetation and eight on technological development for fire prevention and mitigation. The total amount requested was 27.3 MECU.

The following projects have been selected for funding under the 1991-1992 budget of the programme. The total E.C. contribution allocated to these projects amount to 2,9 MECU.

EV5V-0019 Fire modelling and risk studies for the valuating the environment (MINERVE). Coordinator: C.E.A., Laboratoire d'Expériments et de Modélisation des Feux (J.C.Mallet)

EV5V-0017 Post-fire soil and vegetation dynamics in natural and afforested areas in southern Europe: the role of fire intensity

EV5V-0015 Simulation of forest fire. Coordinator: Agence MTDA (D.Alexandrian)

Further information can be obtained from:

R.Fantechi
DG XII/E-2, CEC
200 rue de la Loi
B-1040 Brussels

Phone: (++32) 2-2355735

ECE/FAO FOREST FIRE STATISTICS 1990-1992

The results of the latest enquiry on forest fire statistics, carried out in 1993 by the Joint ECE/FAO Working Party on Forest Economics and Statistics, has been issued. The publication provides information on the number, area, causes and losses of fires in Europe, Belarus, the Russian Federation, Ukraine and North America. Copies are available free of charge from:

ECE/FAO Agriculture and Timber Division
Palais des Nations
CH - 1211 Geneva 10

Phone: (++41) 22-917 2660
Fax: (++41) 22-917 0041

SUMMARY TABLE SHOWING TOTAL AREA OF FIRES (1000 ha)

	1989	1990	1991	1992	1989-1992 average
Europe	788	700	576	445	627
- of which: southern Europe [a/]	776	686	567	389	605
Russian Federation	1831	1670	1126	1143	1442
North America	8881	3138	3741	3011	4693

a/ Cyprus, France, Greece, Israel, Italy, Portugal, Spain, Turkey and former Yugoslavia.

RECENT PUBLICATIONS

Fire in the Environment: The Ecological, Atmospheric, and Climatic Importance of Vegetation Fires

The concentration of several trace gases in the Earth's atmosphere that are important for climate and atmospheric chemistry is strongly increasing due to various human activities. Recently more emphasis has been given to the effects of tropical deforestation and other vegetation fires on atmospheric CO_2 concentrations. There are also significant emissions of trace gases other than CO_2, such as CO, NO_x, CH_4 and non-methane hydrocarbons to the atmosphere. Some of these trace gases are photochemically or climatically active and serve as catalysts and precursors in photochemical smog formation. Prehistorical and historical fire data reveal that natural and anthropogenic vegetation fires are not a new phenomenon. Fires have contributed significantly to the process of shaping and maintaining valuable forest and savanna ecosystems. Traditional use of fire is essential for maintaining the productivity of agricultural lands and is still practiced by rural populations. Forestry in many parts of the world has integrated the use of prescribed fire in forest ecosystem management.

Modern fire regimes in the tropics and elsewhere are undergoing major changes. Forest and savanna ecosystems are increasingly utilized by the rapidly growing populations in the developing world. Humans also interfere increasingly in the remote northern boreal and circumpolar vegetation and largely affect natural fire regimes.

Because of the lack of reliable data on the extent and the impacts of vegetation fires and other biomass burning on the global environment and because of the strong interdisciplinarity and the actuality of this issue, a Dahlem Workshop was convened in Berlin (15-20 March 1992) to elaborate on a new multi- and interdisciplinary approach toward a global fire science. The fire workshop was based on 17 background papers, prepared by 34 contributors from relevant sciences, e.g.from fire ecology, biology, wildland fire science, forest sciences, anthropology, cultural history, biogeochemistry, atmospheric sciences (especially atmospheric chemistry), physics, climatology, remote sensing, and modeling. The results of the discussions are laid down in four group reports jointly prepared by the workshop participants. The book represents the first organized synthesis of a global fire ecology and defines the most urgent problems to be tackled scientifically. *(K.F.W.)*

> *P.J.Crutzen and J.G.Goldammer (eds.) 1993. Fire in the Environment: The Ecological, Atmospheric, and Climatic Importance of Vegetation Fires. Dahlem Workshop Reports. Environmental Sciences. Research Report 13. John Wiley & Sons, Chichester, 400 p. (ISBN 0-471-93604-9)*

Ecology and Geography of Natural Regeneration of Common Pine (Russian)

