General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

07

II

1, 2 & 3rd QTRS

E.T. - 10106
CR - 149592

(E77-10106) MONITORING THE EXTENT AND OCCURENCE OF FIRE IN THE DIFFERENT VELD TYPES OF SOUTH AFRICA WITH PARTICULAR REFERENCE TO IT'S ECOLOGICAL ROLE Quarterly (Department of Agricultural Technical G3/43

N77-19549
HC A02
MF A01
Unclas
00106

PROJECT NO 29580

MONITORING THE EXTENT AND OCCURRENCE OF FIRE IN THE DIFFERENT VELD TYPES OF SOUTH AFRICA WITH PARTICULAR REFERENCE TO IT'S ECOLOGICAL ROLE

FOURTH QUARTERLY PROGRESS REPORT

BY

DENZIL EDWARDS

BOTANICAL RESEARCH INSTITUTE

PRIVATE BAG X101, PRETORIA, SOUTH AFRICA

5 September 1976

29580

5th September 1976

Project No. 29580. MONITORING THE EXTENT AND OCCURRENCE OF FIRE IN THE DIFFERENT VELD TYPES OF SOUTH AFRICA WITH PARTICULAR REFERENCE TO ITS ECOLOGICAL ROLE

by Denzil Edwards

(Botanical Research Institute, Department of Agricultural Technical Services, Pretoria, South Africa)

FOURTH QUARTERLY PROGRESS REPORT (inclusive of previous quarterly reports)

1. Introduction

This report presents the progress to date of project 29580 which was designed through the use of Landsat-B imagery to monitor the extent and occurrence of fire in South Africa, paying particular reference to its ecological role and role in veld management. The report should be taken to include previous quarterly reports, which because of various technical and personnel problems were not submitted for reasons later explained.

The progress and results given include mainly the technical aspects of fire distribution and occurrence as found from analysis of all imagery so far received. While certain ecological conclusions and inferences will be made, these are essentially preliminary and incomplete pending further basic correlative work. Some of the actual data given also require some checking, though they may be generally considered within expected tolerance levels.

In terms of the original objectives of the project, this report therefore concentrates upon the location, area of burned vegetation and time of burning, with preliminary indications of the relation of burning to specific veld types in certain areas.

2. Techniques

The interpretation and cartographic techniques used to date are the most simple and unsophisticated ones capable of being applied by personnel with little academic training under supervision. It is hoped to investigate other techniques also.

Using 70mm MSS imagery from bands 5 and 7, the basic approach has been to identify the burnt areas on the satellite imagery and then to transfer the outlines of the burned areas onto a

suitable base map. Once the burned areas have been plotted onto a map certain features, relationships, correlations and inferences can be made. Basic burn information includes, amongst others,

(i) The area of burned vegetation, burn size classes, and density of burns;
(ii) The area of vegetation burned at particular times of the year, that is, the monthly and seasonal development of fire patterns;
(iii) Geographical regions of high and low intensities of burning;
(iv) The relationship of burning to the national Veld Types. vegetation map.

Identification of burnt areas has been done by direct visual interpretation of the 70mm imagery, using as a constant check the visual appearance on an International Imaging Systems Mini-Addcol Additive Colour Viewer Model 6020. Unfortunately, late receipt of imagery has prevented some direct ground checking where it would have been desireble.

The chief problems encountered in interpreting burns were in areas where black and very dark coloured soils, especially when freshly ploughed, are found. Interpretation is particularly difficult in intensively cultivated areas where there is a mosaic of relatively small areas of cultivation and burn patches in the intervening areas. Fortunately, from a practical viewpoint, the problem is not too serious in that such areas are of less interest from a range management view. Also, less significance is generally attached to the occurrence of small burns because of the lower reliability of interpretation and estimation. It is also interesting to note that this problem did not arise in the original test study done on the ERTS-1 imagery for Natal where such soils are of limited extent (see M.L. Jarman, Preliminary assessment of veld burning patterns in Natal from ERTS-1 imagery. Type III Report for Period July 1972 to November 1973. in O.G. Malan, Special Rept Fis 50.)

