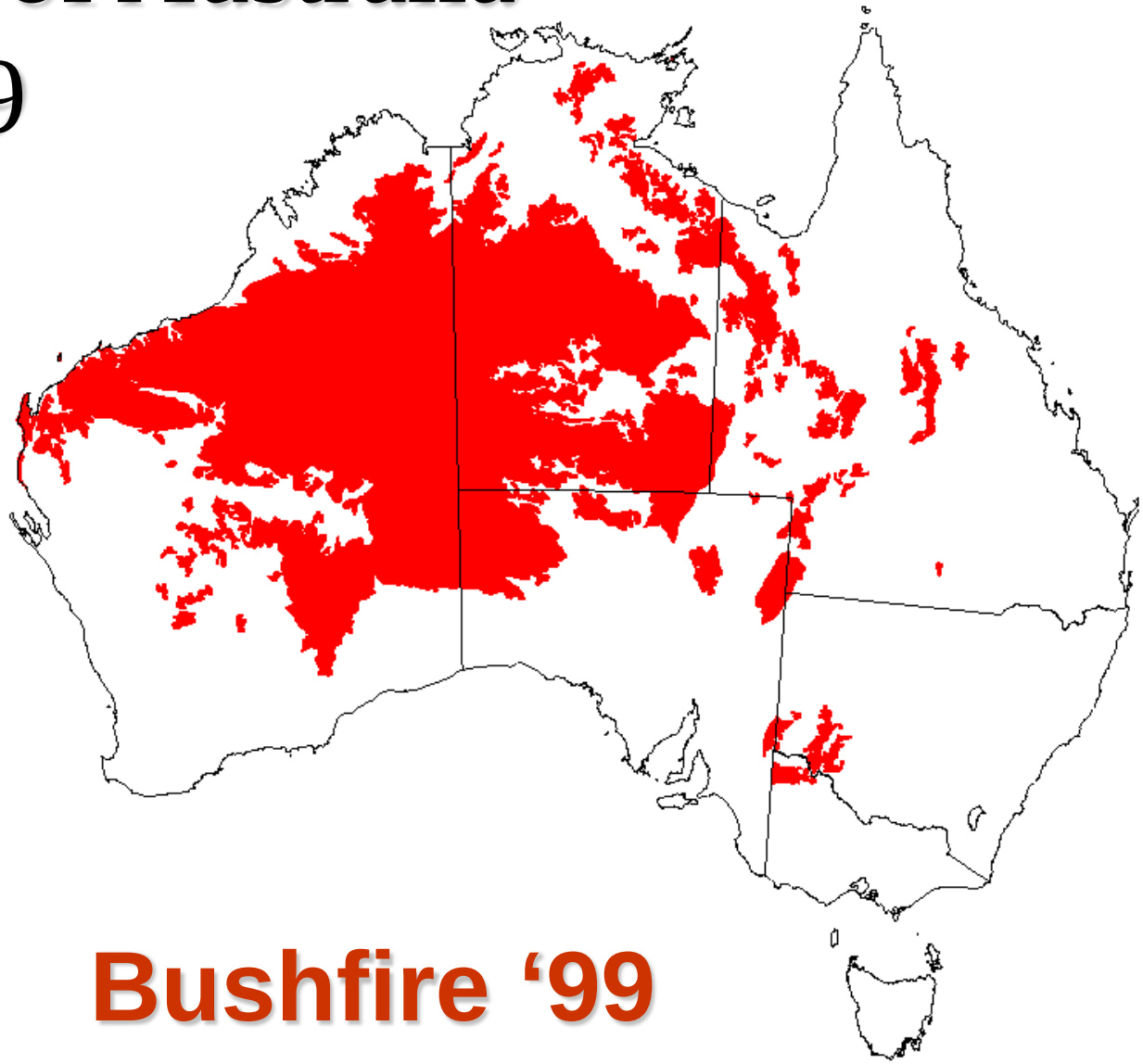
An Overview of Fire in Central Australia

1982 to 2004

Grant Allan
Bushfires Council NT
Alice Springs Australia

BUSHFIRES COUNCIL NT

Fire Regimes in the Spinifex Grasslands of Australia 1982 - 1999



Bushfire ‘99

Spinifex species and communities

- 64 species of *Triodia*,
- 2 species of *Symplectrodia*, and
- 1 species of *Monodia*

(Lazarides 1997).

7 major community alliances

The most widespread are:

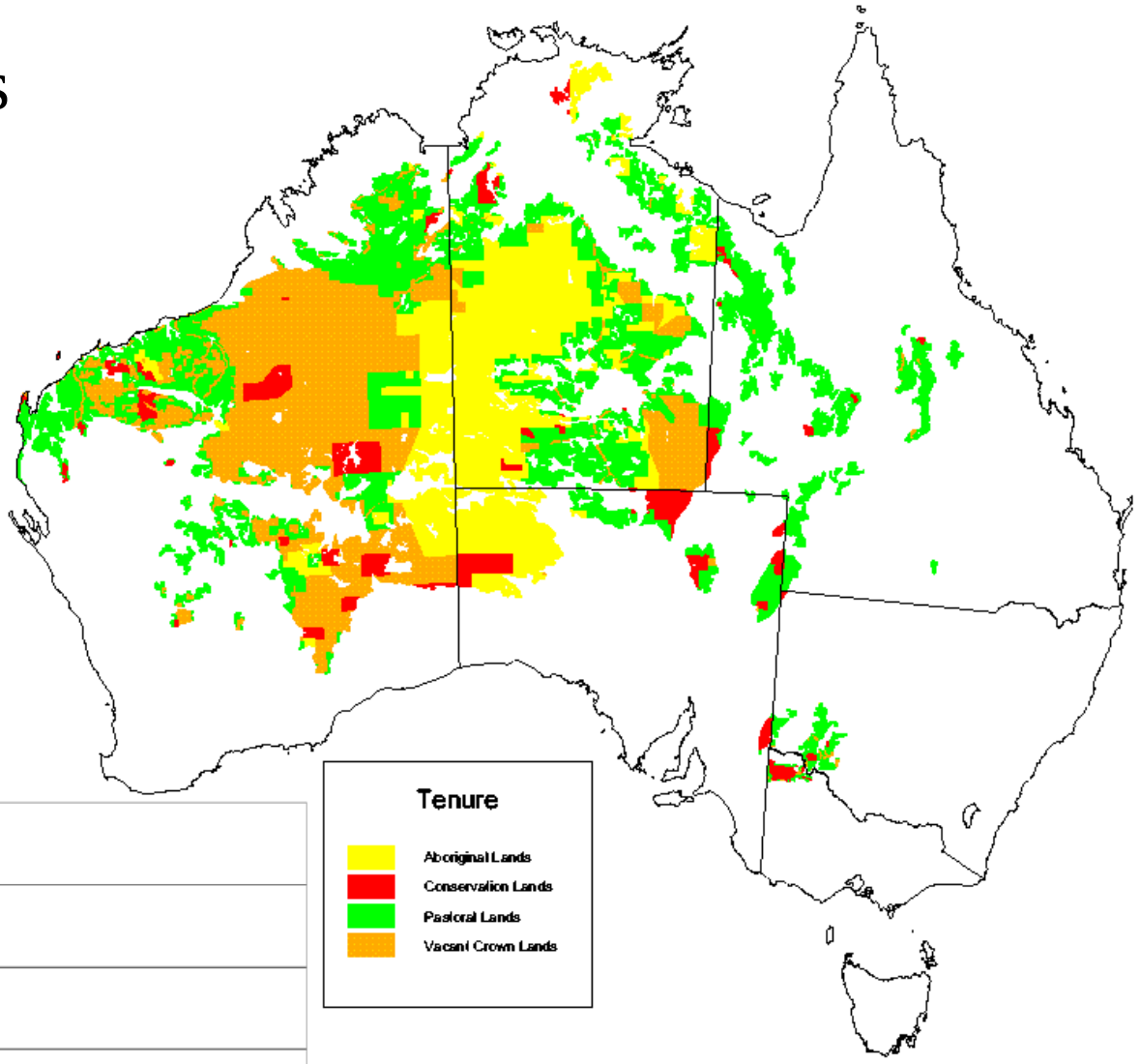
- *Triodia pungens* and *T. schinzii*,

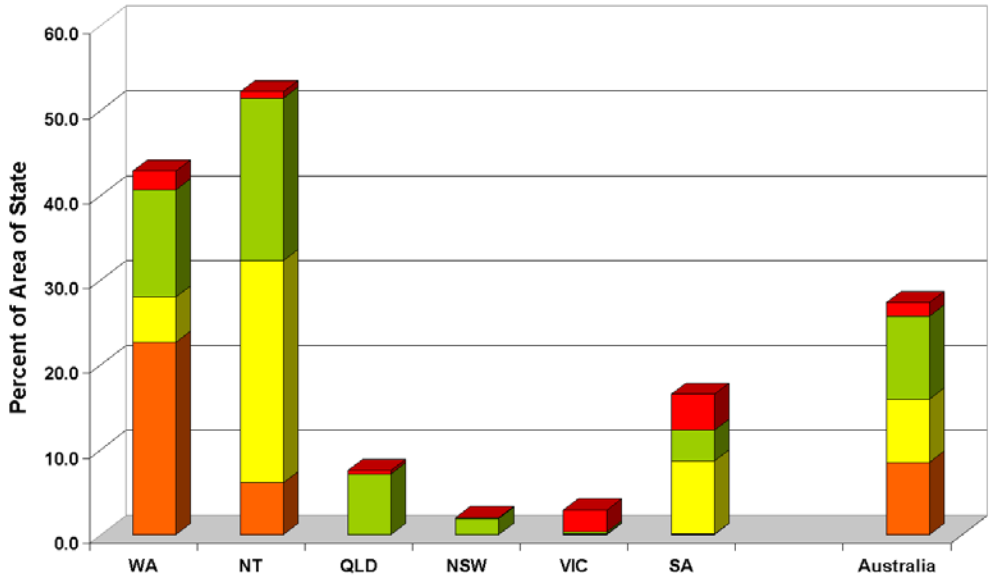
and

- *Triodia basedowii.*

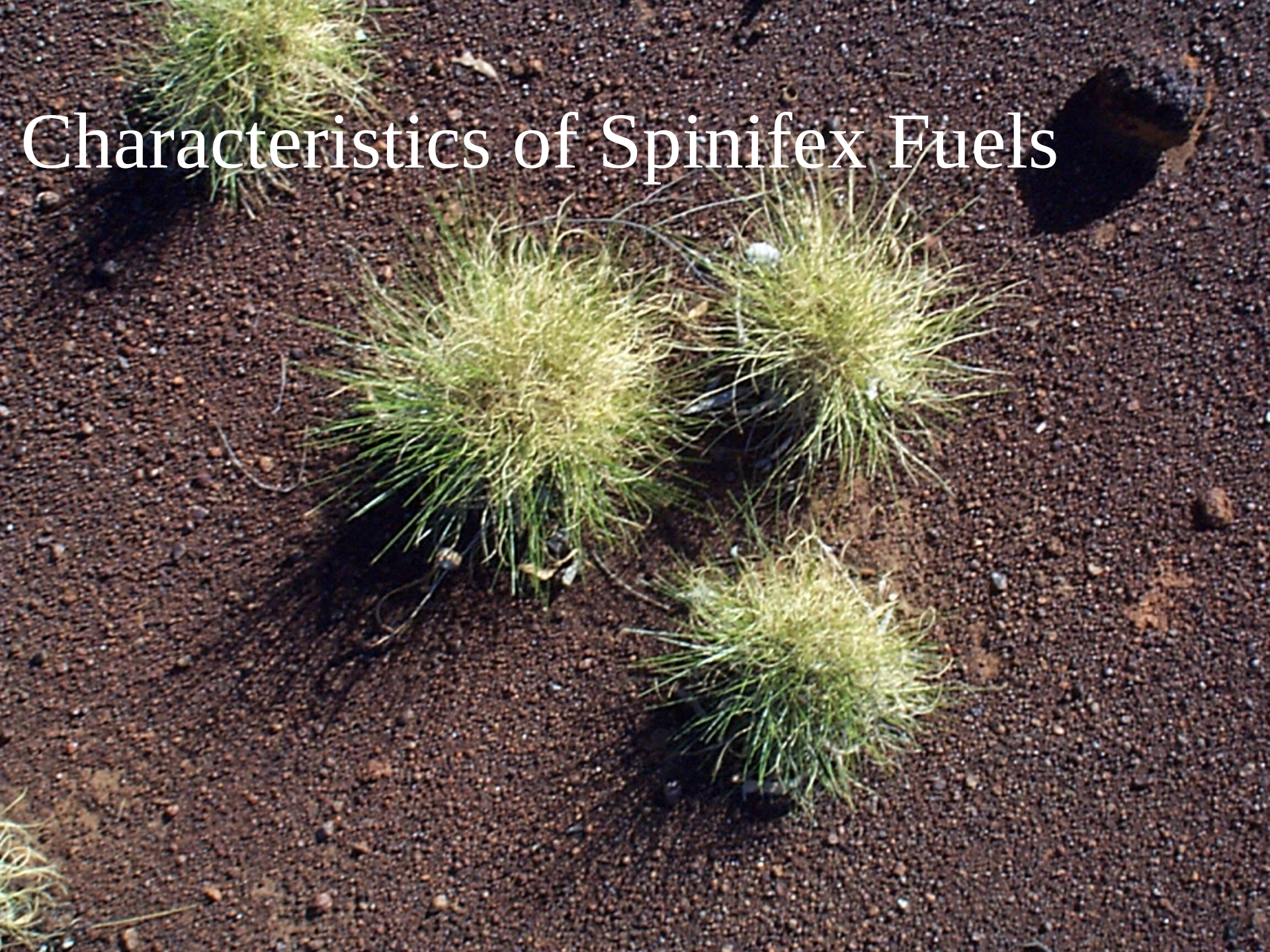
Spinifex Grasslands of Australia

stratified by land tenure

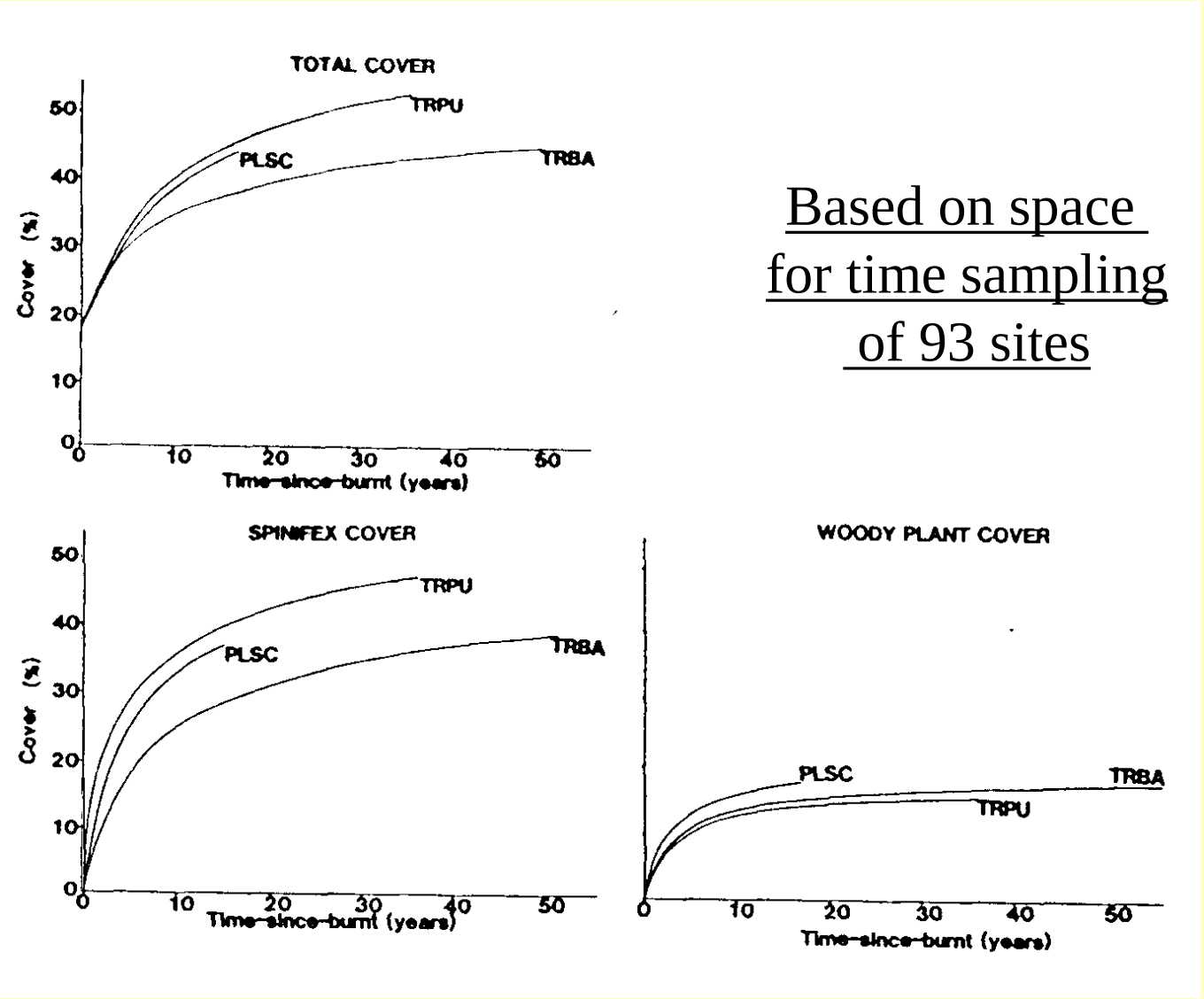




Characteristics of Spinifex Fuels



Rate of post fire recovery varies by species



Based on space for time sampling of 93 sites

Griffin, Morton, Allan and Fleming (1990)

Total Cover

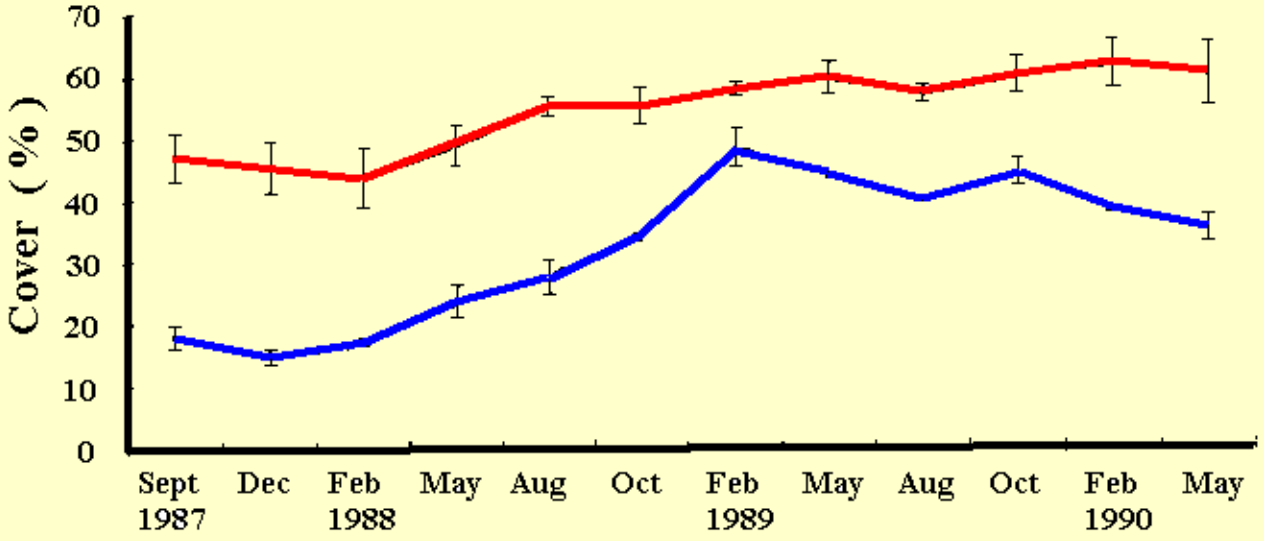


Fig. 1. The mean (± s.e.) vegetation cover on the plots burnt in 1986 ( ) compared with that on the 1976 plots ( ).

