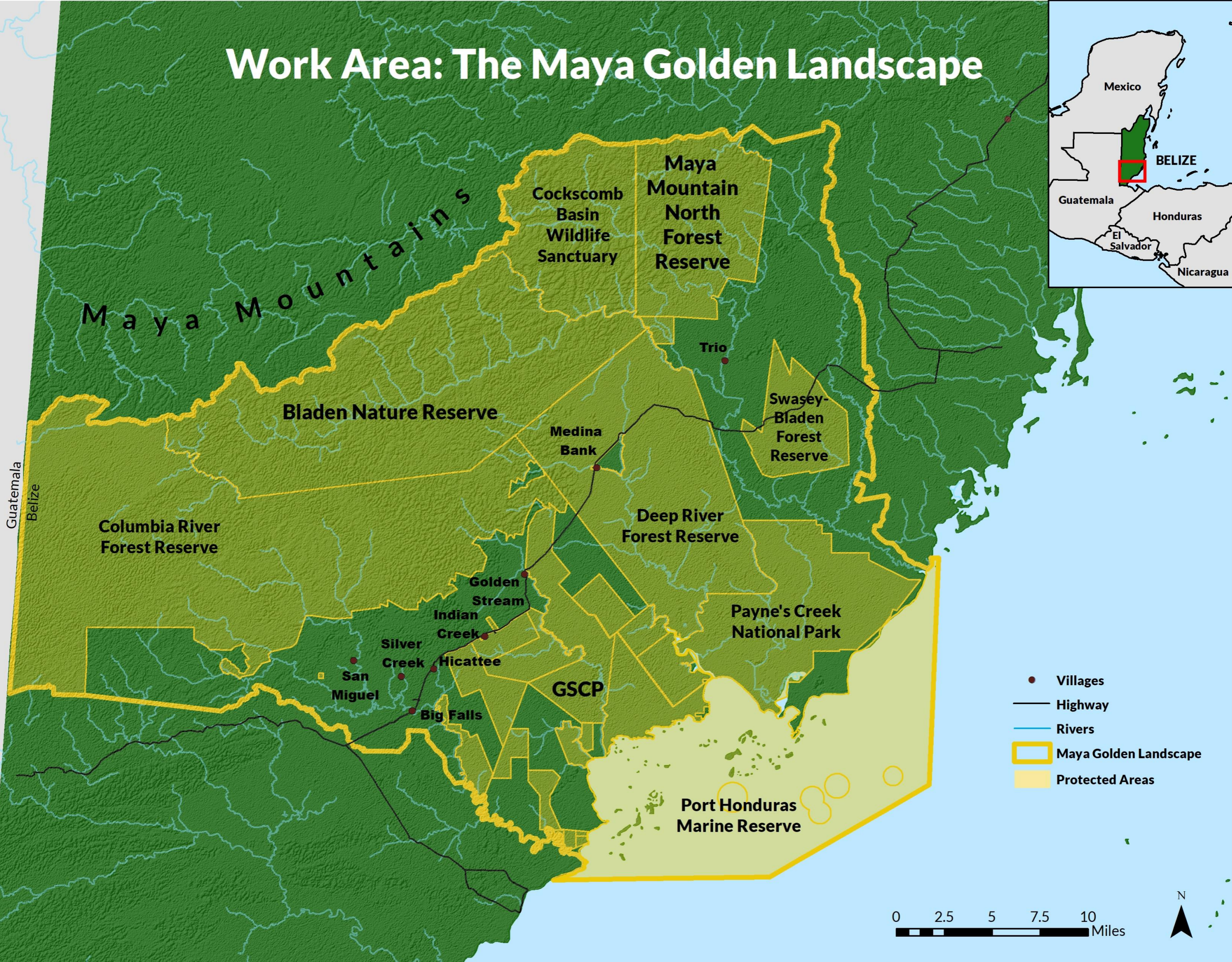





Utilizing GIS and remote sensing to inform spatial conservation planning: Assessing vulnerability to future tropical forest loss in southern Belize

Carly Voight

Work Area: The Maya Golden Landscape





Ya'axché Conservation Trust is a Belizean community-based nonprofit organization which aims to maintain a healthy environment with empowered communities by fostering sustainable livelihoods, protected area management, biodiversity conservation, and environmental education within the Maya Golden Landscape.

Introduction



- Tropical forests threatened by deforestation, degradation, & fragmentation
- Long-term effects on species, ecosystem processes & functions, climate patterns, medicines, crops
- Resources for conservation are limited
- Need to ID areas vulnerable to future deforestation to
 - Conduct conservation planning
 - Strategically implement conservation efforts where most effective
 - Produce greatest conservation impact



An aerial photograph of a vast, dense tropical forest. The canopy is a rich, multi-layered green, with various shades of emerald and forest green. The trees are packed closely together, creating a textured, undulating surface. The word "Methods" is centered in the middle of the image in a large, white, sans-serif font. The lighting is bright, suggesting a sunny day, and the overall impression is one of a healthy, thriving ecosystem.

