Deforestation threatens the earth's species and climate

90,000 km²

Each year an area the size of Portugal is deforested. Deforestation decimates habitats for 100,000+ species, among which are the forest elephant, gorilla, orangutan and rhino

6.7 billion tonne CO_2

The annual greenhouse gas emissions of deforestation-related activities account for 15% of global emissions, equivalent to the emissions of the entire USA
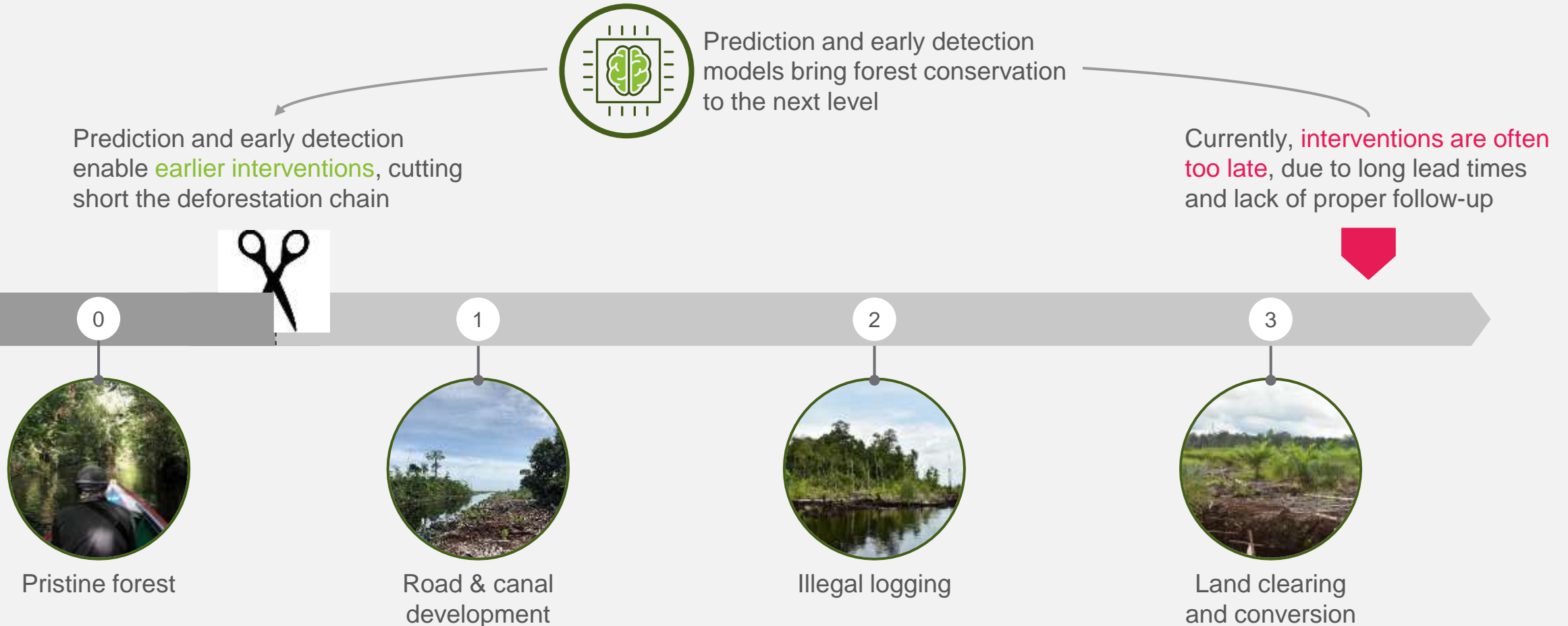
Disrupting livelihoods

Deforestation can change precipitation patterns, induce erosion and cause floods, thereby disrupting livelihoods of millions of people

Source: WWF Living forest report

Case for change: enabling earlier interventions to bring the forest conservation practice to the next level

Prediction and early detection models bring forest conservation to the next level

Prediction and early detection enable earlier interventions, cutting short the deforestation chain

Currently, interventions are often too late, due to long lead times and lack of proper follow-up

0

1

2

3

Pristine forest

Road & canal development

Illegal logging

Land clearing and conversion

Source: Photos were taken near the Sebangau National Park border (Central-Kalimantan)

