

SAVANNA FIRE IGNITION RESEARCH EXPERIMENT “SAVFIRE”

**Promoting Savanna Heterogeneity for African Wildlife
through greater Pyrodiversity**

Kruger National Park, South Africa

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Pyrodiversity

Definition: Degree of variation in fire effects in terrestrial ecosystems e.g.

- Variation in **Fire Patterns** due to burnt and unburnt areas;
- Variation in **effects** of **Type** and **Intensity** of fire due to different meteorological and fuel conditions and topographical features of the landscape

OBJECTIVE

- To compare the *Pyrodiversity* that develops from *Point* versus *Perimeter* ignitions applied to areas of increasing size in the Kruger National Park, South Africa

MOTIVATION

Generally accepted:

- Biodiversity is promoted when controlled burns are applied as *Point Ignitions* vs *Perimeter Ignitions*
- Reason - fires vary more in terms of *type* and *intensity* resulting in greater *Pyrodiversity*

[MOTIVATION]

- However, *Point Ignitions* are *more difficult to control* and can be *dangerous* to life and property
- For *safety reasons* it is *preferable* to use *Perimeter* rather than *Point Ignitions* for controlled burning

[HYPOTHESIS being tested]

Pyrodiversity of Point & Perimeter Ignitions:

- Small areas - significantly different
- Large areas - similar

Reason:

With *Perimeter* Ignitions:

- **Small areas** - result in a single convection column drawing in the fire front on all sides - *lower Pyrodiversity*
- **Large Areas** – air does not coalesce into single convection column - fire front fragments into individual fires - *higher Pyrodiversity*

PROCEDURE

Applied *Point* & *Perimeter* Ignitions simultaneously to paired areas of:

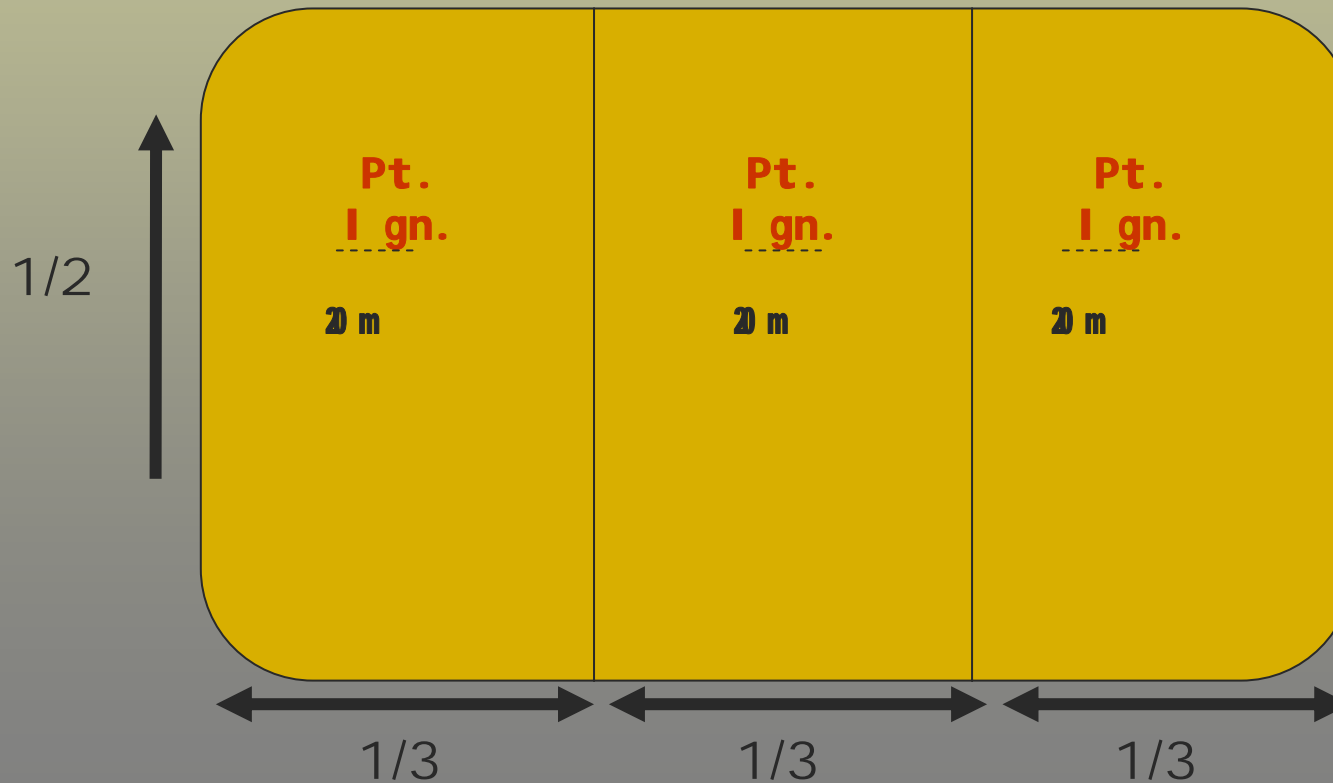
- 500 ha
- 1000 ha
- 2000 ha
- 3000 ha

Under similar fuel and atmospheric conditions

POINT IGNITIONS

- Ignition

- ignited 20m length fire front

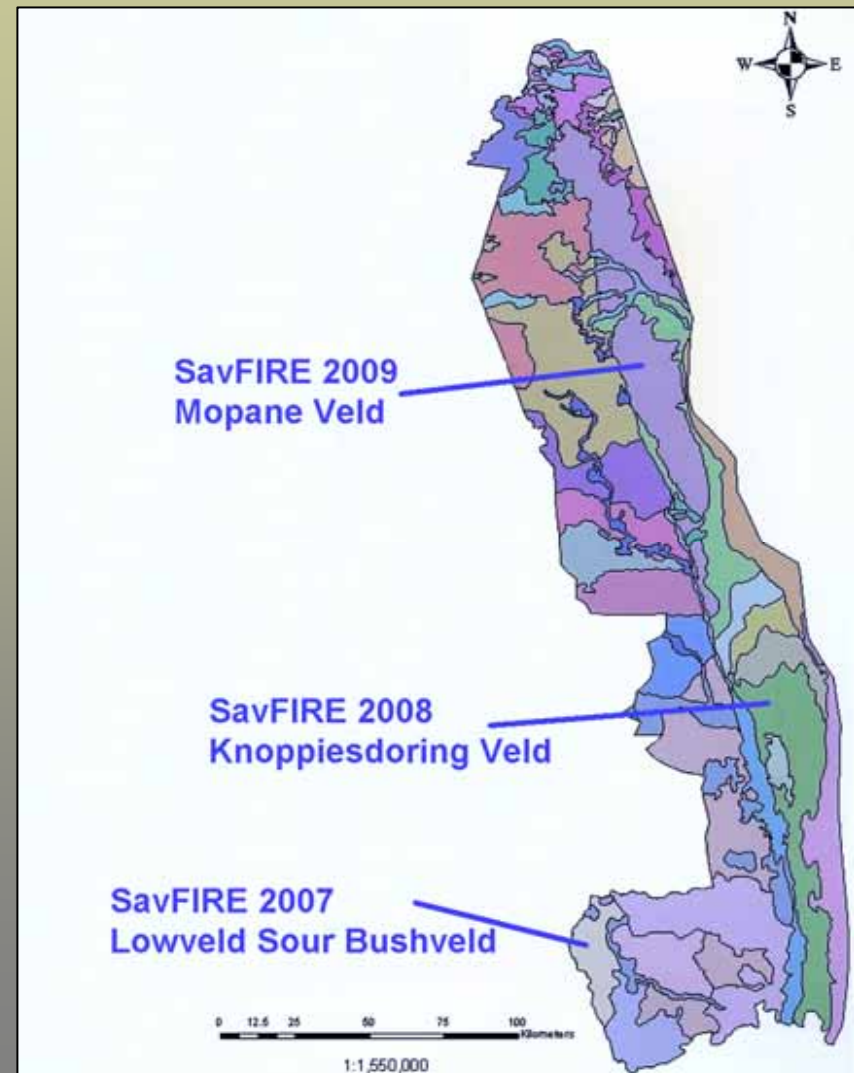


[Application - Three Point Ignitions]



PROCEDURE

Replicating SavFIRE in different vegetation landscapes in the Kruger National Park