The monograph is a result of fundamental studies and the theoretical generalization of the self-regeneration regularities of natural cenopopulations of common (Scotch) pine (*Pinus silvestris*) using as an example a 1500-km long series of plain pine forests in the Trans-Urals and Northern Turgai. By synthesizing principles and methods of population ecology, biogeocenology, fire ecology and cenogeography the author gives wide-scale, comprehensive and quantitative consideration to the regeneration of pine populations depending on major factors in the environment - in particular forest fire. Presented are the biotopic and zonal-geographical peculiarities of pine population reproduction along with seed distribution, spreading, survival, number dynamics, structure and cenotic role of their self-sowing in burns and clear cuts. The ecological role of cyclical fires is established as one of the most essential natural factors responsible for the structural transformation, regeneration and dynamics of populations and biogenocenoses. Ecological and geographical regularities of natural regeneration of common pine revealed in the work are explained based on the hypothesis of "pulsed pyrogenic stability" and the author's evolutionary-ecological theory of "petropsammophytness-pyrophytness" of common pine.

(S.N.S.)

> *S.N. Sannikov 1992. Ecology and Geography of Natural Regeneration of Common Pine. Nauka Publisher, Moskau, 264 p. (ISBN 5-02-004130-0).*

Orders can be placed through: Dr. Stanislav N. Sannikov, Institute of Forest, Ural Division of Russian Academy of Sciences, P.B.620134, Bilimbaewskaja-st.32a, Ekaterinburg, Russian Federation.

Introduction to Fire Ecology (Italian)

During the 85th Congress of the **Italian Society of Botany** (Naples, October 1990) a special symposium was held on "Fire and Vegetation". The papers given at the symposium were edited by Stefano Mazzoleni and Giovanna Aronne and are now available in the form of a comprehensive synopsis on fire ecology (in Italian), with the following chapters:

- Effects on vegetation (J.Miles)
- Boreal ecosystems (O.Engelmark)
- Mediterranean ecosystems (S.Mazzoleni)
- Potential vegetation in Mediterranean Italy (F.Spada)
- Tropical ecosystems (J.Goldammer)
- Succulent plants (P.Thomas)
- Bryophytes (A.Esposito)
- Fire management (C.H.Gimmingham)
- Reforestation (B.Schirone)

(J.G.G.)

Bibliographical information:

S.Mazzoleni and G.Aronne (eds.) 1993. Introduzione all' Ecologia degli Incendi. Liguori Editore, Via Mezzocannone 19, I-80134 Napoli, 205 p. (ISBN 88-207-2207-0)

Forest Fire Fighting in High Mountainous Terrain (German)

A new booklet (in German) is now available on forest fire fighting in high mountainous terrain. The 107-page booklet was developed by the Swiss authors Robert Jecklin and Toni Schöb. Enriched by numerous drawings it provides an introduction to fire basics and the most important fire-fighting techniques. The target group of readers is the personnel of the forest services and the fire services operating in the high mountainous regions of the alps of Switzerland, Austria and Germany. Since no similar introduction to fire fighting is available in the German language, this book fills a clearly recognized gap. *(J.G.G.)*

Bibliographical information:

R.Jecklin and T.Schöb 1993. Waldbrandbekämpfung im Gebirge. Verlag Bündner Wald. Switzerland.

The book can be ordered from: Gasser AG, P.O.Box, CH-7007 Chur (Price: SFr 25.00)

Disaster Management - Special Issue on Forest Fires

Disaster Management is a journal of contingency planning for large-scale emergencies and is published quarterly (FMJ International Publications). The first issue of 1993 is devoted to forest fires and contains the following contributions:

- Wildfire management in forests and other vegetation: A global perspective (J.Goldammer)
- Monitoring grassland fire fuels with satellites (J.Barber)
- High-intensity forest fires in the Mediterranean Basin: Natural and socio-economic causes (R.Velez)
- Forest fire management in Canada (B.J.Stocks and A.J.Simard)
- Wildfires in industrial plantations: How to reduce the risk (C. de Ronde)
- Wildland fire terminology

(K.F.W.)