Deep dive: Strong technical foundation underlying EWS

Predict hot zones at risk

1 Collect historic satellite images, analyze and label changes in forest cover

2 Collect input data and generate data set with static and dynamic indicators

3 Train machine learning models based on historical data, using static and dynamic inputs

4 Use machine learning model to generate a map of forest cover at risk and validate on historic data

Historic images

Topological data

Socio-economic data

Satellite data and land cover data

Predictive model

New road

Forest at risk
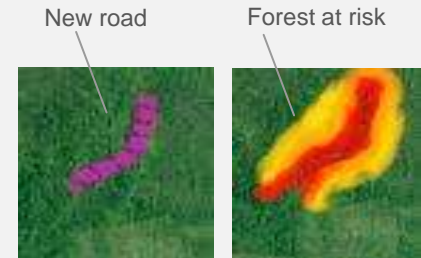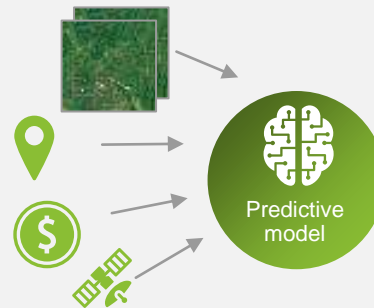
Dynamic indicators
- Distance to degradation
- Distance to deforestation
- Landscape heterogeneity metrics
- …

Static indicators
- Population density
- Distance to population center
- Distance to roads
- …

6 months

Predict deforestation between 1-6 months in the future

80%

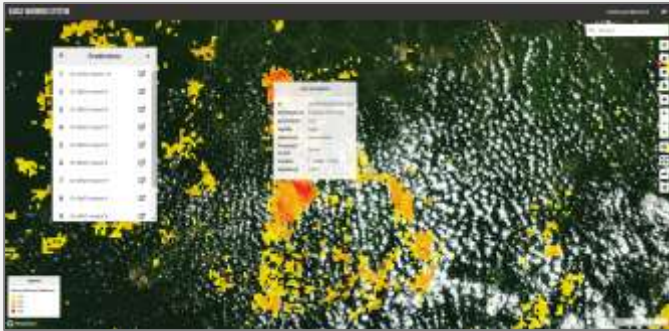Achieved user's accuracy for 6-months prediction (at ~50% detection rate[1])
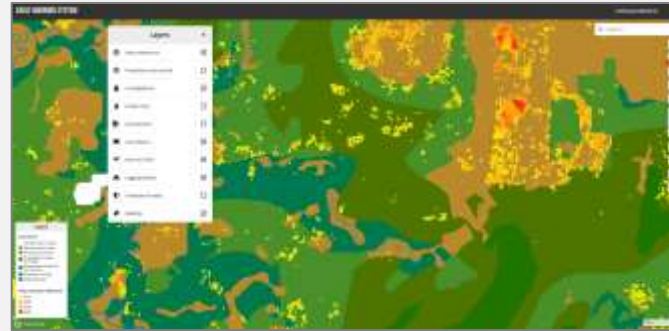
Ensemble Trees (XGboost)

Best performer

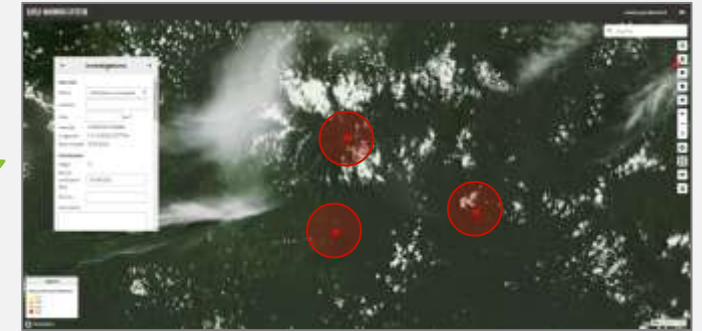# What a typical end-to-end EWS process looks like…

1 **EWS team** opens dashboard to review monthly predictions using filters and contextual data

2 **Area Manager** is informed of predictions and logs in to dashboard to prioritize predictions and check permits
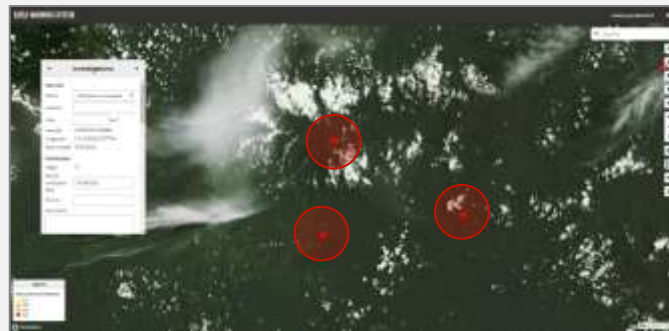