BURNING CRITERIA

- **Fuel Conditions**

Fuel Loads - > 4000kg/ha

Fuel Moisture – fully cured

- **Atmospheric Conditions**

Air Temperature < 30°C

Relative Humidity > 50%

Wind 10 – 15km/h

Fire Danger Index <50 **Green/Yellow**

- **Results – Fires too intense – low *Pyrodiversity***

Changed:

- Air Temp. <20°C

- RH >50%



2000ha & 3000ha Blocks

SAMPLING PROCEDURE FOR ASSESSING CONDITION GRASS SWARD



Recorded at 10m intervals along 3 transects:

- Botanical composition
- Basal cover
- Grass fuel load - DPM

Veld Condition Assessment Crews



**& their
challenges!**



Survey Results

■ Catenae Profile

- Crest, mid-slope, bottom slope, valley bottom - **Similar**

■ Condition Grass Sward

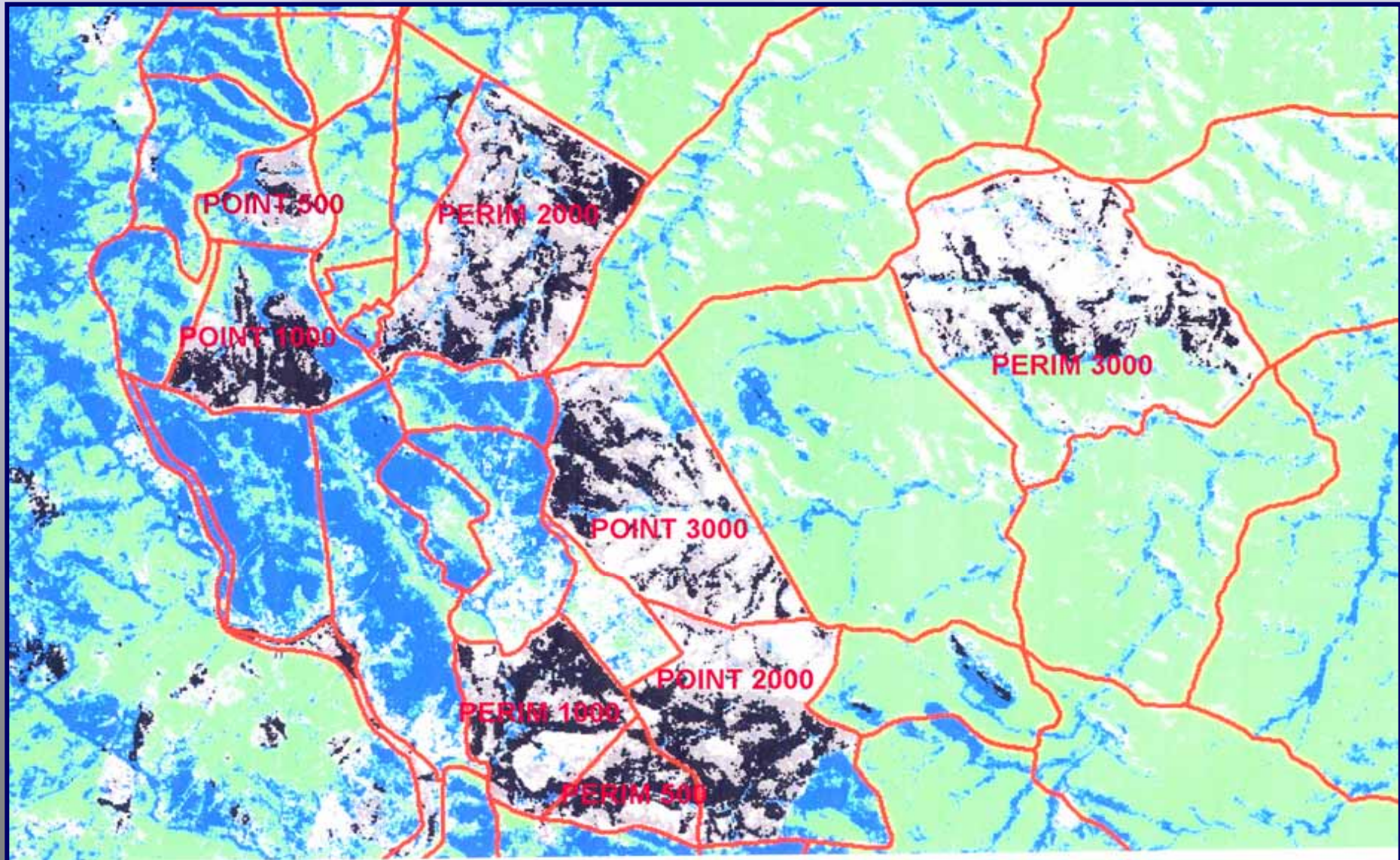
- Botanical composition – **NS Different**
- Basal cover – **NS Different**
- Grass fuel loads - **NS Different**