The outlines of burned areas have been transferred directly from the 70mm, usually band 7 MSS images, onto overlays of the standard 1:250 000 SA Topo Series maps, or when not available, the standard 1:250 000 SA Topocadastral Series maps which

are slightly less accurate. A Bausch & Lomb Model 7T-4 Zoom Transfer Scope that has been used for this purpose has saved considerable time and cost in not requiring enlargement of the 70mm imagery. A minor modification facilitating the transfer work has been achieved through fitting an easily removable microscope sub-stage so that systematic scanning in X and Y directions is possible. The negative 70mm image has often been found more convenient to use because the generally lighter grey toned band 7 infra red image is easier to orient on the map than the darker toned positive. Diazochrome false colour composites have not been used in practice although they will have value in certain areas of difficult orientation that may be found in the future.

The areas of each individual burn have been measured from the 1:250 000 overlays, using either a dot grid or planimeter.

To determine the relationship of the burned areas to veld type, the national 1:1 500 000 Veld Types of South Africa by Acocks has been enlarged to 1:250 000 scale, thereby allowing direct comparison of the 1:250 000 burn overlays with veld type. Although enlargement of the small scale 1:1 500 000 veld types map to the larger scale is not a desirable practice, the original map is a remarkably accurately drawn one and no satisfactory alternatives exist. Obvious errors can be fairly easily corrected. The area of each veld type is determined for each image by dot grid or planimeter. Since burns often cross veld type boundaries, the areas burned for each veld type must be separately determined.

3. Accomplishments

Sixty-five Landsat-B images have been analysed for fire occurrence in the eastern summer rainfall part of South Africa and fire occurrence plotted on 1:250 000 overlays. While somewhat time-consuming and tedious, the unsophisticated and simple techniques used are yielding expected results in ascertaining fire patterns on the broad scale only possible by the use of repetitive satellite imagery.

Preliminary results with the available imagery show the

highest intensities of burning in the savanna type vegetation and adjoining grasslands of the eastern, southern and western Transvaal. A local area of high burning intensity has also been found in the coast and semi-coast vegetation of the Transkei.

Burning intensity is very low or absent for the dry Karoo and adjoining Karoo-grassland transitions, despite the favourable season preceding that resulted in an exceptionally higher than normal grass cover. The possibility of unusual widespread burns was thus not realized for these regions.

A significant preliminary finding is that when expressed on the basis of mean daily increase in burnt area, values for different scenes range through the dry season from a mean daily increase in burnt area of 252,6 ha/day to a mean of 2062,5 ha/day, with an overall average mean daily increase of 613,5 ha/day for 12 scenes over a five month period.

Preliminary data show that very large burns account for veld types with the highest amount of burning, from 10% to 19% of the image area of these veld types having been burnt by the end of the dry season. Less than 1% of the area of other vegetation types may show evidence of burning, and the expected large variation in burning between vegetation types is so far confirmed.

A high number of burns has been found on certain scenes to be associated with the peripheral areas of a major urban complex. This may be interpreted as a high fire risk associated with a high population density.

4. Significant results

Basic data on burned areas for 34 scenes comprising all 65 images received are given in Table 1, while Tables 2 and 3 summarize fire pattern development from consecutive 18-day and monthly images. The distributions of the 34 scenes and scenes with consecutive imagery are shown in Figs 1 and 2. Data for burning in relation to veld types is given in Tables 4 and 5 for nine images of four scenes in the Transvaal province.

a) Geographic variation in intensity of fire pattern

The available imagery shows the highest amount of burned

area to be in the western, southern and eastern Transvaal and in one scene of the Transkei coast region. The percentage of burned area per image in all instances exceeds 1,4%, reaching a maximum of 8,24%, equivalent to 121 758 ha out of 1 476 540 ha of one image in the eastern Transvaal lowveld. Within this general area, images from Pretoria westwards and northwards to the Botswana border show a consistently high degree of burning ranging from 2,4% to 4,05% of the image areas. Unfortunately imagery of the four north central Transvaal scenes is all for the early part of the fire season or during wet midsummer. It is thus not possible from the available imagery to ascertain whether the north and central Transvaal has the same or a different fire intensity pattern as the surrounding high intensity area, though there is a suggestion from the seasonal fire development pattern that the area may have a similar high degree of burning.