Methods

Research Methods



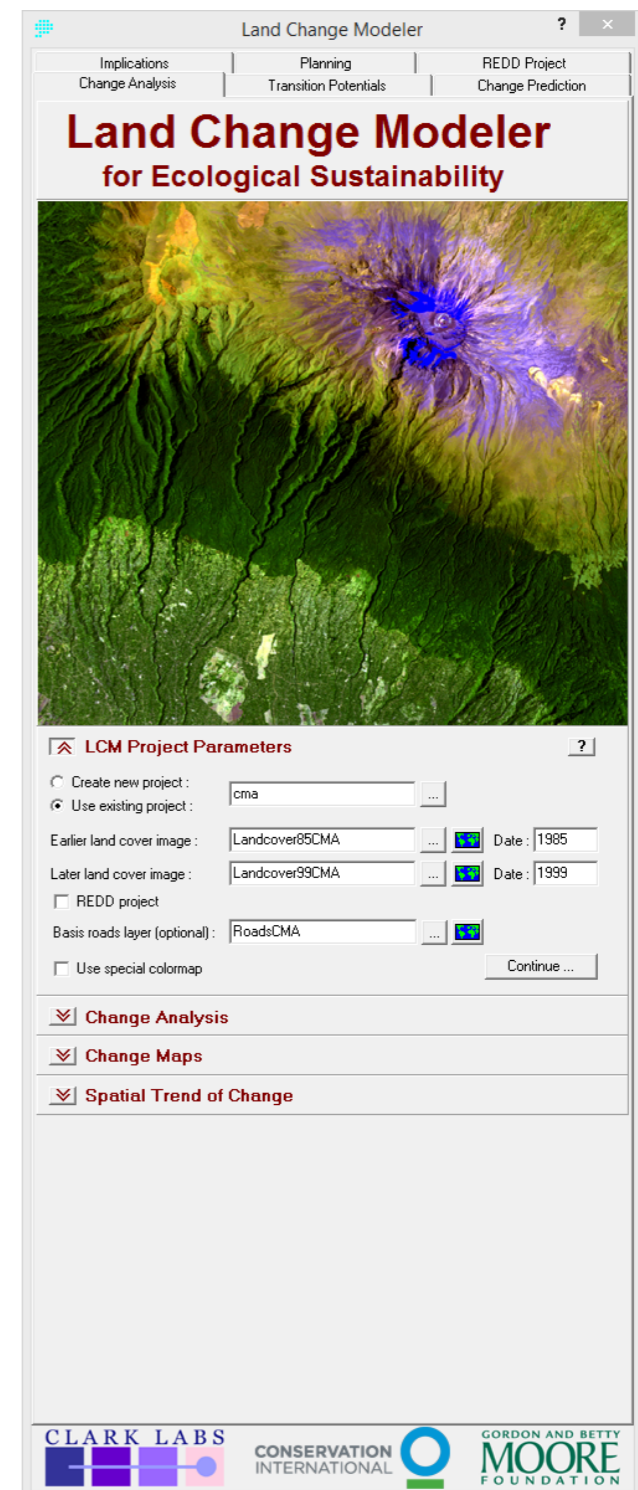
- Supervised classification of Landsat imagery in Google Earth Engine
- Training points: Satellite imagery, aerial photography, GPS “ground-truthed” points, NASA fire point data
- Classified: older-growth forest, regenerating fallow areas, anthropogenic areas, & non-forest natural areas
 - Changes in river pathways
 - Monoculture plantations
- Savannas, wetlands, large water bodies, and marine ecosystems excluded
- Calculated in ArcGIS & Excel



Research Methods



- Land Change Modeler in IDRISI TerraSet
 - Models the potential for deforestation
 - Predicts the forest patches that may be deforested in the future
 - Multi-layer perceptron neural network
- Conducted 2nd forest cover change analysis
- Created transition potential maps



Research Methods



- Spatial drivers of deforestation
 - Proximity to roads
 - Proximity to settlements
 - Proximity to forest edges
 - Level of protection
- How selected
 - Previous studies that identified major drivers
 - Visual inspection of deforestation since 1980
- Strong Cramer's V predictive power ($V \geq 0.3$) & p-value ($p < 0.001$)
- Model Results
 - Vulnerability to forest conversion
 - Prediction map of landscape in 2026

