# North American Collaboration on Ecosystem Carbon Sources and Storage

## Goals

❶ Develop trilaterally agreed methods and products to monitor continental land cover change and model landscape-level ecosystem carbon changes to improve North America's capacity to store carbon and reduce GHG emissions

❷ Model carbon dynamics in Mexican forest ecosystems for the assessment of long-term carbon dynamics in Mexico and North America

❸ Contribute to the development of a national-scale carbon accounting system for Mexico

❹ Provide recommendations for a North American modeling and analysis approach to support REDD+ in Mexico

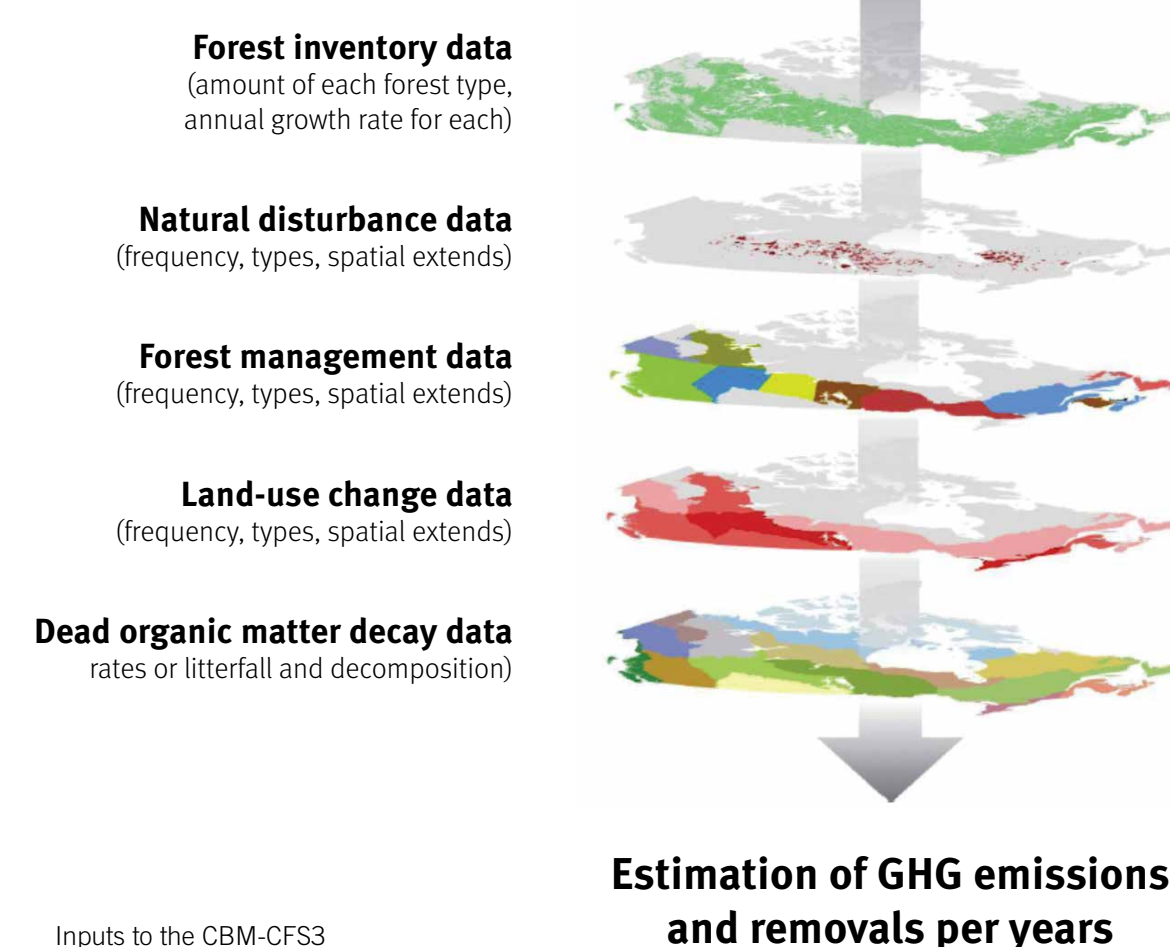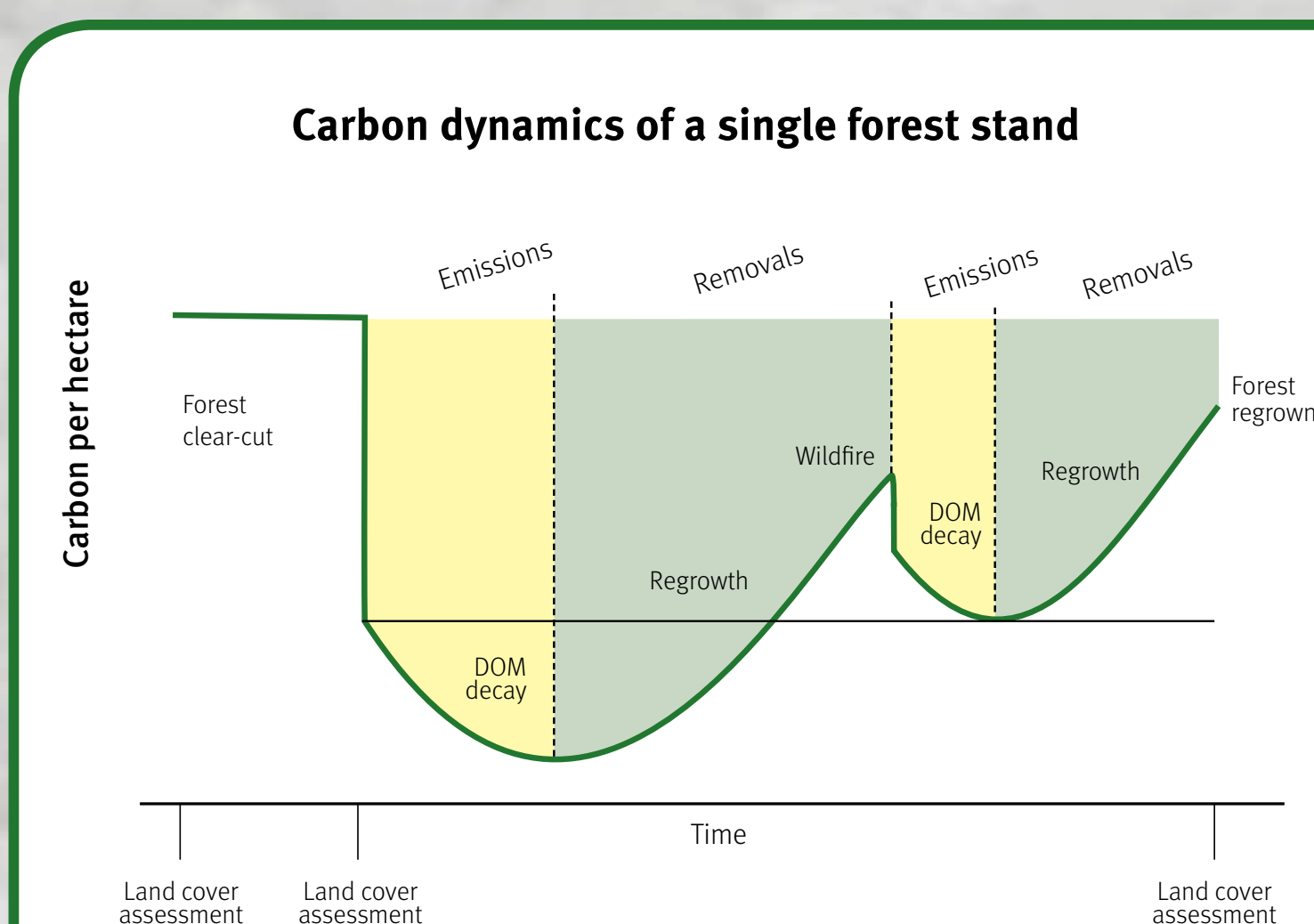## Methodology and Proof of Concept