Eight scenes almost entirely in the dry Karoo and marginal Karoo-grassland transition in the central and south central part of South Africa show no evidence of fire during the dry season up to the end of October. Three scenes for which images are only available for the wet season are excluded from consideration here.

b) Seasonal fire development pattern

As clearly shown in Tables 1, 2 and 3 in all scenes showing burning for which repeated imagery is available, there is a consistent increase in the amount of burnt area on the images from July through to the end of October, one scene showing a maximum for November and one scene a small decline from 30 July to 22 September. From October onwards there is a decrease in burned area so that during December there is none or very little burning evident.

Expressed on the basis of mean daily increase in burnt area, values range from a mean 252,6 ha/day to a mean 2062,5 ha per day, with an average mean daily increase of 613,5 ha/day for the 12 scenes showing an increase in burned area during the dry season. A number of the highest rates of mean daily increase correspond with the high fire intensity

area of the Transvaal, but many fall outside this area. It is evident that some images, such as for scene 182-82 of the Queenstown area, show a high mean daily increase due to accidental fires during July, whereas in the Transvaal high fire intensity area a high mean daily burn increase could be expected throughout the fire season.

In general, the seasonal fire development pattern is the one expected, but for the first time an indication is gained of the mean daily increase in burnt area through the dry fire period over a wide area. Spatial and chronological gaps in the imagery make a precise general interpretation difficult at this stage of the investigation.

c) Fire patterns in veld types

Four scenes comprising nine images show burning according to the twelve veld types represented on the imagery. Considerable variation is evident in the burning between different veld types, between 10% and 19% of the Mixed, Sourish-mixed and Sour Bushveld types (veld types 18, 19 and 20) is burnt, but in other veld types the percentage burnt area may be less than 1%.

Table 5 shows the expected increase in the number of burns shown on the imagery towards the end of the dry fire season. Small burns of less than 500 ha are prevalent in the veld types, but if Table 4 is compared, a few large burns account for the large area burned in veld types 18, 19 and 20 with the largest area burnt.

Certain images and veld types, such as the Bankenveld grassland (veld type 61) have a very high number of burns, which in the case of scene 182-78 is associated with the peripheries of the sprawling Pretoria-Witwatersrand urban complex.

Establishment of the high burning intensity in the Transvaal Bushveld and Lowveld savanna type vegetation will be a significant feature because of the recent trend in range management concepts to eliminate burning as a range procedure. Not only will it indicate the current extent and degree of burning, but also the specific areas where burning appears to be a current practice.

5. Publications

Brief report on project with section of image showing fires in western Transvaal for 1975/76 Annual Report of Department of Agricultural Technical Services (in press).

6. Problems

The chief problem found in carrying out the work according to schedule was due to intrument delivery. In designing the project a Zoom Transfer Scope was called for. In anticipation of its use the instrument was ordered through the local agency during June 1974. The instrument was finally delivered from Bausch & Lomb to be received here in October 1975, after the first sets of imagery were received. The continual delaying of delivery was supposedly due to lack of a U.S. export permit, despite repeated details and assurances given to the firm of the specific use of the instrument for the Landsat project. Consequent upon the delay, no personnel training, preparatory and other correlative work associated with use of the instrument could be carried as was originally planned for the six month period before imagery would be received. All this preparatory work has had to be done during the operational phase of the project, and since much of it is testing is, in terms of project results, unproductive.

Another contributing factor has been that as supervisor and investigator I have this year had to maketwo unscheduled absences from office totalling nearly two and one half months.

7. Data quality and delivery

Image quality has generally been found to be very good and superior to that of ERTS-1.

