



# National Forest Monitoring System (NFMS) in Zambia

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# Scope of Presentation

- Status of NFMS in Zambia
- Development of the NFMS
- Limitations of the NFMS
- SADC/JICA Forestry Project
- Road Map-Raising Technical Level
- Forest Fire Detection and Management



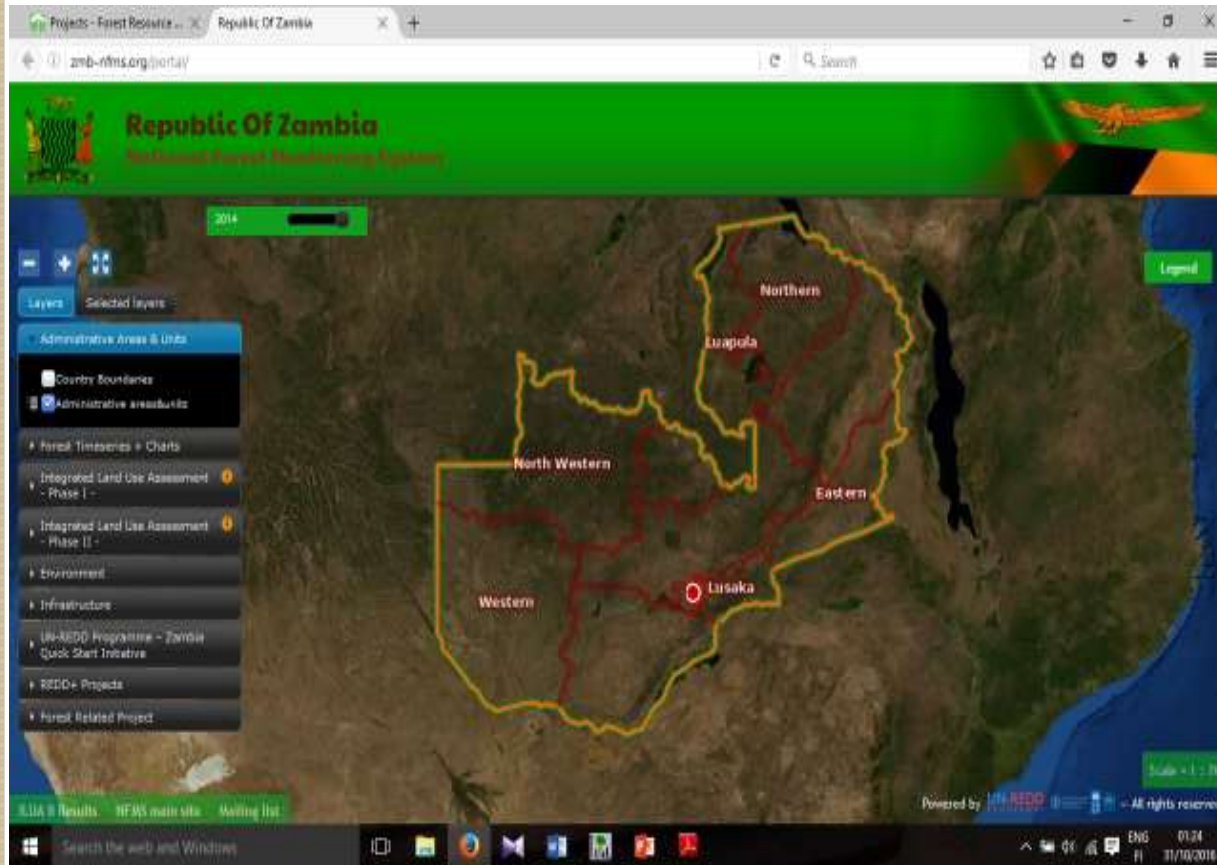
# National Forest Monitoring System (NFMS)

- Zambia has a developed National Forest Monitoring System (NFMS) used for information access and sharing
- The objective of the NFMS is generally to achieve:
  - Timely access to consistent and accurate data
  - Sharing of data for collaborative decision-making
  - Fast, efficient service to both government offices and the general public



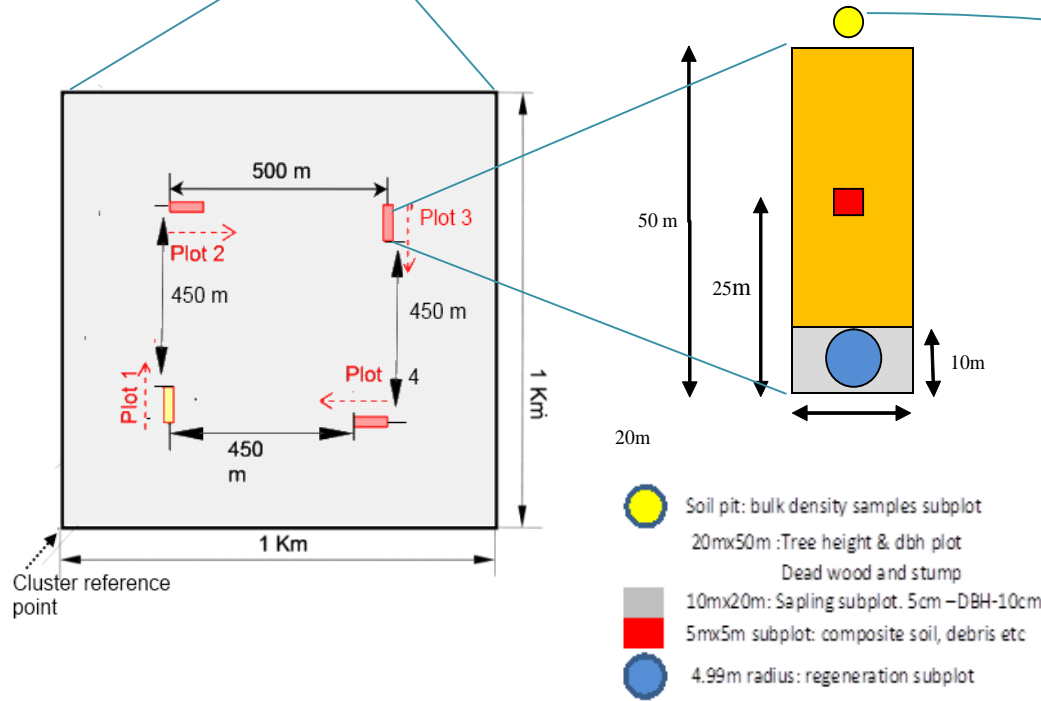
# Status of the NFMS

- The Development was guided by the **pillars** of the UN-REDD+ requirements which supported the country.