3 **Area Manager** plans field investigations that are uploaded in the intervention tracking app

6 **Area Manager** instructs to carry out intervention plan, monitors results and reports back to EWS team
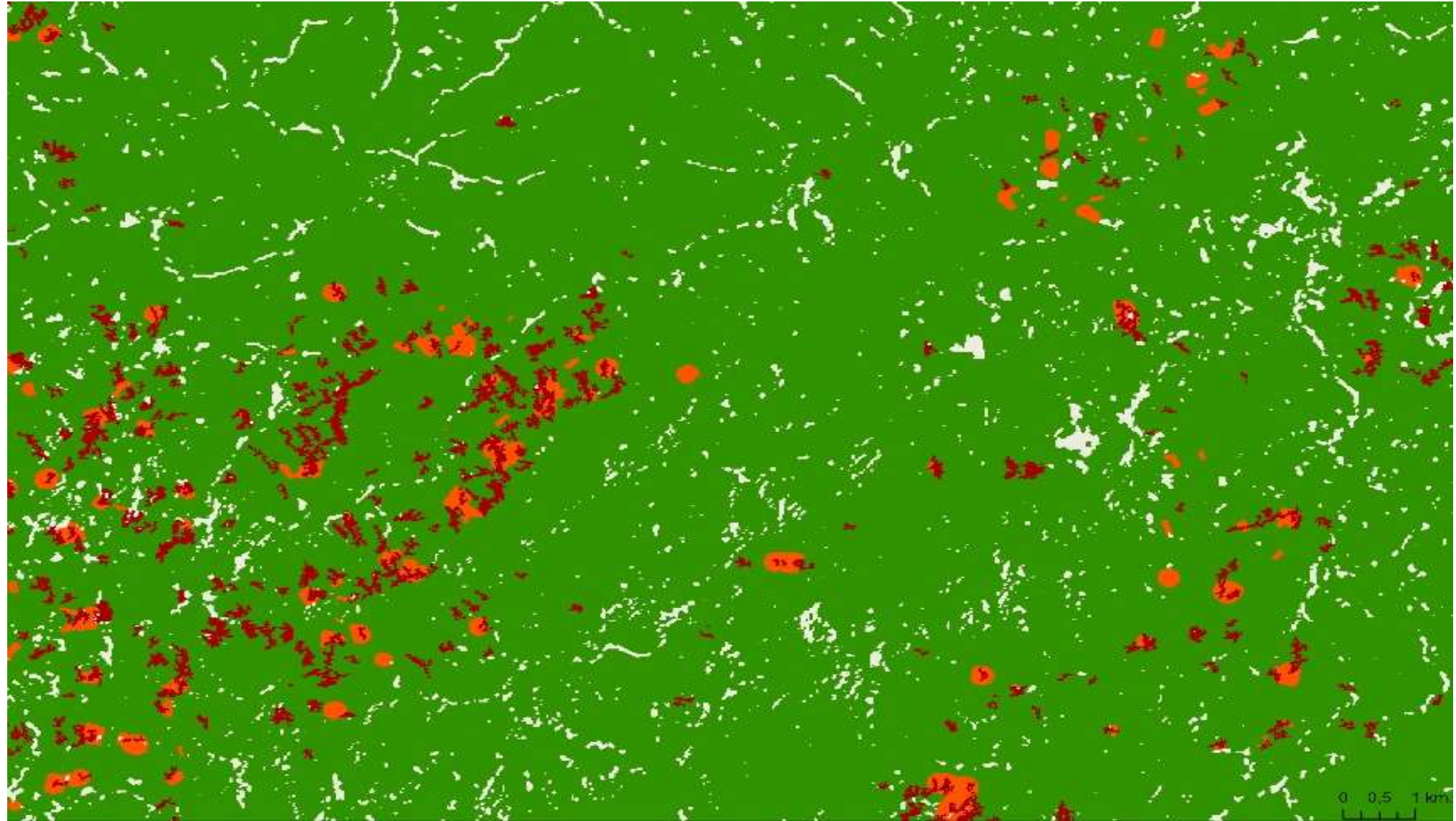