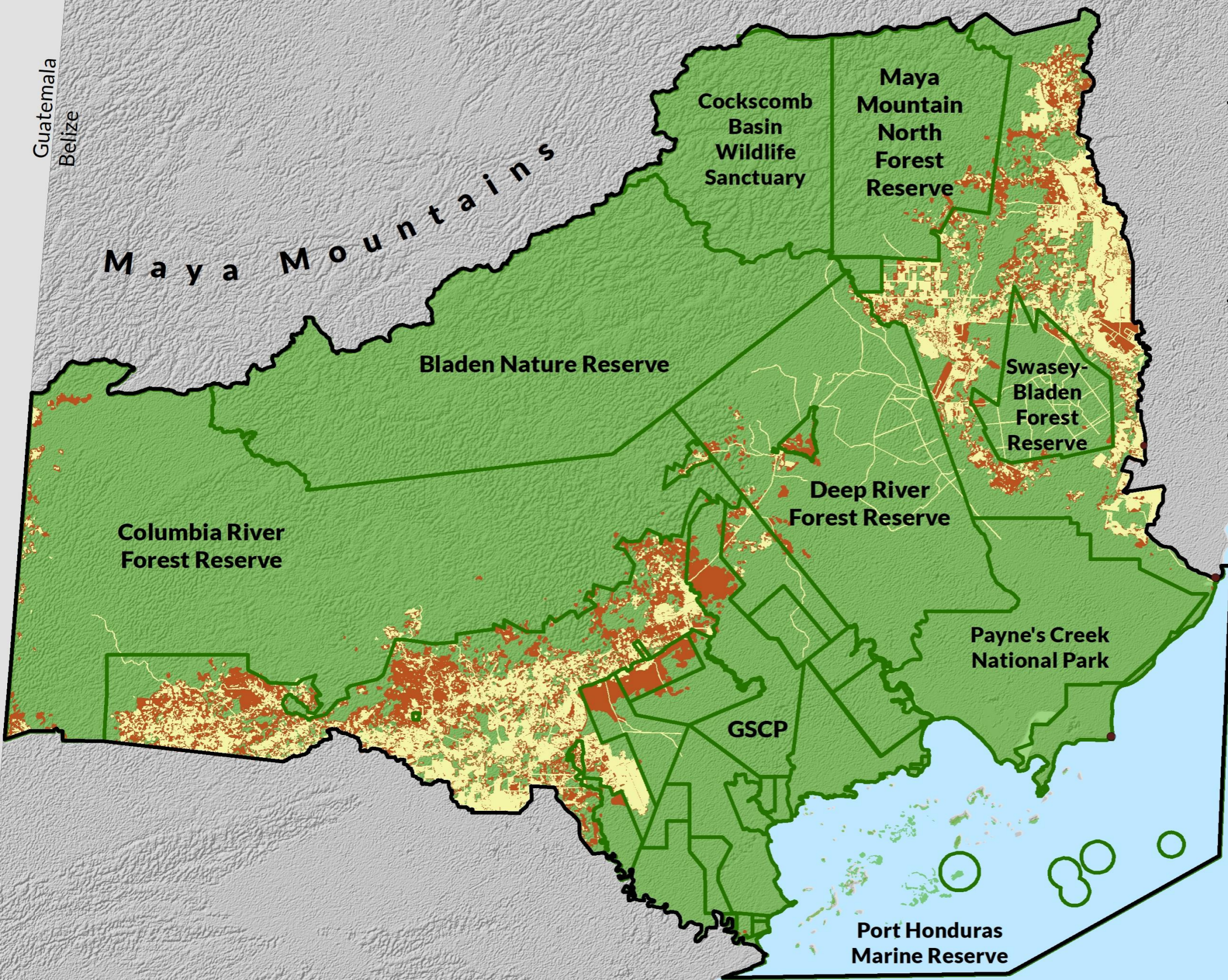


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An aerial photograph of a vast, dense tropical forest. The canopy is a rich, multi-layered green, with various shades of emerald and forest green. The trees are packed closely together, creating a textured, undulating surface. The word "Results" is superimposed in the center of the image in a large, white, sans-serif font. The lighting is bright, suggesting a sunny day, and the overall impression is one of a healthy, thriving ecosystem.

Results

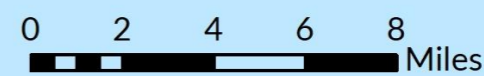
Vegetation Cover of the Maya Golden Landscape, Belize - 2016



- 75.5% of MGL in forest, not including fallow areas
- 62.7% of Belize forested, not including fallow areas (Cherrington et al. 2010)

- Natural Vegetation Cover
- Anthropogenic Areas
- Regenerating Forest*
- Maya Golden Landscape
- Protected Areas