# Development of the NFMS



(a) Cluster

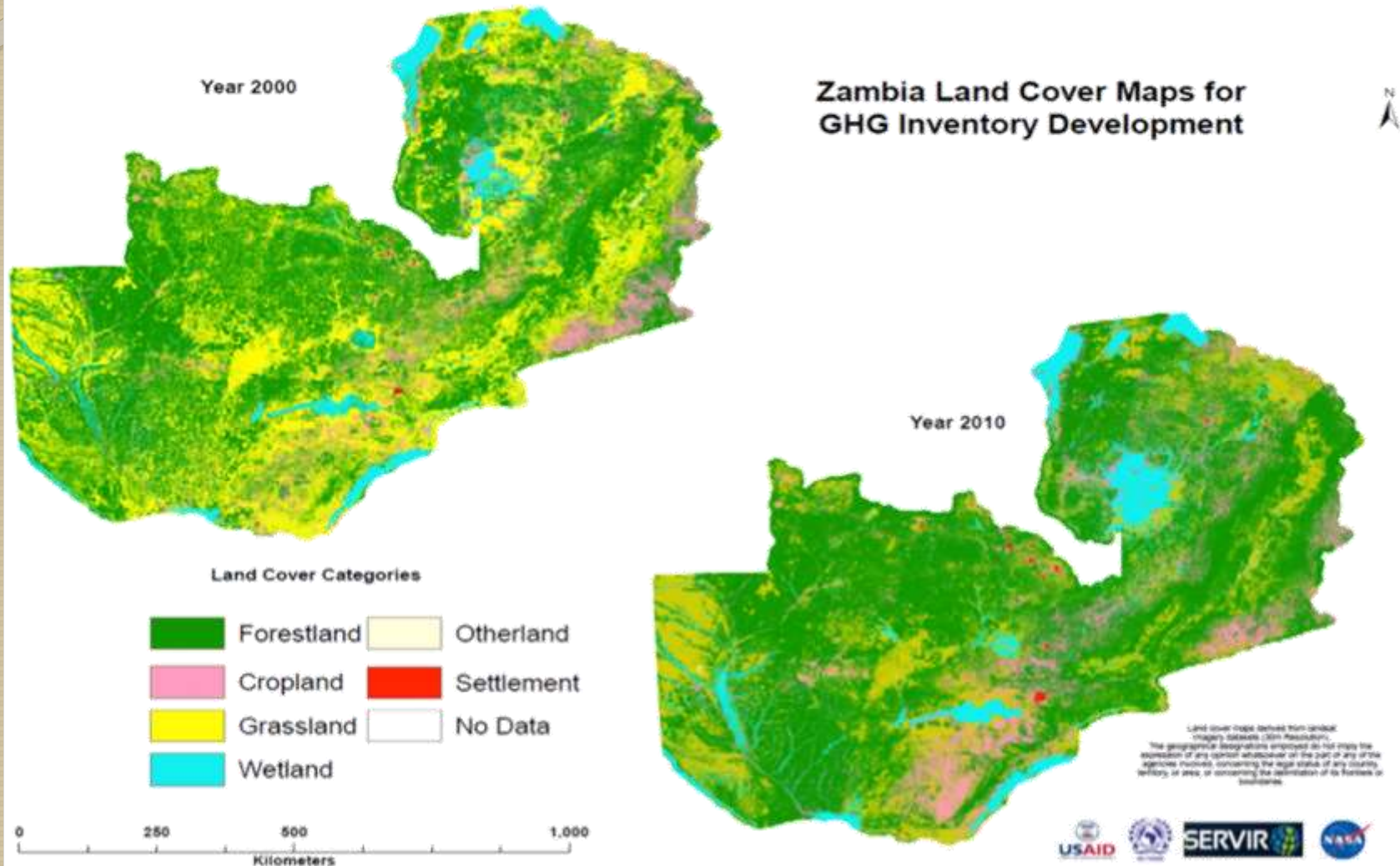
(b) Plot 1 subplots



(c) Soil pit

# Forest Cover Mapping and Change Detection

- Landsat 5, 7 and 8 images with a 30 m spatial resolution were acquired and used to generate land cover maps for the years 2000, 2010 and 2014.







# Limitations of the NFMS

- The system is not fully developed and can be improved with more data and functionality
- The applications at provincial level should improve productivity and reduce duplication of tasks and efforts
- Its not possible to monitor changes and calculate areas of changes
- The user can not upload their area of interest on NFMS portal
- Irregular updates of the data





