

Land Cover Mapping as Baseline for Forest Landscape Restoration in Bukidnon/Misamis Oriental Landscape

Presented by:

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Presentation Outline

- The need for Updated Land Cover Data
- ESSC's mapping history in Bukidnon
- 2018/2019 Land Cover Update for Bukidnon and Misamis Oriental
- Methods
- Initial Insights and Opportunities for Forest Landscape Restoration

The Need for Updated Land Cover

- Context
 - Poor understanding of the interactions of biophysical and social processes operating in any given area
 - Lack of accurate, comprehensive and up-to-date information
 - Absence of appropriate tools for analysis to serve as the basis for planning
- ***“How can we manage a resource if we don’t know where it is, how much of it exists, and what the different pressures it is subjected to?”***

2005 Bukidnon Land Cover Map

- 20m x 20m SPOT images
- 22 Land Cover/Use classes
- Aerial and Ground Validation



2018 Bukidnon Land Cover Update

- Mapping Component of Assessment of Land And Resource Management (ALARM) and Generating Advancement for Upland Peoples In Northern Pantaron Range (GAUP) Project funded by Forest Foundation Philippines
- Expected Result: “*Land cover for Northern Pantaron Range in Bukidnon and Misamis Oriental assessed in collaboration with key stakeholders*”

Mapping Inputs and Method

- Sentinel 2A and 2B satellite images (10m x 10m resolution)
- With 5 day revisit since March 2017
- Processed using ESA's Sen2Agri Protocol with L4B Product (Crop Type Map) as output
- Utilizes drone and ground validation

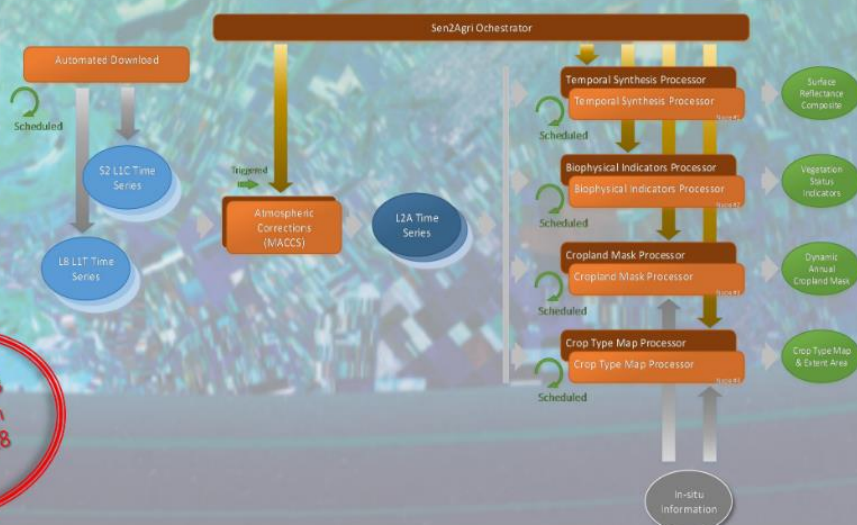


Semi-automated Land Cover Classification

[Operational System](#)[Products](#)[System Demonstration](#)[Resources](#)[Sen2-Agri Project](#)[Forum](#)[Log In](#)[Register](#)[+ AGRICULTURE](#)

THE SEN2-AGRI SYSTEM

To serve the exploitation of Sentinel-2 for local to national operational agriculture monitoring



Produce high resolution EO products suitable for Agricultural Monitoring from local to national scales

Processing chains validated over a wide range of cropping systems around the world

Download and process Sentinel-2 and Landsat 8 dense time series without any effort

Cutting-edge image processing methods are performed automatically over your region and monitoring period

Access through a Graphical User Interface

System to be installed on a Linux server but easily accessible and configurable on a graphical user interface through your favorite web browser

Free and Open source system under GPL license

Based on Orfeo Toolbox and SLURM

Data privacy

Field data and products can be processed and stored locally

Version 1.8.3
released on
20/09/2018

sentinel-2
sentinel-2 for agriculture monitoring

[sites](#)[products](#)[system overview](#)[dashboard](#)[custom jobs](#)[monitoring](#)

Username:

Password:

LEGEND

NATURAL FOREST

- Mossy forest
- Primary forest
- Secondary forest

PLANTATION FOREST

- Plantation trees
- Pine Plantation

OTHER WOODED LAND

- Shrubland
- Other Land with Tree Cover

OTHER LAND

- Grassland

PERENNIAL CROPLAND

- Pineapple
- Rubber
- Banana
- Mango
- Oil Palm

ANNUAL CROPLAND

- Sugarcane
- Corn
- Irrigated Ricefield
- Coconut
- Cassava
- High Value Crops

- Built-up area
- Road
- Agri-industrial Establishment
- River/Lake

- Provincial Boundary
- City/Municipal Boundary
- Coastline



10 0 10 20 km

UTM ZONE 51N

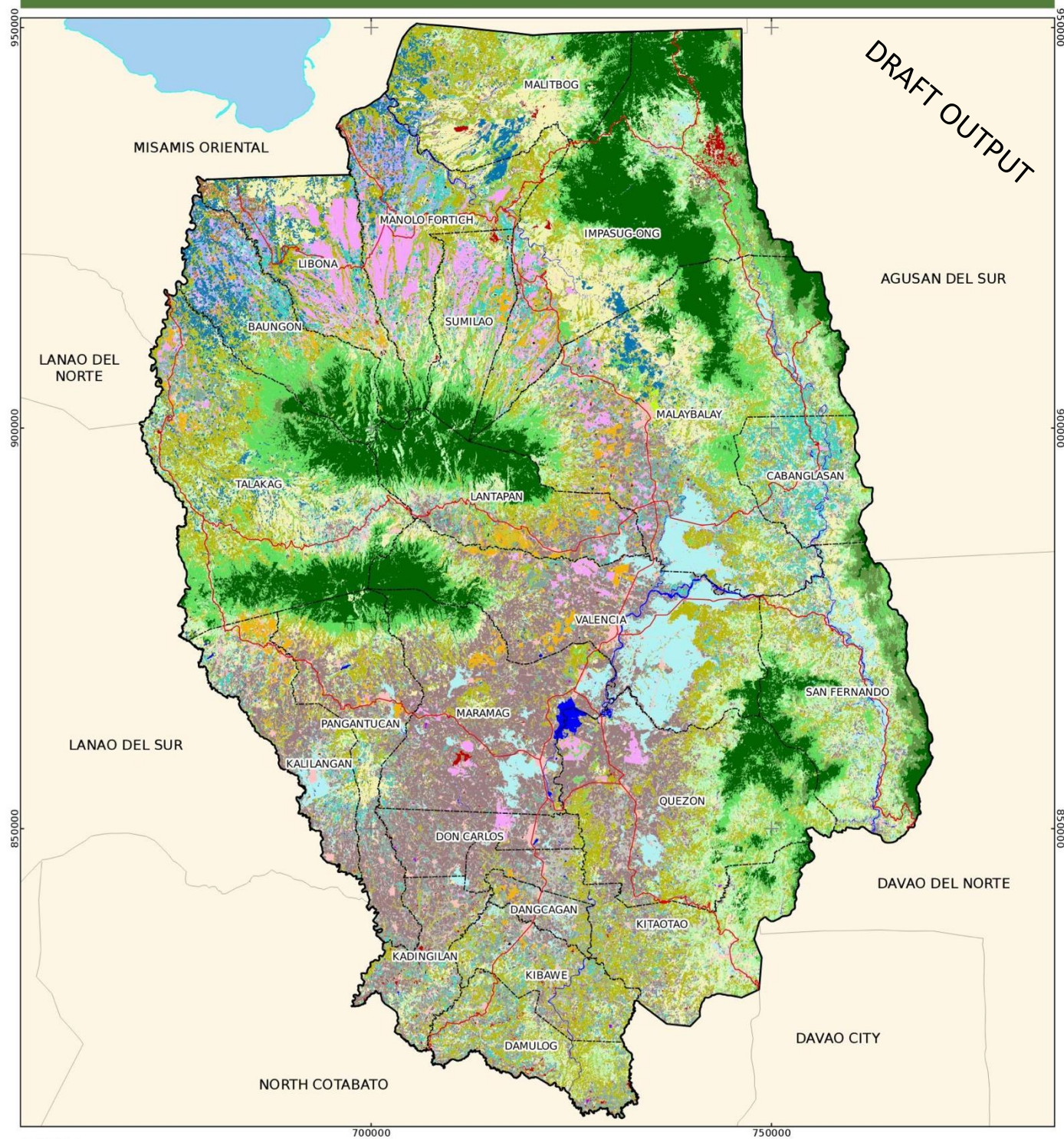
ENVIRONMENTAL SCIENCE FOR SOCIAL CHANGE
Malaybalay City, Bukidnon
September 2018

REFERENCES
LAND COVER
ESDC, Sentinel 2 and Landsat 8 Satellite Images dated June 2017 - August 2018

ADMINISTRATIVE BOUNDARIES
PSDO - Bukidnon
Global Administrative Map - Philippines
(www.gadm.org)

2018 BUKIDNON LAND COVER MAP

Northern Mindanao Region, Philippines



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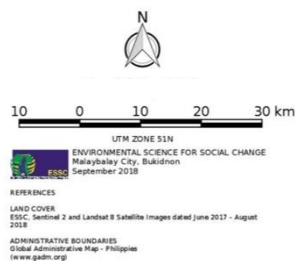
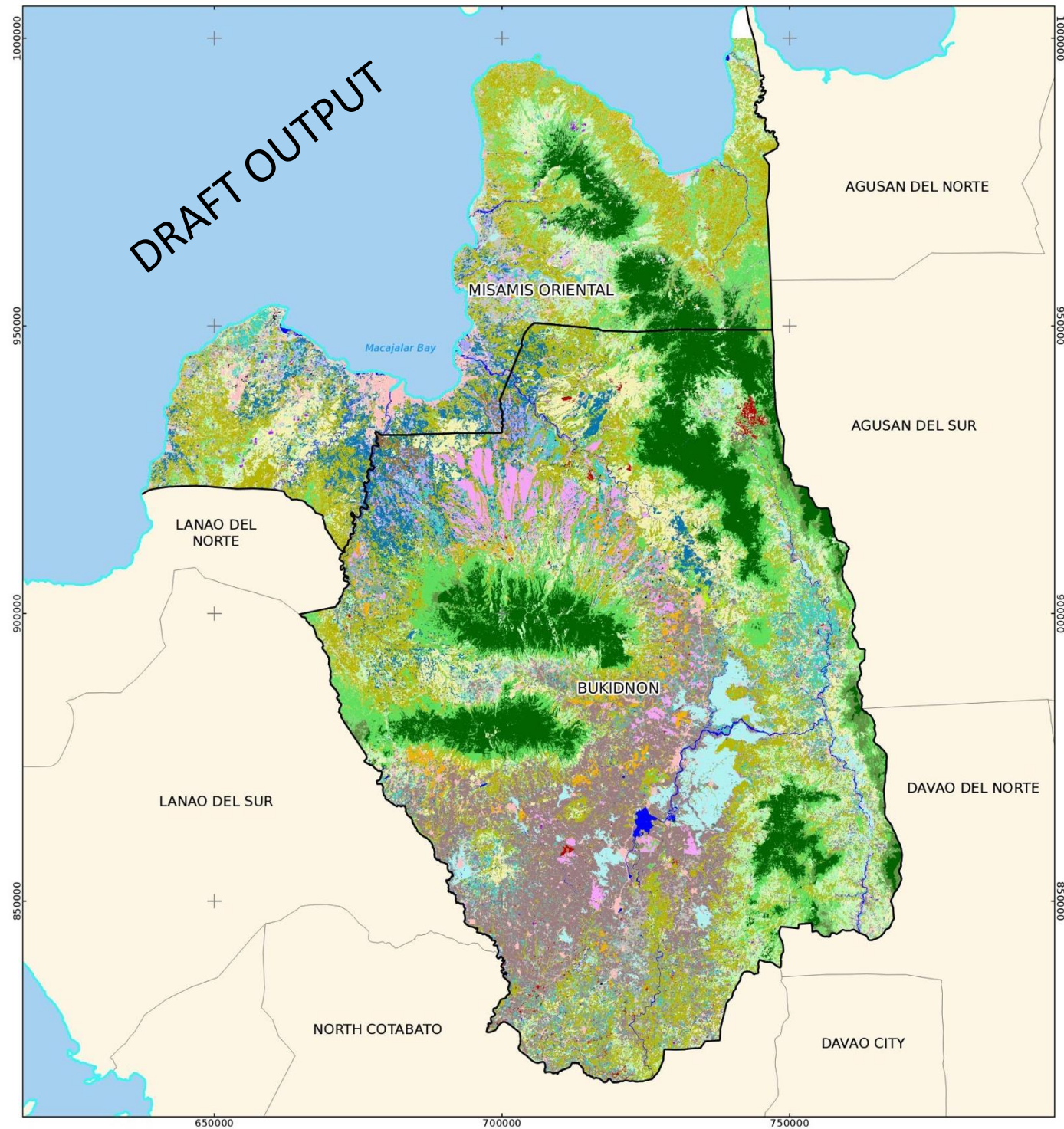
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2018 LAND COVER IN FOREST FOUNDATION PARTNER AREAS