Bibliographical information:

Disaster Management Vol.5, No.1, January 1993 (ISSN 0953-4962)

Fire: Technology - Symbolism - Ecology - Science - Hazard

Hazel Rossetti, a Fellow and Tutor in Chemistry at St.Anne's College, Oxford, has published a number of textbooks and science books for the general reader. With her latest book "Fire" she aims to tease out the common thread which runs through the immensely varied phenomena which we call fire. Adopting a lively approach, and with the imaginative use of illustrations, the author explores five broad themes: Fire, the phenomenon; fire for comfort; fire for use; fire as a hazard; and fire for contemplation. The non-mathematical approach will appeal to the general reader, while experts in wildland fire science will find much to interest them in the many areas which border their own.

The author has invested a tremendous amount of literature research into the translation of fire science into a generally readable book. Since only main book publications are given as references, however, the reader interested in more specific details must go once more for literature search. *(J.G.G.)*

H. Rossetti 1993. Fire: Technology, Symbolism, Ecology, Science, Hazard. Oxford University Press, Oxford, 288 p. (ISBN 0-19-855722-1)

Young Men and Fire

On 5 August 1949 a crew of fifteen smokejumpers, the United States Forest Service's elite airborne firefighters, stepped into the sky above a remote forest fire in the Montana wilderness. Less than two hours after their jump, all but three of these men were dead or fatally burned. Exactly what happened in Mann Gulch that day has been obscured by years of grief and controversy. Now a master storyteller finally gives the Mann Gulch fire its due as tragedy.

Norman Maclean returns to the scene with two of the survivors and pursues the mysteries that Mann Gulch has kept hidden since 1949. From the words of witnesses, the evidence of history, and the research of fire scientists, Maclean at last assembles the scattered pieces of the Mann gulch tragedy.

Norman Maclean (1902-90), woodsman, teacher, and storyteller, grew up in the Western Rocky Mountains of Montana and worked for many years in logging camps and for the United States Forest Service before beginning his academic career. He is the author of the modern classic, *A River Runs Through It*, and other stories, which he completed after his retirement from the University of Chicago in 1973.

N.Maclean 1992. Young men and fire. The University of Chicago Press, Chicago, 301 p. (ISBN 0-226-50061-6)

FOREST FIRE MANAGEMENT TRAINING COURSES

U.S.A.

International Course in
WILDLAND FIRE MANAGEMENT PLANNING
Fire Prevention, Detection and Suppression

Wildlands and forests of the world are receiving increasing attention because of their economic importance and their effects on climate and ecological stability. It has also become critically important that losses from wildland fires be minimized. New fire management technology and planning methods, as described in this course prospectus, are indispensable tools to the land manager.

In its broadest objective, wildland fire planning can provide fire control measures that will preserve natural resources and promote wise use of natural resources outside of fire management. WILDLAND FIRE

MANAGEMENT PLANNING is a carefully constructed three-week course which examines the process for developing a forest fire prevention, detection and suppression plan to achieve this broad objective for any forested wildland region in the world. The planning process presented is an adaption of the model developed and implemented by the United States Forest Service. It has been used by Washington Institute [1] to instruct a wildland fire planning course for the Government of India. The course emphasizes methods for producing an individualized plan which will include identification of fire management plan objectives, planning scope, data and information needs, planning steps and document preparation, with case studies and workbooks provided to illustrate procedures.

Participants should have basic technical skills in mathematics and statistics.

Course Content

Unit I:	Introduction to Wildland Fire Management Planning
Unit II:	Defining Planning Objectives
Unit III:	Developing the Planning Analysis
Unit IV:	Constructing the Wildland Fire Management Plan
Unit V:	Tailoring Plans to the Local Situation

Participation

This course is designed for people who need to know how a wildland fire management plan is developed, including an understanding of the factors that influence wildfire occurrence and behavior. Participants must be able to communicate in English and possess skills in mathematics and statistics.

Objectives: The objective of this course is to provide to participants the information necessary to prepare a Wildland Fire Management Plan. This includes the identification of plan components, data requirements, planning example or model and ways of adapting examples to specific area requirements.

Instructors: The instructors for this course include university professors and government agency representatives with international experience in forest fire control and planning.

Course location: This course will take place at the Washington Institute's headquarters near Seattle, Washington. Board and room costs are separate and arrangements will be made for participants to stay in nearby motels. The course can be presented at other locations, if desirable. Contact W.I. for additional information.