The chief problems associated with the imagery are related to delivery time and to coverage. June and July imagery were thus received at the end of September, the end of the dry season and burning and when in many parts rapid vegetation growth is occurring. Although the delivery time lag has been off-set by the intrument-training-preparatory work delay in the project as a whole, the original concept that early delivery would permit necessary ground checking

and would enable fire maps to be provided reasonable soon after the fire events to the agricultural extension services, has proved impossible due to delivery time.

Coverage received to date while excellent for certain scenes is chronologically and spatially too irregular for adequate comprehensive monitoring to be carried out. Because of the large area covered by images there is considerable variation in fire pattern so that interpolation and extrapolation is not considered reliable at this stage without an adequate data base. Notable gaps in spatial coverage exist for WRS orbits 180 and 183 and for the lower parts 181-83, 182-83 and 183-84. Orbit 183 covering Natal is specially important because of the known high fire intensity in Natal where I have had ground check controls waiting. Orbit 183 is of interest because of its geographical position between the drier west Karoo and wetter eastern grassland and the major agricultural activity in much of the area. Lack of imagery for scenes 181/182/183-83-84 has also missed an unusual large forest fire as well as other unique information.

The chronological and spatial coverage problem means that the objective of obtaining a comprehensive and complete analysis of fire distribution and development will not be achieved with the imagery on hand. It is for instance not possible to confirm the extent of the high intensity Transvaal fire pattern, nor to compare it with the known high intensity pattern for Natal.

Although in terms of the Provisions for Participation for ERTS Follow-on Programme, provision does not appear for coverage of the Southwestern Cape Province, there is here a different seasonal and image character of the fire pattern. It would be desirable to have some imagery for this area where fire is becoming a regional management priority under the winter rainfall dry inflammable summer chapparal type fynbos mountain vegetation. There are also developing needs because of economic developments for land and land use information.

8. Recommendations

(a) If the basic objective of obtaining a complete and comprehensive

picture of fire occurrence over at least the eastern part of South Africa, complete scene coverage is necessary with consistent 36 to 54 day coverage, especially for the period from March to November.

(b) No imagery is yet available here for detecting fire development in the late summer-autumn period from March to June, so that virtually nothing is known of fire occurrence at the beginning of the fire season.

(c) Imagery has been received from June(one) 1975 to January 1976. To obtain an adequate picture of fire occurrence a minimum of one years imagery would be required and, most desirably if points (a) and (b) are borne in mind, of an eighteen month period.

(d) If real time use of the monitoring capability of satellite imagery is to be made use of, a very rapid delivery time is needed, of the order obtained from a local receiving station.

9. Conclusions

Considerable local interest has been found in the Landsat fire project and this is also stimulating use in other fields, such as hydrology and land use. There is clear evidence that a slow appreciation of the various use possibilities of satellite imagery is engendered by the seen use and availability of satellite images.