Bukidnon and Misamis Oriental, Philippines



2018 BUKIDNON LAND COVER WITH SOME VALIDATION PHOTOS

Northern Mindanao Region, Philippines

DRAFT OUTPUT



Presence of Mango plantations (Libona)



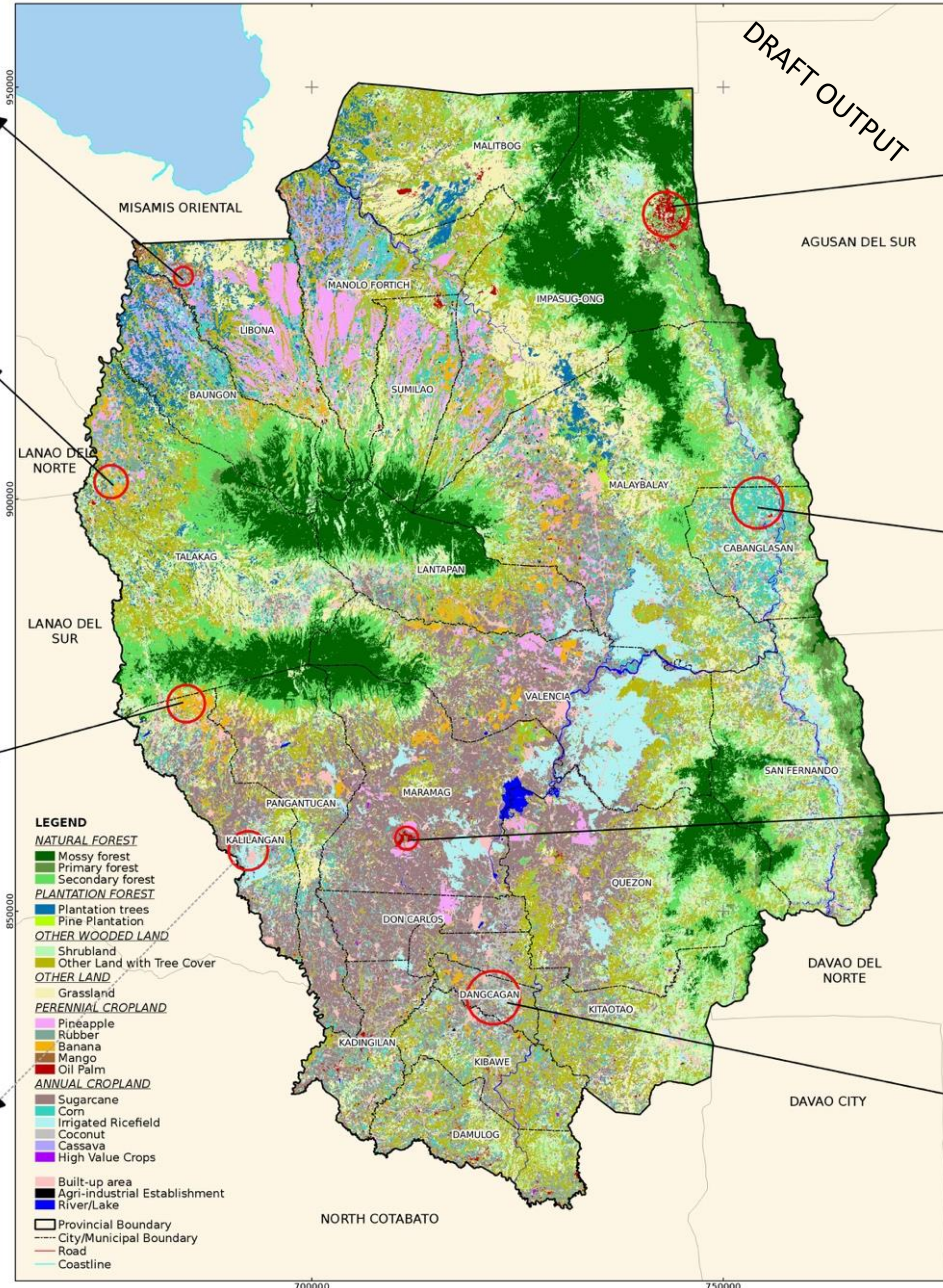
Some of the areas where corn converted to Banana Plantation