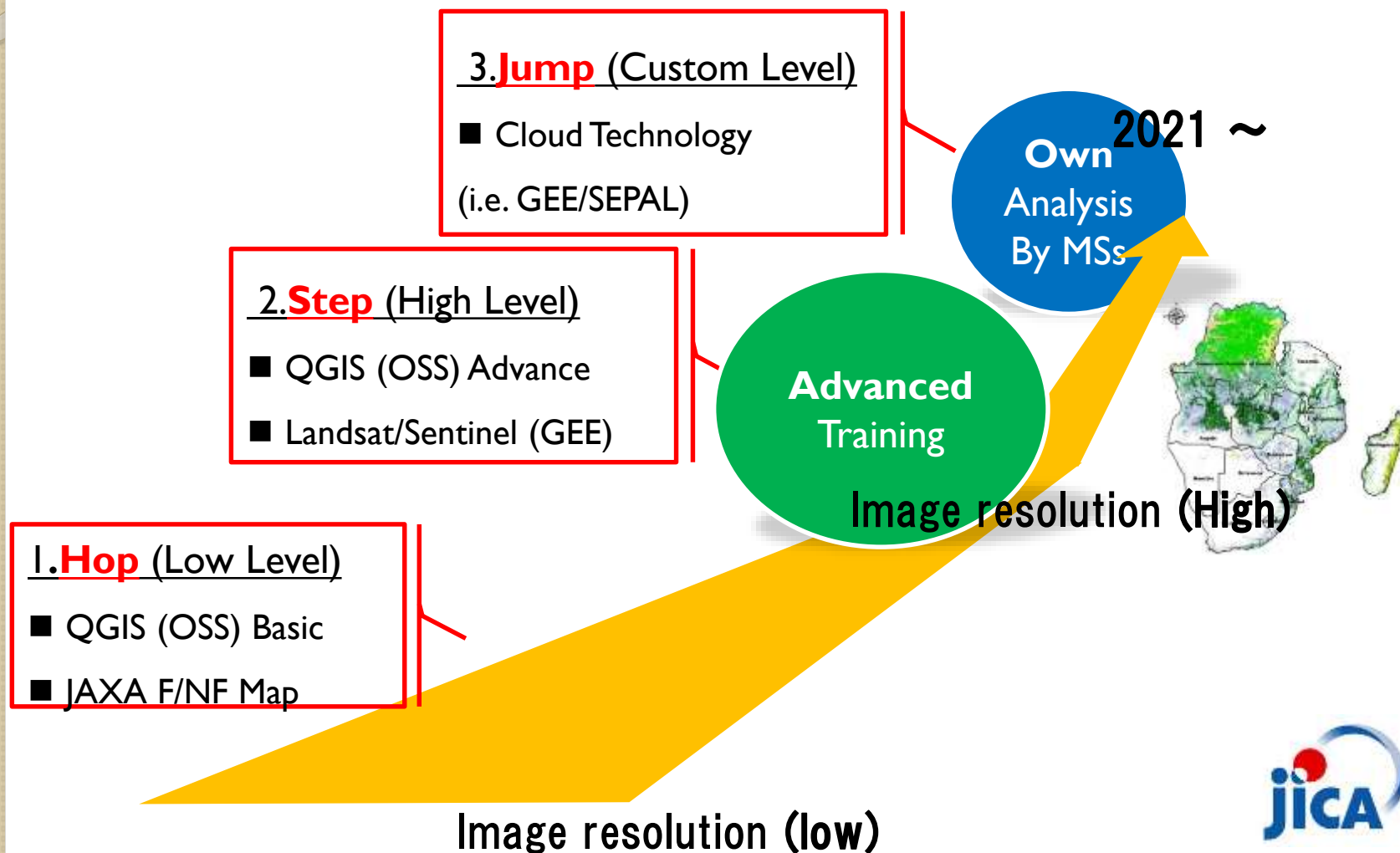
# SADC/JICA Forestry Project

- Develop the capacity of Member States to generate Forest Resources Information for promoting forest conservation and sustainable management of forests
- Harmonize National Forest Information Systems of the MS and develop the SADC Regional Forest Information
- Finalize the land cover mapping for 2015 and compile other datasets for forest monitoring in the region
- Maintenance of the NFMS requires technical skill and capacity to provide up-to-date information and statistics on forest resources. The project has therefore contributed to the efforts that are being undertaken by the country and the department in particular to conserve the forest resources.