Spinifex Cover

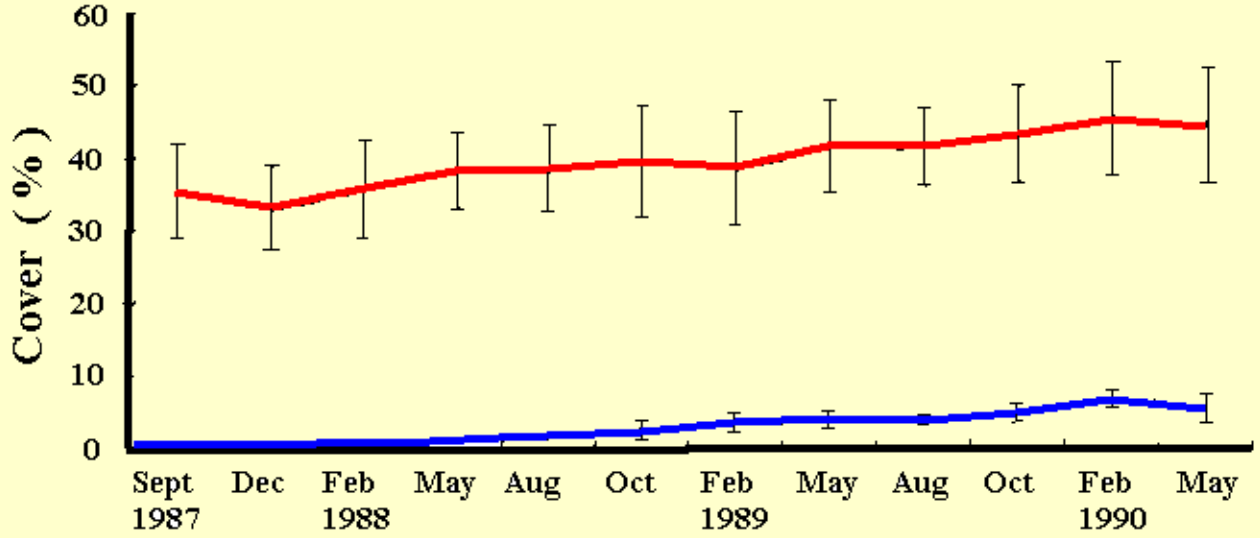
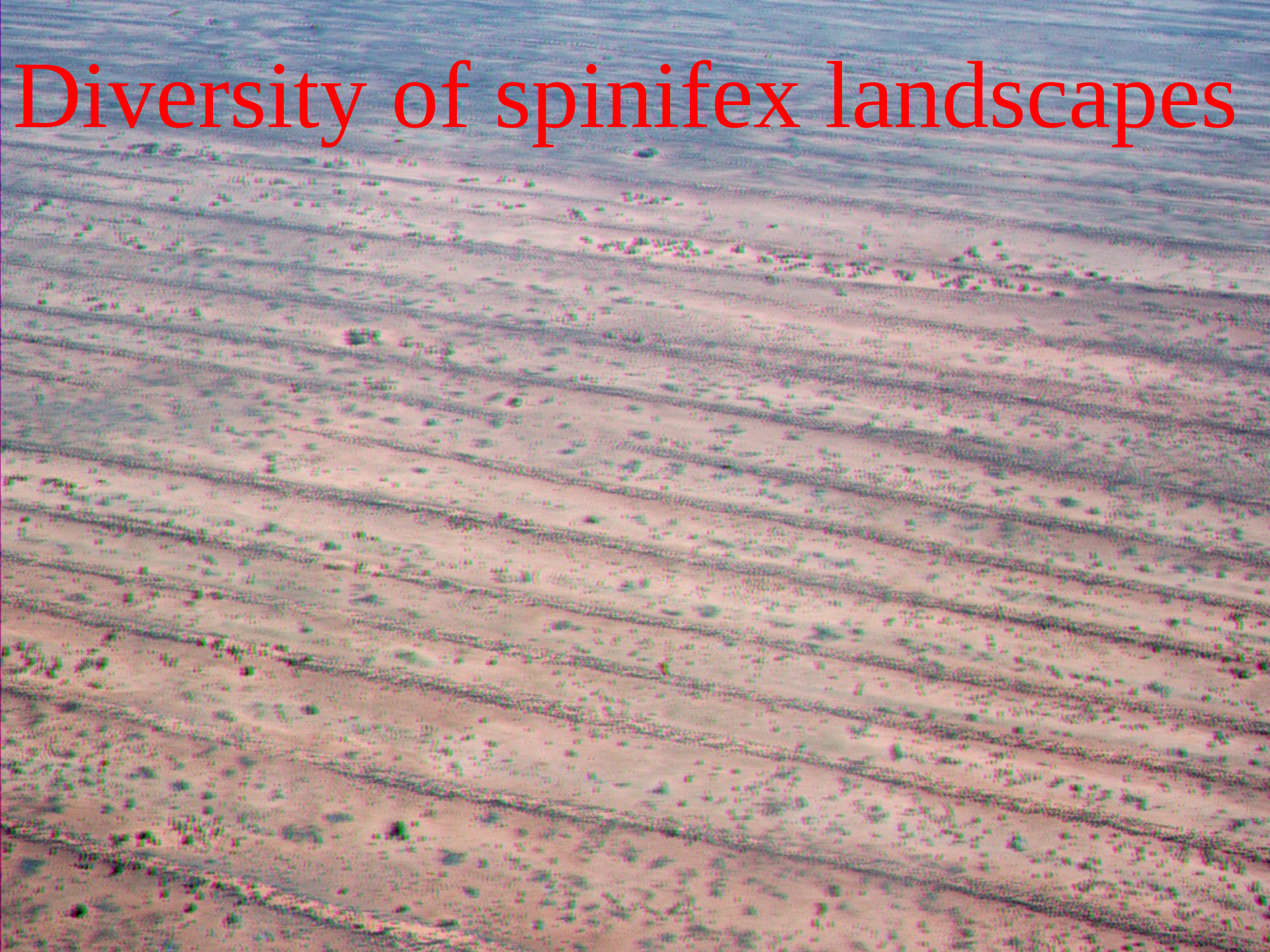
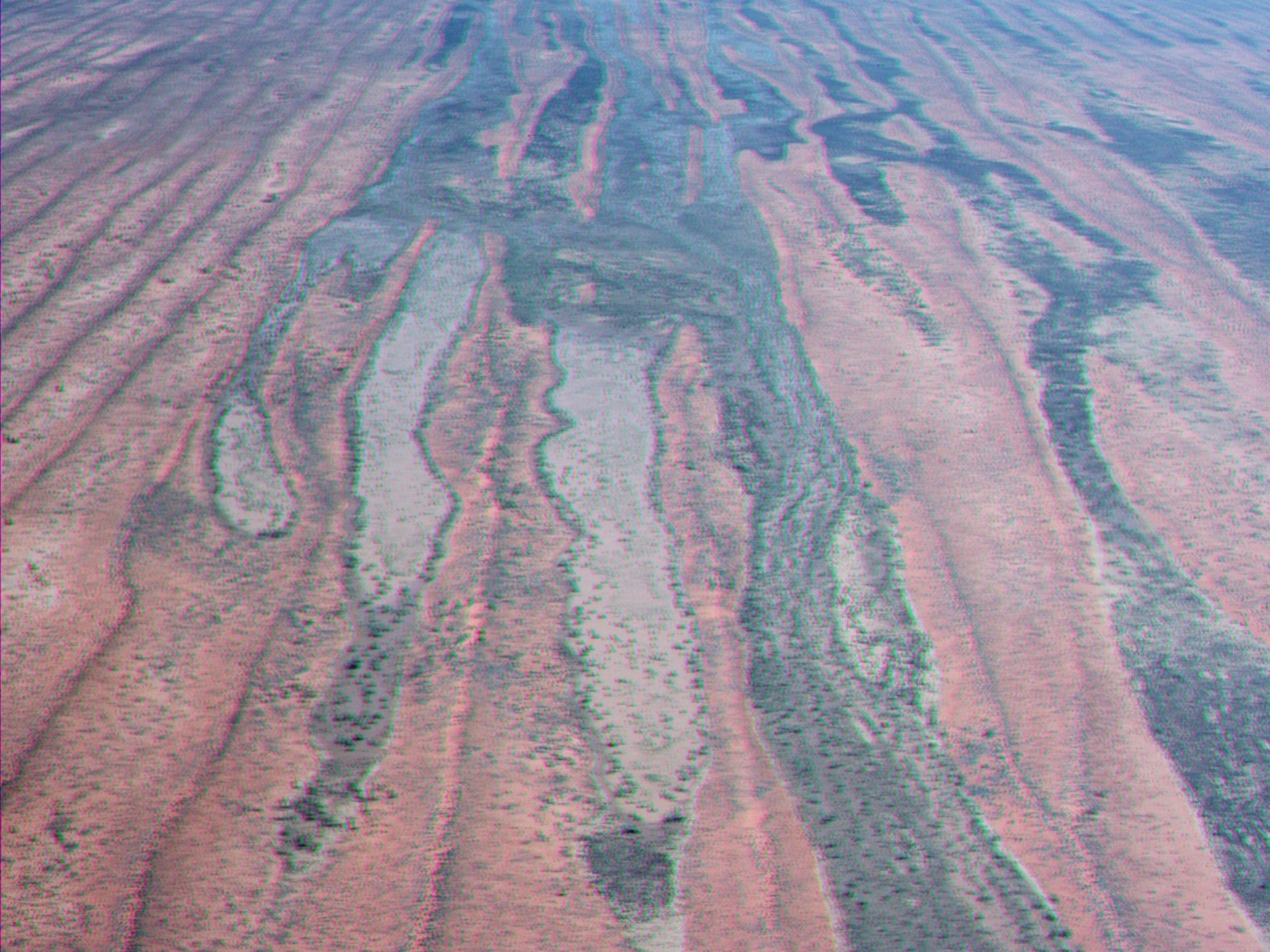


Fig. 2. The mean (± s.e.) spinifex cover on the plots burnt in 1986 ( ) compared with that on the 1976 plots ( ).

Source: Masters 1993

Diversity of spinifex landscapes





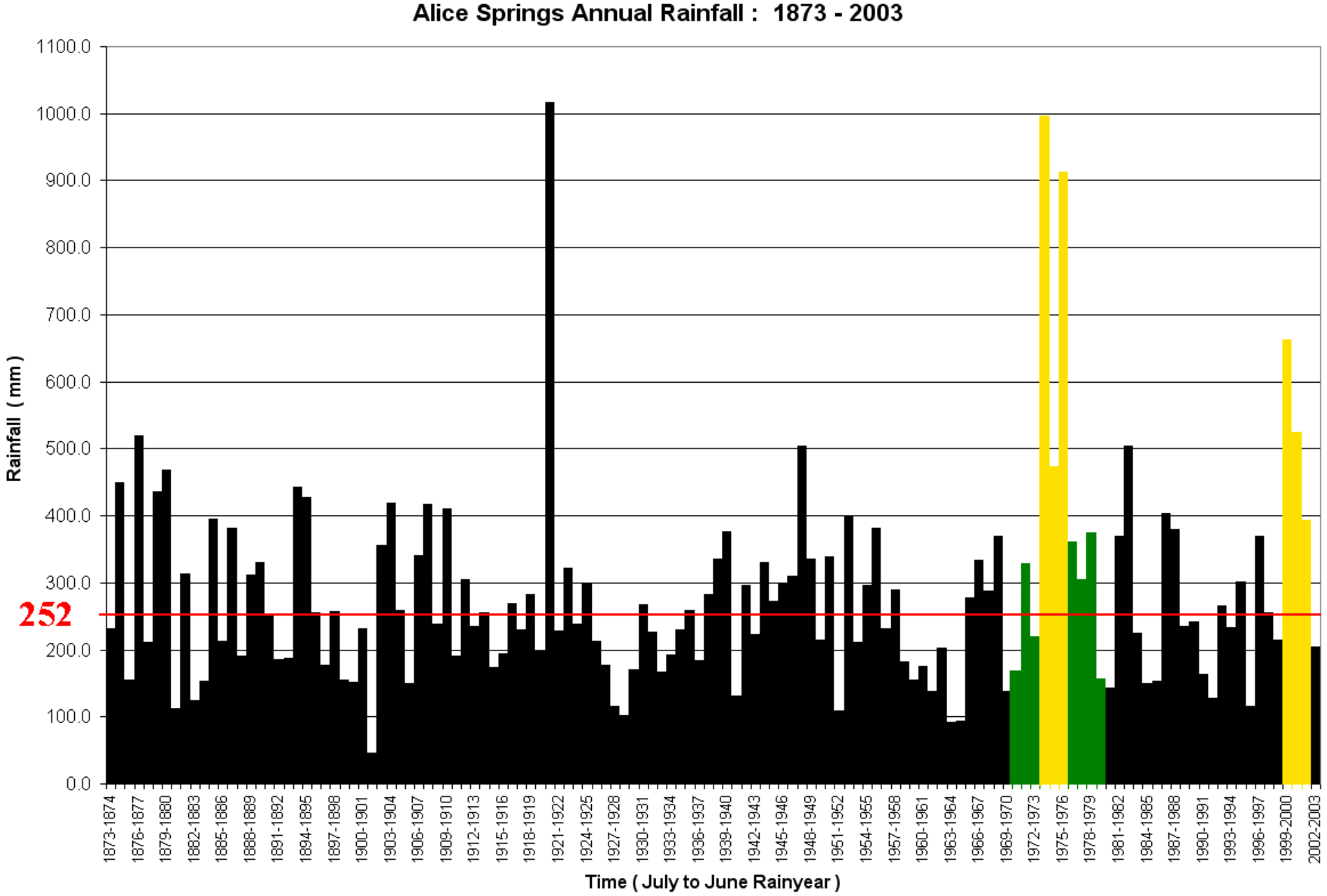
Fire Behaviour

- Three ROS models for spinifex grasslands are available
  - Griffin and Allan 1984
  - Burrows, Ward and Robinson 1991
  - Griffin and Allan 1993
- recent work on improving the ROS models using simulation
- lack of topography / slope component in the available ROS models
- available models are not being used