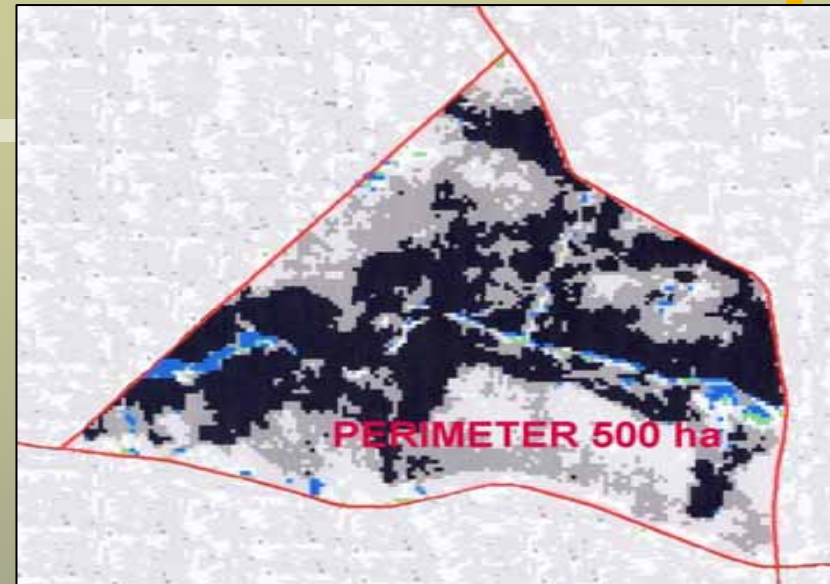
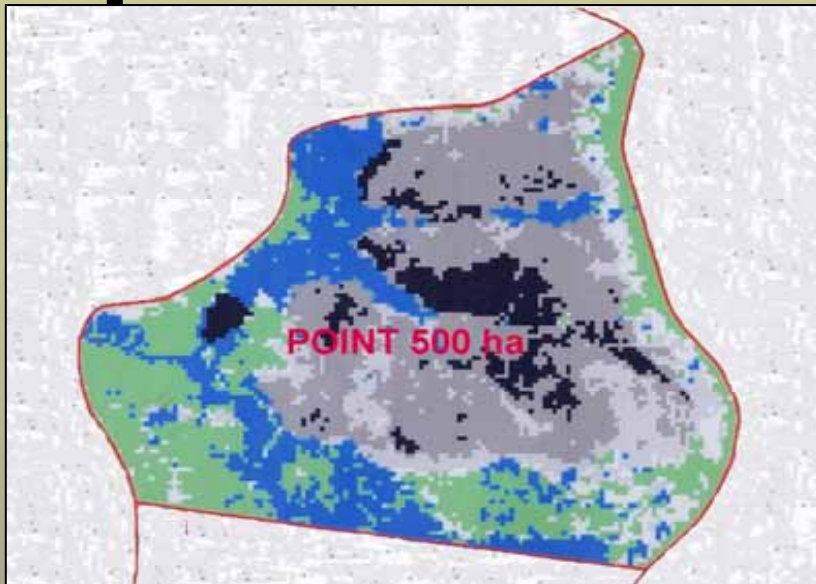
Results - *Pyrodiversity*