Course dates: 16 August - 3 September 1993[2]

Course fee: Registration (tuition) fee for this three-week course is US-$3,500. This fee includes all course materials, instruction, computer use, field trips (when appropriate), weekday lunches, refreshments and transportation to and from motels, if needed. Registration **deadline** is **July 16, 1993**. Cancellation fee after August 1 will be US-$500, unless a substitute is available. To register, call or write:

Washington Institute, Inc.
P.O. Box 1108
USA-Duvall, WA 98019

Phone: (++1) 206-788-5161
Fax: (++1) 206-788-0688

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[1] Washington Institute, Inc., is a private educational and training organization which specializes in the fire management and natural resource fields.

[2] Although the announcement of this course is late, its publication is aimed to familiarize the readers with the concept of the course. Readers interested in attending future courses are encouraged to contact the Washington Institute.

MEETINGS HELD IN 1992

INDONESIA — **International Seminar on Forest Fire Control in Balikpapan and Banjarbaru, Kalimantan 24 August - 11 September 1992**

An international seminar was held in Balikpapan and Banjarbaru in August and September 1992. It was jointly organized by the Forestry Training Programme (FTP) of the Finnish National Board of Education, Ministry of Forests, Indonesia. The seminar was financed by the Finnish International Development Agency, FINNIDA.

The course participants (25 altogether) were B.Sc., M.Sc. and Ph.D. level forestry or fire control officers involved in forest fire control or fire research. They came from the following countries: Fiji, India, Indonesia, Laos, Malaysia, Namibia, Nepal, The Philippines, South Korea, Sri Lanka, Thailand, Western Samoa and Viet Nam. The course resource persons were from Finland, Indonesia, The Philippines, Thailand and Zimbabwe.

The topics were:

- Applied pedagogics for instructors
- Management of plantation forests
- The fire plan
- Leadership during the fire
- Use of methods and tactics in fire fighting
- Tools and equipment
- Fire control practice

The seminar sessions consisted mainly of lectures, practical demonstrations, group work and fire control practices. The seminar had a strong practical emphasis. A partial outcome of this seminar is the new FTP Publication *Handbook on Forest Fire Control* (to be published in 1993).

From: Mike Jurvélius

Address: Forestry Training Programme
P.O. Box 484
SF-00101 Helsinki

MEETINGS PLANNED FOR 1993-94

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

For information on the programme see the January 1993 issue of IFFN (No.8, p.35). Conference sessions will be held in the Training Centre at the Department of Conservation and Land Management Operations Headquarters, 50 Hayman Road, Como, WA 6152. An optional post-conference field trip will be held on 30 September. For further information contact Mrs Michelle Lathwell at the following address:

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

Phone: (++61) 97-711 988
Fax: (++61) 97-712 855

U.S.A. **12th International Conference on Fire and Forest Meteorology**
26-29 October 1993, Jekyll Island, Georgia
Fire, Meteorology and the Landscape

A detailed announcement of the conference was given in the January issue of IFFN (No.8, p.36). For further information contact:

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

GREECE **International Workshop: Satellite Technology and GIS for Mediterranean Forest Mapping and Fire Management**

The Department of Forestry and Natural Environment; Aristotelian University, Thessaloniki, in cooperation with the Joint Research Centre, Ispra, Italy, and the EARSeL (European Association of Remote Sensing Laboratories), Paris, France, are organizing an International Workshop entitled "Satellite Technology and GIS for Mediterranean Forest Mapping and Fire Management", which will be held in Thessaloniki, Macedonia, Northern Greece, between 4 and 6 November 1993.

We would be very happy if you could participate in this workshop and, together with other internationally well-known colleagues, contribute to its success. For all necessary information regarding the workshop contact the Organizing Committee by phone or by fax:

Michael A. Karteris
Laboratory of Forest Management and Remote Sensing
Department of Forestry and Natural Environment
Aristotelian University
P.O. Box 248
GR-Thessaloniki 54006

Phone: (++30) 31-992542, 472815
Fax: (++30) 31-206138, 992564, 992571

PORTUGAL **2nd International Conference on Forest Fire Research**
21-24 November 1994, Coimbra, Portugal

Objectives

Following the First International Conference on Forest Fire Resaerch that took place in November 1990, a Second Conference is announced for November 1994 to be held also at Coimbra. The scope of this conference is to bring together scientists from Europe and other parts of the world working on various aspects of wildland fires, and encourage the presentation of results of scientific research, discussion of methodologies and the increase of international cooperation. The format of the conference will be basically that of its first edition, with two or three days of formal sessions and a guided tour. Formal sessions will include keynote lectures by invited speakers, round-tables and presentation of papers by the authors.