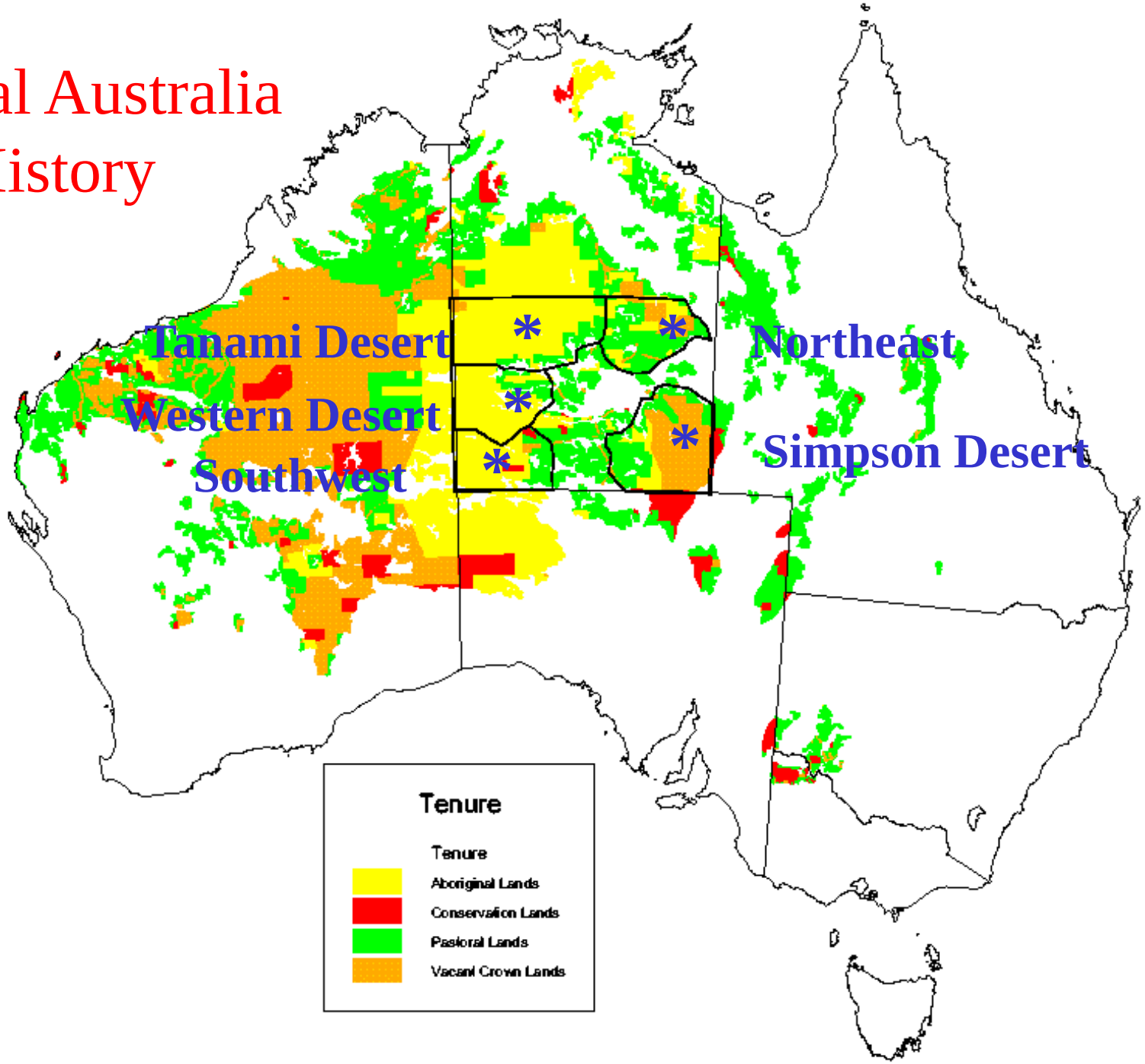
Characterisation of Fire Regimes

- 2 Fire History Databases
  - Central Australia
  - 3 Regional Case Studies

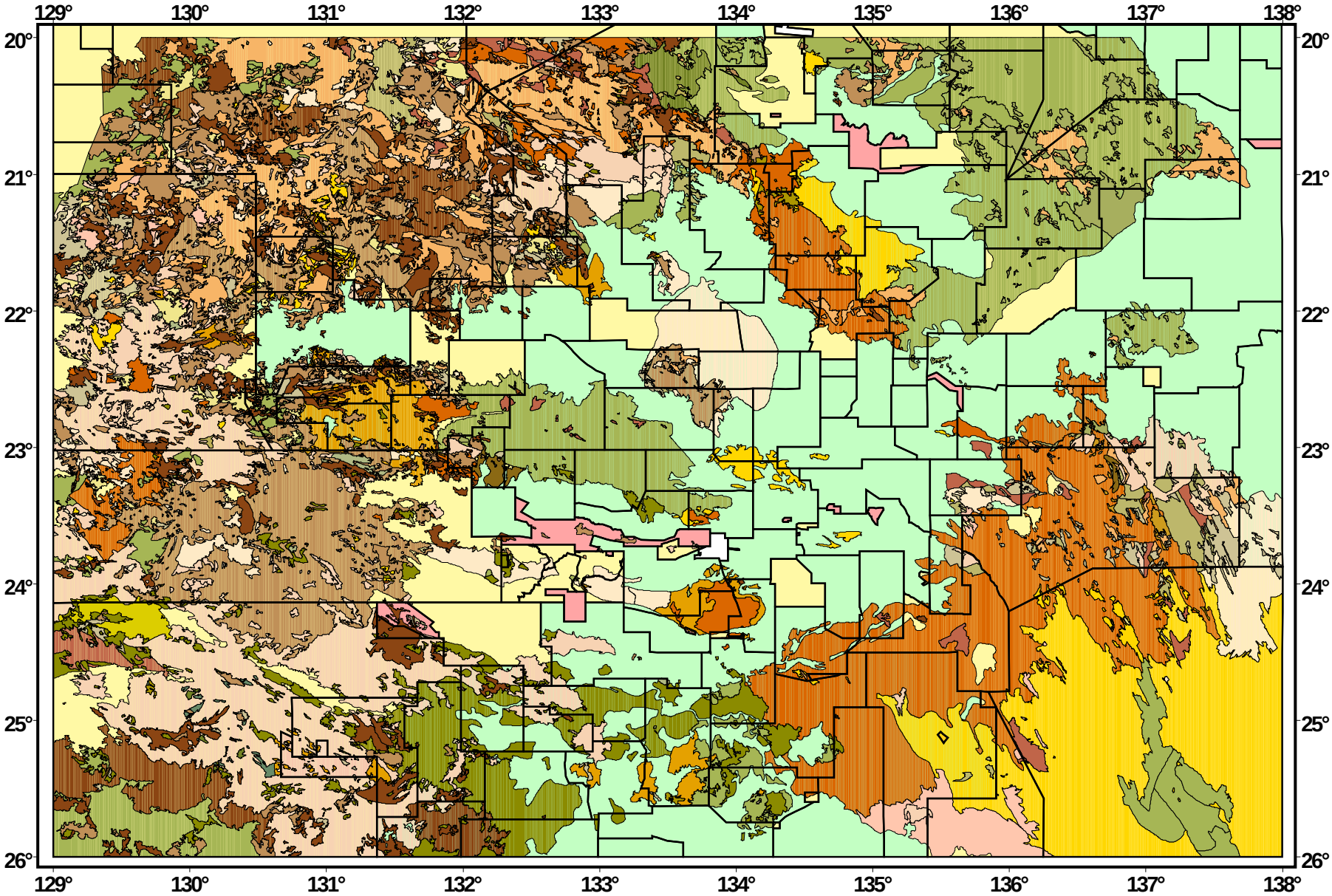
- Fire Regime Characteristics
  - Fire Extent
  - Fire Intervals
  - Fire Patchiness


Alice Springs Annual Rainfall : 1873 - 2003
Rainfall (mm)
1100.0
1000.0
900.0
800.0
700.0
600.0
500.0
400.0
300.0
252
200.0
100.0
0.0
1873-1874
1876-1877
1879-1880
1882-1883
1885-1886
1888-1889
1891-1892
1894-1895
1897-1898
1900-1901
1903-1904
1906-1907
1909-1910
1912-1913
1915-1916
1918-1919
1921-1922
1924-1925
1927-1928
1930-1931
1933-1934
1936-1937
1939-1940
1942-1943
1945-1946
1948-1949
1951-1952
1954-1955
1957-1958
1960-1961
1963-1964
1966-1967
1969-1970
1972-1973
1975-1976
1978-1979
1981-1982
1984-1985
1987-1988
1990-1991
1993-1994
1996-1997
1999-2000
2002-2003
Time (July to June Rainyear)

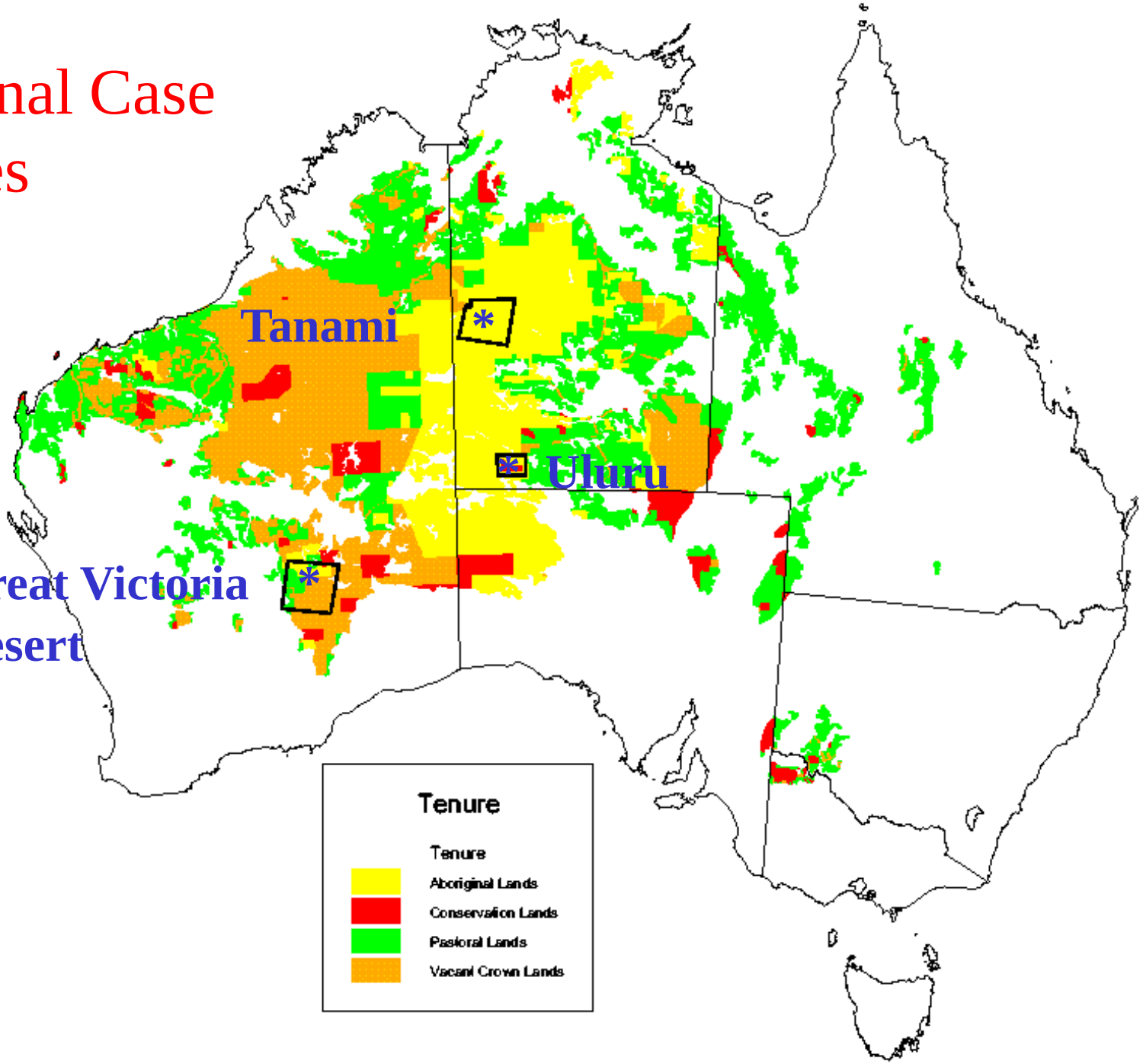
Central Australia Fire History



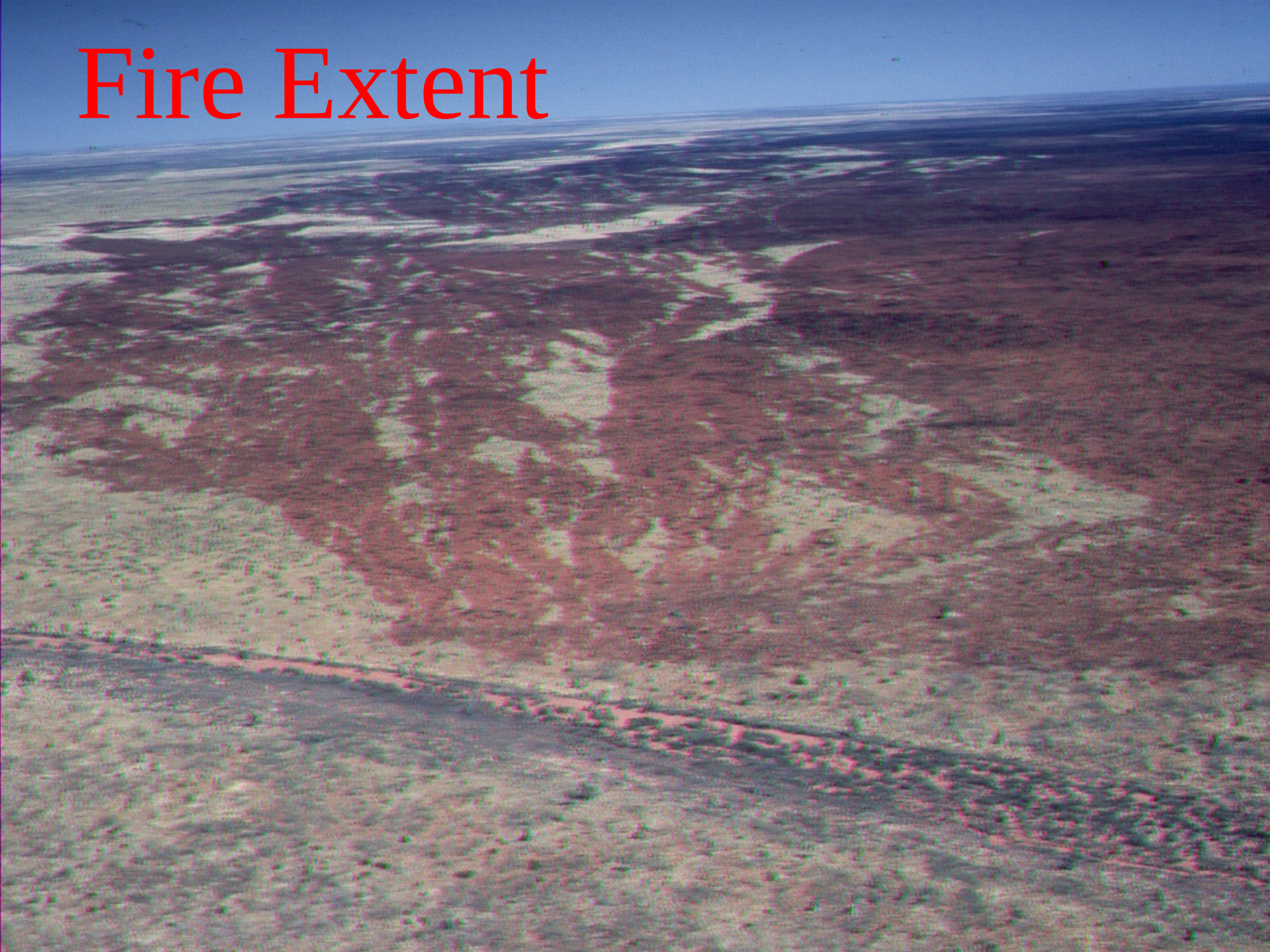
Central Australia Fire History : TSF to 1984