Farm areas converted to Banana Plantation (Pangantucan)



Increase in Ricefields (Kallangan)



Oil palm plantation (Impasug-ong)



Corn plantation (Cabanglasan)



Oil palm plantation (Maramag)

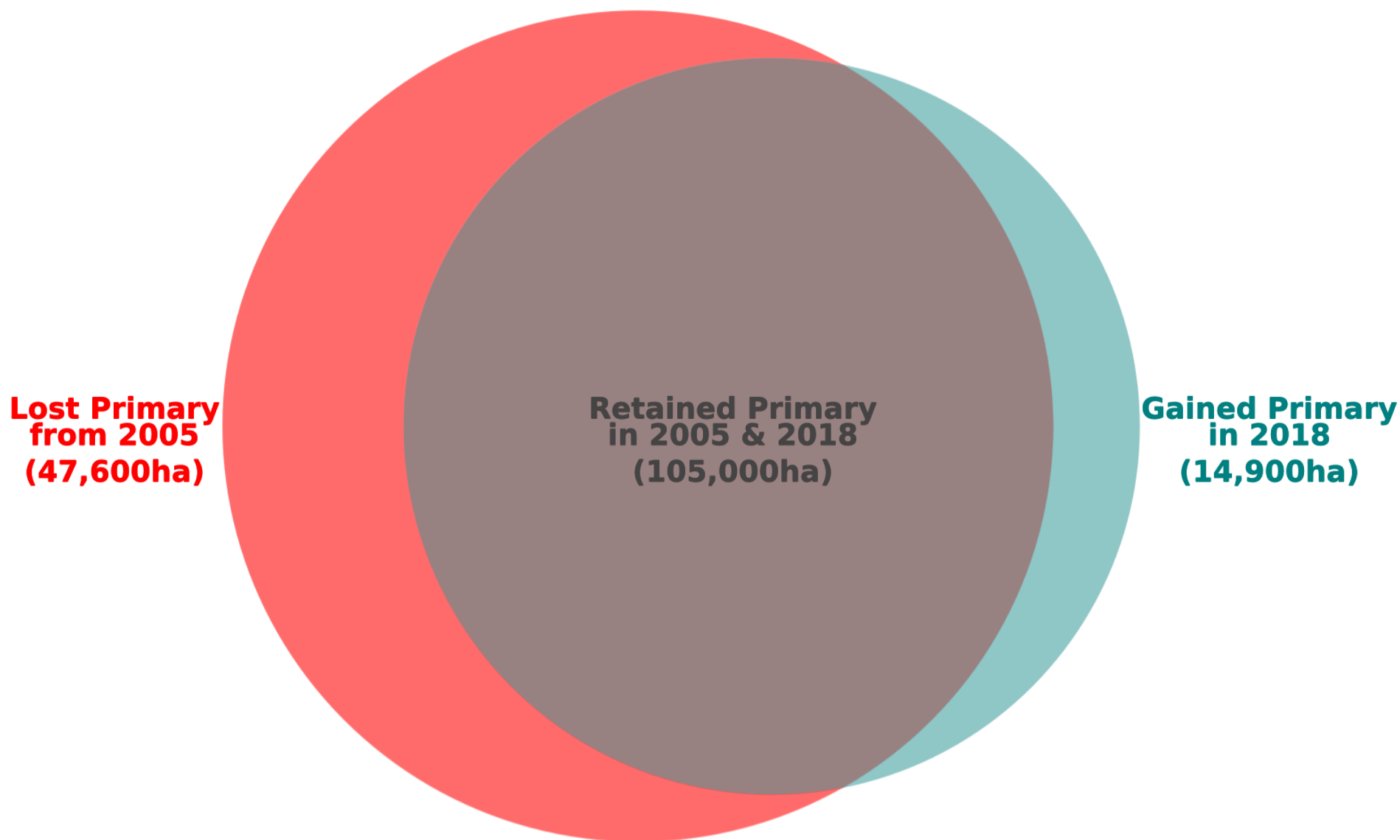


Rubber plantations (Danqcaan)

Bukidnon Land Cover Stock Change Analysis	2005	% to total 2005	2018 (Q4)	% to total 2018	Area Change	% change
NATURAL FOREST	225,895	25%	210,268	23%	(15,627)	-7%
Mossy (Primary Forest above 1000m)	129,121	14%	106,040	12%	(23,081)	-18%
Primary	25,348	3%	14,538	2%	(10,810)	-43%
Secondary	71,426	8%	89,690	10%	18,264	26%