Subjects

Various areas of this multidiscilpinary problem are covered in this conference. Papers or posters dealing with subjects related to forest fires on a scientific basis are welcome. Although there are not restrictions on the areas to be covered, the following topics are given as a guideline:

- Fire Behaviour
- Fire Weather
- Fire Effects
- Human and Institutional Factors

Abstracts

Authors willing to submit a paper must send an abstract written in English, of not less than 300 words but not exceeding two pages A4 including key figures, before 31 December 1993. The abstracts will be refereed by the Scientific Committee of the conference. The authors will be informed of acceptance of papers by 1 March 1994. Detailed instructions about the presentation of the written version will be given at the same time. The papers must be written in English. It is recommended that the same language is used for its oral presentation, although it is accepted that one of the following lanuages may be used for oral presentation: Portuguese, Spanish or French. There will be no simultaneous interpretation.

Proceedings

Papers accepted for presentation and received in their full version before 30 June 1994 will appear in the Proceedings which will be available at the time of the conference. Papers received after that date will be included in a post-conference volume of the Proceedings.

For more information contact:

Grupo de Mecânica dos Fluidos
Departamento de Engenharia Mecânica
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ANNOUNCING: THE WESTERN FOREST FIRE RESEARCH CENTER

We are pleased to announce the establishment of an interdisciplinary, integrative research consortium based at Colorado State University in Fort Collins, Colorado, U.S.A. The goal of the **Western Forest Fire Research (WESTFIRE) Center** is to define more effective fire management strategies, as related to natural resource systems; WESTFIRE will bring together researchers, land managers, and affected publics for the purpose of developing and applying technologies for managing wildland fires before they occur. The WESTFIRE Center will fill a void in current fire management and research activities by:

* providing new visions for forest fire research/management: technology synthesis, information fusion, and timely dissemination;
* integrating basic and applied research in forest fire science;
* developing new theories and applications in forest protection science;
* focusing initially on developing computerized Early Warning Systems (short- and long-term) for low frequency, high intensity fire-prone ecosystems found throughout the western United States.

Recent disastrous wildfire years in the western U.S. (e.g., California 1991, 1990, 1987, and 1985; Colorado 1990 and 1989; Oregon 1987; Washington-Idaho 1991; Yellowstone 1988) illustrate problems of increasing severity, complexity, and cost. The situation is accentuated throughout the entire region due to prolonged droughts, human population incursions into wildland areas, and unacceptable fuel situations created by anthropogenic and natural disturbances.

Fire management becomes tremendously critical with adverse physical forces, natural fire hazards, and unique resource values. Society impinges on natural fire settings through land uses and management practices which unwittingly may increase fire hazards. Further, the budgets of local, state, and federal entities supporting firefighting efforts have been stretched to their limits. These same limits have left a U.S. federal fire research program funded at approximately one-third of what would be required to address emerging wildfire problems. In light of today's physical and socioeconomic constraints, the WESTFIRE Center represents a cost-effective, interdisciplinary opportunity for mitigating the effects of damaging wildland fires, particularly those in the western U.S. and the Rocky Mountain region.

Urban encroachment, increasing utilization of forests for consumptive and non-consumptive uses, and natural susceptibility to fire ignitions complicate management alternatives, but do not negate the need for creative solutions. Consequences of alternative policy and management decisions can be examined through systematic investigation and computer simulation. Preventive measures and post-disaster remedial actions can be analyzed from ecological and socioeconomic perspectives. Colorado State University, situated in proximity to imminent problems (urban interface, wilderness, and forest management areas), is uniquely positioned to support and carry out these activities of WESTFIRE.

The existing U.S. government fire laboratories are restricted in their capabilities to address fully the complexity of biophysical and socio-economic impacts from forest fires due to budget and personnel cutbacks. In fact, WESTFIRE focuses on two research subjects which have been casualties of recent budgetary cutbacks in federal experiment stations: fuel management and fire prevention, both already funded at Colorado State University with grants from the U.S. Department of the Interior. Moreover, federal research facilities are limited by institutional boundaries which inhibit integrative research. At WESTFIRE natural resource experts can join forces with support disciplines such as atmospheric science, soil and water relations, remote sensing, ecology, political science, and sociology to address pressing wildfire problems. This mix of University faculty expertise cannot be matched by any government fire research laboratory. In addition, Colorado State University has an extensive network of computerized resources with access to climate and weather models, fire behavior prediction and smoke dispersion systems, models for predicting fire effects on ecosystems, systems for analyzing and displaying satellite data, and geographic information systems (GIS) capabilities.