### 1. Land Cover and Land Cover Change Products

- Continental baseline map 2005 using MODIS imagery
- 19 land cover classes (level II)
- 5 year change product (2005-2010)
- Annual land cover
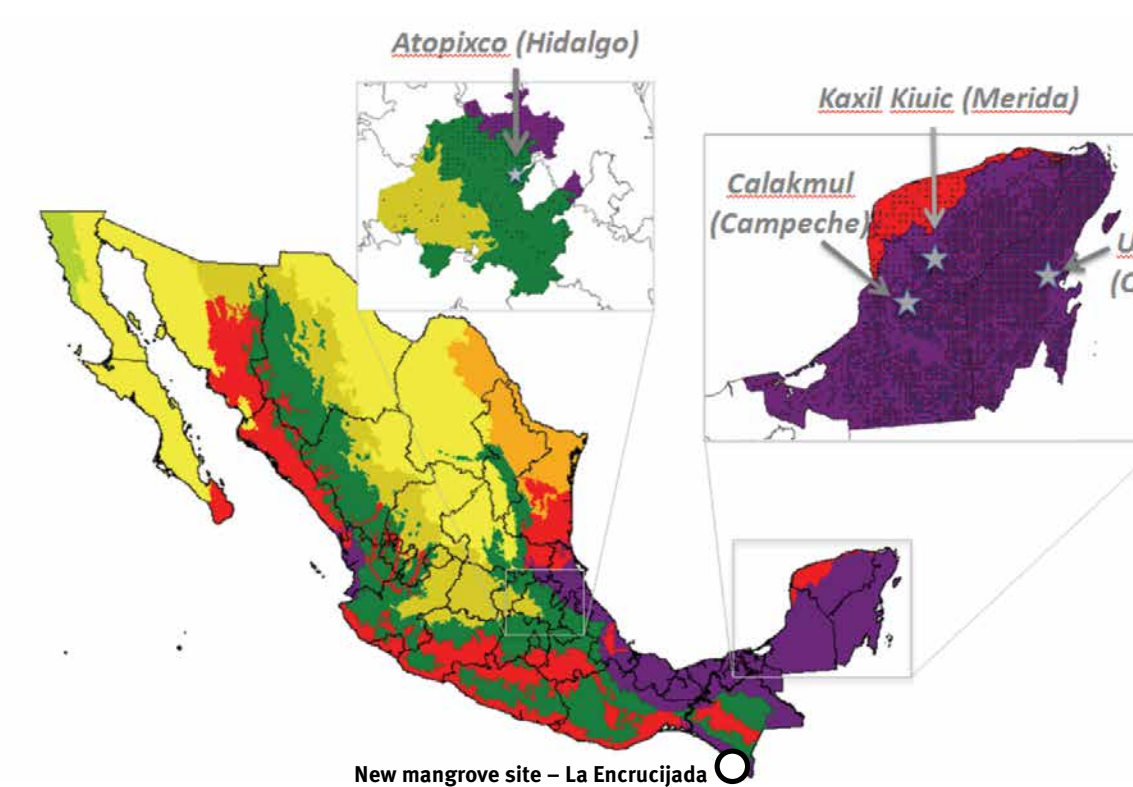- Testing of 30m scale (Landsat)