SavFIRE 2007

Point & Perimeter Ignitions



Point vs Perimeter Ignitions – 500 ha



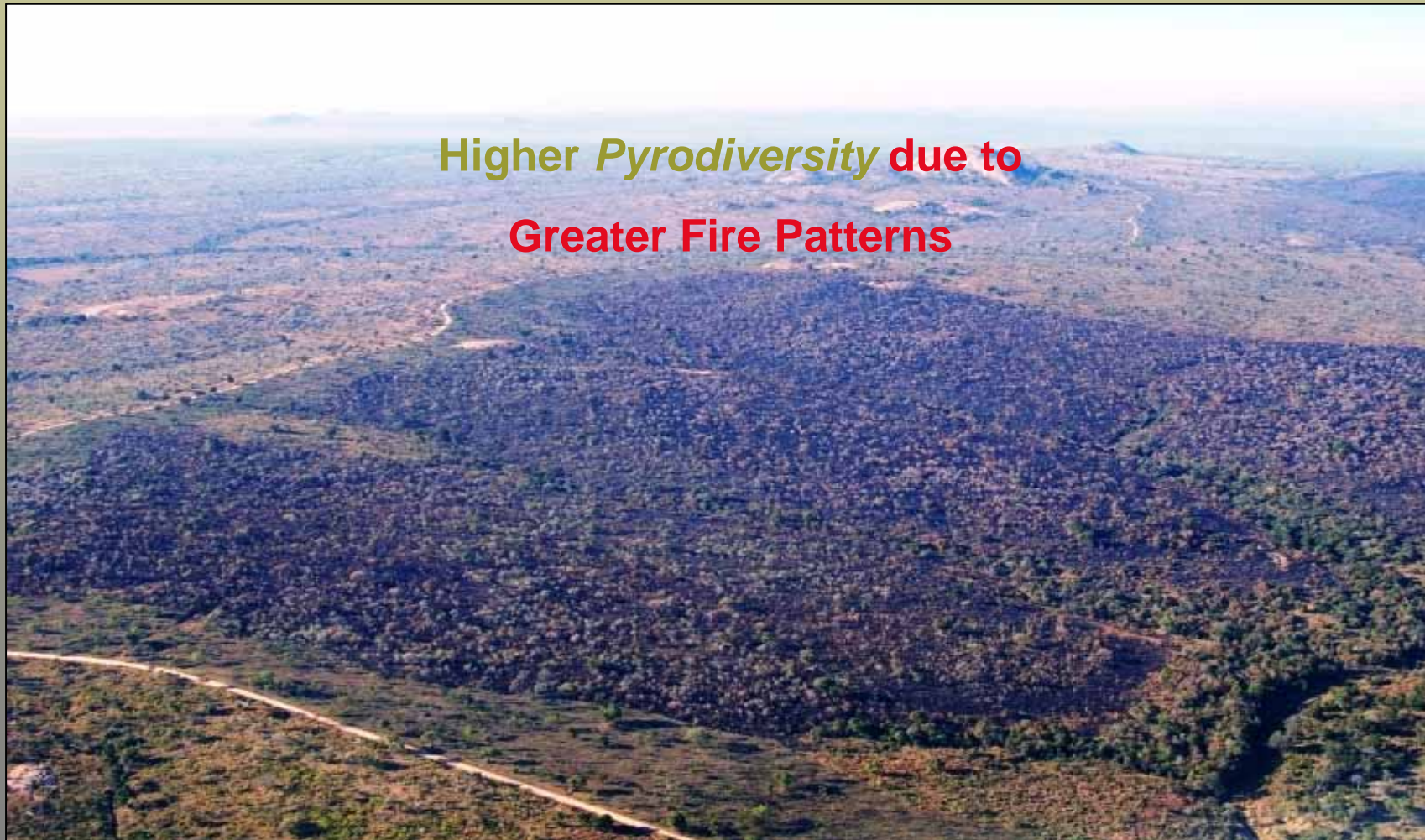
Conclusions:

- Overall Fire Intensity lower with Point vs Perimeter ignitions
- *Pyrodiversity due to Fire Intensity* greater in Perimeter Ignition because of greater range of fire intensities
- *Pyrodiversity due to Fire Patterns* greater in Point Ignition because less uniform burn