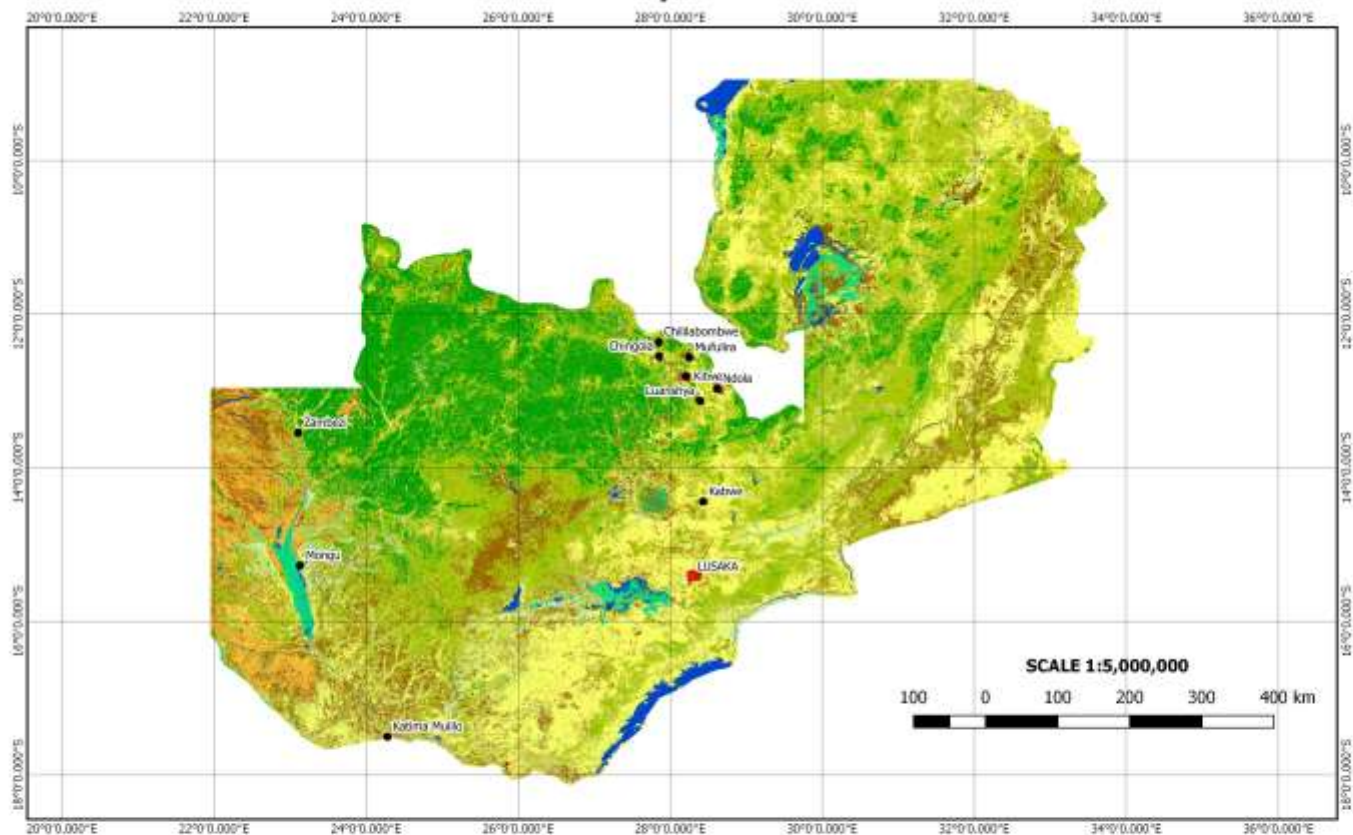


# Road Map-Raising Technical Level

## - Forest area change detection with time-lapse -



## ZAMBIA LANDCOVER/LANDUSE MAP FOR 2010



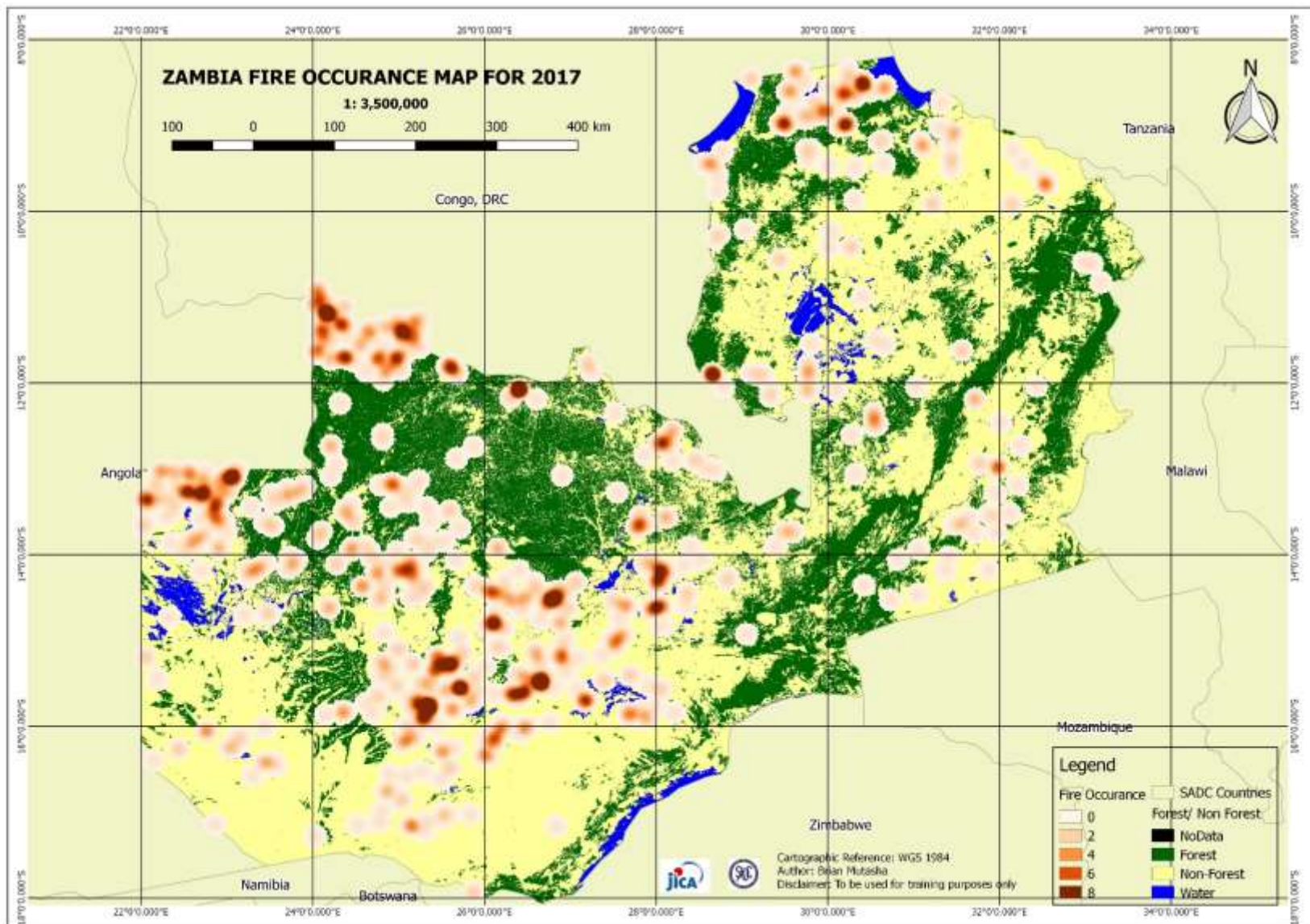
MAP DATUM  
WGS 1984  
Data Source:  
Hatfield Consultants Africa