Land Cover, 2005
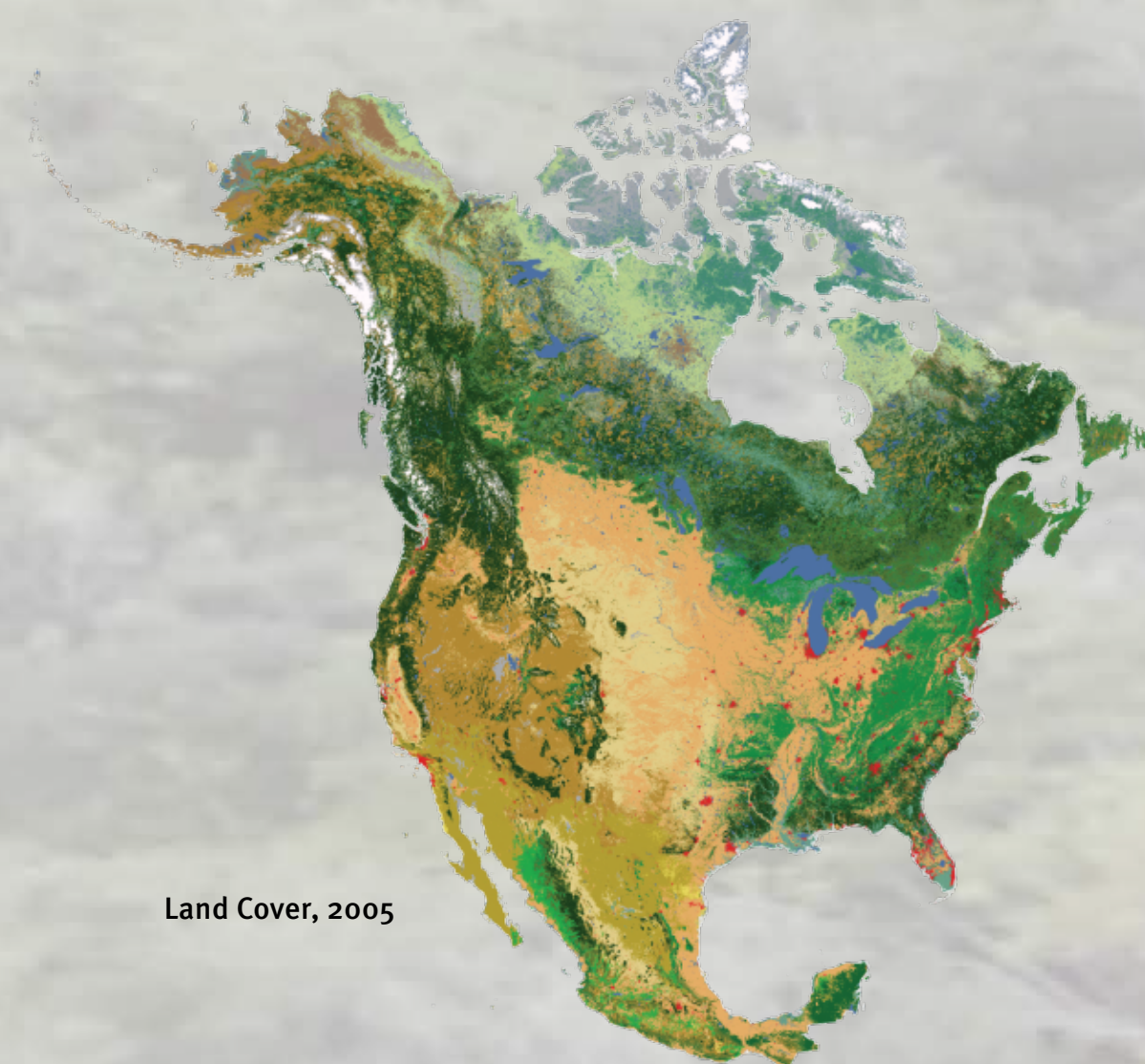
### 2. Application of the Canadian Forest Service Carbon Budget Model (CBM-CFS3) in Mexico
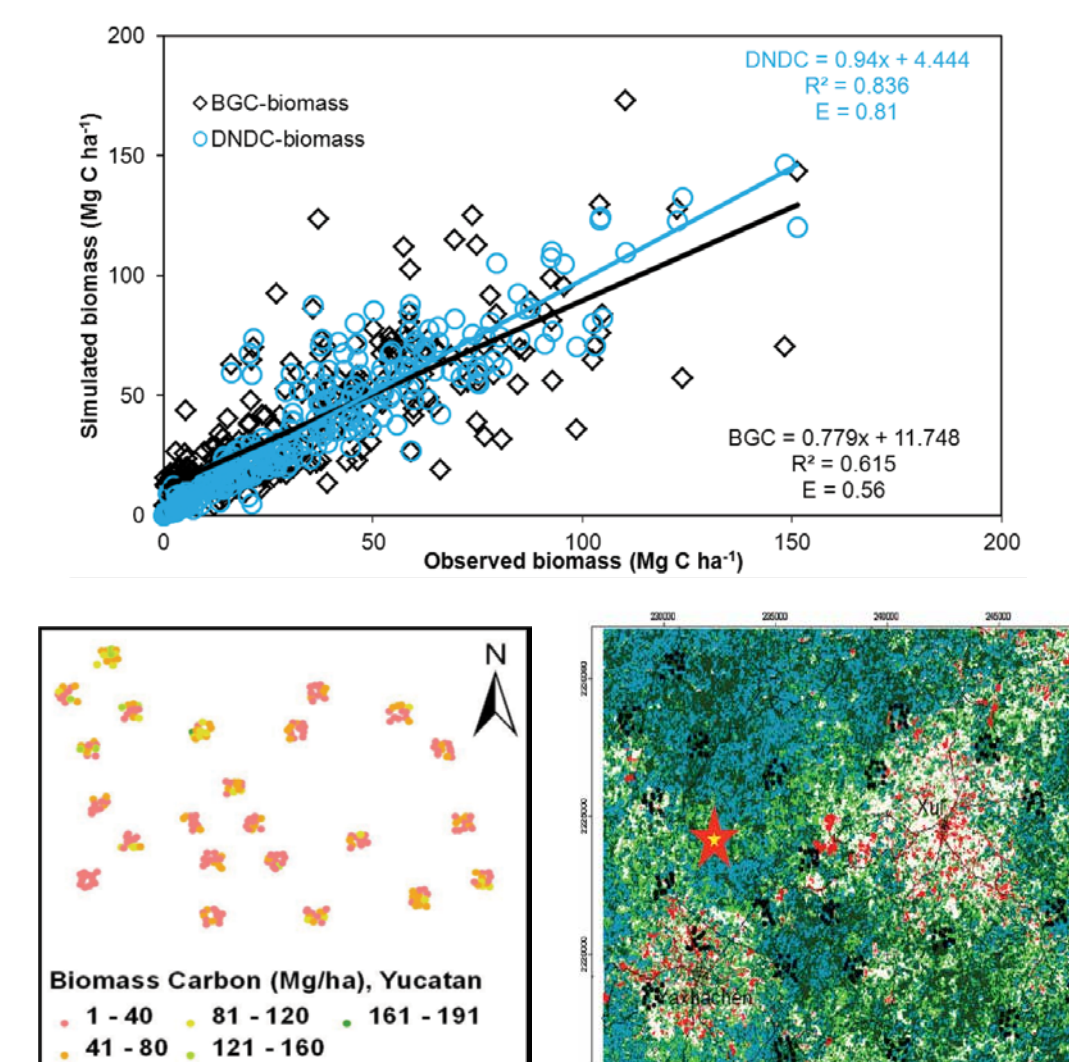
- Research on application of CBM-CFS3 model for spatially-explicit (e.g. REDD+ projects) and spatially-referenced (regional to national scale) projects
- Estimations of past and possible future GHG emissions and removals from land use, land use change, and forestry in Mexico
- Evaluation of model for Mexican Tier 3 reporting and early action REDD+ estimations of GHG emissions and removals over time