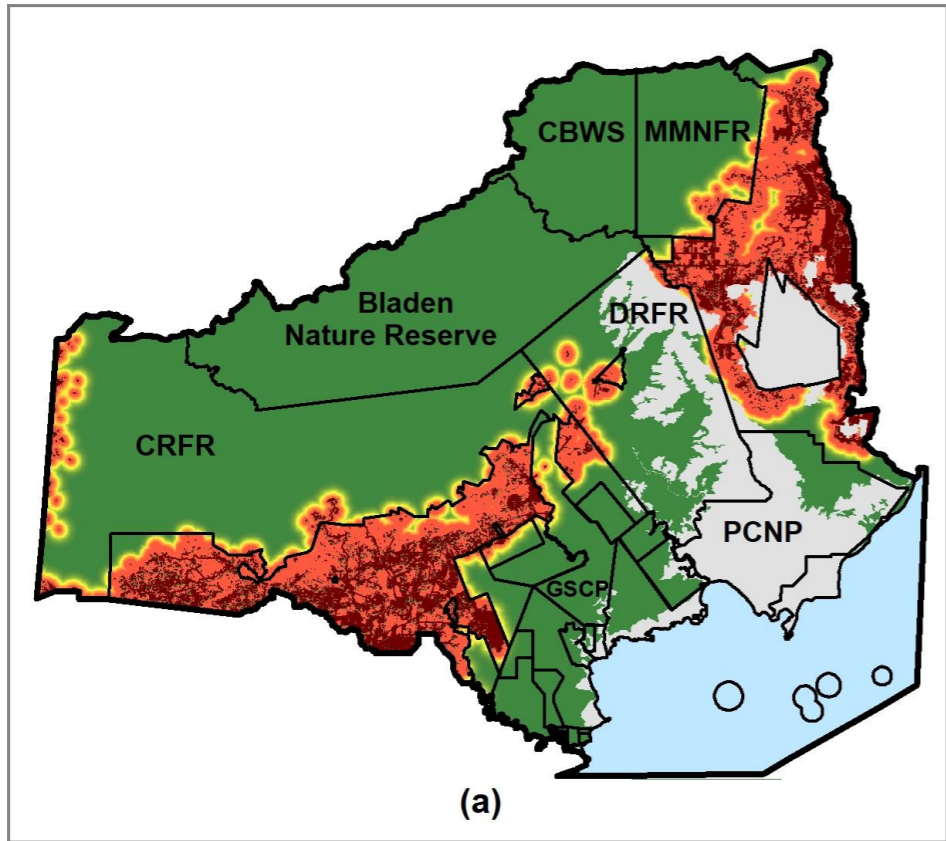
● Punta Gorda



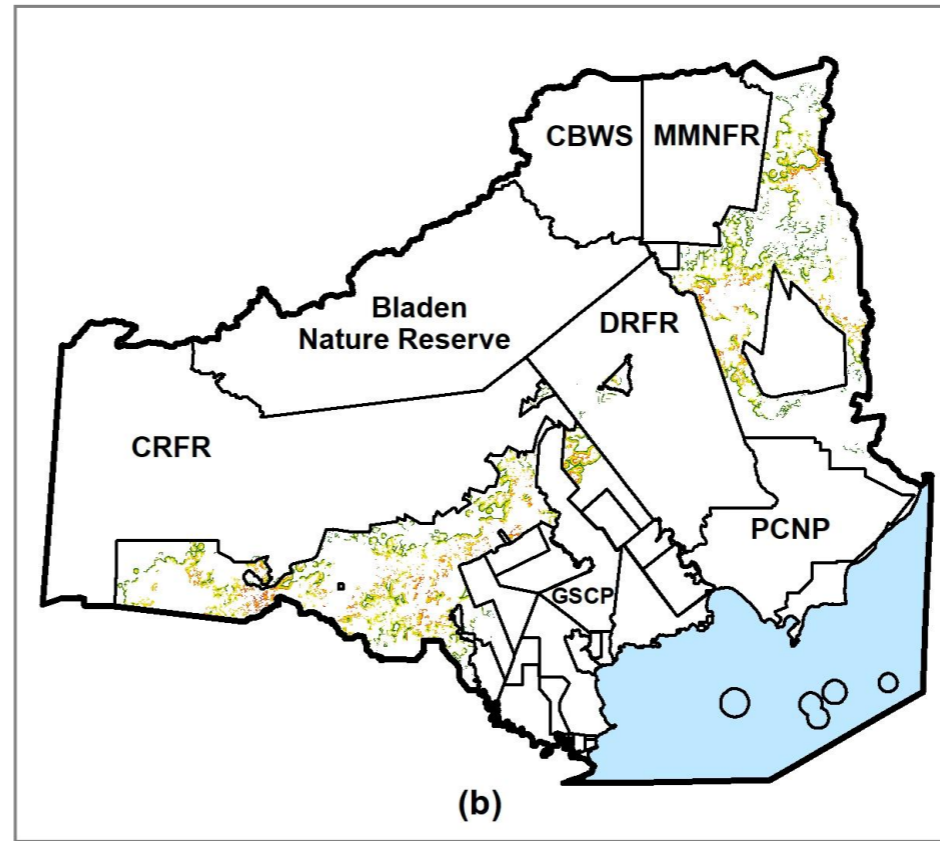
Map prepared by:
Carly Voight
Sept 2017



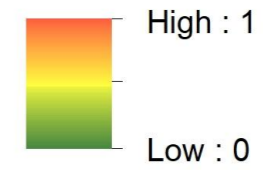
Vulnerability to future deforestation



Hotspots of vulnerability for future deforestation of older-growth forests



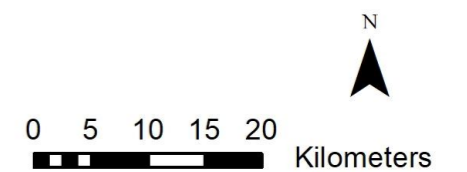
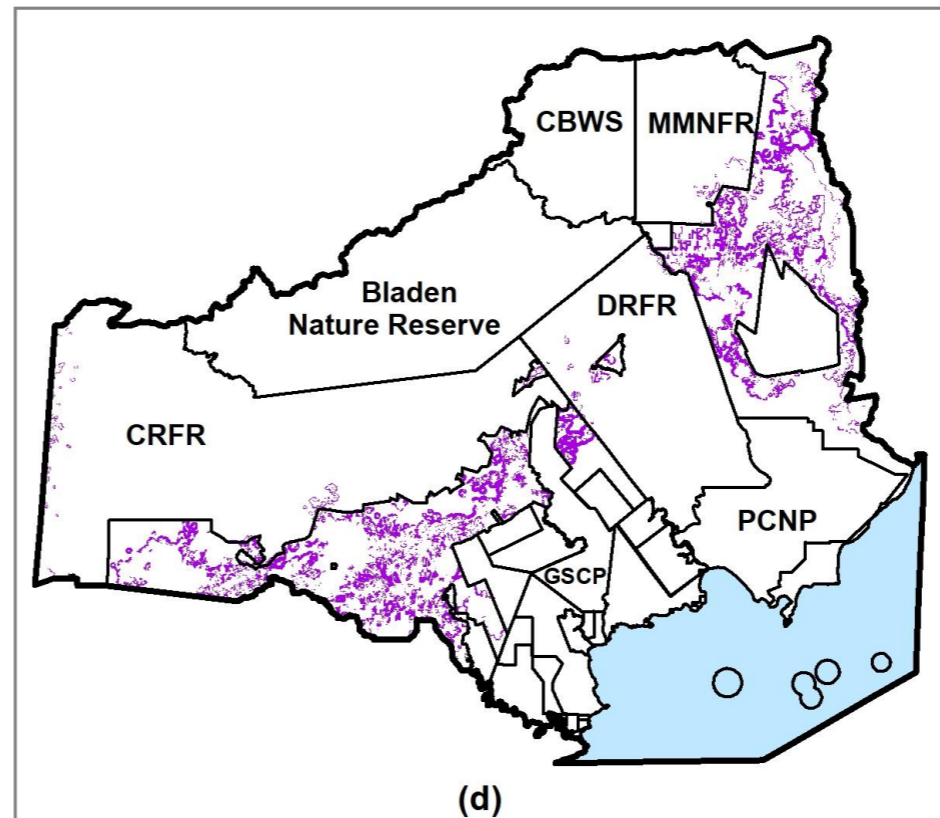
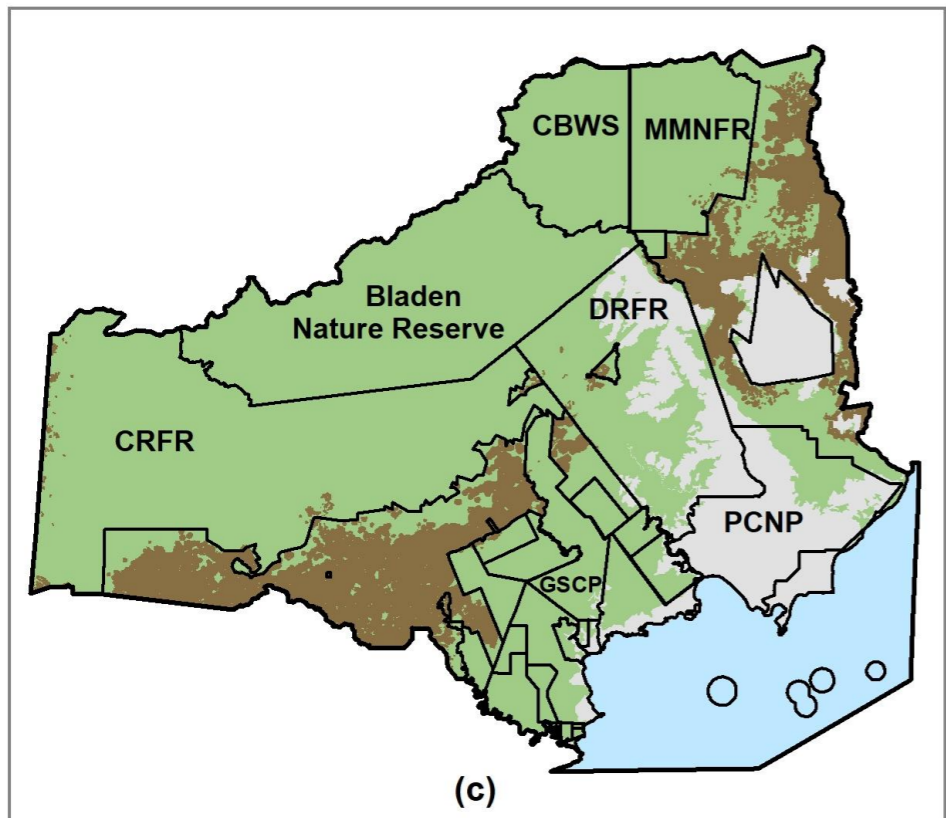
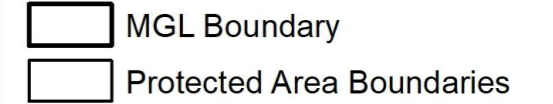
Vulnerability