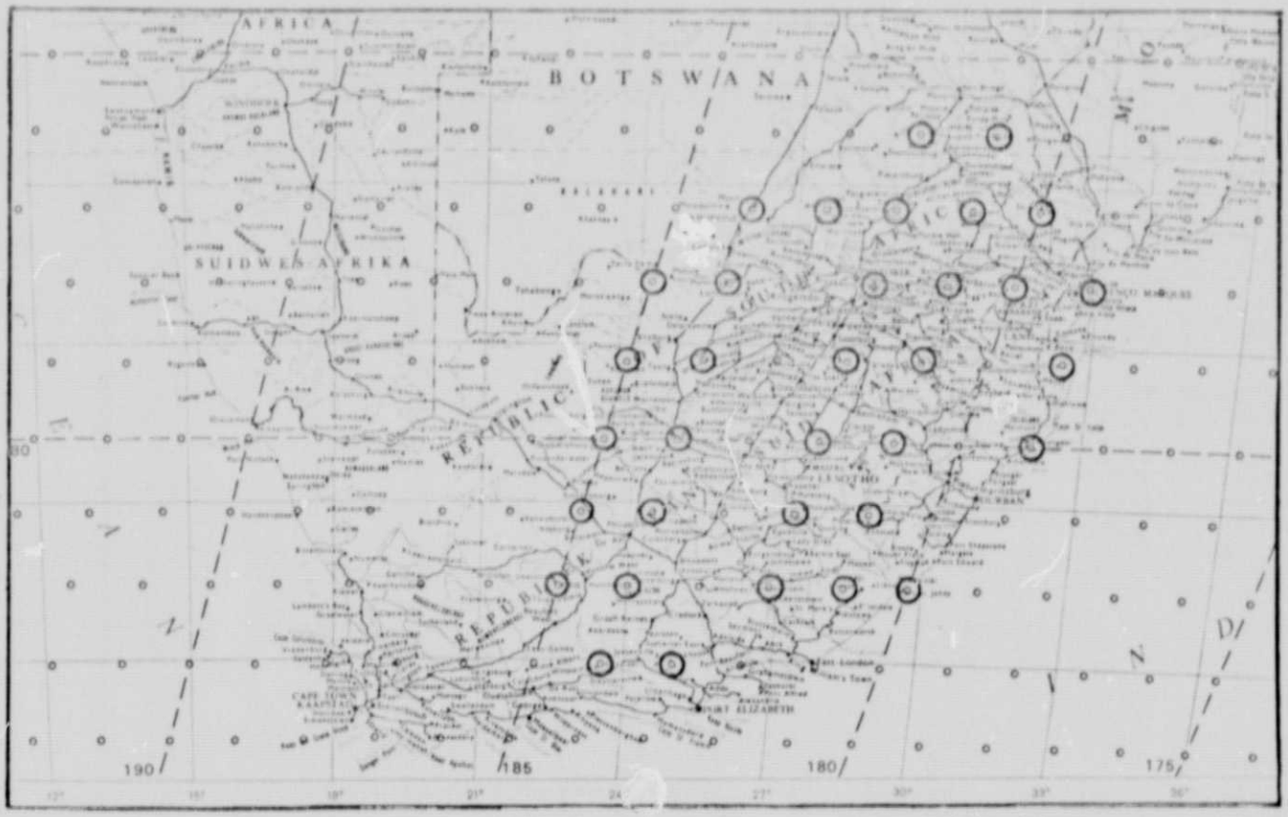

Fig. 1. Distribution of all Landsat scenes over South Africa.