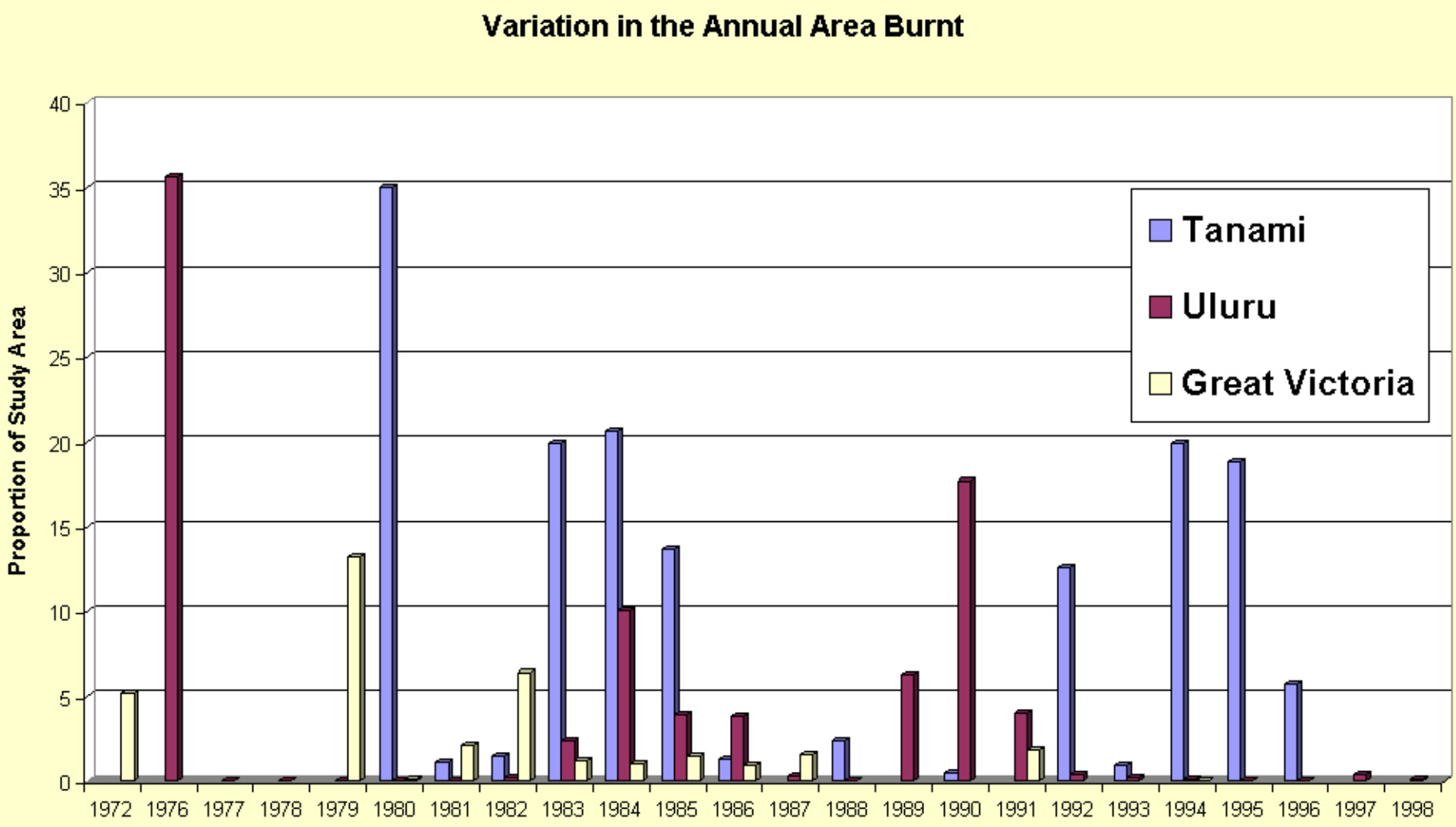


Regional Case Studies



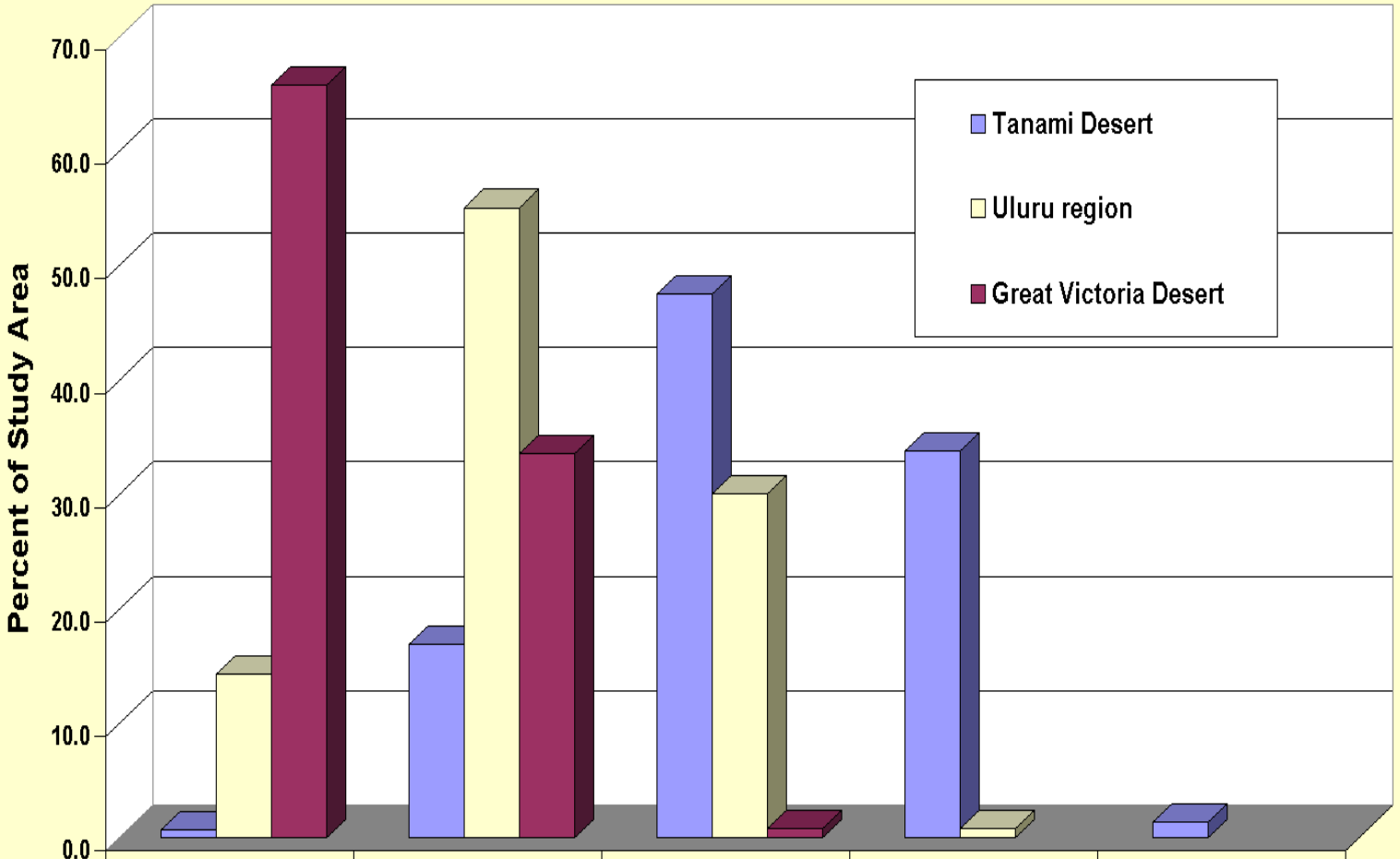
Fire Extent




Variation in the Annual Area Burnt
Proportion of Study Area
40
35
30
25
20
15
10
5
0
1972
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
Tanami
Uluru
Great Victoria

Regional Comparison of Fire Frequency

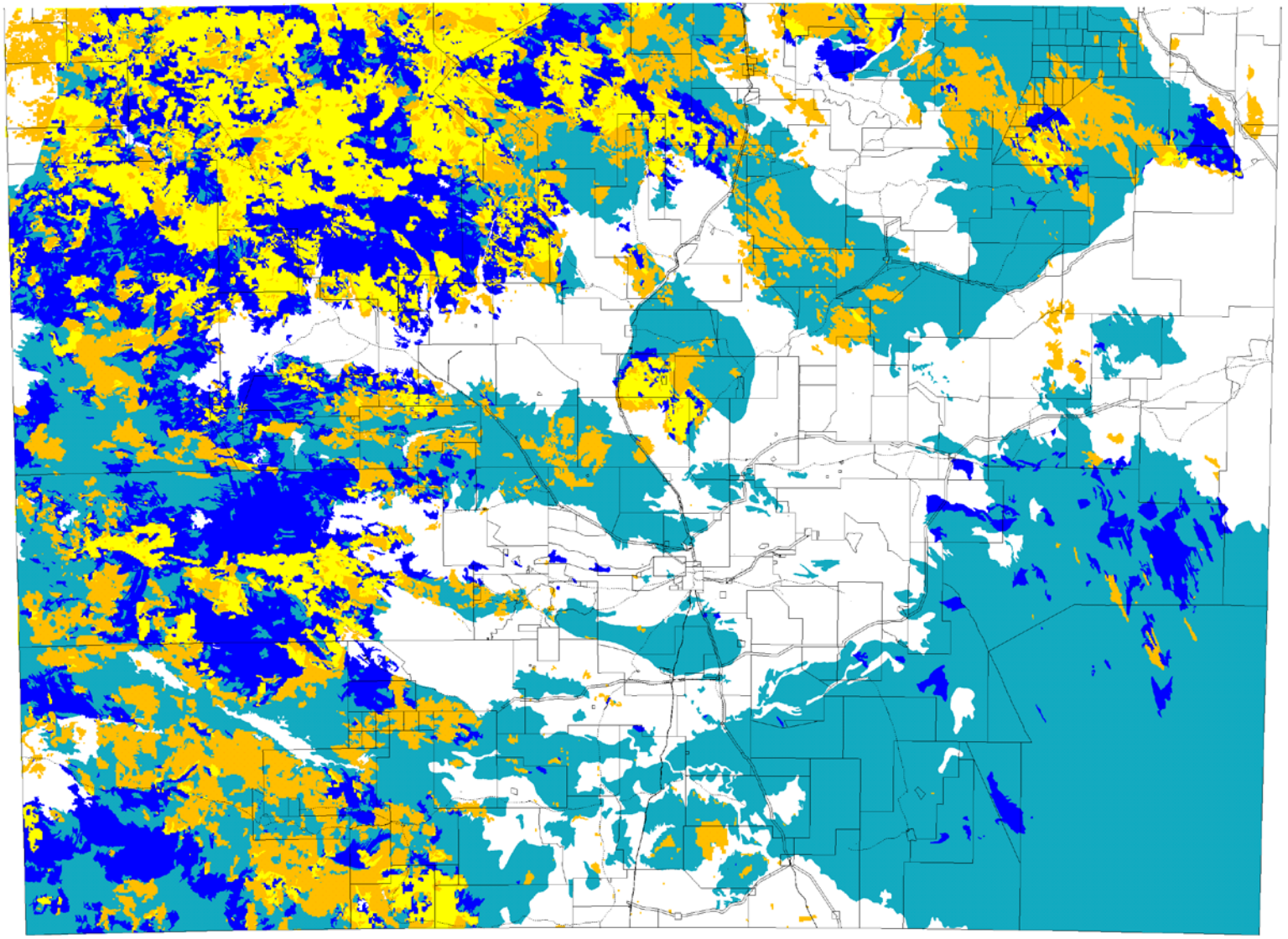
Tanami Desert (1972 to 1996); Uluru NP Region (1972 to 1998); Great Victoria Desert (1972 to 1994)



	0	1	2	3	4
Tanami Desert	0.6	16.9	47.4	33.7	1.3
Uluru region	14.2	55.0	30.0	0.8	
Great Victoria Desert	65.7	33.5	0.8		

