

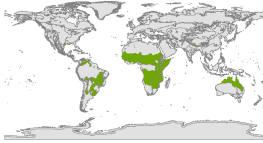
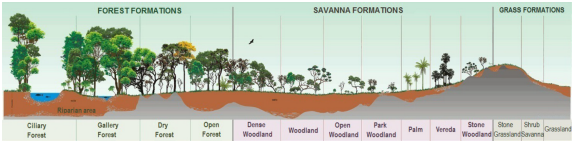
The use of remote sensing to study fire frequency in the Brazilian Cerrado

ENV 202/502 - Introductory remote sensing

Sofia Oliveira
26 May 2015


Background

- Tropical savannas are a biome characterized by tall grasses and occasional trees
- Climate is tropical with a wet season and a dry season
- One of the most fire-prone biomes on Earth
- Knowledge of fire frequency is essential for proper implementation of fire management plans


Brazilian Cerrado

- Covers 23% of Brazilian territory (200 million hectares) and is the most extensive savanna in South America
- It is the second largest and richest biome in Brazil
- It is the most biologically rich savanna in the world
- Only 1.5% of the Cerrado is protected

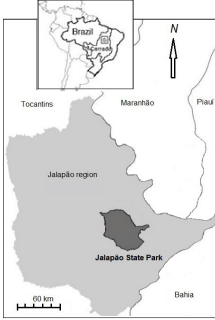
Threats to biodiversity

- In recent years, the rate of ecological destruction in the Cerrado has been twice that in the Amazonia
- Large-scale agriculture is responsible for deforestation and land clearance
- Tourism and golden-grass handicrafting
- Native Brazilians used fire to clear small areas for cattle grazing, raising crops, and hunting and fishing for subsistence but current fire regime is characterized by extensive and frequent anthropogenic fires



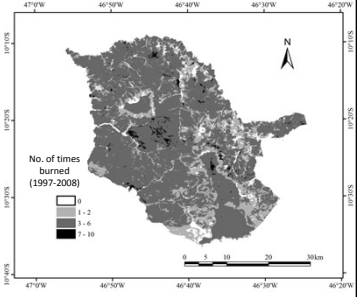
Study area & study period

- Study area: Jalapão State Park, a protected area with 159 225 ha
- No fire management plan
- Study period: 1997-2008



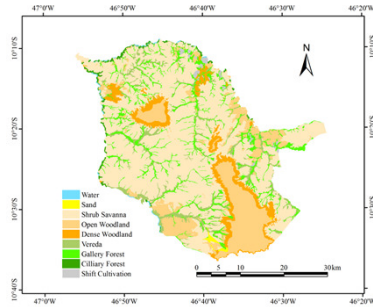
Burned area mapping

- Landsat-5 TM and Landsat-7 ETM+ 47 images (3 per year) to reduce omission errors
- Classification was performed using OBIA complemented with manual on-screen editing



Vegetation mapping

Based on Landsat-5 TM data acquired in 2007 and modified using field data collected in December 2005 and May 2008

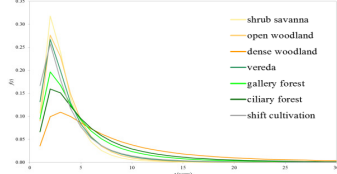


Fire frequency

Metric	Definition	Equation
Fire rotation period FRP	Time needed to burn an area of the same extent as the study area	$\frac{\text{No of years} \times \text{study area}}{\text{total burned area}}$
APAB	Annual percentage of area burned	$\frac{1}{FRP}$
Fire interval <i>f(t)</i>	Probability of having fire intervals of <i>t</i> years	$\phi\left(\frac{\ln(t) - \mu}{\sigma}\right) - \phi\left(\frac{\ln(t-1) - \mu}{\sigma}\right)$
Median fire interval	Median interval between consecutive fires	$\exp(\mu)$
Modal fire interval	Most frequent fire interval	$\exp(\mu - \sigma^2)$

Fire frequency results

Vegetation type	FRP	APAB	Median fire interval	Modal fire interval
Shrub Savanna	2.7	37	3	2
Open Woodland	2.8	36	3	2
Dense Woodland	5.5	18	6	3
Vereda	3	33	3	2
Gallery Forest	4.4	23	4	2
Cillary Forest	4.6	22	5	2
Shift Cultivation	3.7	27	3	2
Jalapao State Park	3	34	4	2



Conclusions and recommendations

- Through the use of remote sensing areas that burn more frequently and where to prioritise fire prevention activities were identified
- Fire frequency is very high (3-6 years)
- Land cover with lower tree density have higher fire frequency
- Early dry season patch mosaic burning
- Strategic use of firebreaks