### Legend

#### Landcover Classes

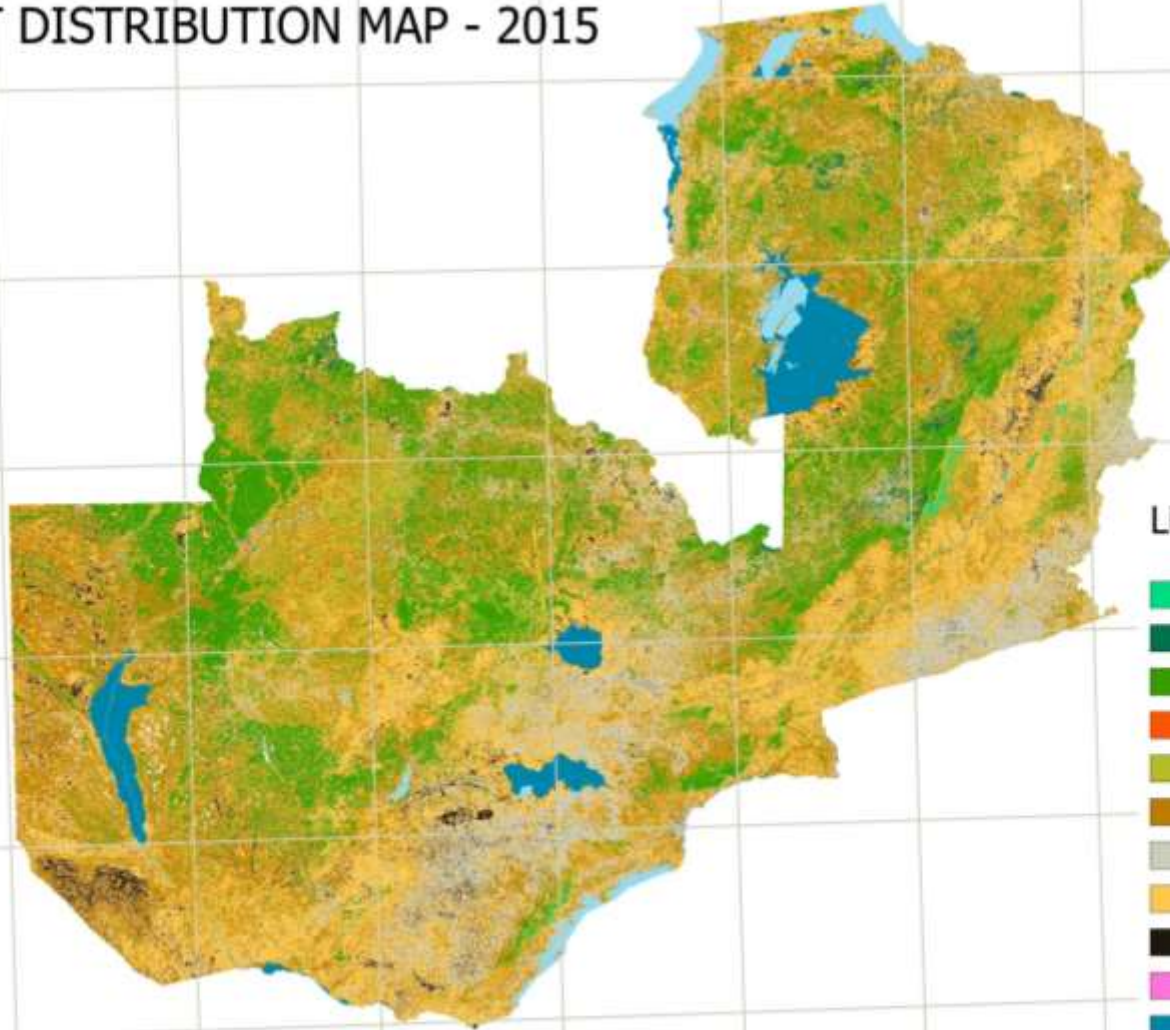
- |  |  |  |
|--|--|--|
| Cropland: rainfed  | Tree cover: needleleaved: deciduous: closed (>40%)         | Sparse herbaceous cover (<15%)                                 |
| Cropland   | Tree cover: needleleaved: deciduous: open (15-40%)         | Shrub or herbaceous cover: flooded: fresh/saline/brakish water |
| Tree cover: broadleaved: evergreen: closed to open (>15%)  | Tree cover: mixed leaf type (broadleaved and needleleaved) | Urban areas  |
| Tree cover: broadleaved: deciduous: closed to open (>15%)  | Mosaic tree and shrub (>50%) / herbaceous cover (<50%)     | Bare areas   |
| Tree cover: broadleaved: deciduous: closed (>40%)          | Mosaic herbaceous cover (>50%) / tree and shrub (<50%)     | Consolidated bare areas  |
| Tree cover: broadleaved: deciduous: open (15-40%)          | Shrubland  | Unconsolidated bare areas                                      |
| Tree cover: needleleaved: evergreen: closed to open (>15%) | Shrubland evergreen  | Water bodies   |
| Tree cover: needleleaved: evergreen: closed (>40%)         | Shrubland deciduous  | <b>Cities</b>  |
| Tree cover: needleleaved: evergreen: open (15-40%)         | Grassland  | CAPITAL CITY   |
| Tree cover: needleleaved: deciduous: closed to open (>15%) | Sparse vegetation (tree: shrub: herbaceous cover) (<15%)   | MAJOR TOWN   |
|  | Sparse shrub (<15%)  |  |