Land Cover Classes



Boundaries



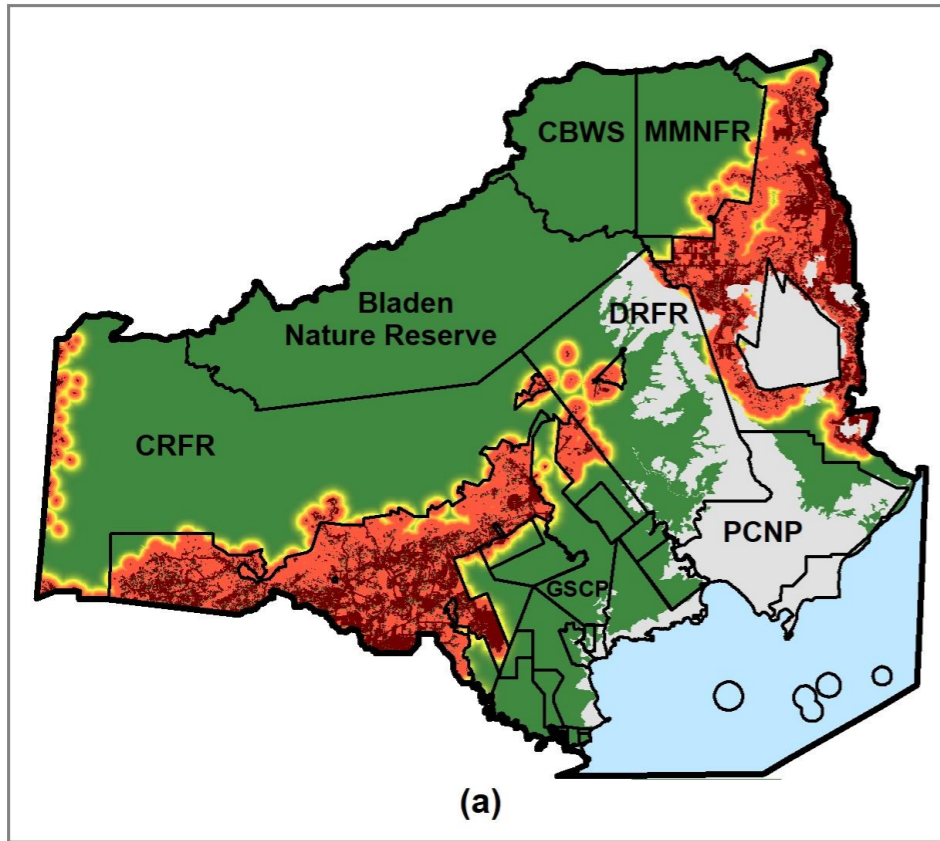
Forest cover predicted for the year 2026