5 **Lead by the Area Manager**, **EWS team** reviews the investigation report and agrees intervention plan if needed
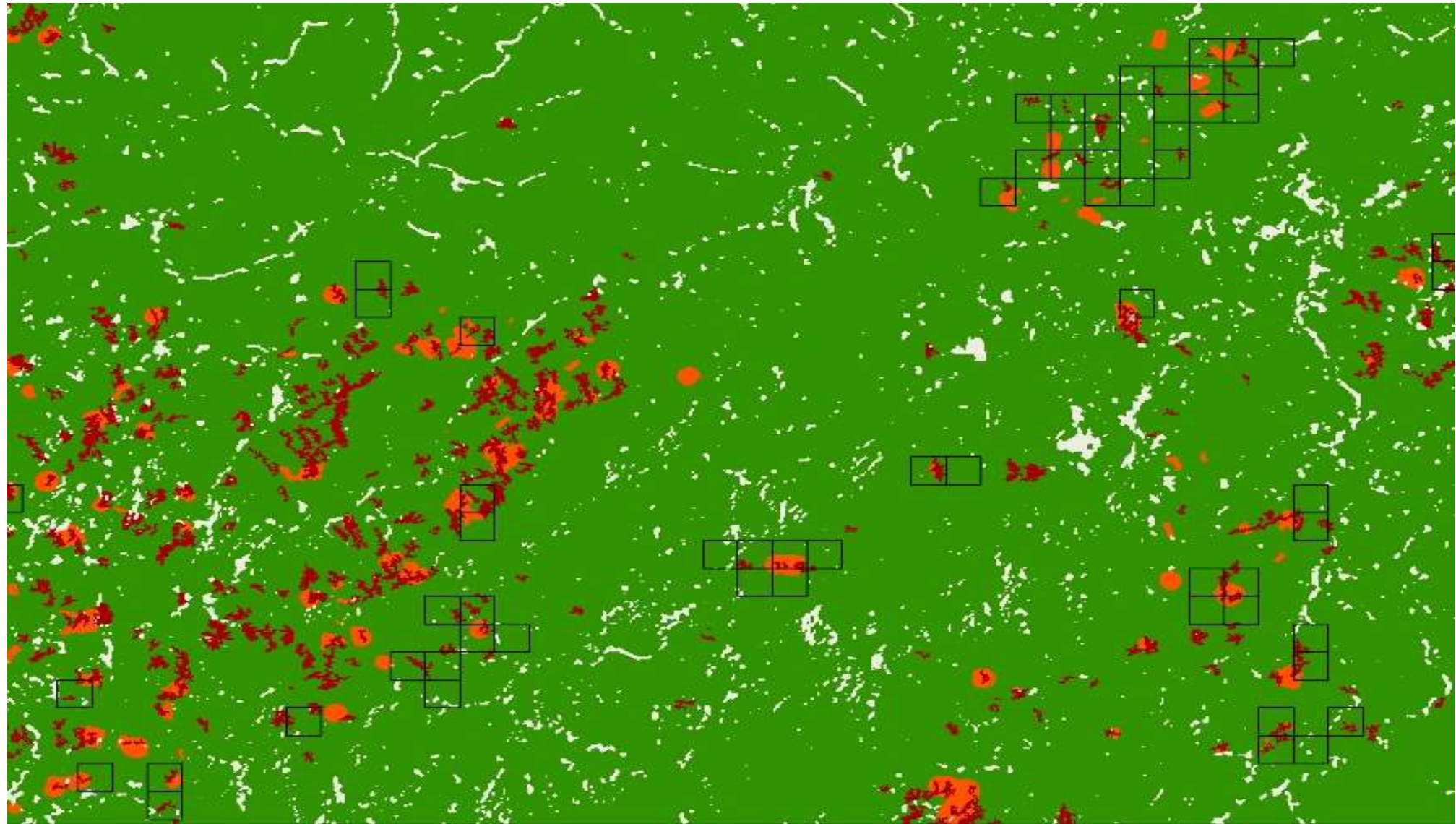

4 **Patrol team** verifies deforestation by visiting predictions in the field, taking photos & completing survey / checklist

Deforestation (red) and forest degradation (orange) (2015-2020)