Number of Times Burnt

Fire Intervals

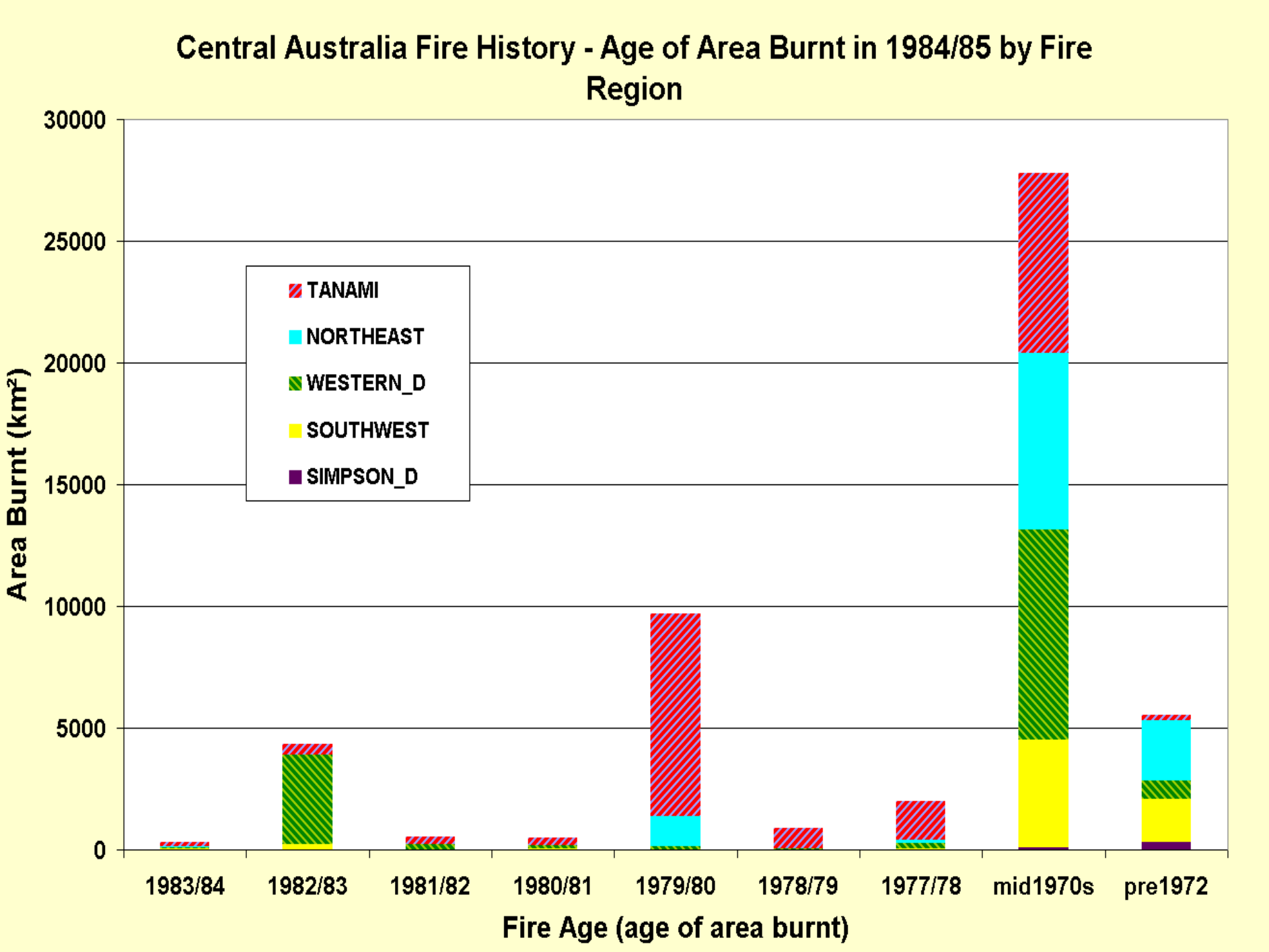


Burnt Once - approximate fire age

Burnt Twice - known fire interval

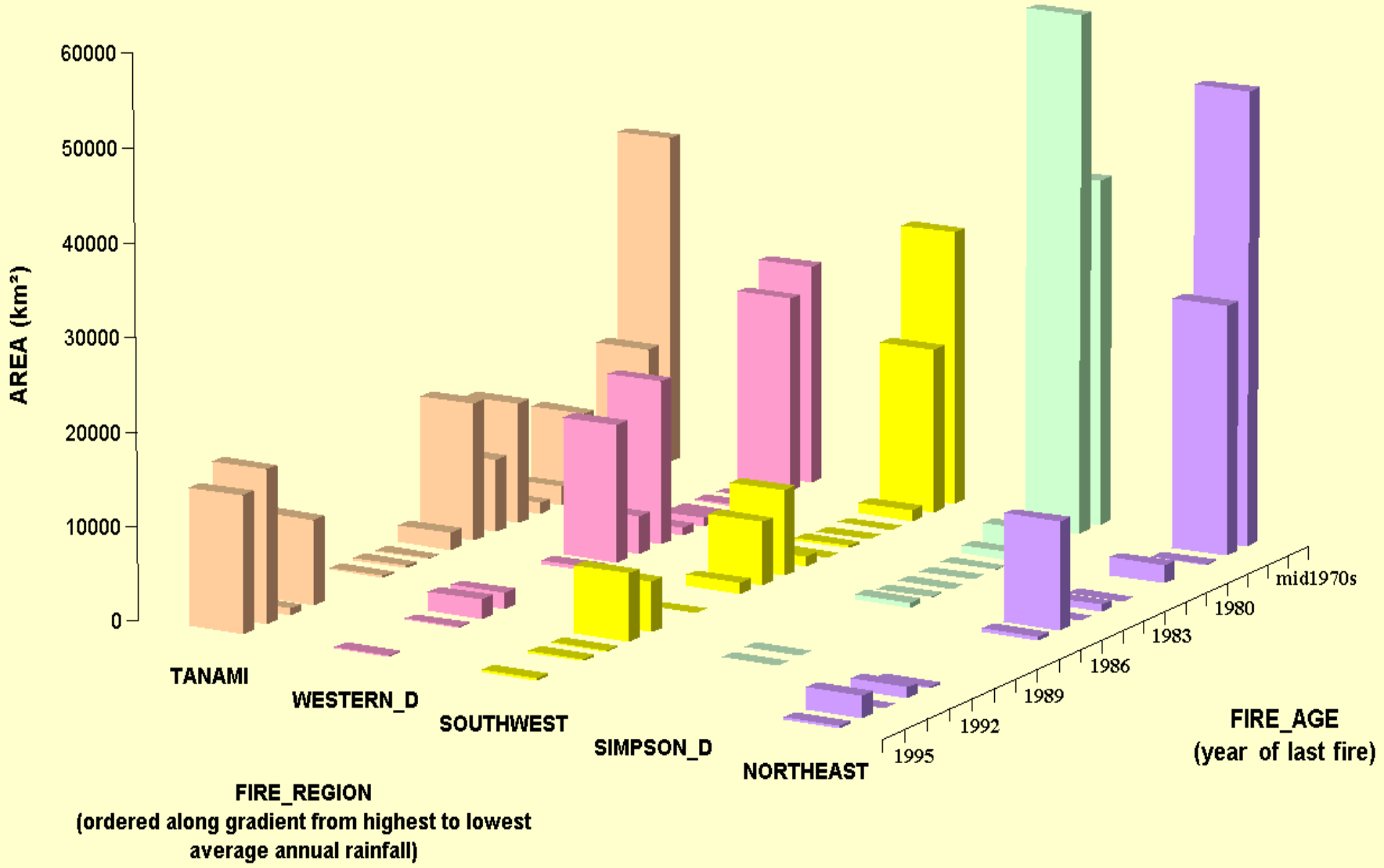
Burnt Once - known fire age

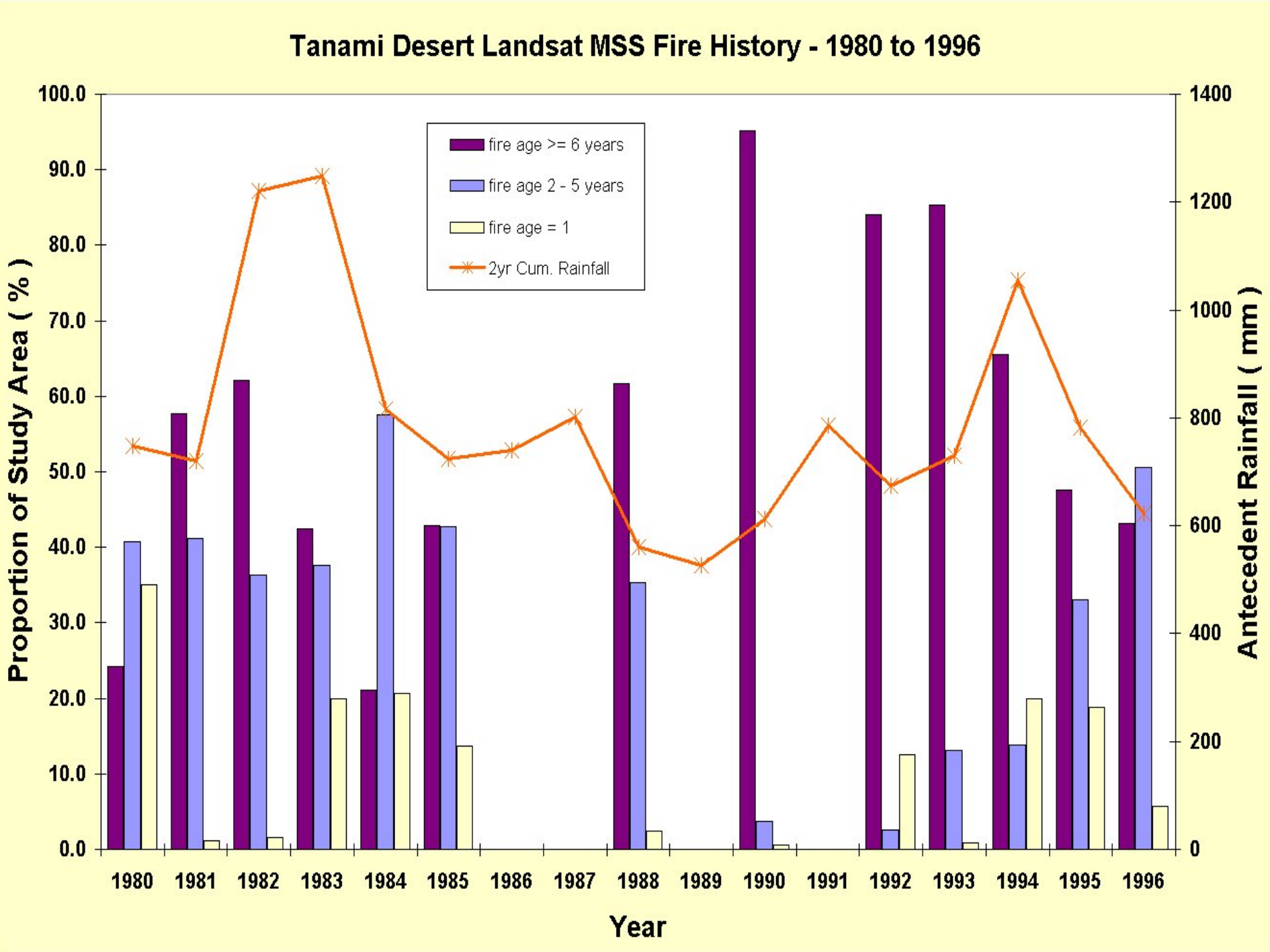
Burnt Twice - approximate fire interval


Central Australia Fire History - Age of Area Burnt in 1984/85 by Fire Region
30000
25000
20000
15000
10000
5000
0
Area Burnt (km²)
TANAMI
NORTHEAST
WESTERN_D
SOUTHWEST
SIMPSON_D
1983/84
1982/83
1981/82
1980/81
1979/80
1978/79
1977/78
mid1970s
pre1972
Fire Age (age of area burnt)


Fire Patchiness

CENTRAL AUSTRALIA FIRE HISTORY AREA HISTOGRAMS: pre 1972 to 1995




Tanami Desert Landsat MSS Fire History - 1980 to 1996
fire age >= 6 years
fire age 2 - 5 years
fire age = 1
2yr Cum. Rainfall
Proportion of Study Area (%)
Antecedent Rainfall (mm)
Year
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1400
1200
1000
800
600
400
200
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996

Spinifex and Fire Sensitive Vegetation

Fire History of Isolated Mulga Communities in the Tanami Desert

area remaining unburnt

year	Tanami subregion	Tanami Region
1983/84	8.2 km²	369 km²
1984/85	5.3 km²	332 km²
1993/94	4.6 km²	
1994/95	2.6 km²	
1995/96	2.2 km²	

Fire and Fauna

- world's richest assemblage of reptile species
- significant decline or extinct of mammals
- 3 significant fauna studies in the spinifex grasslands
  - Fire Created Patch Dynamics in the Tanami Desert (Morton *et al.* unpublished)
  - the Uluru Fauna Survey (Reid *et al.* 1993)
  - Habitat Modelling for the Mulgara (Masters *et al.* 1997)

Habitat Modelling for the Mulgara

- Combined field survey and GIS modelling project using available spatial dataset for an area of 121,000 km² within the Tanami Desert

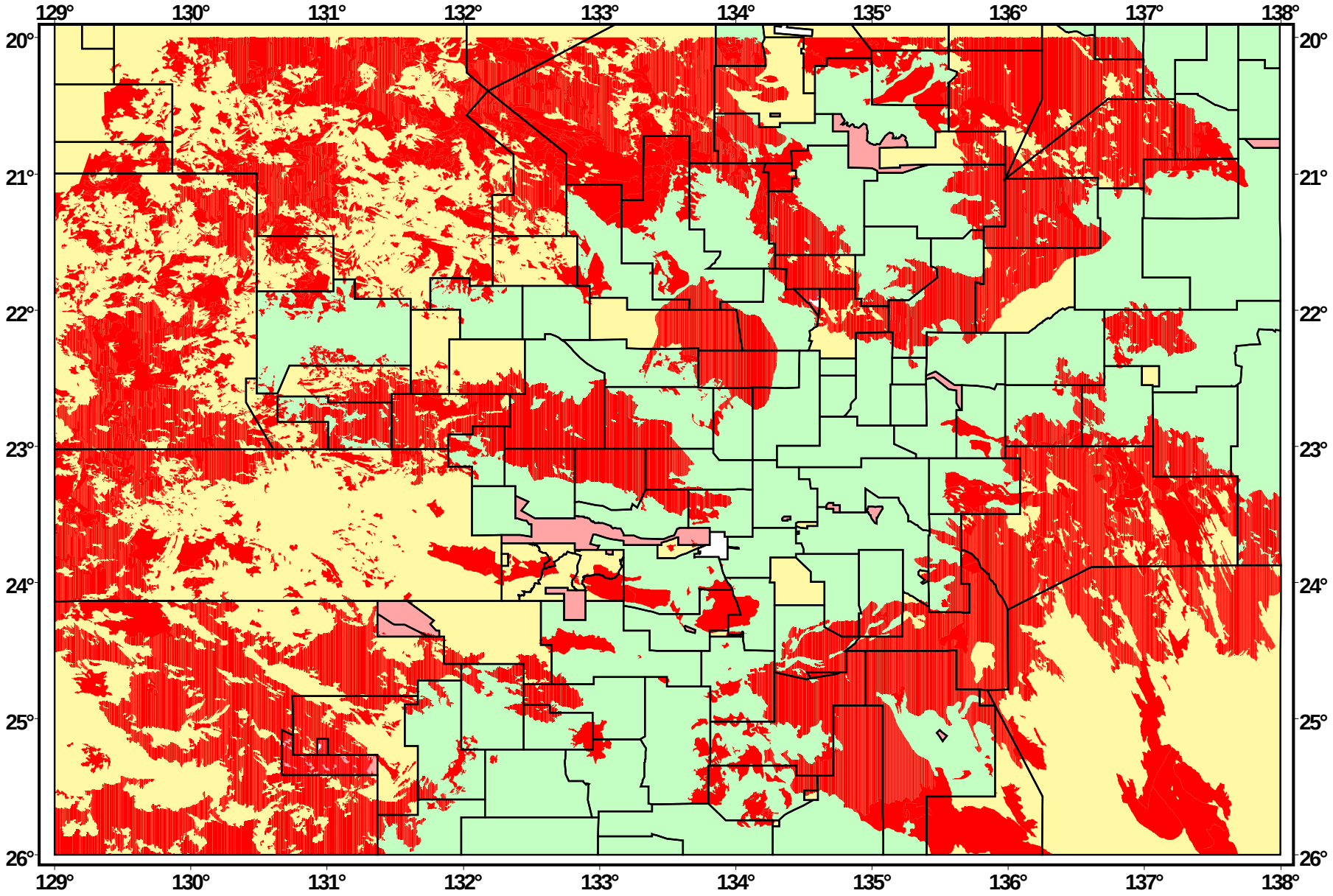
Modelling results

- Mulgaras have a widespread but patchy distribution across the landscape.
- The presence of mulgaras was linked to spinifex species and growth habitat; they were never found in *Triodia schinzii* communities.
- No definite preference for fire age, although this contrasted with earlier studies.
- Suggested that grain size of the fire history database may be important, and that AVHRR data is too coarse.

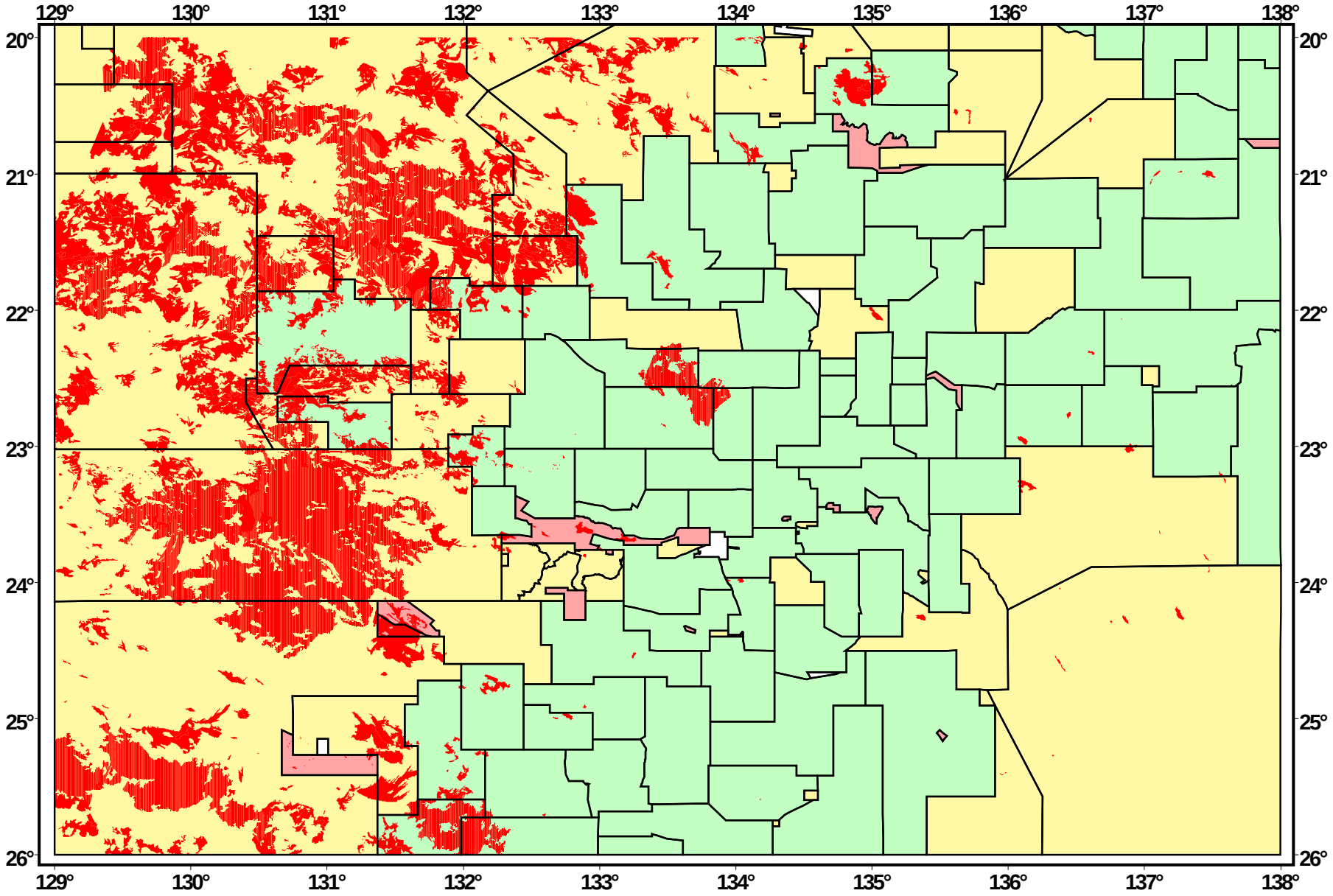
Fire Management on Aboriginal Lands

- 1.22M km² of spinifex landscapes are Aboriginal land tenure
- issues include:
  - threats of changed fire regimes on the longterm survival of plants and animals, and
  - problems caused by fires burning out into adjacent lands, both pastoral and conservation.
- successful fire management programs require:
  - cooperation between fire management agencies and Aboriginal people, both individually and via the land councils;
  - greater effort to achieve a mutual understanding of fire issues and appropriate compromises, and
  - **implementation of aerial control burning programs.**

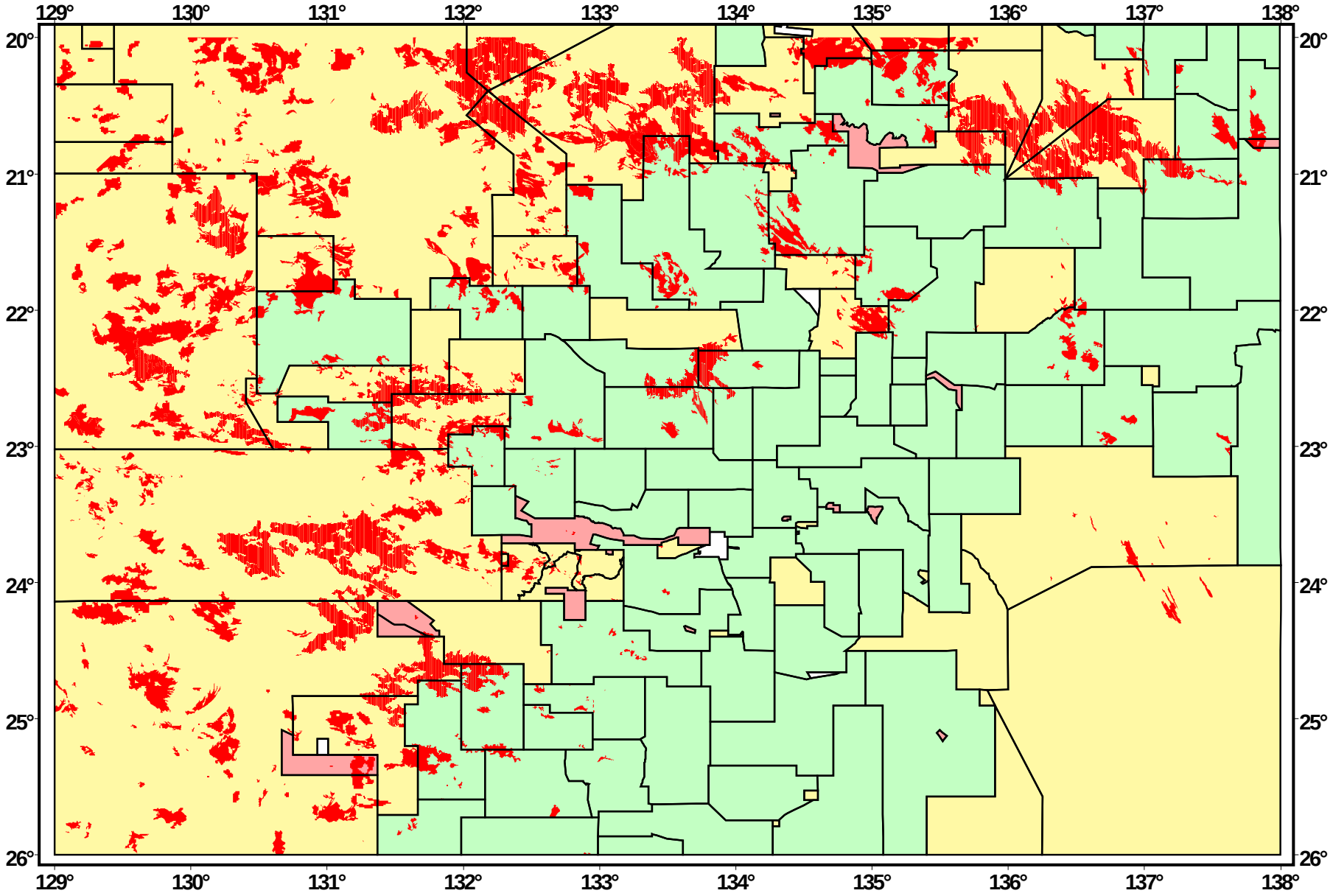
Central Australia Fire History : 1970 to 1979