Predicted deforestation of older-growth forest for 2016-2026

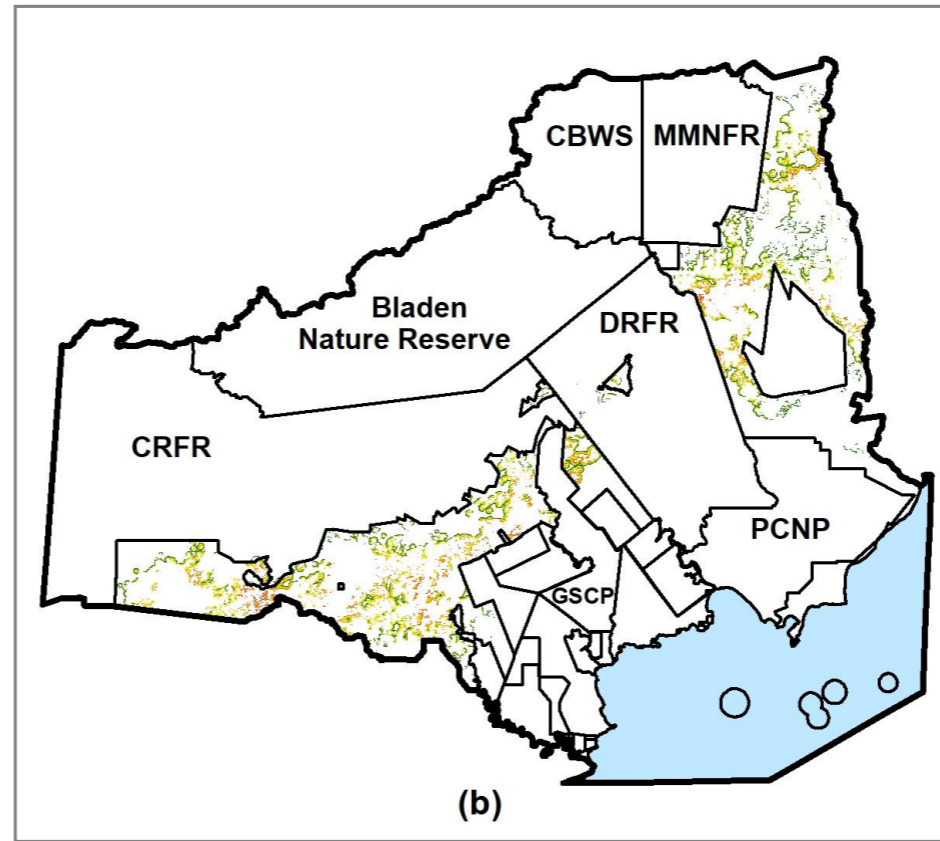
An aerial photograph of a vast, dense tropical rainforest. The canopy is a rich, multi-layered green, with various shades of emerald and forest green. The trees are packed closely together, creating a textured, undulating surface. The word "Discussion" is centered in the middle of the image in a large, white, sans-serif font. The lighting is bright, suggesting a sunny day, and the overall impression is one of a healthy, thriving ecosystem.