Secondary Forest Gain and Mossy/Primary Forest Loss

Distribution of Primary Forest in Bukidnon between 2005 and 2018



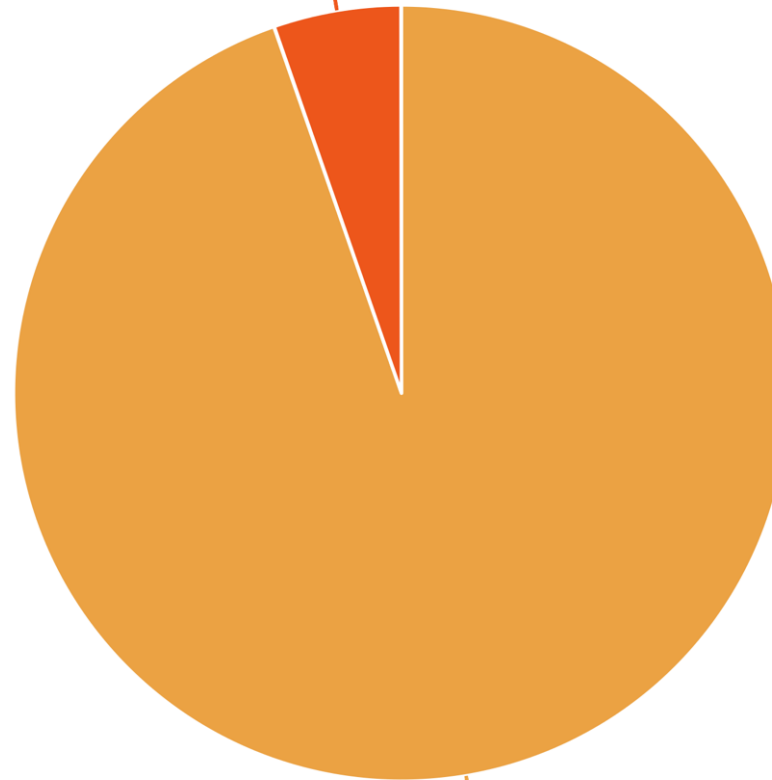
Distribution of Lost Primary Forest from 2005

ESSC from Sentinel 2 Data

Deforestation: 2,535ha - 5.3%

Top deforestation causes*

1. Sugarcane (307)
2. Built-up areas (256)
3. Coconut (250)
4. Rice (249)
5. Oil palm (243)



Primary forest degraded to:

1. Secondary forest (35k)
2. Other land with tree cover (4k)
3. Shrub land (4k)

Degradation: 45,084ha - 94.7%

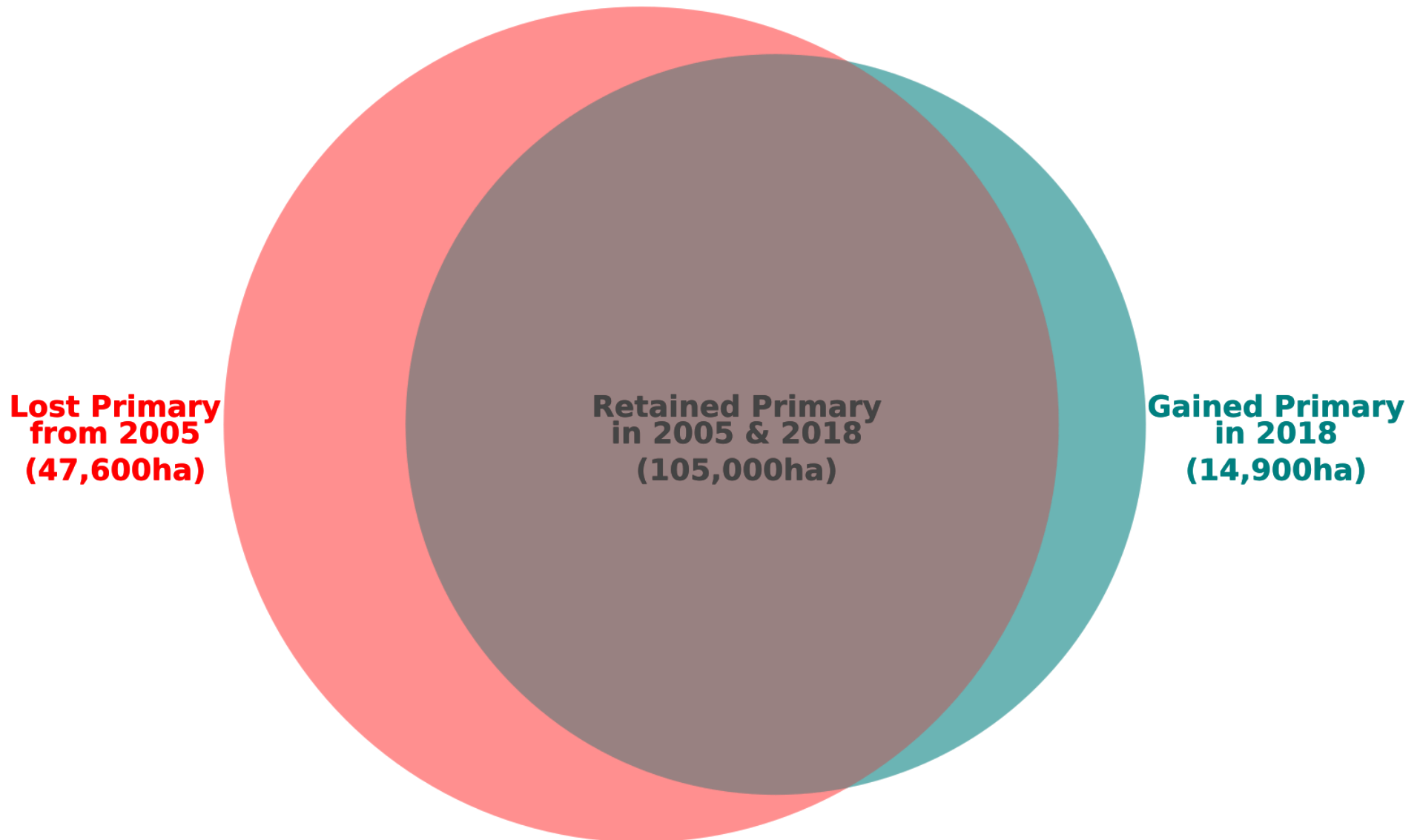


Degradation



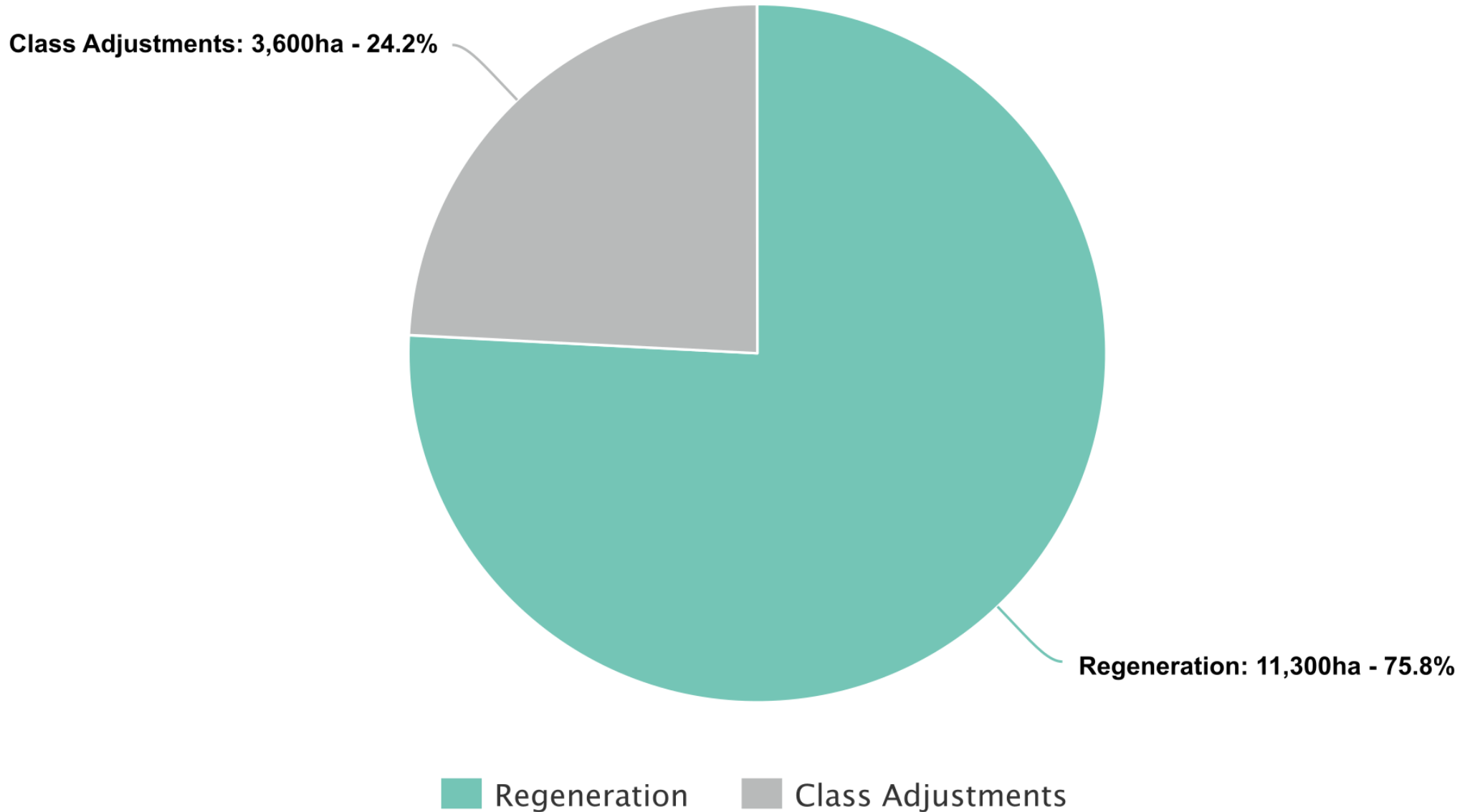
Deforestation

Distribution of Primary Forest in Bukidnon between 2005 and 2018