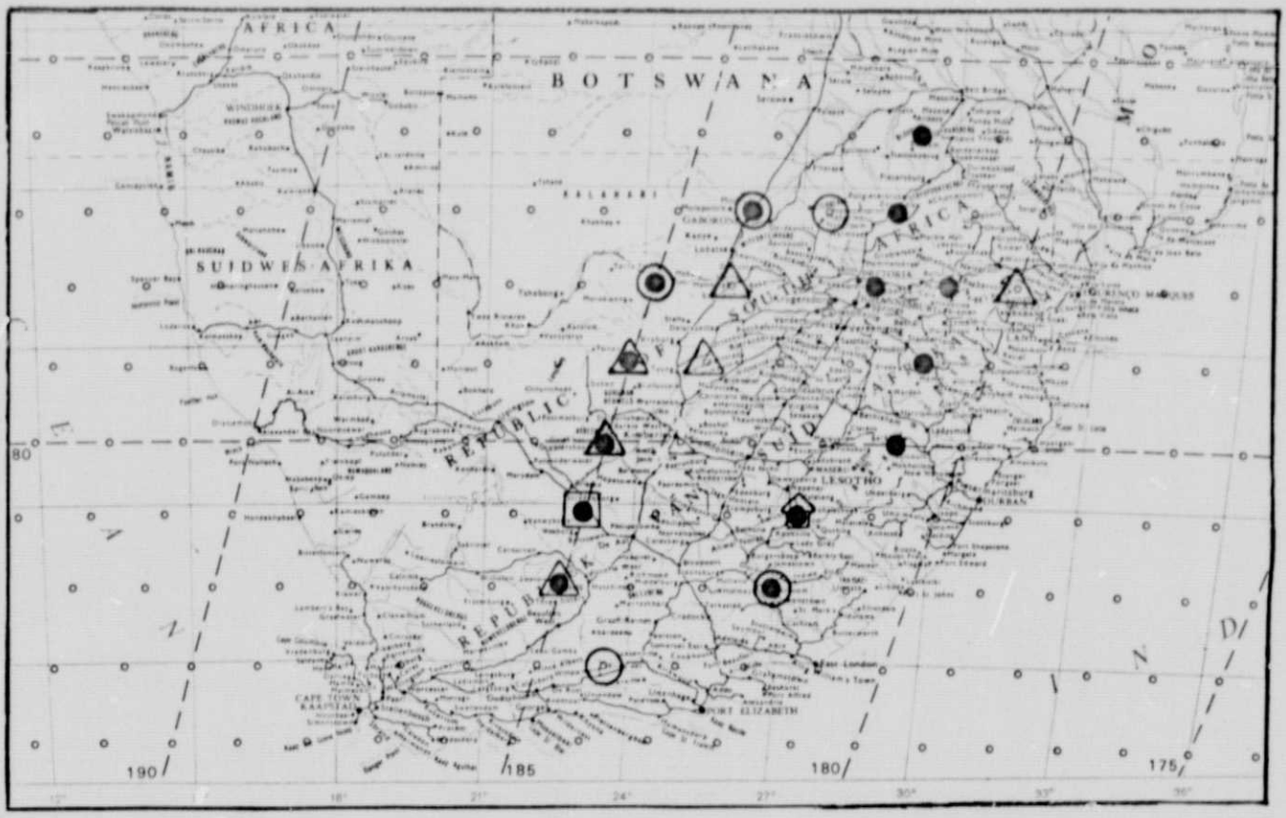

Fig. 2. Distribution of consecutive 18-day and monthly Landsat images over South Africa. ● = consecutive 18 days; ○ = consecutive 2 months; △ = consecutive 3 months; □ = consecutive 4 months; ⬠ = consecutive 5 months.

TABLE I ANALYSIS OF ALL IMAGES GIVING AREAS BURNT IN HA AND % OF PAGE AREA

W.R.S. NO	DATE	USABLE IMAGE HA	BURNT AREA HA	BURNT / IMAGE x 100
179-80	23 JAN.	1721850	0	0
180-77	20 SEP.	1476540	121758	8,24
180-78	20 SEP.	1476306	7956	0,50
180-78	13 NOV.	1403922	24258	1,80
180-82	15 AUG.	110338	15132	1,40
181-76	7 JAN.	2968914	2262	0,08
181-77	11 JUL.	2851446	3666	0,12
181-78	11 JUL.	3233100	15210	0,47
181-78	29 JUL.	3168906	60684	1,91
181-79	11 JUL.	3289338	6084	0,18
181-79	29 JUL.	2850042	22230	0,77
181-80	11 JUL.	2176356	7878	0,06
181-80	29 JUL.	2238522	18018	0,80
181-81	11 JUL.	2118558	14976	0,70
181-82	11 JUL.	3063996	12636	0,40
182-76	12 JUL.	2792868	312	0,01
182-76	30 JUL.	3193008	7644	0,23
182-77	12 JUL.	3258684	8346	0,25
182-77	30 JUL.	3279120	21372	0,65
182-78	12 JUL.	3283098	56862	1,73
182-78	30 JUL.	3280914	93988	2,86
182-79	12 JUL.	3290742	9594	0,29
182-80	22 SEP.	2378532	11622	0,48
182-81	12 JUL.	2129088	0	0
182-81	30 JUL.	1998204	0	0
182-81	22 SEP.	1812720	0	0
182-81	28 OCT.	1989156	0	0
182-81	3 DEC.	2117934	0	0
182-81	8 JAN.	2147184	0	0
182-82	12 JUL.	3300570	7722	0,23
182-82	30 JUL.	3300570	22386	0,69