Discussion

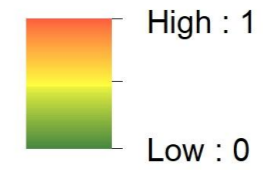
Vulnerability to future deforestation



Hotspots of vulnerability for future deforestation of older-growth forests



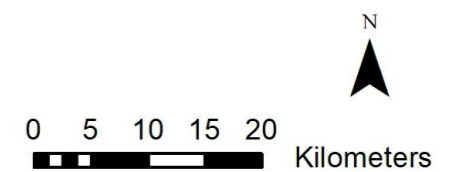
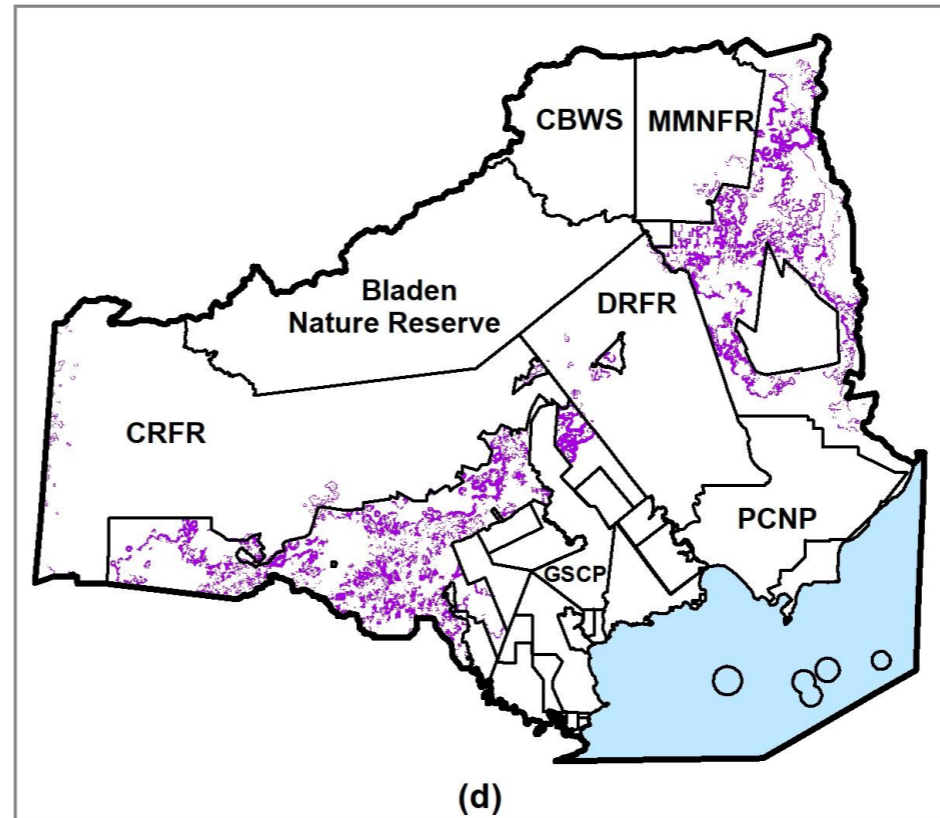
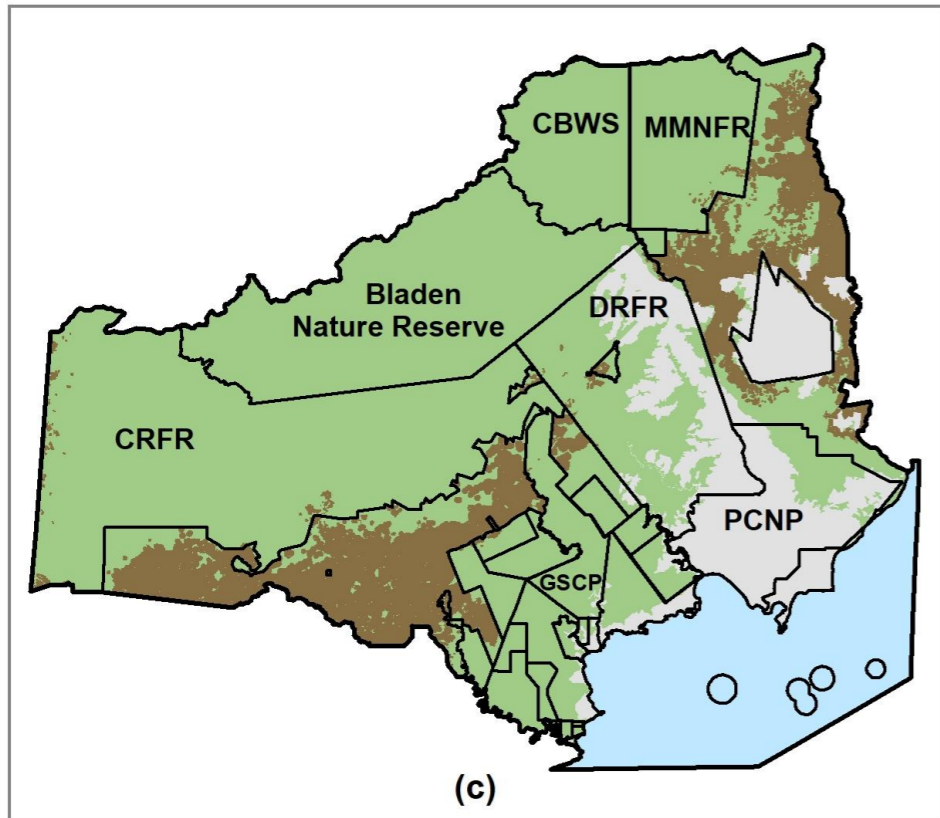
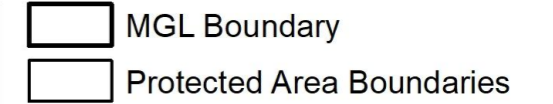
Vulnerability



Land Cover Classes



Boundaries



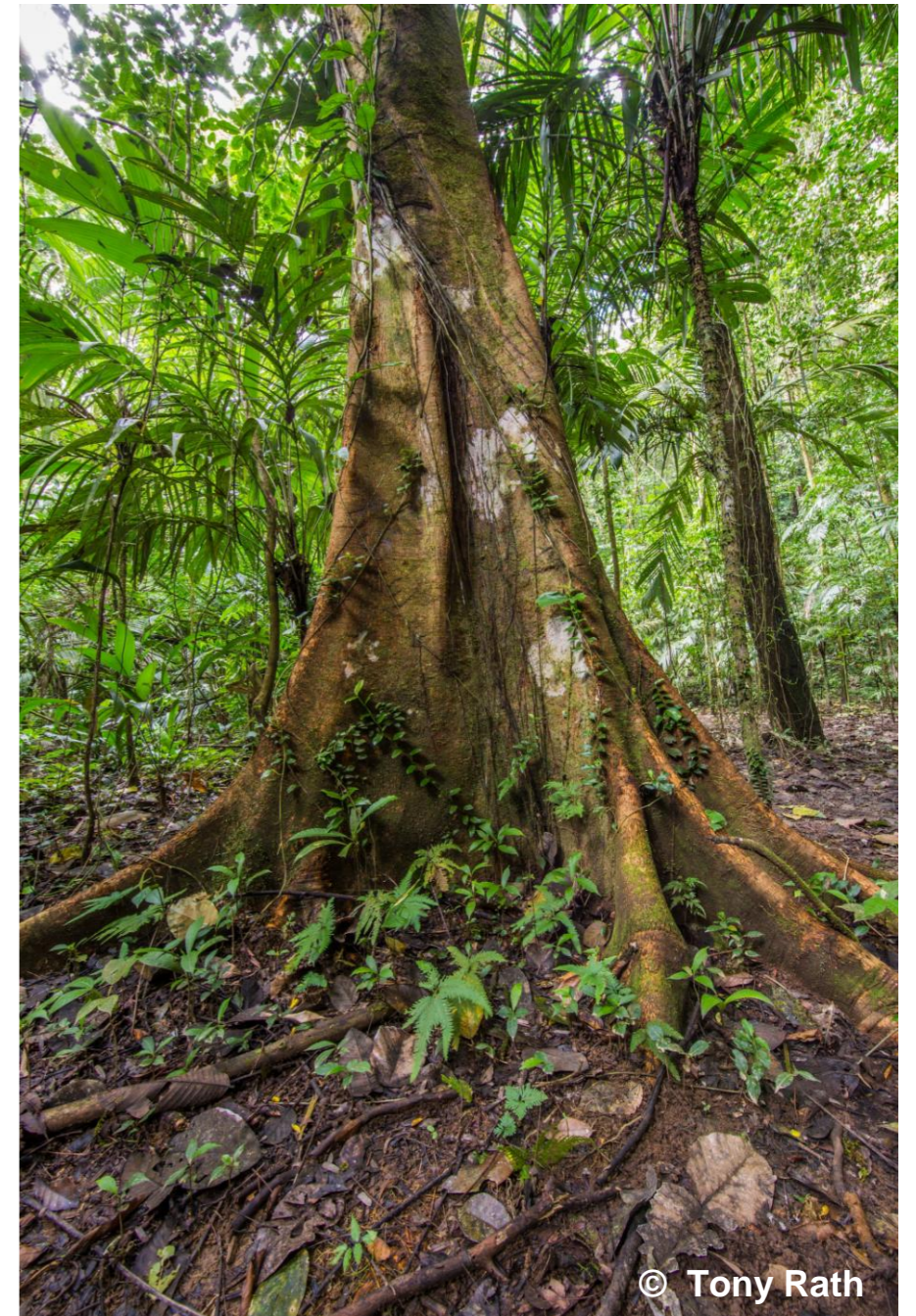
Forest cover predicted for the year 2026