Point Ignition – 500 ha



Point Ignition – 500 ha

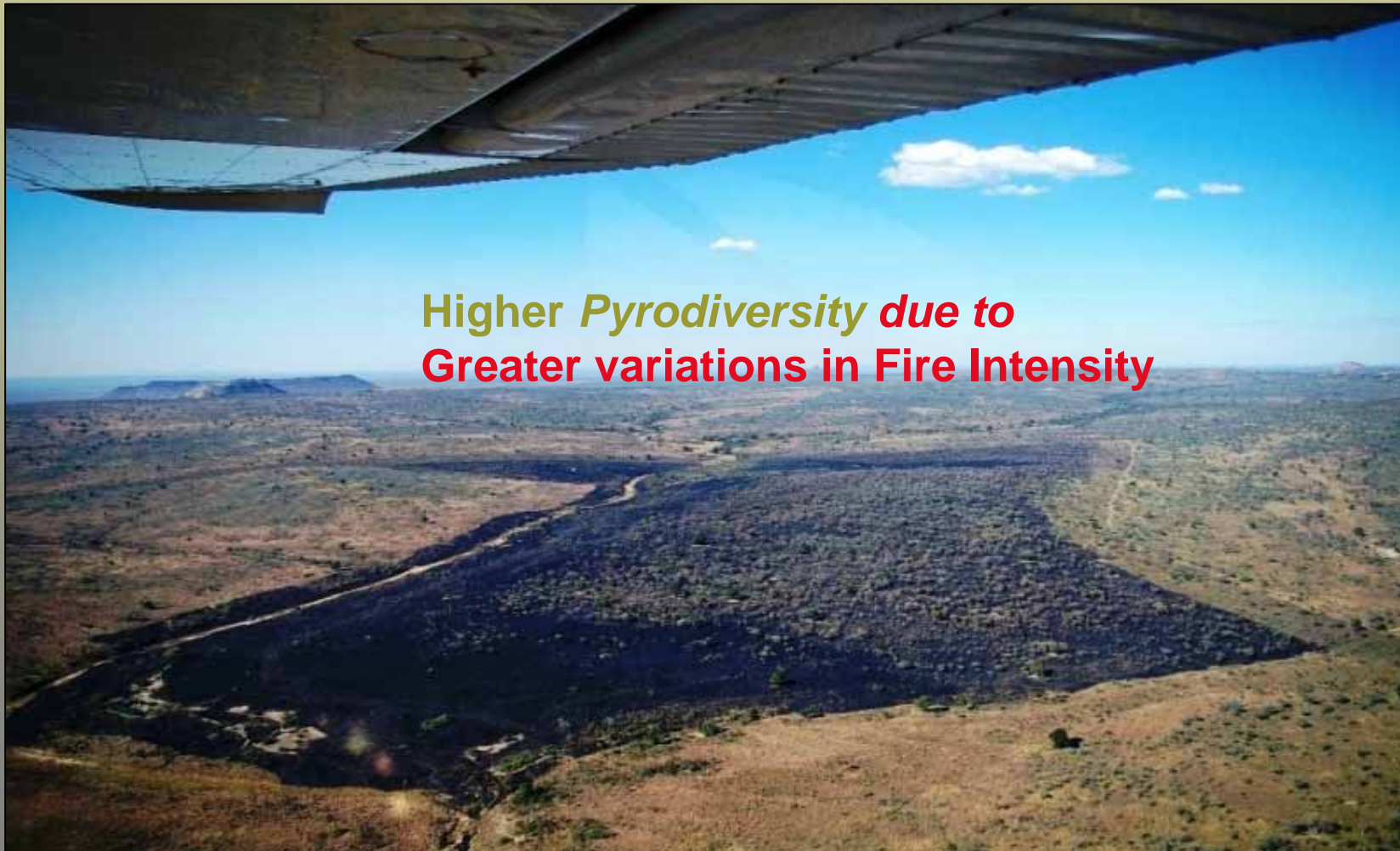


Higher *Pyrodiversity* due to
Greater Fire Patterns

Perimeter Ignition – 500 ha

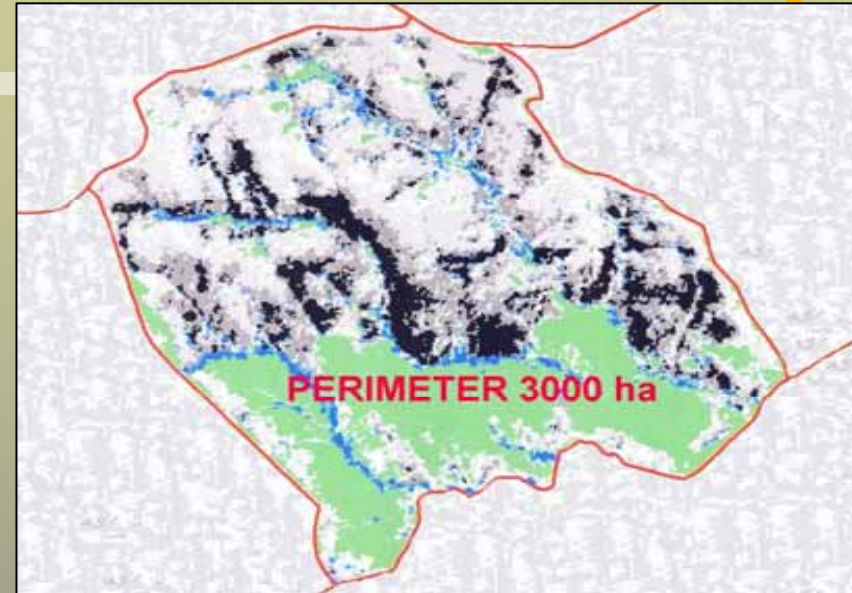
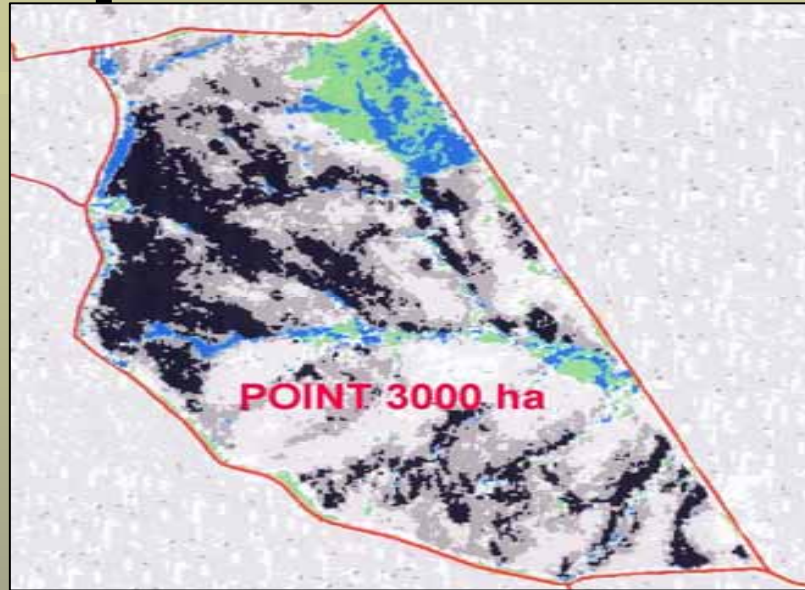


Perimeter Ignition – 500 ha



Higher *Pyrodiversity* due to
Greater variations in Fire Intensity

Point vs Perimeter Ignitions – 3000 ha



Conclusions:

- Overall Fire Intensity lower due to fires being applied when Air Temp. $<20^{\circ}\text{C}$ and RH $>50\%$
- *Pyrodiversity* in terms of Fire Intensity and Fire Patterns not radically different within burnt areas

Point Ignition – 3000 ha



Point Ignition – 3000 ha

Pyrodiversity due to Fire Intensity & Fire Patterns
similar for both



Perimeter Ignition – 3000 ha



Perimeter Ignition – 3000 ha

Pyrodiversity due to Fire Intensity & Fire Patterns
similar for both



[General Discussion & Conclusions]

Hypothesis Tentatively not disproved:

- *Pyrodiversity* similar for 2000/3000 ha burns with Point & Perimeter Ignitions
- Recognise confounding effects of different **Air Temperature & Relative Humidity** conditions
- Possible to use **Point & Perimeter** Ignitions to promote *Pyrodiversity* in relatively small areas - <3000 ha

General Discussion & Conclusions

- **Weather conditions** fundamentally important in influencing *Pyrodiversity*:
 - Relative Humidity >50%
 - Air Temperature <20 °C
- **Shape of Burn Block** significantly influences *Pyrodiversity* – square areas enable greater diversity of fire effects to occur
- **Initiate single Point Ignition** in centre of Burn Block – enables greater diversity of *Types of Fire* to develop
- Results suggest that *Pyrodiversity* can be achieved with both Point & Perimeter ignitions in Kruger National Park if required

Thank You