Finally, Colorado State University possesses one of the world's largest and most prestigious forest fire science programs. Existing support relations with research labs, public fire management agencies (U.S. Forest Service, Bureau of Land Management, National Park Service, and Fish and Wildlife Service), and the Boise Interagency Fire Center will facilitate the work of the WESTFIRE Center. The University also maintains active ties with other U.S. and international academic institutions, as well as private organizations, with wildland fire interests. This mix provides tremendous opportunities for carrying out WESTFIRE study objectives, as well as for developing tools which can be used not only throughout the western U.S. but also world-wide.

From: Philip N. Omi
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LETTERS TO THE EDITOR

To the Editor,
International Forest Fire News.

Dear Johannes,

You used up valuable space in your Editorial in the January 1993 issue of IFFN to say some very flattering things about me on the occasion of my recent retirement. Frankly, I can think of at least 100 issues that better deserve your editorial attention, but nevertheless I was deeply touched by your words.

I would, however, like to put straight some misconceptions that might have arisen as a result of your Editorial and to give credit where it is really due. Bringing the IFFN into existence was, as you said, a rather long and laborious process, and I very much doubt if its birth would ever have taken place without the exceptional efforts of a midwife by the name of Johannes Goldammer. You coaxed and bullied us to get it off the drawing-board, and took on the difficult and time-consuming task of Editor. And it is thanks to you that IFFN is now well established and expanding its readership with each issue. You were probably the first to recognize that there was a "market" for an international newsletter; the rest of us, who have been involved in the project, have merely supported you in whatever ways we could.

May I pay tribute here to the Governments of Poland, Spain and Greece who organized seminars on forest fire topics in 1981, 1986 and 1991 under the auspices of the Joint FAO/ECE/ILO Committee on Forest Technology, Management and Training; to the many specialists who contributed their expert knowledge to them; and to the Joint Committee's team of specialists on forest fires which provided valuable guidance. There is today a much better understanding of the social and economic, as well as technological, factors involved in forest fire prevention and control, even if the problems are still far from being solved. There is also growing recognition among policy makers and the public of the wider implications of forest destruction by fire, including its contribution to the greenhouse effect. The Joint Committee and its members can probably take a little bit of the credit for this progress but, let's face it, there is still a long way to go before we can begin to relax, and there are always going to be new challenges.

I believe the IFFN has an important role to play in spreading the word about forest fire developments, in the first place among specialists in the field. If I could have two wishes for the future, the first would be to see the IFFN going from strength to strength. The second would be for ways to be found for generating greater dialogue between forest fire specialists and others with concerns for the forest resource, including policy makers, land use managers and environmental and other special interest groups. There is always a slight risk that specialists may overlook where and how their particular fields of interest fit into the broader picture. Maybe IFFN, or eventually a son of IFFN, would have a role to play here too?

With warm greetings to your readers and yourself and best wishes for the continuing success of IFFN.

Yours sincerely,

T. J. Peck

ECE/FAO Agriculture
and Timber Division
attn. Mr. Jorge Najera
Palais des Nation
CH-1211 Geneva
Fax (++41) 22-917 0041

Date: _____

Reply Form

International Forest Fire News

Name: _____

Address: _____

_____

O I wish to receive future issues of IFFN in French (Signature)

Fire Management Experts Needed for Development Projects in Indonesia

Starting in 1993-94 a series of internationally funded fire management projects will be implemented in Indonesia. Main international donors are UNDP/FAO, Germany (GTZ), the European Community, and the USA (US AID, US Forest Service). These fire management projects will be coordinated under the umbrella of a ***"Long-Term Integrated Fire Management Programme"*** initiated in 1992 (see International Forest Fire News No.8, January 1993). International fire specialists with expertise in fire management, fire research, fire policy, fire management-related technologies, etc., will be needed to ensure high-quality professional support for the upcoming projects. Several years of professional international experience are required as well as the willingness to live and work in tropical field conditions. The editor of International Forest Fire News who has been approached by several donors and consulting firms offers to relay names and letters of interest of fire experts to the implementing organizations.

Colleagues interested in working in Indonesia should send a letter of interest and a C/V to the desk of the editor for onward transmission to the recruiting agencies:

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