Predicted deforestation of older-growth forest for 2016-2026

Discussion



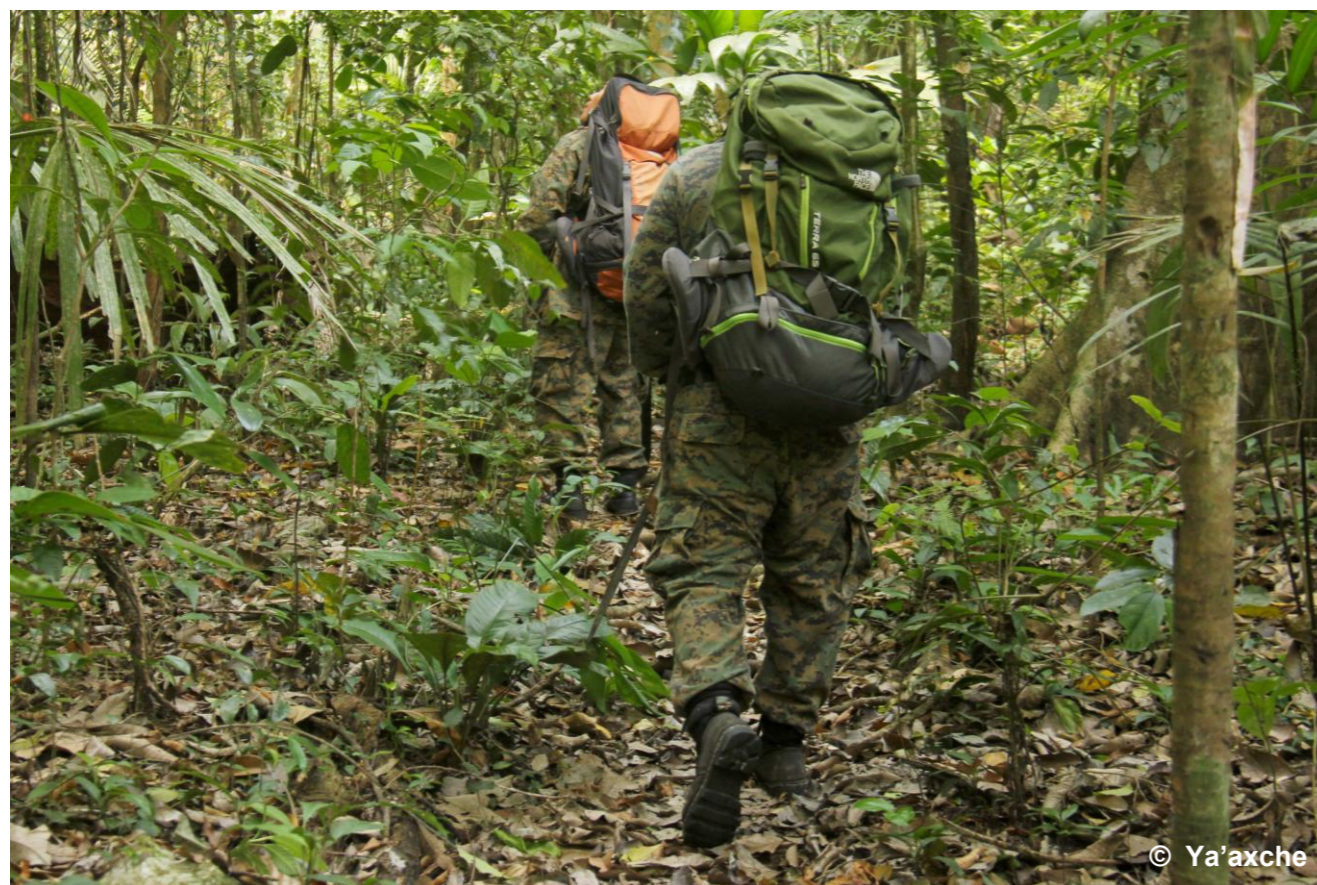
- Majority of current & projected deforestation from unsustainable agriculture
 - Increase in population
 - Shortage of land
 - Reduction of soil fertility
 - More numerous & shorter crop rotations
- Research results used by Ya'axché Conservation Trust and other forest managers in conservation planning
- Implement conservation actions in most vulnerable areas



Discussion



Increased patrols along boundaries of Columbia River Forest Reserve, Maya Mountain North Forest Reserve, & Deep River Forest Reserve



Discussion



Implement fire trainings in communities near threatened areas to reduce risk of escaped fires



Discussion



Promote sustainable agriculture to increase soil fertility and reduce deforestation



Comments and Questions

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