W.R.S. NO	DATE	USABLE IMAGE HA	BURNT AREA HA	BURNT / IMAGE x 100
182-82	22 SEP.	3264066	21372	0,65
183-77	25 J. N.	326820	4290	0,13
183-77	29 OCT.	3175770	128934	4,05
183-83	18 AUG.	2775084	0	0
184-77	1 AUG.	2049422	37128	1,81
184-77	19 AUG.	2072462	49058	2,36
184-77	6 SEP.	2023102	56258	2,78
184-78	1 AUG.	2786784	14674	0,52
184-78	6 SEP.	2745600	66123	2,4
184-78	23 DES.	2634840	1482	0,05
184-79	1 AUG.	3310242	9672	0,29
184-79	6 SEP.	3317964	18720	0,56
184-79	23 DES.	3347682	-	-
184-80	1 AUG.	3149098	3822	0,12
184-81	1 AUG.	2496156	0	0
184-82	17 NOV.	3336606	0	0
184-83	17 NOV.	3222570	1248	0,03
184-83	10 JAN.	3314142	0	0
185-78	18 NOV.	2204592	0	0
185-78	26 DES.	2280408	0	0
185-79	15 JUL.	3301818	2340	0,07
185-79	18 NOV.	3320850	0	0
185-79	6 DES.	3252288	0	0
185-80	15 JUL.	3303222	0	0
185-80	18 NOV.	3357432	0	0
185-80	6 DES.	3272802	0	0
185-81	15 JUL.	3248934	0	0
185-81	18 NOV.	3244722	0	0
185-81	6 DES.	3309774	0	0
185-81	29 JAN.	3332004	0	0
185-82	15 JUL.	3279510	0	0
185-82	6 DES.	3353064	0	0
185-82	11 JAN.	3354624	0	0
185-82	29 JAN.	3329742	0	0

TABLE 2: MONTHLY FIRE DEVELOPMENT PATTERN AS % OF IMAGE AREA
(Based on image showing maximum for month)

WRS No	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan
180-78				0,50		1,80		
182-81		0		0	0		0	0
182-82		0,69		0,65				
183-77	0,13				4,05			
184-77			2,36	2,78				
184-78			0,52	2,40			0,05	
184-79			0,29	0,56			0	
184-83						0,03		0
185-78						0	0	
185-79		0,07				0	0	
185-80		0				0	0	
185-81		0				0	0	0
185-82		0					0	0

TABLE 3: 18 DAY FIRE DEVELOPMENT PATTERN AS % OF IMAGE AREA

WRS No	11 Jul	12 Jul	29 Jul	30 Jul	1 Aug	19 Aug	6 Sept	18 Nov	6 Dec	11 Jan	29 Jan
181-78	0,47		1,91								
181-79	0,18		0,77								
181-80	0,06		0,81								
182-76		0,01		0,23							
182-77		0,25		0,65							
182-78		1,73		2,86							
182-81		0		0							
182-82		0,23		0,69							
184-77					1,81	2,16	2,78				
185-78								0	0		
185-79								0	0		
185-80								0	0		
185-81								0	0		
185-82										0	0

TABLE 4: TOTAL AREAS BURNT IN ha AND % FOR EACH VELD TYPE REPRESENTED ON IMAGES

Veld Type	Burn Area	IMAGE NUMBER AND DATE								
		182-77		182-78		184-77			184-78	
		12 Jul	30 Jul	12 Jul	30 Jul	1 Aug	19 Aug	6 Sept	1 Aug	6 Sept
12	ha	2262	4524							
	%	0,5	1,0							
13	ha			2574	4134	29250	40322	36192	2499	5624
	%			6,0	11,1	4,8	7,1	6,4	2,9	3,2
14	ha						468	156		
	%						0,3	0,09		
16	ha					468	390			
	%					1,1	0,9			
18	ha	3666	6864	9126	17472	3276	3900	6006	2187	6873
	%	0,4	0,7	1,8	3,8	1,5	1,8	2,7	3,2	10,2
19	ha	312	3354	10608	26675	3744	3588	11934	2812	18979
	%	0,09	1,0	1,9	5,4	3,6	5,8	19,1	0,7	5,4
20	ha	1170	4602	78	156	390	390	1950		156
	%	0,2	0,8	0,4	1,1	3,1	3,0	15,0		2,1
48	ha			3120	2885					
	%			1,1	1,3					
52	ha			720	5616					
	%			0,2	1,1					
55	ha			720						
	%			1,2						
61	ha			21294	27534				234	11481
	%			2,0	2,5				0,2	8,4
67	ha	936	2028							
	%	1,2	4,1							