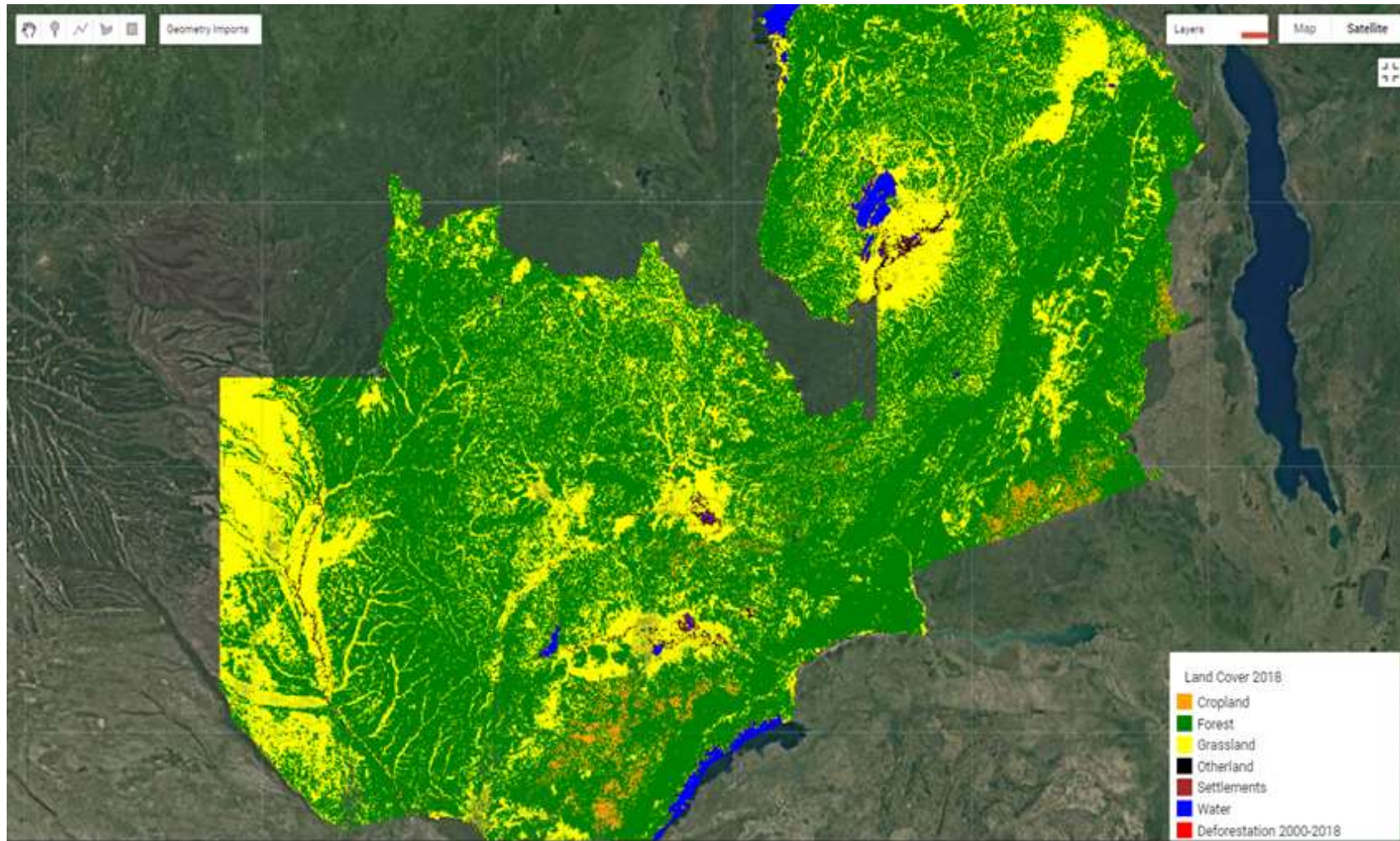
# FOREST DISTRIBUTION MAP - 2015



## LEGEND

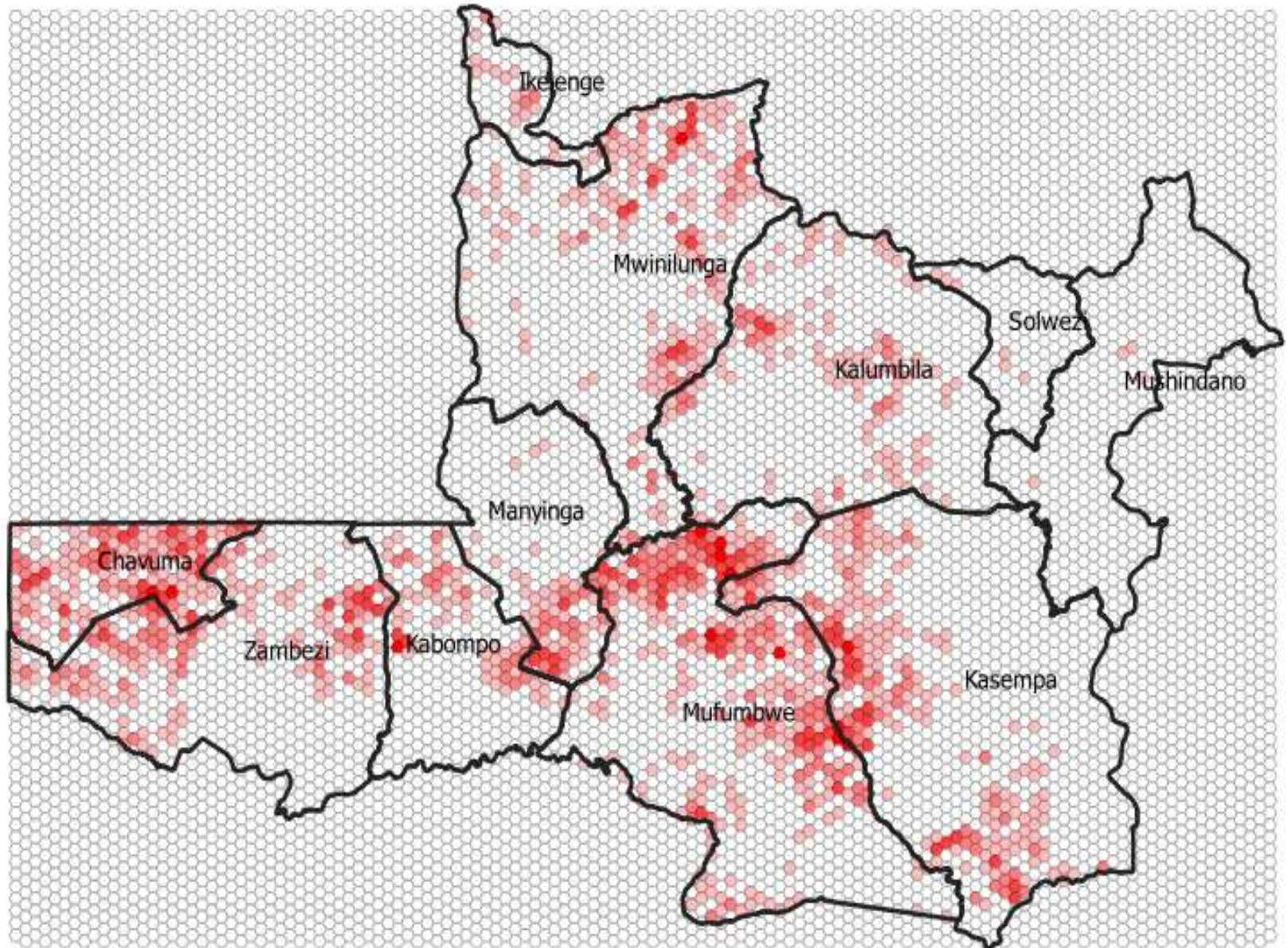
- Closed Forest
- Montane Forest
- Sub-montane Forest
- Plantation
- Deciduous Woodland
- Deciduous Shrubs
- Cropland
- Savana
- Bareground
- Mangrove
- Swamp
- Waterbody
- Pan