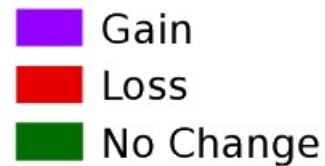


Distribution of Gained Primary in 2018

ESSC from Sentinel 2 and SPOT Satellite Imagery



DRAFT OUTPUT

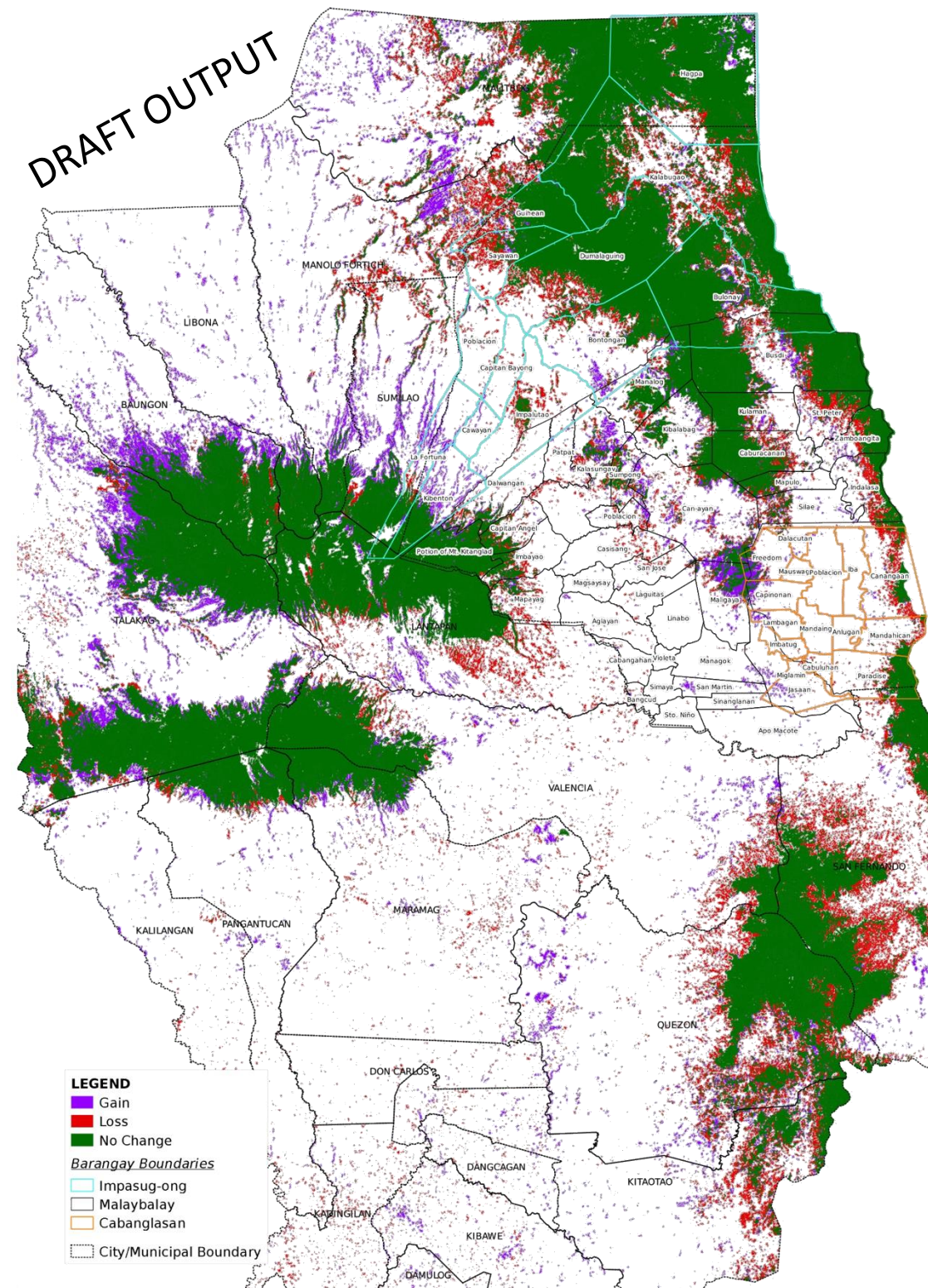


☐ Impasug-ong

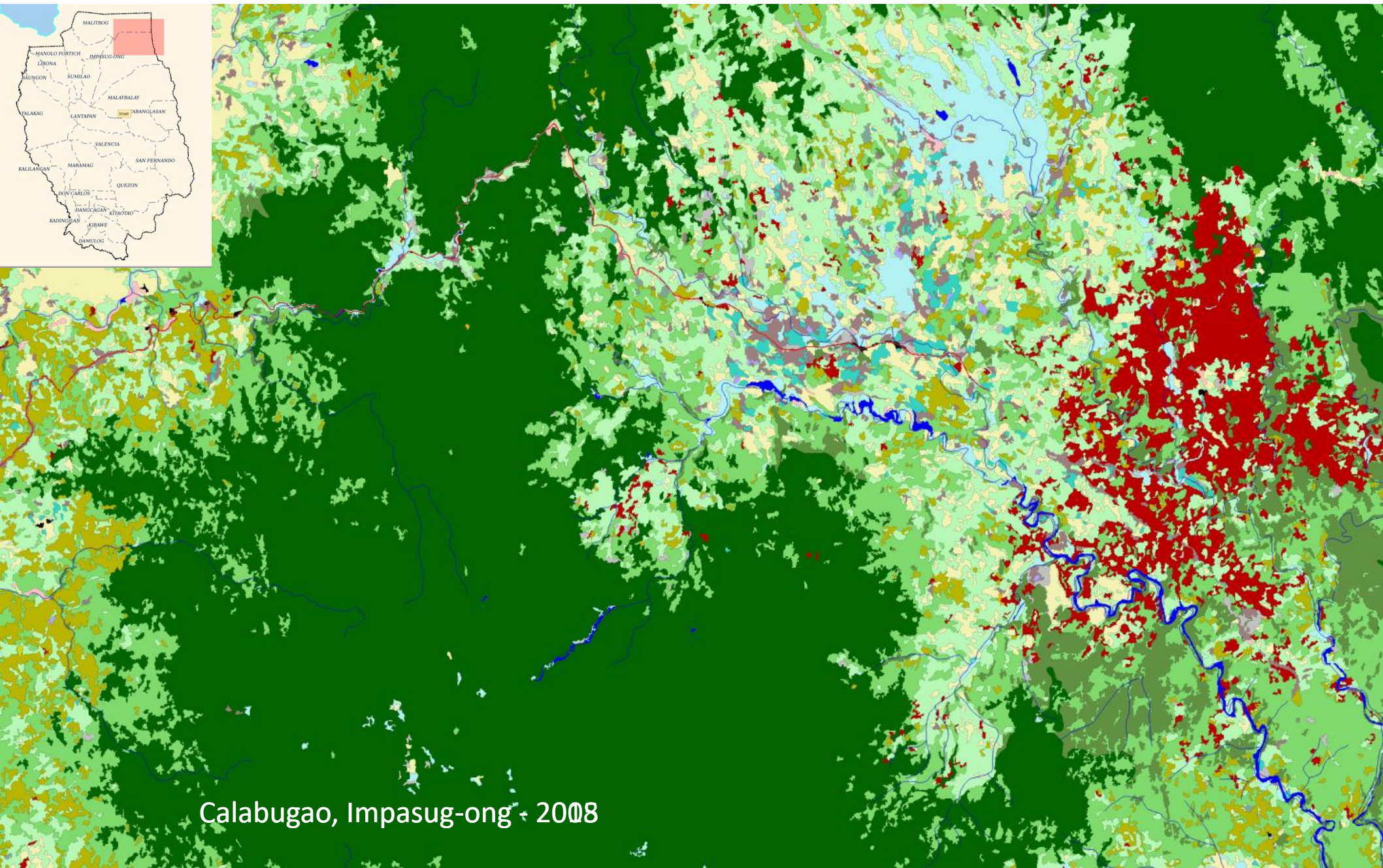
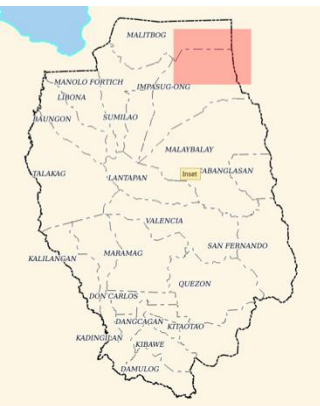
☐ Malaybalay