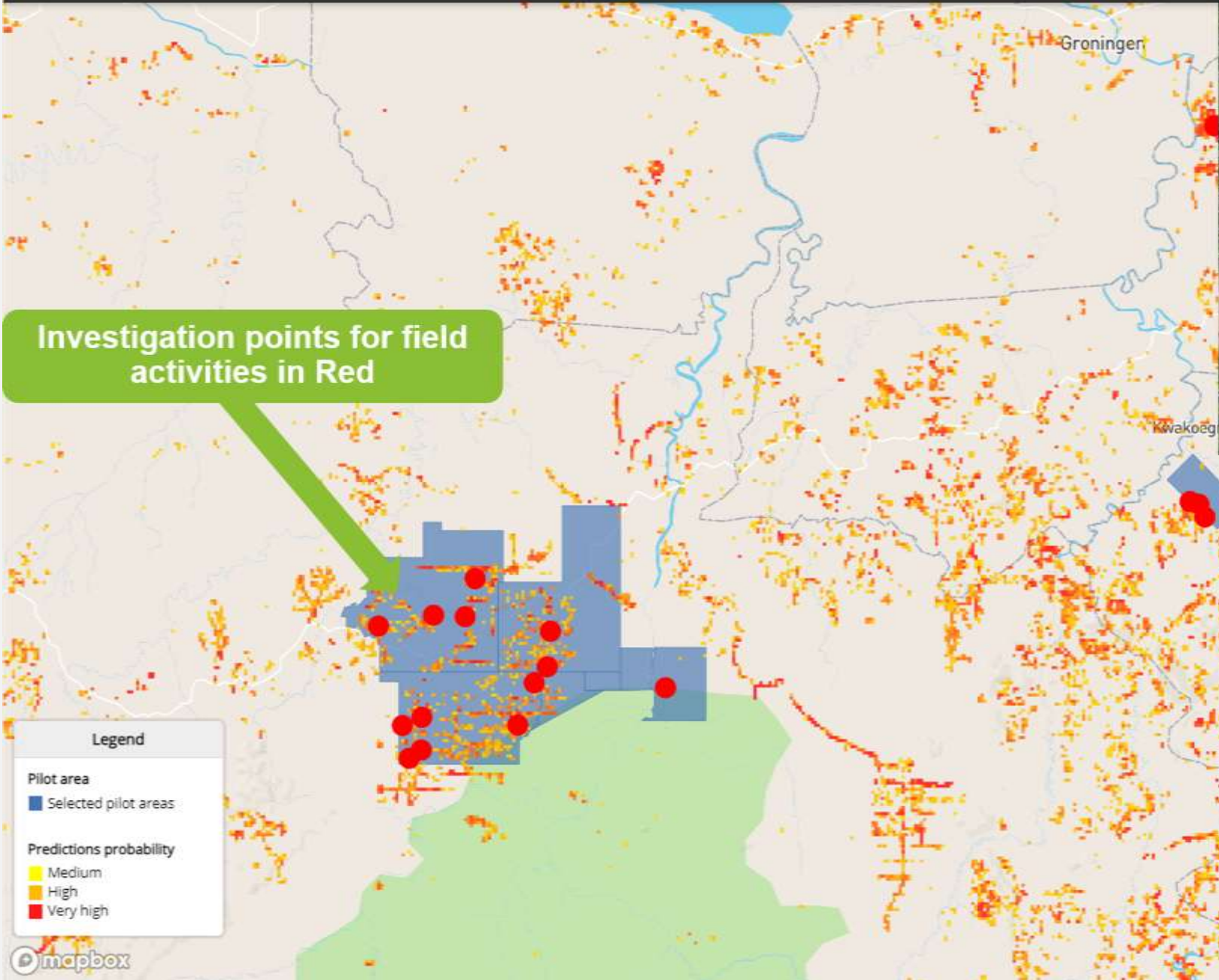# Predicting deforestation 6 months into the future (black squares)

Observed new deforestation 6 months later (yellow)