**Carbon dynamics of a single forest stand**



**Forest inventory data**
(amount of each forest type, annual growth rate for each)

**Natural disturbance data**
(frequency, types, spatial extends)

**Forest management data**
(frequency, types, spatial extends)

**Land-use change data**
(frequency, types, spatial extends)

**Dead organic matter decay data**
rates or litterfall and decomposition)

Inputs to the CBM-CFS3

**Estimation of GHG emissions and removals per years**

**Intensive forest monitoring sites in Mexico**

Atopixco (Hidalgo)
Kaxil Kiuic (Merida)
Calakmul (Campeche)
Uyoolche (Quintana Roo)
New mangrove site – La Encrucijada

Disturbance data include: Fire,hurricanes and insects. Activity data include :Degradation, deforestation, reforestation and aforestation.

### 3. Modeling Forest Carbon Dynamics in Several Intensive Sites in Mexico

- Development of forest growth and mortality estimates from field observations and modeling of forest dynamics
- Benchmark estimates and maps of carbon stocks and fluxes and ground-based estimates of changes in carbon stocks in response to management, disturbances, and climate
- Evaluation of different process-based models, including InTEC , Biome-BGC and Forest-DNDC

**Observations vs. Simulations of Biomass for Kaxil Kiuic Intensive Site**



**Biomass Carbon (Mg/ha), Yucatan**
- 1 - 40
- 41 - 80
- 81 - 120
- 121 - 160
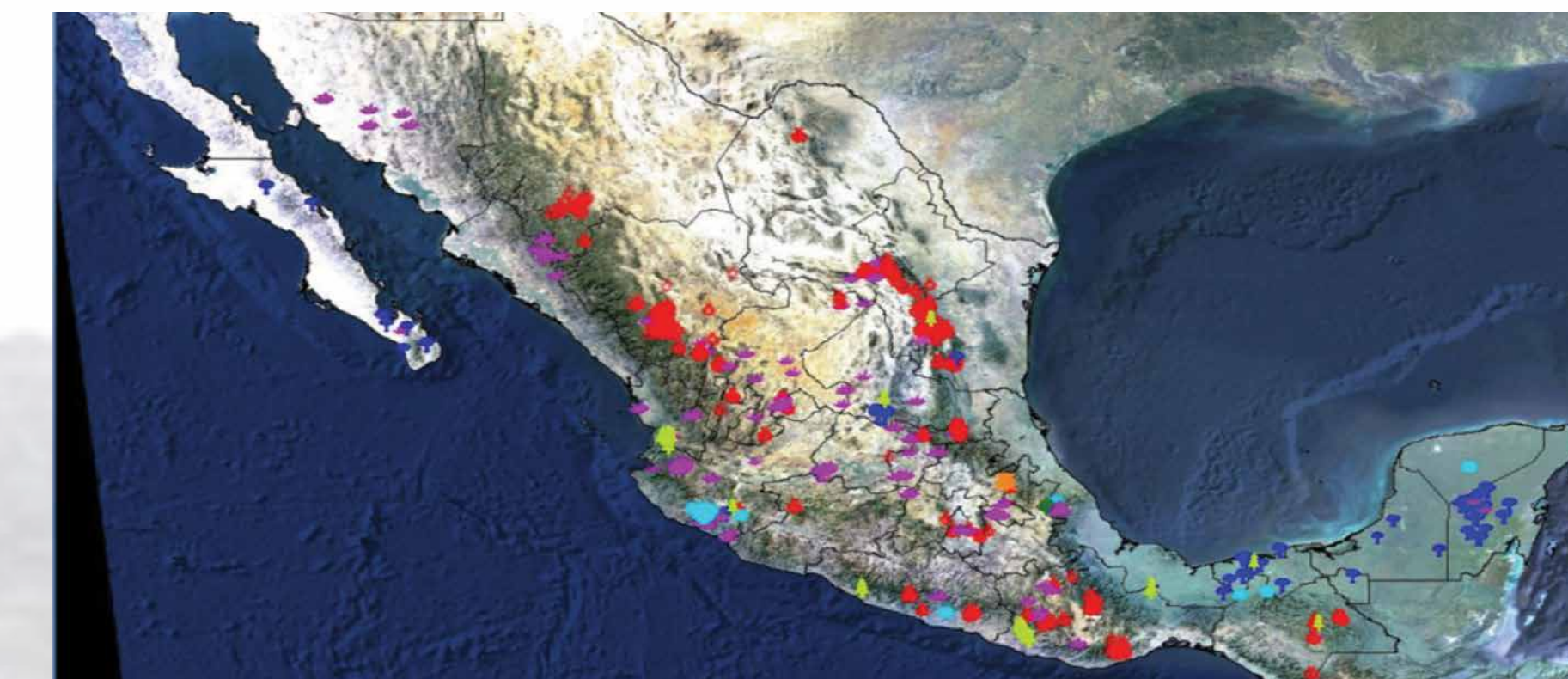- 161 - 191

**Where is carbon before the disturbance?**



**Where does carbon go after the disturbance?**

Carbon transfers between the different pools
- Aboveground biomass (AGB)
- Belowground biomass (BGB)
- Soil
- Litter (Lit)
- Dead wood (DW)

Proportion of C pool that moves to X pool

### 4. Impact of Different Disturbances and Activities on Carbon Pools

- Analysis of how different disturbance and forest activity data impact different events that shape the forest by altering their composition, structure and function
- Analysis of how these disturbances and activities impact carbon pools

## Outcomes and Products

- Contribution to the reduction of GHG emissions associated with forest degradation and land cover change by generating and improving access to better information on land cover change and carbon accounting.
- Recommendations for a North American modeling and analysis approach to support REDD+ for Mexico
- Proof of concept for a national-scale carbon accounting system for Mexico
- Publicly available databases
- Comprehensive set of forest growth curves for Mexico
- Comparison and evaluation of land cover change products at different resolutions
- Improved institutional capacity to monitor carbon stocks in Mexico
- Training of scientists and students

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