# Future Plans





# Deforestation Hotspot Analysis





# Forest Fire Management in Zambia





# Presentation Layout

- Situation of Forest Fires in Zambia
- Causes of Wildfires
- Legal framework to regulate Forest Fires
- Forest Fire Detection and Management



# Land Administration in Zambia

- Over 60% of total land in Zambia is under forest cover, out of which 9.6% are gazetted forests.
- There are 20 national parks and 36 game management areas in Zambia covering approx. 30% total land cover.
- Less than 7% of the country is designated as State Land (i.e. government can issue title deeds on this land).
- The rest of land is designated customary land.



# Situation of Forest Fires in Zambia

- On average, 25% of the country is subjected to fires every year
- Protected areas such as Forests and National Parks are some of the most frequently burnt areas in the country
- Agriculture practices, Hunting and poaching are some of the major causes of unwanted bush fires in the country
- There is no single institution with an overall mandate to manage wild fires in country though ZAWA and FD have some responsibility in this regard



# Area Affected by Fires ('000 Ha) in Zambia

Year/ Categories	Total land area affected by fire	...of which on forest
2000	15,130	12,484
2001	13,725	11,662
2002	16,053	14,114
2003	19,586	16,745
2004	19,061	15,798
2005	20,827	17,823
2006	18,118	15,309
2007	18,047	14,916
2008	19,000	15,999
2009	14,790	12,208
2008	19,000	15,999
2009	14,790	12,208
2010	17,863	14,799
2011	17,863	14,582
2012	18,018	14,645
2013	18,946	15,528
2014	17,299	14,248
2015	18,015	15,077
2016	17,474	14,253





# Main Causes of Forest Fires

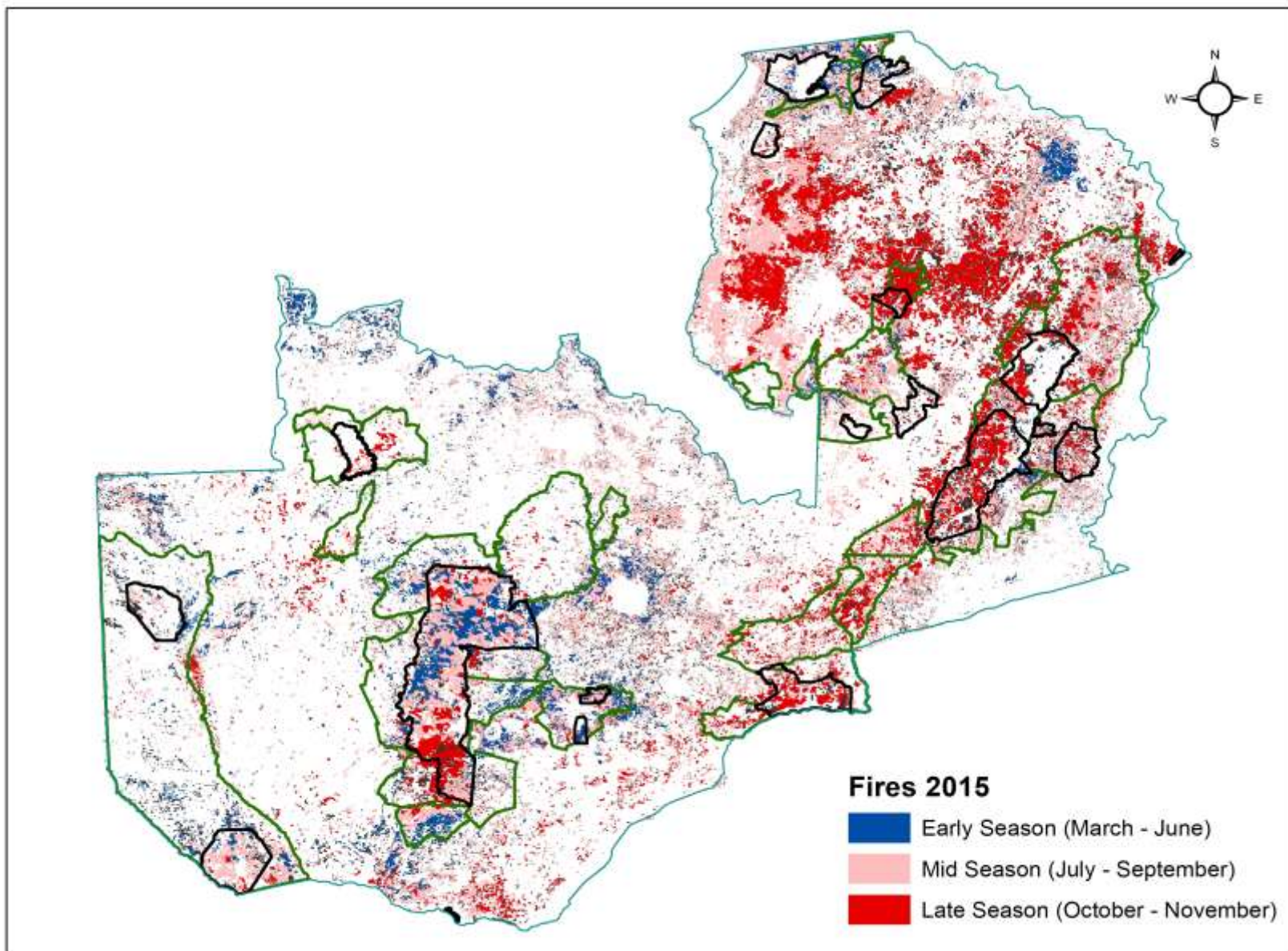
- Why do they burn
  - Hunting mice
  - Clearing fields
  - Poaching
  - Protection from wild animals
  - Allow regeneration of grass for animal grazing
- Why Burn Late
  - Allow grass to mature
  - Wait for crops to be harvested
  - Allow caterpillars eggs to develop