EARLY WARNING SYSTEM

Investigation points for field activities in Red

Photo of field observation during the EWS Pilot

Groningen

Kwakoeg

Brokopondo Reservoir

Legend

Pilot area

Selected pilot areas

Predictions probability

Medium

High

Very high

mapbox
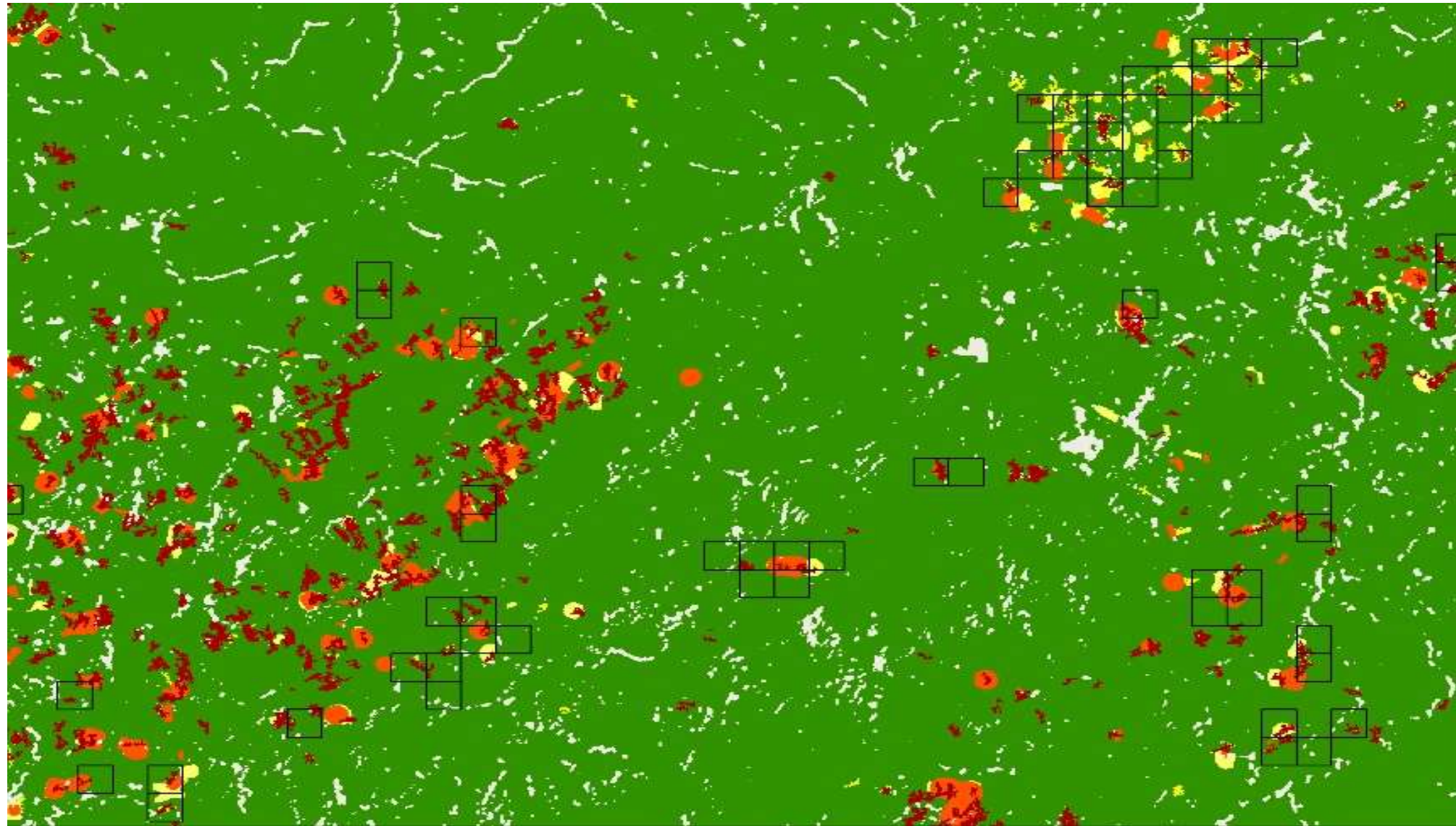
User story's

Indonesia

Gabon

Suriname

"Predictive information helps, especially for patrols because it can allocate limited resources to areas that have the potential for change."

"the alerts put in evidence effective deforestation on the ground."

"Recent field visits to predicted deforestation locations show no signs of upcoming deforestation.. "

EWS is currently active in 5 countries with potential impact of up to 30% reduction in illegal deforestation

Amazon & Guiana shield
23-48 million ha
Guyana & Suriname

Congo Basin
12 million ha
Gabon

Greater Mekong
15-30 million ha

New Guinea
7 million ha

East Africa
12 million ha

Gran Chaco
10 million ha

Cerrado
15 million ha

Borneo-Sumatra
27 million ha
Boneo

Legend

Current focus   Future roll-out

The hectares indicate projected forest loss between 2010 and 2030

Source: WWF Living Forest Report, 2015

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Thank you

Contact: ews@wwf.nl