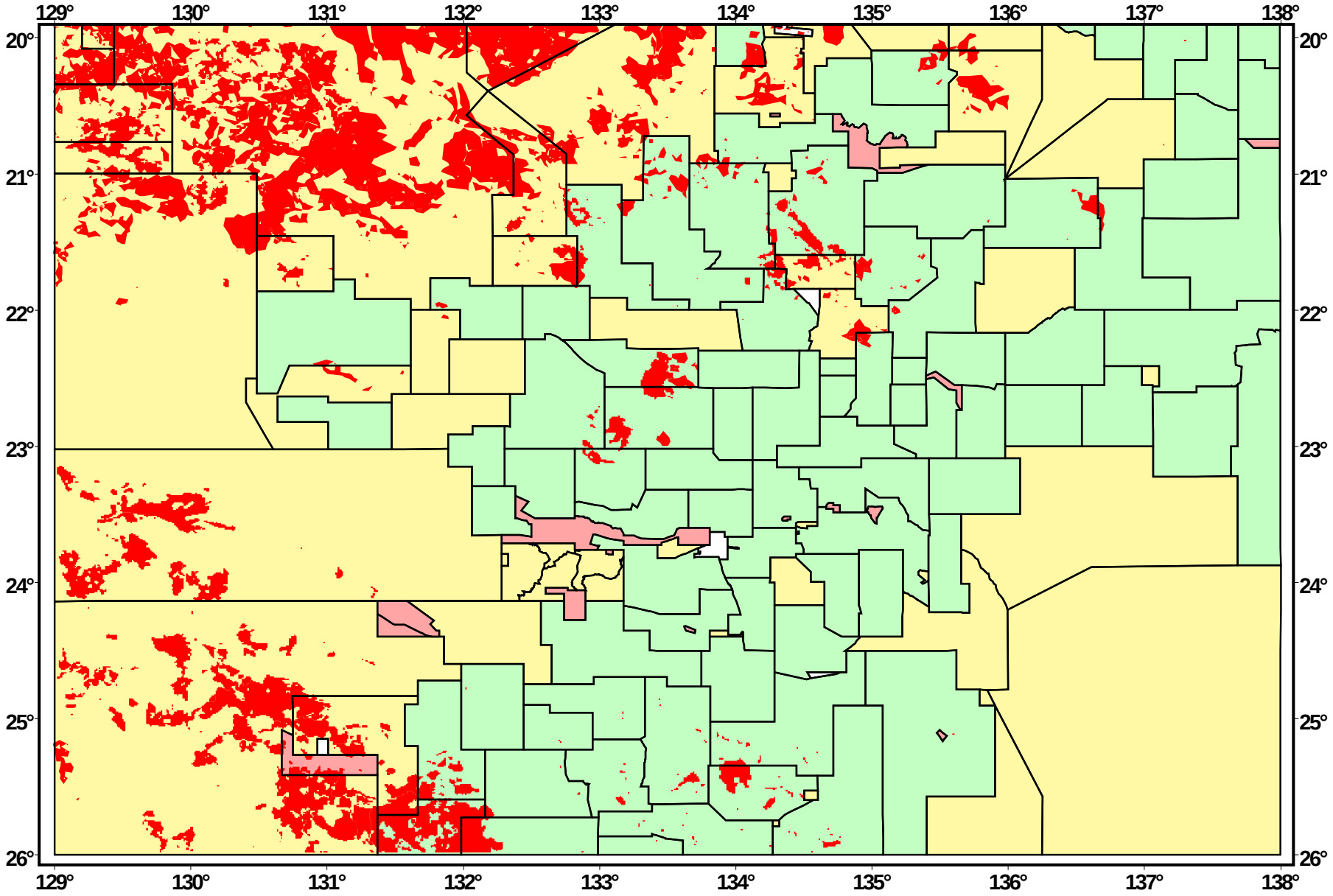
Central Australia Fire History : 1980 to 1984



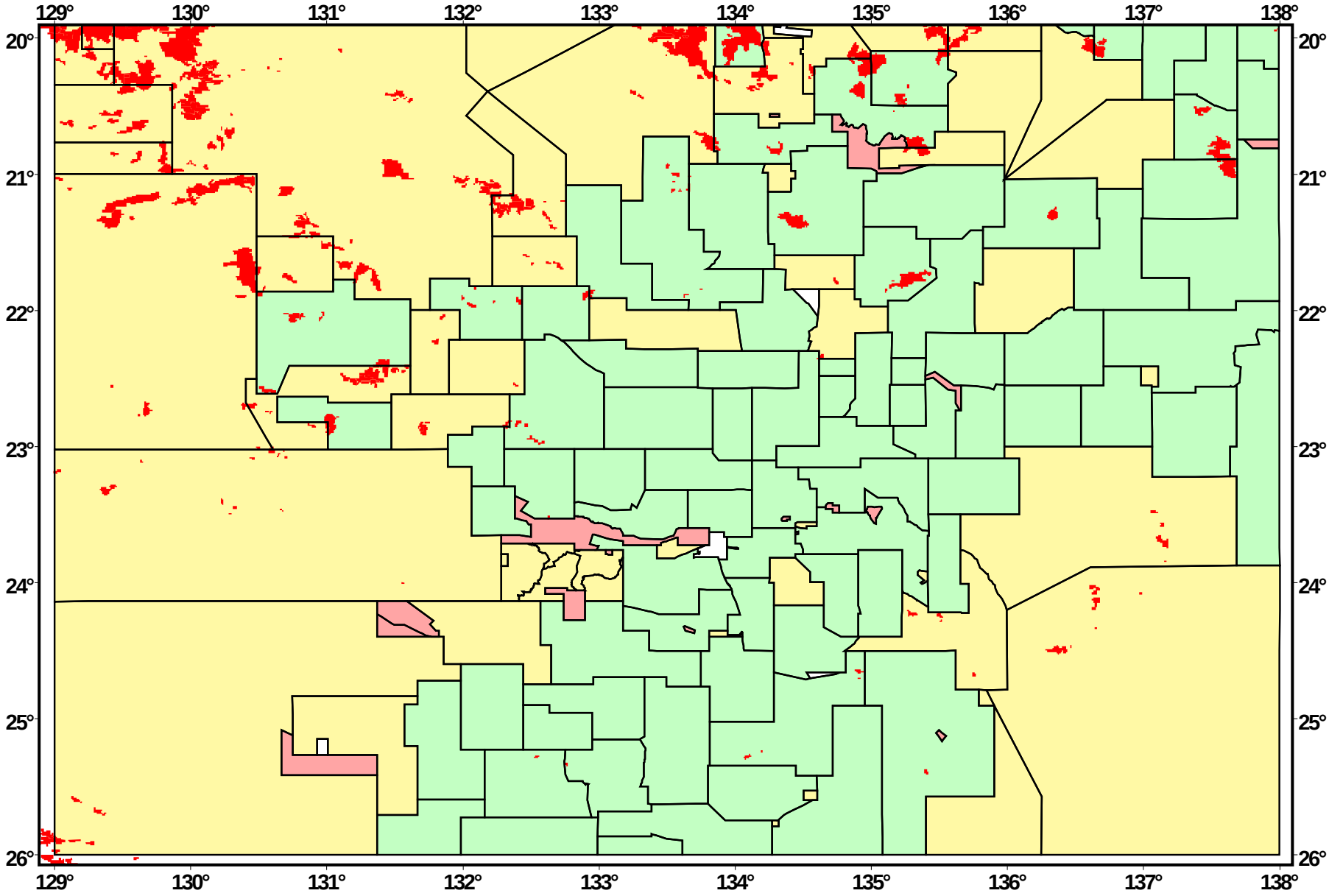
Central Australia Fire History : 1985 to 1989



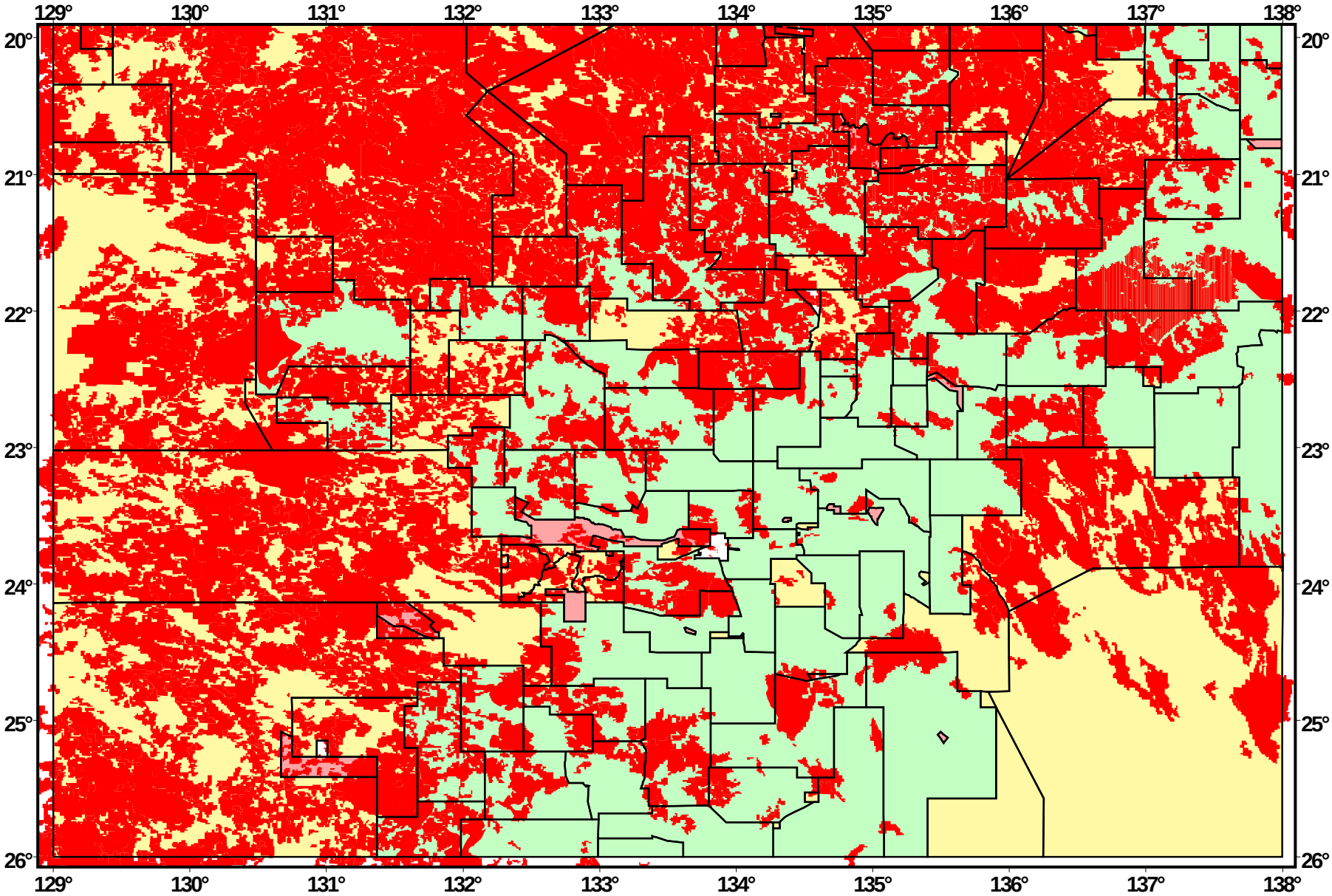
Central Australia Fire History : 1990 to 1994



Central Australia Fire History : 1995 to 1999



Central Australia Fire History : 2000 to 2002



I.A.L.E. 2003

A Comparison of Two Periods of Exceptional Fires in Central Australia:

1974 - 1977 and 1999 - 2002

Grant Allan
Bushfires Council NT
Alice Springs Australia

BUSHFIRES COUNCIL NT

TABLE 4. Comparison of fire numbers, area and causes in central Australia for the period July 1970 to June 1980

	Spinifex	Hills	*Acacia* shrubland	Plains	**TOTAL**
Total number of fires	301	162	35	287	785
Total area burnt (km^2)	177 908	34 068	13 357	78 939	304 272
Mean fire size (km^2)	591	210	381	274	
Caused by lightning (%)	66	57	48	53	58
Caused by man (%)	23	36	43	42	33
Of unknown cause (%)	11	7	9	5	9

TABLE 4. Comparison of fire numbers, area and causes in central Australia for the period July 1970 to June 1980

April 1980 to April 1985

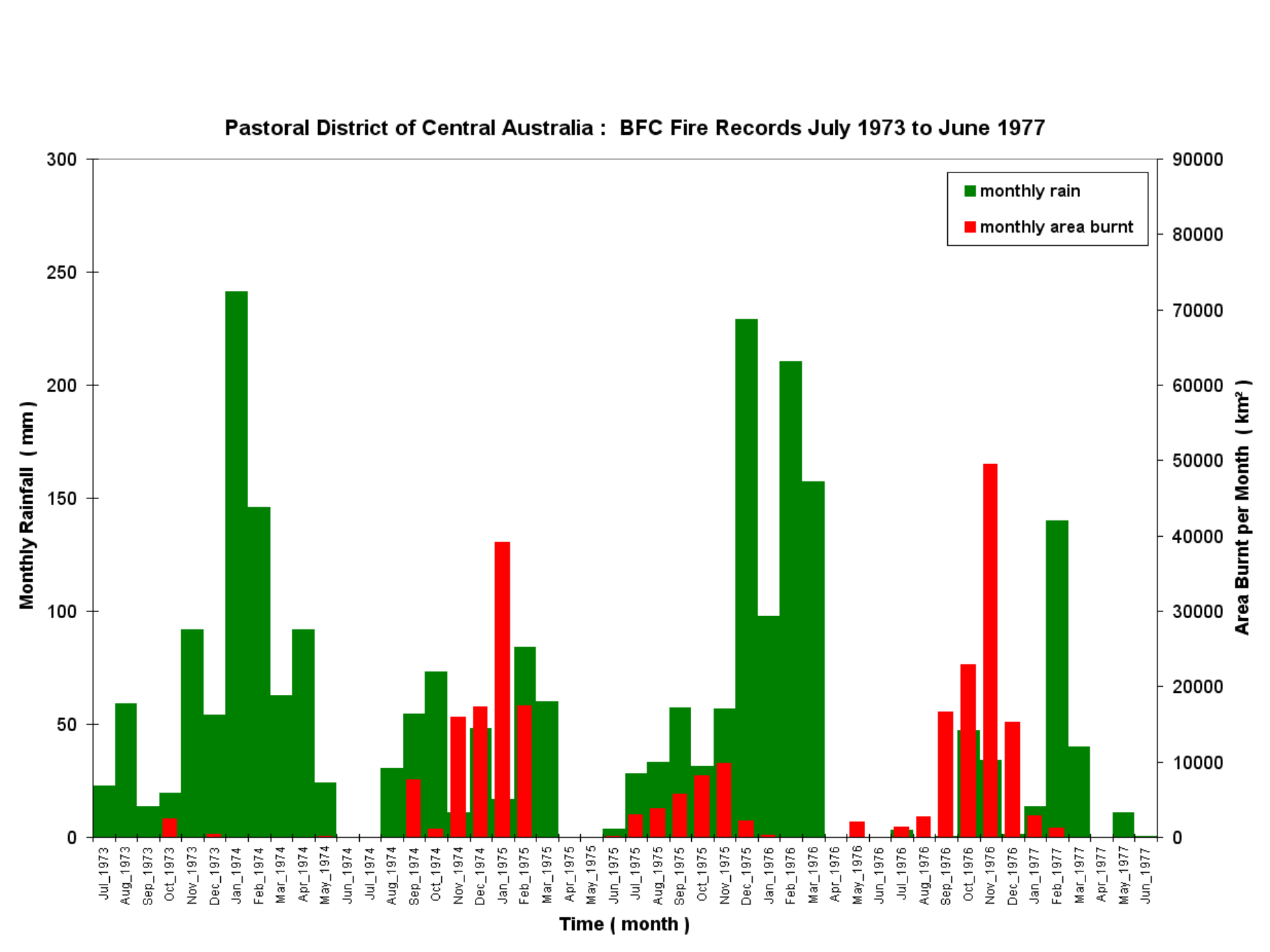
	Spinifex	Hills	*Acacia* shrubland	Plains	**TOTAL**	**TOTAL**
Total number of fires	301	162	35	287	785	1792
Total area burnt (km^2)	177 908	34 068	13 357	78 939	304 272	139 237
Mean fire size (km^2)	591	210	381	274		
Caused by lightning (%)	66	57	48	53	58	
Caused by man (%)	23	36	43	42	33	
Of unknown cause (%)	11	7	9	5	9	

Landsat-based mapping estimate

pastoral zone = 130,269

central Australia = 257 873

excludes many fires in central pastoral zone and areas of the Tanami Desert burnt in both the mid1970s and 1980-1984 period


Pastoral District of Central Australia : BFC Fire Records July 1973 to June 1977
monthly rain
monthly area burnt
Monthly Rainfall (mm)
Area Burnt per Month (km²)
Time (month)
0
50
100
150
200
250
300
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
Jul_1973
Aug_1973
Sep_1973
Oct_1973
Nov_1973
Dec_1973
Jan_1974
Feb_1974
Mar_1974
Apr_1974
May_1974
Jun_1974
Jul_1974
Aug_1974
Sep_1974
Oct_1974
Nov_1974
Dec_1974
Jan_1975
Feb_1975
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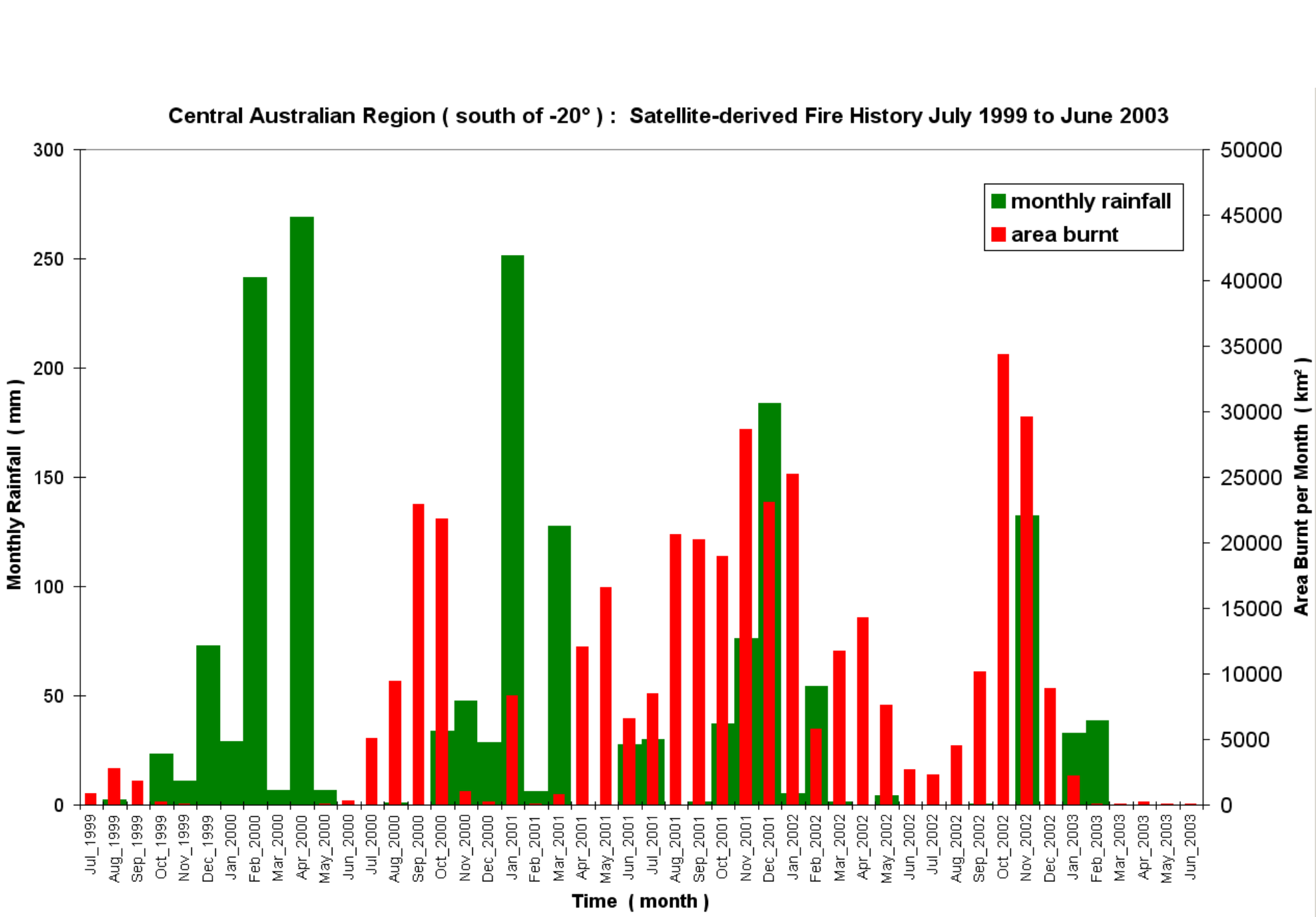
Dec_1976
Jan_1977
Feb_1977
Mar_1977
Apr_1977
May_1977
Jun_1977