TABLE 5 : NUMBER OF BURNS IN VARIOUS AREA CLASSES FOR VELD TYPES

Veld Type	Burn* Class	IMAGE NO AND DATE								
		182 - 77 12 JUL	30 JUL	182 - 78 12 JUL	30 JUL	184 - 77 1 AUG	19 AUG	6 SEP	184 - 78 1 AUG	6 SEP
12	1	7	15							
	2	1	1							
	3	0	0							
	4	0	0							
	5	0	0							
	Total	8	16							
13	1			1	4	12	15	19	3	9
	2			1	2	4	4	3	2	3
	3			1	0	0	1	1	0	1
	4			0	1	0	2	6	0	0
	5			0	0	2	3	2	0	0
	Total			3	7	18	25	31	5	13
14	1						1	1		
	2						0	0		
	3						0	0		
	4						0	0		
	5						0	0		
	Total						1	1		
16	1					2	1	0		
	2					0	0	0		
	3					0	0	0		
	4					0	0	0		
	5					0	0	0		
	Total					2	1	0		
18	1	11	17	22	21	3	6	4	2	8
	2	2	2	4	3	1	1	2	0	0
	3	0	1	1	1	1	0	1	1	2
	4	0	0	0	2	0	1	1	0	1
	5	0	0	0	1	0	0	0	0	0
	Total	13	20	27	28	5	8	8	3	11

* Burn Class 1 = 0-500 ha 3 = 1000-2000 ha 5 = over 4000 ha
2 = 500-1000 ha 4 = 2000-4000 ha

TABLE 5 : NUMBER OF BURNS IN VARIOUS AREA CLASSES FOR VELD TYPES

Veld Type	Burn Class	IMAGE NO AND DATE								
		182 - 77 12 JUL	30 JUL	182 - 78 12 JUL	30 JUL	184 - 77 1 AUG	19 AUG	6 SEP	184 - 78 1 AUG	6 SEP
19	1	2	5	10	18	6	5	2	6	8
	2	0	2	3	9	1	1	1	1	2
	3	0	1	2	3	1	1	2	0	7
	4	0	0	0	1	0	0	0	0	1
	5	0	0	1	2	0	0	1	0	1
	Total	2	8	16	33	8	7	6	7	19
20	1	1	5	1	1	1	1	0	0	1
	2	1	2	0	0	0	0	0	0	0
	3	0	1	0	0	0	0	1	0	0
	4	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0
	Total	2	8	1	1	1	1	1	0	1
48	1	0	0	3	6					
	2	0	0	3	2					
	3	0	0	0	1					
	4	0	0	0	0					
	5	0	0	0	0					
	Total	0	0	6	9					
52	1			1	5					
	2			1	4					
	3			0	2					
	4			0	0					
	5			0	0					
	Total			2	11					
61	1			19	41				1	3
	2			4	4				0	0
	3			2	4				0	2
	4			1	0				0	1
	5			1	1				0	1
	Total			27	50				1	7

TABLE 5 : NUMBER OF BURNS IN VARIOUS AREA CLASSES FOR VELD TYPES

Veld Type	Burn Class	IMAGE NO AND DATE								
		182 - 77		182 - 78		184 - 77			184 - 78	
		12 JUL	30JUL	12 JUL	30 JUL	1 AUG	19 AUG	6 SEP	1 AUG	6 SEP
55	1			0	0					
	2			1	0					
	3			0	0					
	4			0	0					
	5			0	0					
	Total			1	0					
67	1	0 0	5							
	2	1	0							
	3	0	1							
	4	0	0							
	5	0	0							
	Total	1	6							