☐ Cabanglasan

 City/Municipal Boundary

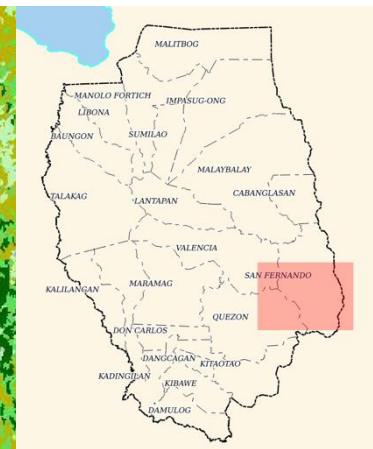
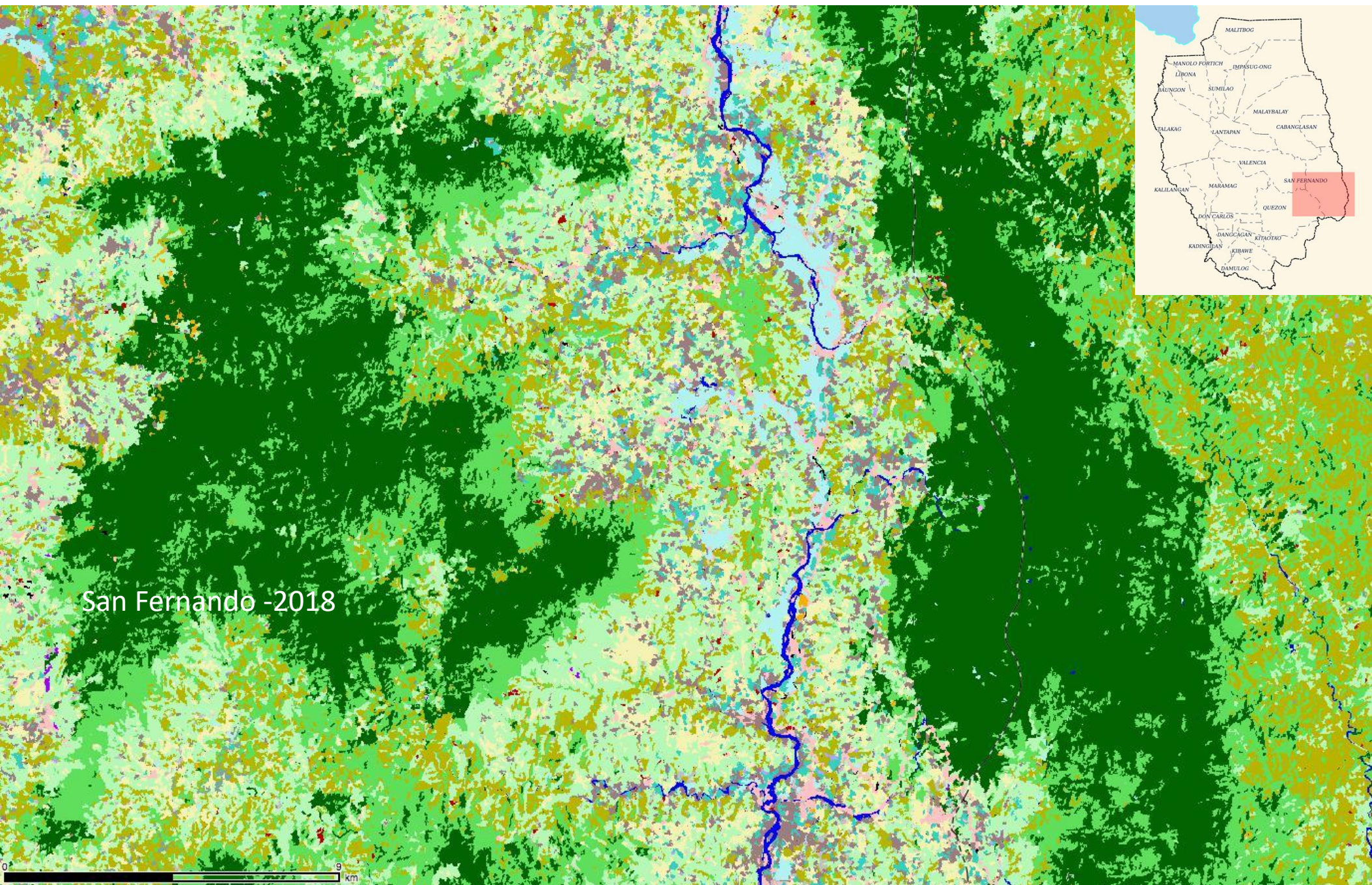


Loss in certain areas



Calabugao, Impasug-ong - 2008

Loss in certain areas



Insights and Opportunities for FLR

- Forest gains documented in the northeastern portion of Mt. Kitanglad Range:
 - Was it due to effective efforts in Protected Area management?
- Other vegetation that reverted to forest:
 - Was it due to natural regeneration or a result of more accurate classification methods?
- Identification of former forest lands that can be restored – such as other land with tree cover, shrubland, and grasslands – through more focused interventions.