Central Australian Region (south of -20°) : Satellite-derived Fire History July 1999 to June 2003
monthly rainfall
area burnt
Monthly Rainfall (mm)
Area Burnt per Month (km²)
Time (month)
0
50
100
150
200
250
300
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
Jul_1999
Aug_1999
Sep_1999
Oct_1999
Nov_1999
Dec_1999
Jan_2000
Feb_2000
Mar_2000
Apr_2000
May_2000
Jun_2000
Jul_2000
Aug_2000
Sep_2000
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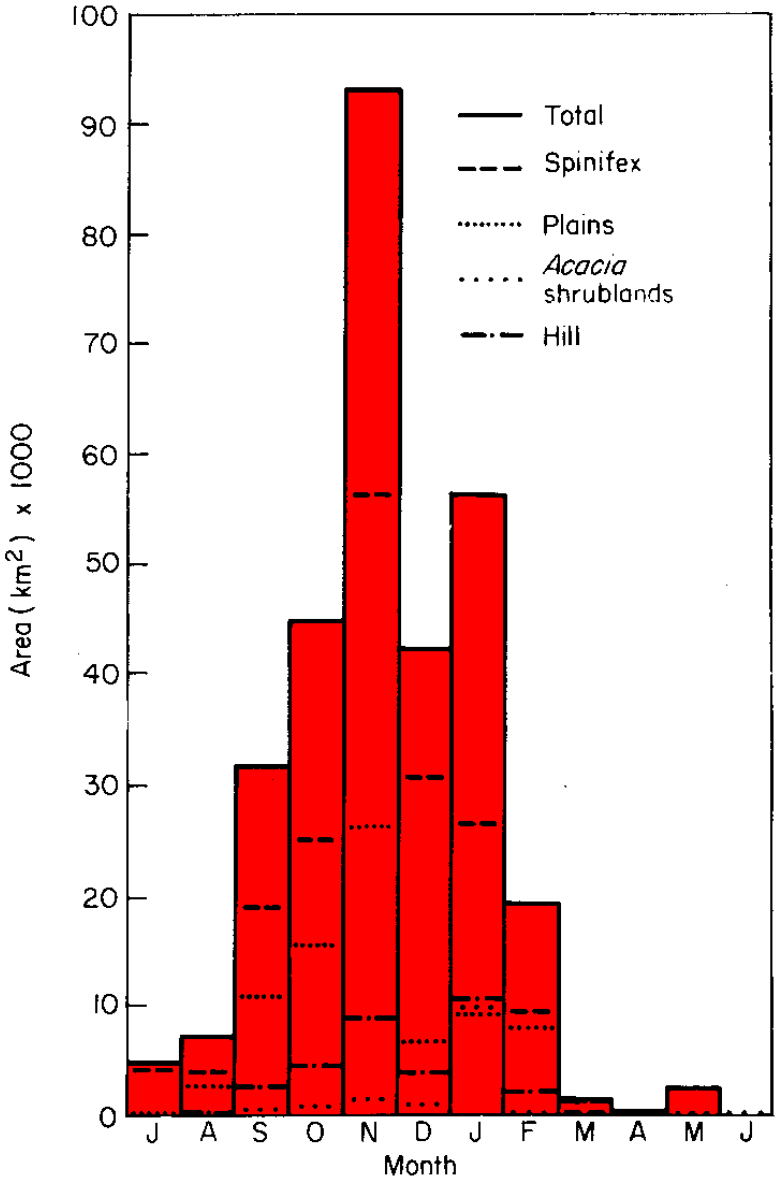
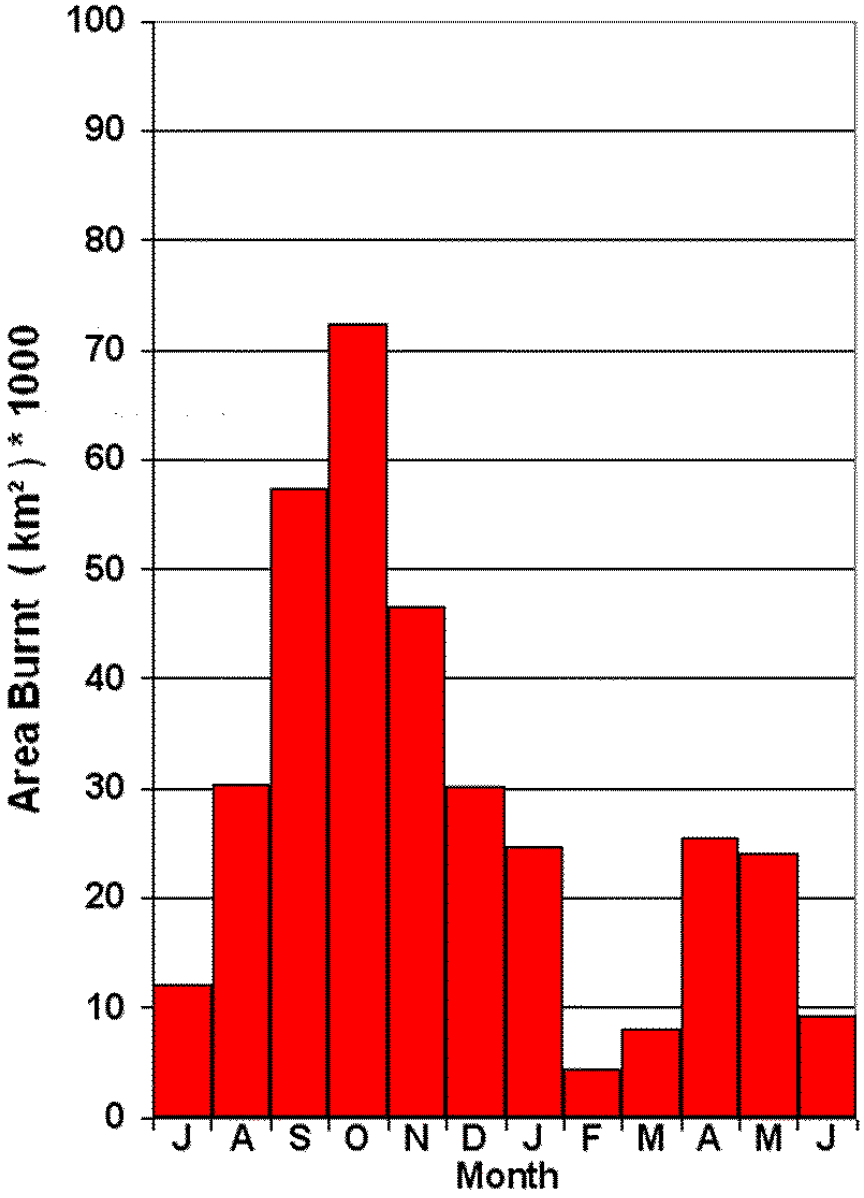
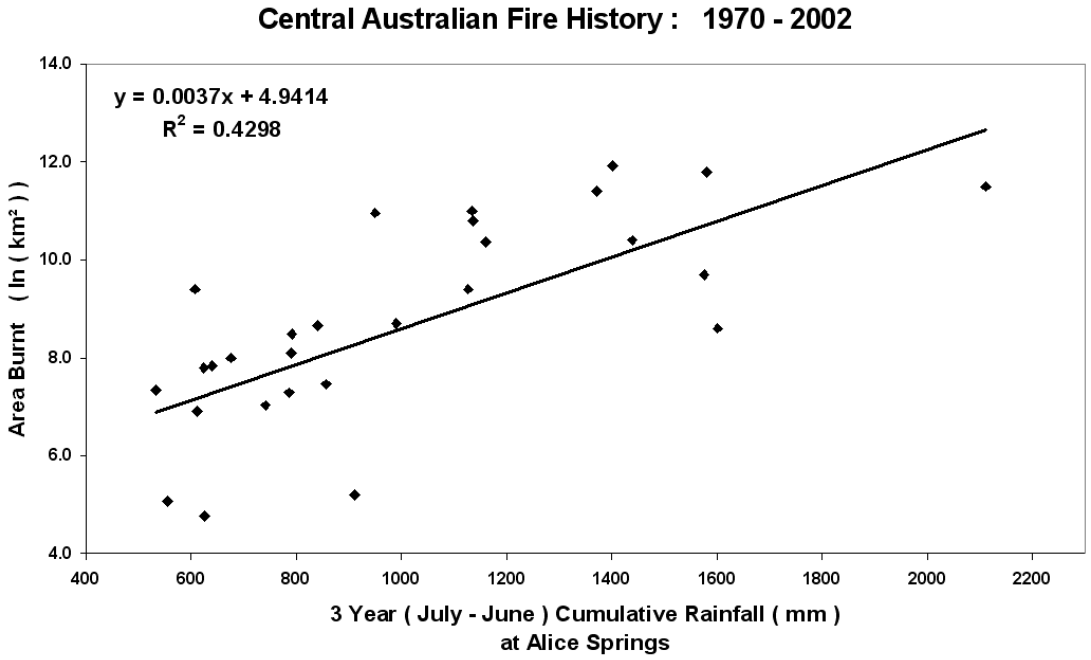
May_2003
Jun_2003

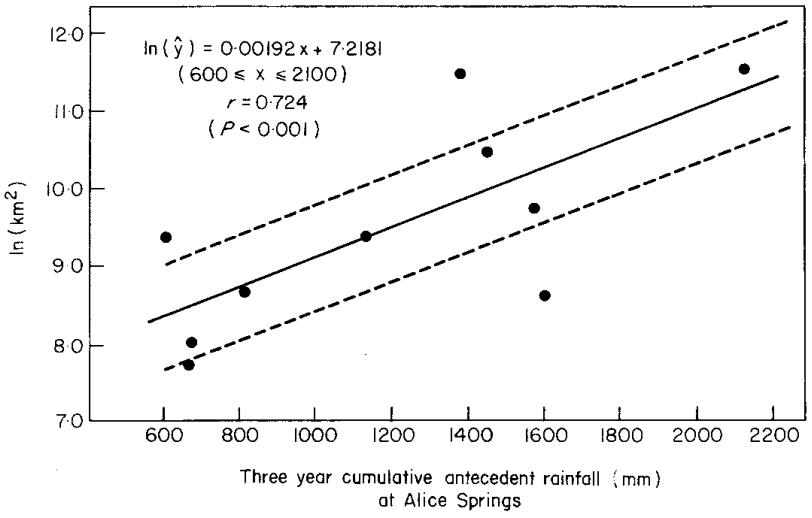


July 1970 - June 1980



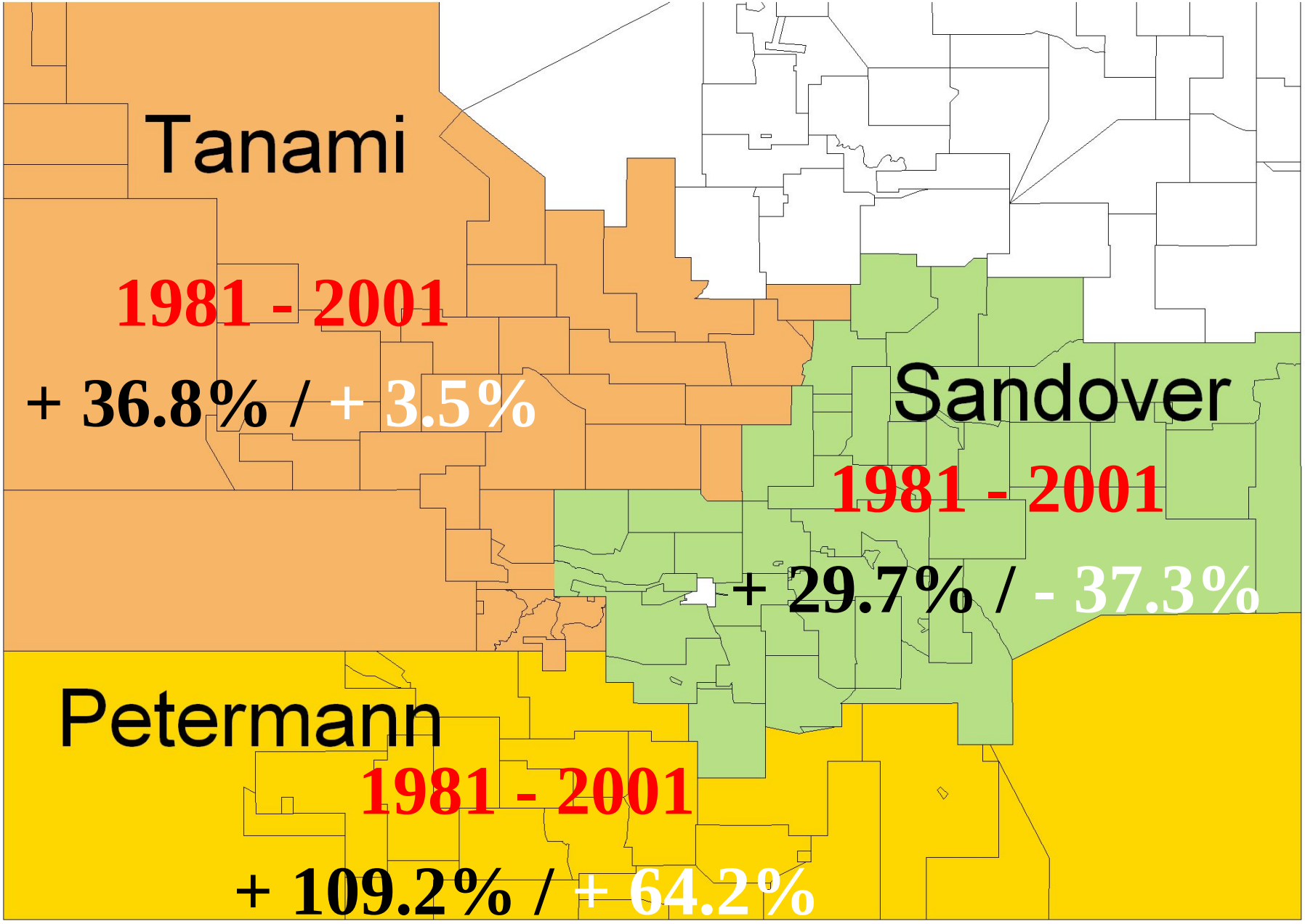
Apr 2000 - Dec 2002



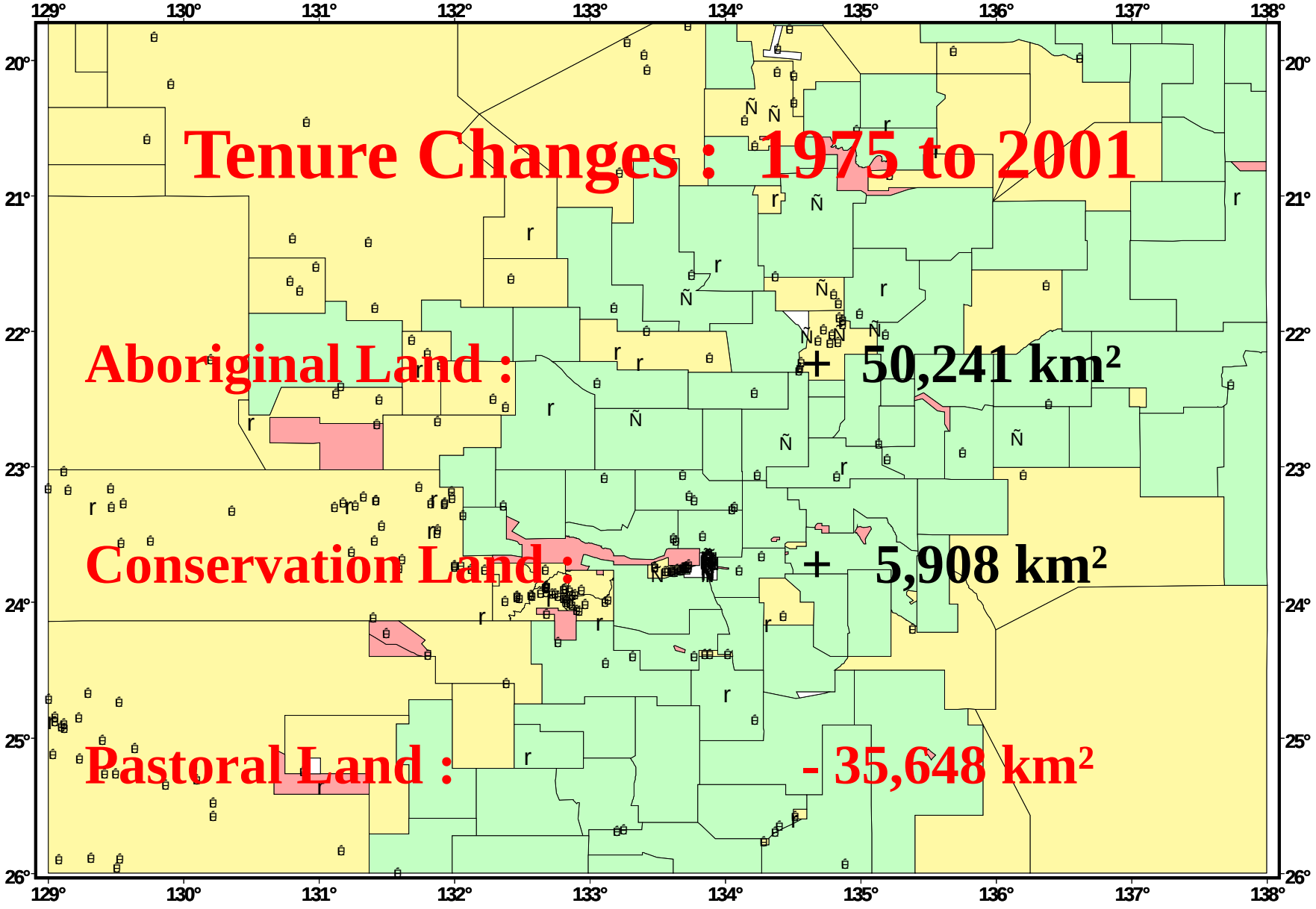


Comparison of total area burnt and 3 years of cumulative antecedent rainfall

Central Australia Census Districts



2001 Land Tenure and Aboriginal Communities



3rd International Wildland Fire 2003

Learning Lessons from an Exceptional Period of Fires in Central Australia:

2000 to 2002

Grant Allan, Neil Phillips and Patrick Hookey
Bushfires Council NT, and Uluṟu-Kata Tjuṯa National Park
Alice Springs Australia

BUSHFIRES COUNCIL NT

Presentation Overview

- Fire Regime Characteristics
- Technological Advances in Fire Monitoring
- Ecological Impact of Fires
- Active Fire Management and Suppression
- Social Conflicts

Active Fire Management and Suppression

- Issues
  - patch burning strategy on Parks
  - management priorities on pastoral properties
    - cattle and bores vs firebreaks and fuel reduction
  - major fires
    - timely declaration of Incident Management
    - staff management and public protection

Active Fire Management and Suppression

- Lessons
  - Parks: adaptive approach to fire management
    - reading the country - effectiveness of previous burns
    - training and involvement of non-ranger staff in control burns as preparation for major fires
  - Pastoral: lack of fire experience
    - more info required on risk and economics of fires
  - Major Fires:
    - declaration of Incident Management

Successful Fire Management Examples (1)

- **Uluru Kata Tjuta National Park – Patrick Hookey, Park Rangers and Mutitjulu community**
  - **Recognised the increased importance of adaptive management in "big seasons"**
  - **Large amount of manpower, based on joint management and availability of local aboriginal people to implement fire programs and their value as a community activity**
  - **Active fire program provided the opportunity to continually read the fire behaviour of the country and adjusting their burning program to match the risk**
  - **Actively aimed to seal gaps and weak points in the mosaic. Recognised that the disconnected mosaic would be ineffective**

Successful Fire Management Examples (2)

- **Finke Gorge National Park – Dennis Matthews, PWSNT Park Manager**
  - **Fire management based on detailed flora information and spatial data.**
  - **Intensive management input with fire as a management priority and burning at every opportunity**
  - **Despite best intentions, resource limitations of time, money and experience restrict burning program to asset protection and minimising wildfire impact. Insufficient resources to undertake ecological burning.**

Successful Fire Management Examples (3)

- **Narwietooma Pastoral Station – Chris Connellan (Owner) and Doug Sims (Manager)**
  - **Have had an active burning program over many years. Use fire in all ecosystem types, including mulga, not just spinifex.**
  - **Have a high level of confidence to burn**
  - **Burnt at every opportunity**
  - **Relatively high proportion of the station was burnt during 2000-2002 period with any significant impact on pastoral activities or significant effort expended in wildfire suppression.**
  - **Burning program was a combination of their intentional burning with roadside ignitions and lightning, which limited the impact of the second two sources.**

Social Conflicts

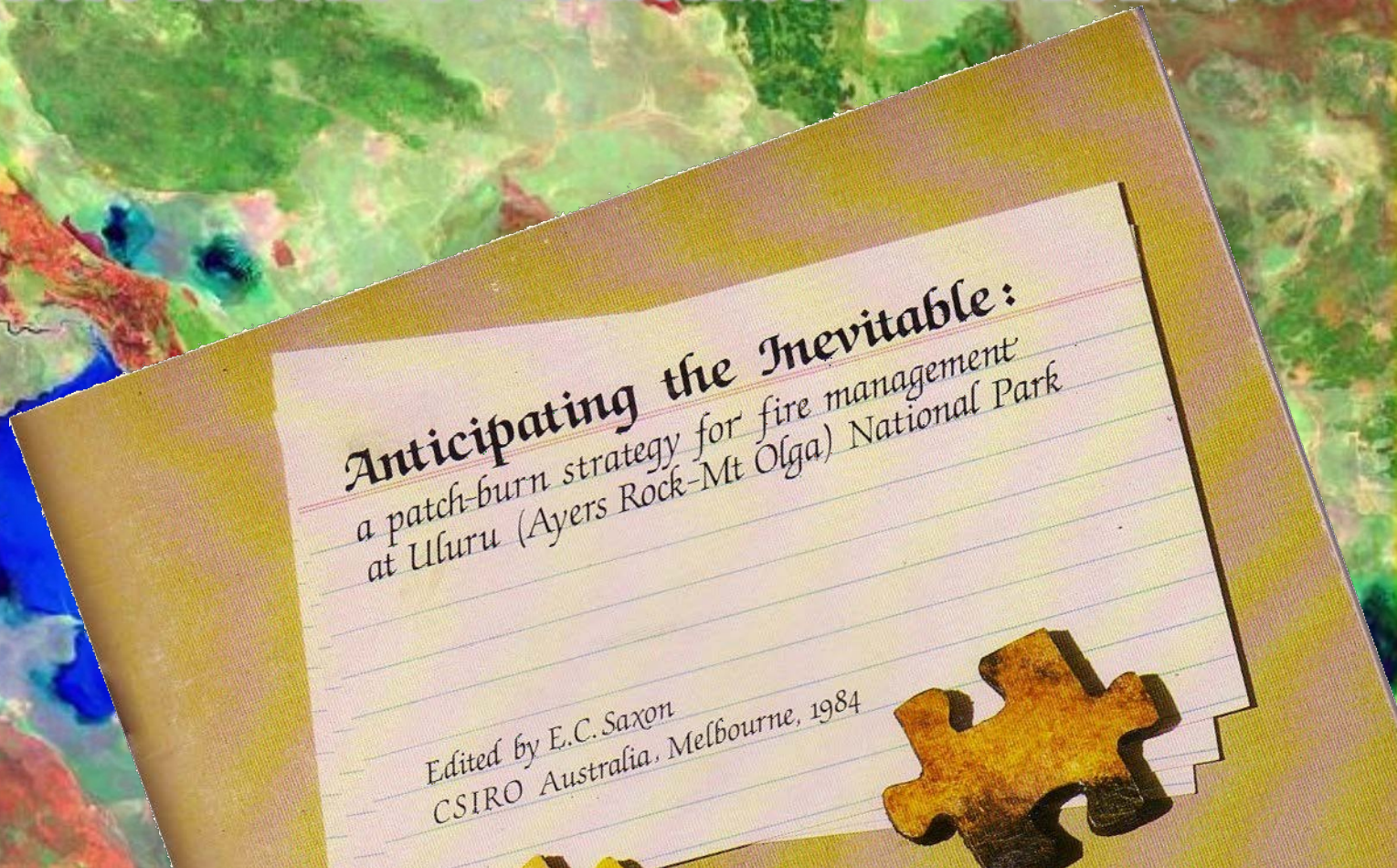
- Issues
  - roadside ignitions
    - change of land tenure / land use mosaic
    - change of population patterns and distribution
  - public awareness and education
  - impact of fires on local economy

Social Conflicts

- Lessons
  - value of joint mgmt regional plans
    - whole of community involvement
    - role of BFC as facilitator
  - use of media
    - raise public and government awareness
    - target audiences
  - cost of fires extends beyond suppression
    - tourism / health / pastoral livelihood

Future Challenge

- Maintaining fire awareness
- Will these lessons be remembered in 2027 ?



Desert Knowledge
Cooperative Research Centre
"Growing in the Desert"

Desert Knowledge CRC

An initiative of:

DESERT KNOWLEDGE AUSTRALIA

Desert Fire Project

DK-CRC Desert Fire Sub-Projects

1. Fire regimes of the desert regions of Australia at a continental scale
2. Fire regimes of the desert regions of Australia at a regional scale:
   - overview and priority setting
3. Fire regimes of the desert regions of Australia at a regional scale:
   - case studies

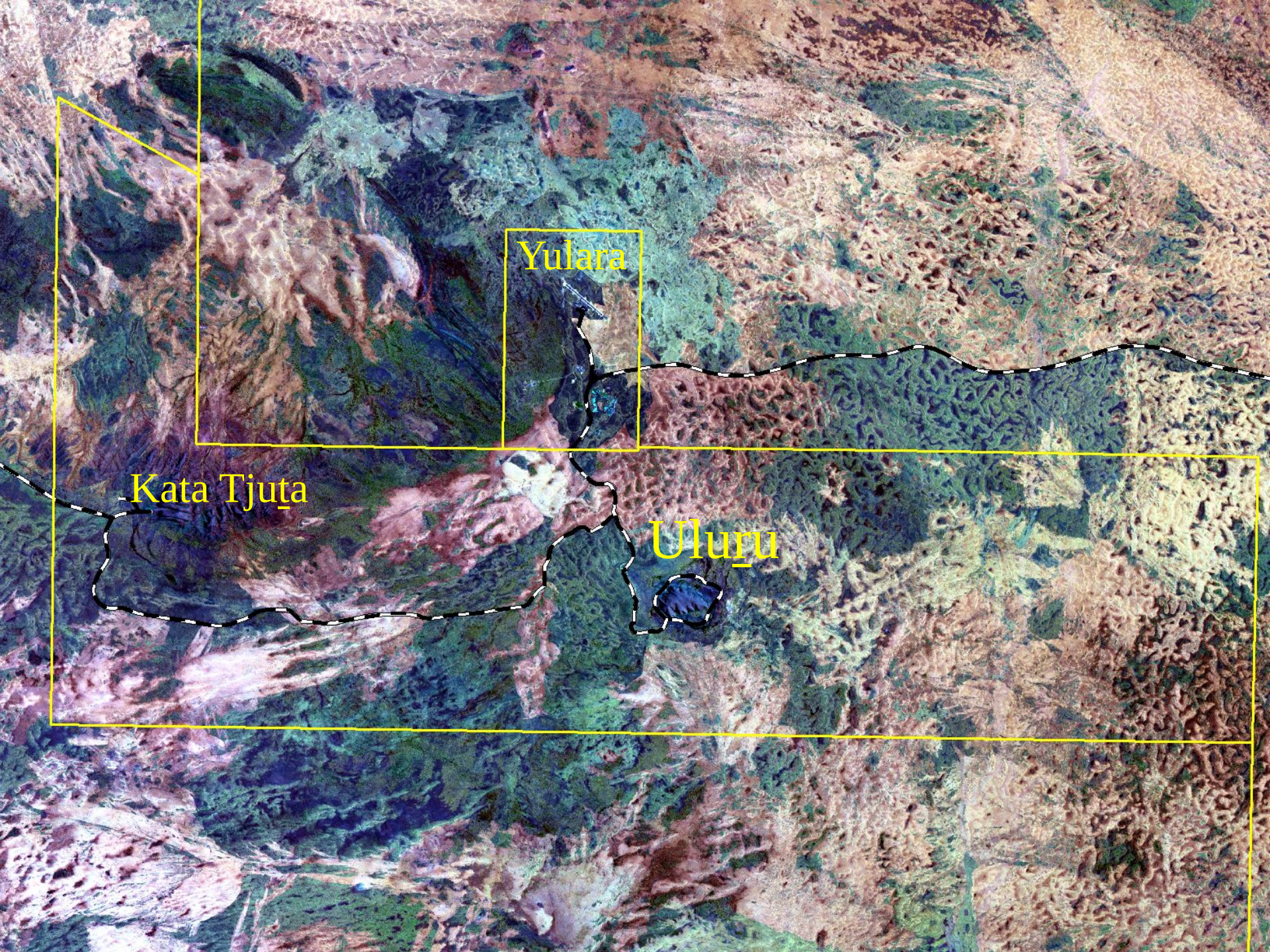
DK-CRC Desert Fire Sub-Project 2

- Fire regimes of the desert regions of Australia at a regional scale: overview and priority setting
  - review of current ‘scientific’ knowledge relating to environmental impacts and management of fire in desert areas (literature review)
  - identify priority areas of fire management research for Desert Fire Phase 2 : 2006 - 2010
    (workshop and community consultation)
    - proposed for May 2005 in Alice Springs
    - expressions of interest most welcome; W.A. contribution invited

DK-CRC Desert Fire Sub-Project 3

- Fire regimes of the desert regions of Australia at a regional scale: case studies
  - 3a : managing fire in the southern Tanami Desert
  - 3b : economic assessment of fire on pastoral lands in central Australia during 2000 to 2002
  - 3c : review of fire management planning and implementation on parks and reserves in central Australia and development of best practice protocols
  - 3d : using *Acacia* shrublands landscape change as an indicator of ecosystem health
  - 3e : impacts of fire on biodiversity in central Australia


The End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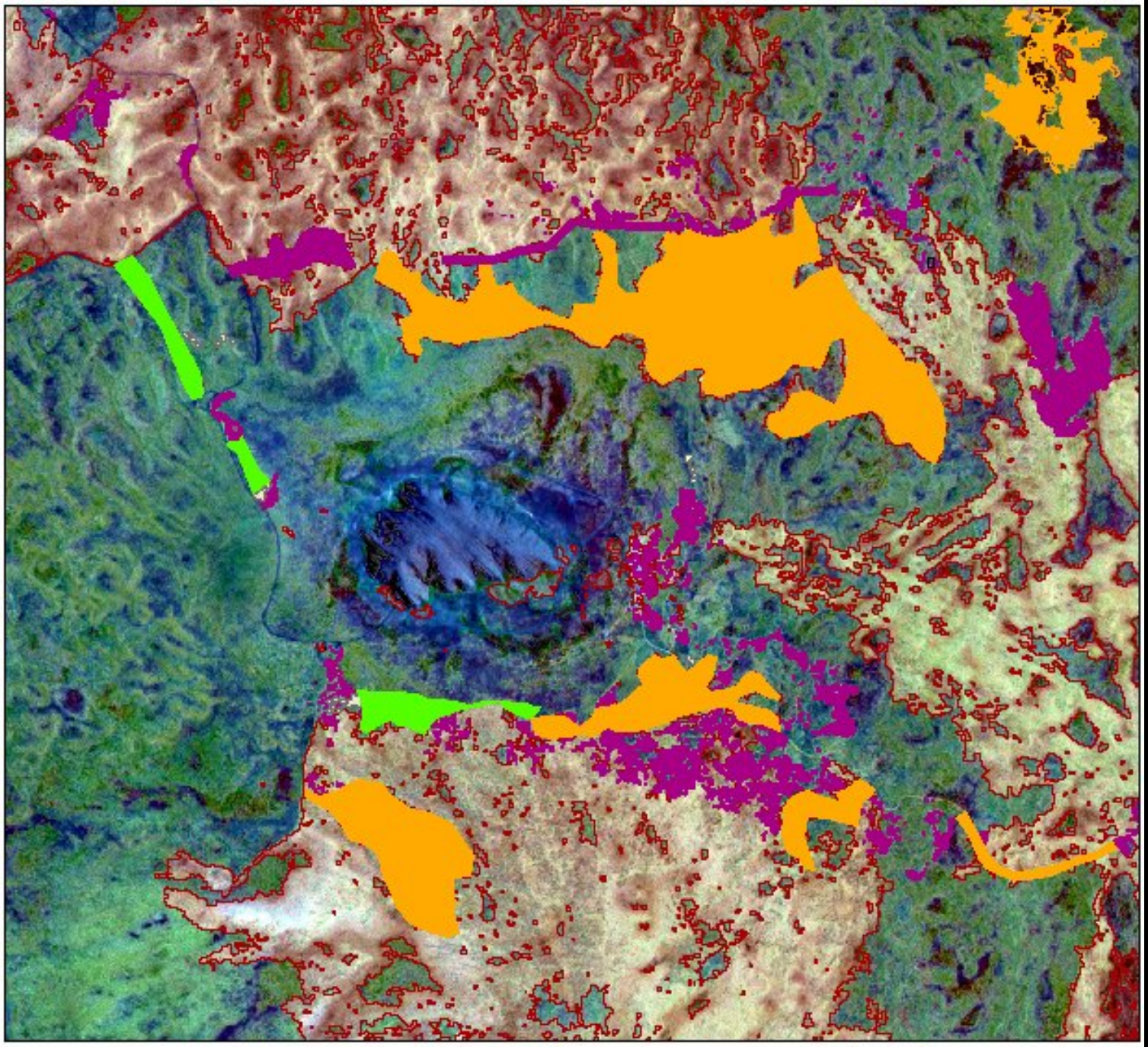
Managed Burns
2000
2001
2002
Wildfires
2002