Photo credit: Gift Sikaundi



# Distribution of Forest Fires



# Legal Framework

## **Environmental Management Act, (No 12 of 2011) of the Laws of Zambia:**

- This is the principal environmental law in Zambia under which laws and regulations aimed at protecting the environment have been set up.
- The Zambia Environmental Management Agency (ZEMA) established under this act
- Through its regulations, prohibits any form of environmental degradation, and any form of open air burning

## **The Forest Act (No. 4 of 2015):**

- This law prohibits any person from setting fire to any plant, grass or any undergrowth in the forest area.
- It also mandates the forests commission to make fire breaks and to conduct controlled early burning, as a forest management

## **Zambia Wildlife Act:**

- Prohibits the lighting of any fires by any person in the national parks or game management areas
- Mandates Zambia Wildlife Authority to carry out fire management in the parks inclusive of early burning or making fire breaks

## **The Disaster Management Act:**

- This act mandates the Disaster Management and Mitigation Unit (DMMU) to respond to any disasters that may affect the community, including effects of fire disasters

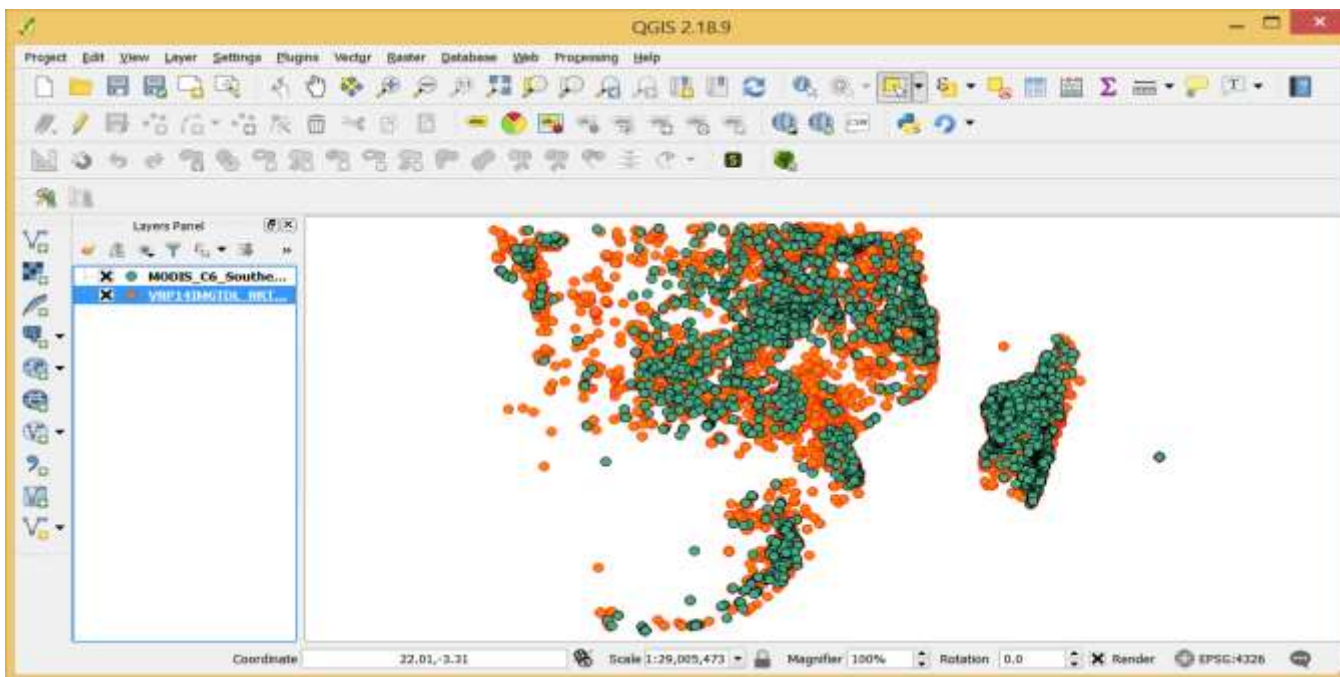




# Training for Forest Fire Management



- Setting up working environment for Advanced RS/GIS work
- Detection of burnt scar areas
- Update firebreak lines
- Development of FDI
- Development of Fire Fighting Map





# FUTURE PLANS

- There is need to invest in the basic equipment and tools required for fire suppression.
- Firefighters need to understand and practice how to use the tools in terms of the fire triangle



# FUTURE PLANS

## Development of Fire Danger Index

### Methodology and tools

#### Traditional method

- ✧ GIS software
- ✧ Very high technical skills;
- ✧ Download very big data;
- ✧ Same jobs every time;
- ✧ And more...



#### Advanced method

- ✧ Cloud computing
- ✧ Low/non technical skill;
- ✧ Machine learning;
- ✧ Download output only;
- ✧ Easy to replicate/improve



Google Earth Engine





# Thank You

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Please visit us at: <http://zmb-nfms.org/portal>