Technical Workshop on National Reference Levels for REDD+ November 9, 2011

Progress on Reference Level Work to Date in Guyana

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WINROCK INTERNATIONAL

Guyana Forestry Commission — Ensuring Sustainable Forestry

Guyana's Monitoring, Reporting, Verification System

- The forest areas assessment work that Guyana completed to date covers the periods 1990-2000, 2001-2005, 2006-2009, 2009-2010, with a framework developed for annual reporting (preparation for 2011 underway)
- The forest carbon monitoring (FCMS) work underway by Winrock International is linked to the forest area assessment effort :
  - Data generated from C stock work will be linked to the forest area assessment effort to provide historic emissions (RL) and estimates of annual carbon emissions and removals (MRV)

Historic and future emissions estimated using the IPCC framework

Need two types of data:

- activity data (AD)
- emission factors (EF)

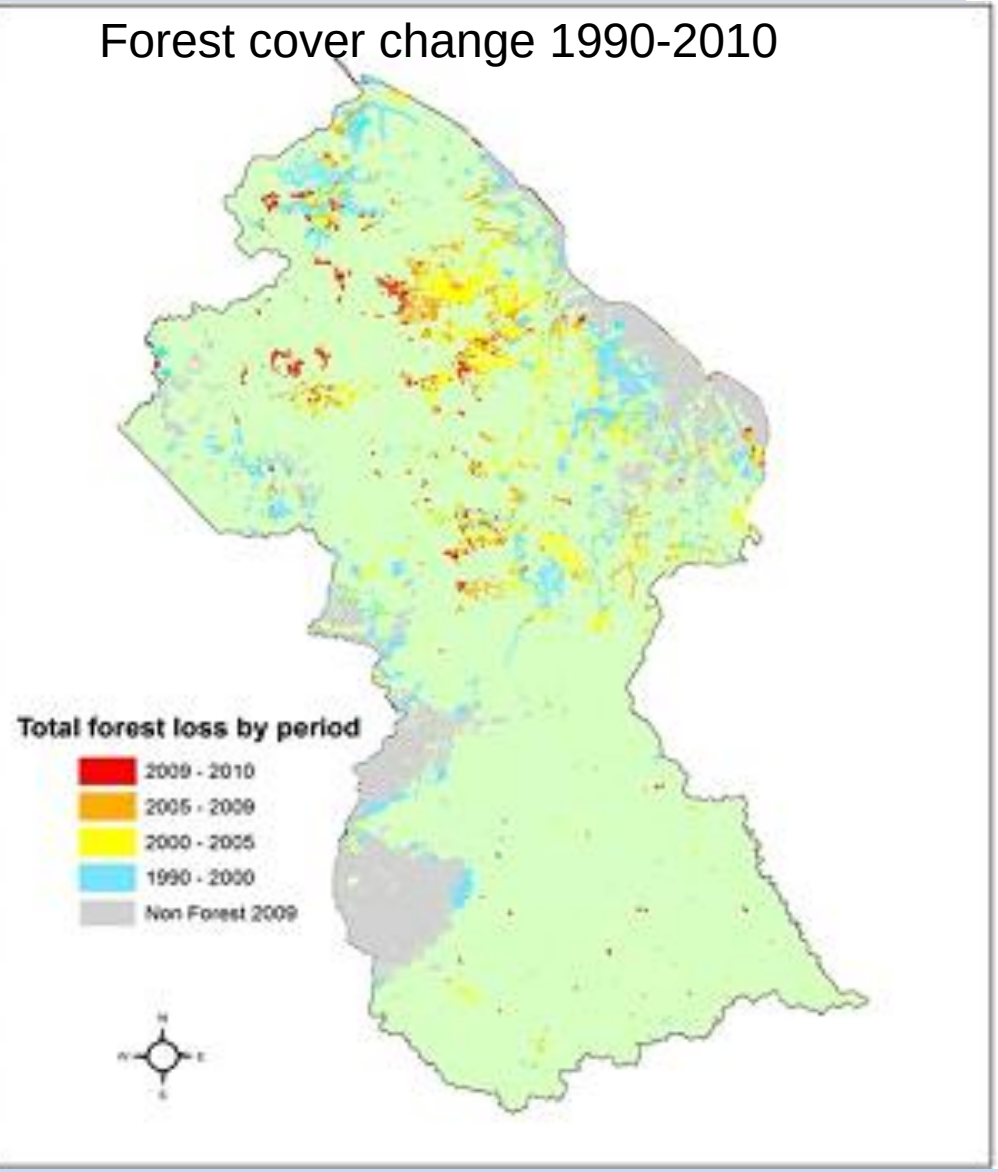
Stock-Change Approach for EF

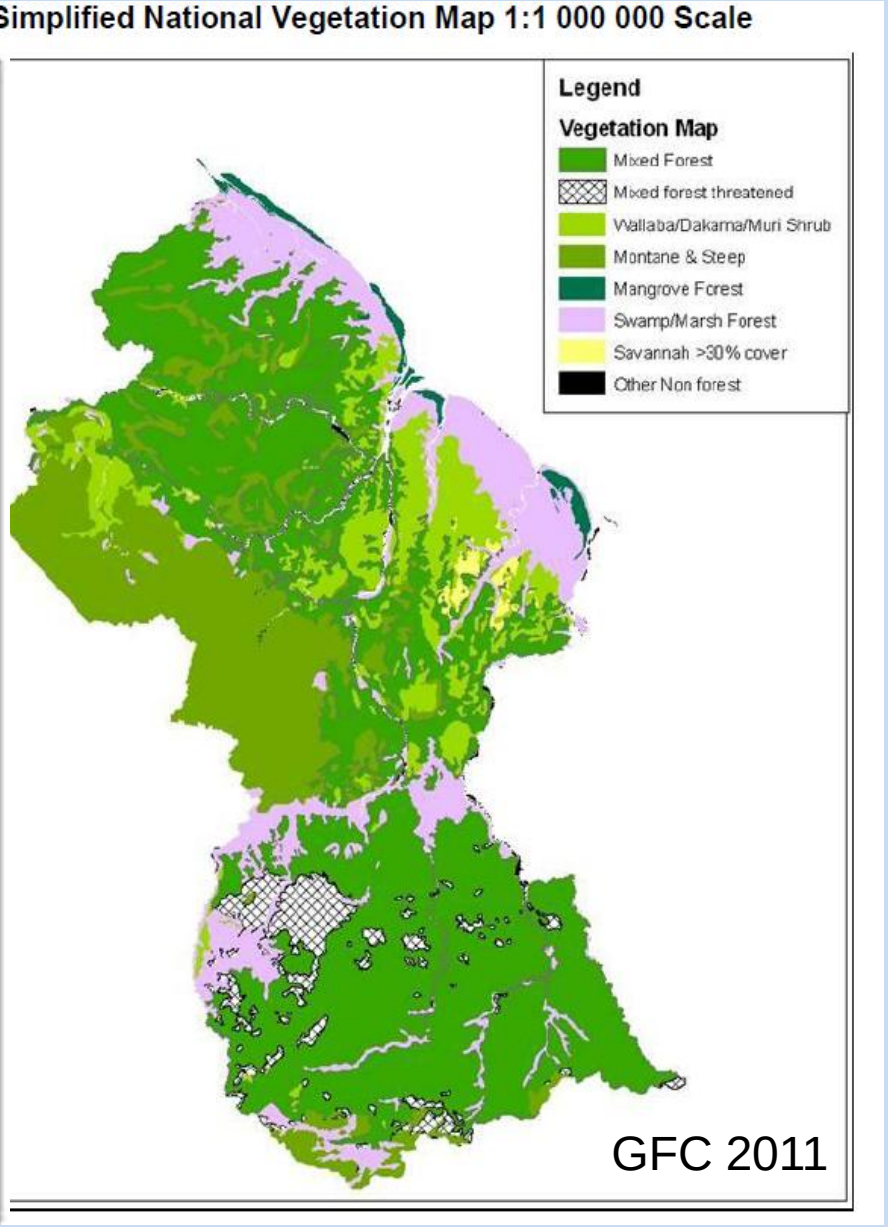
- Deforestation
  - Difference in C stocks in a particular pool at two points in time
  - Data needed;
    - Decision on pools to include
    - Pre and post deforestation C stocks in selected pools

Gain-Loss Approach for EF

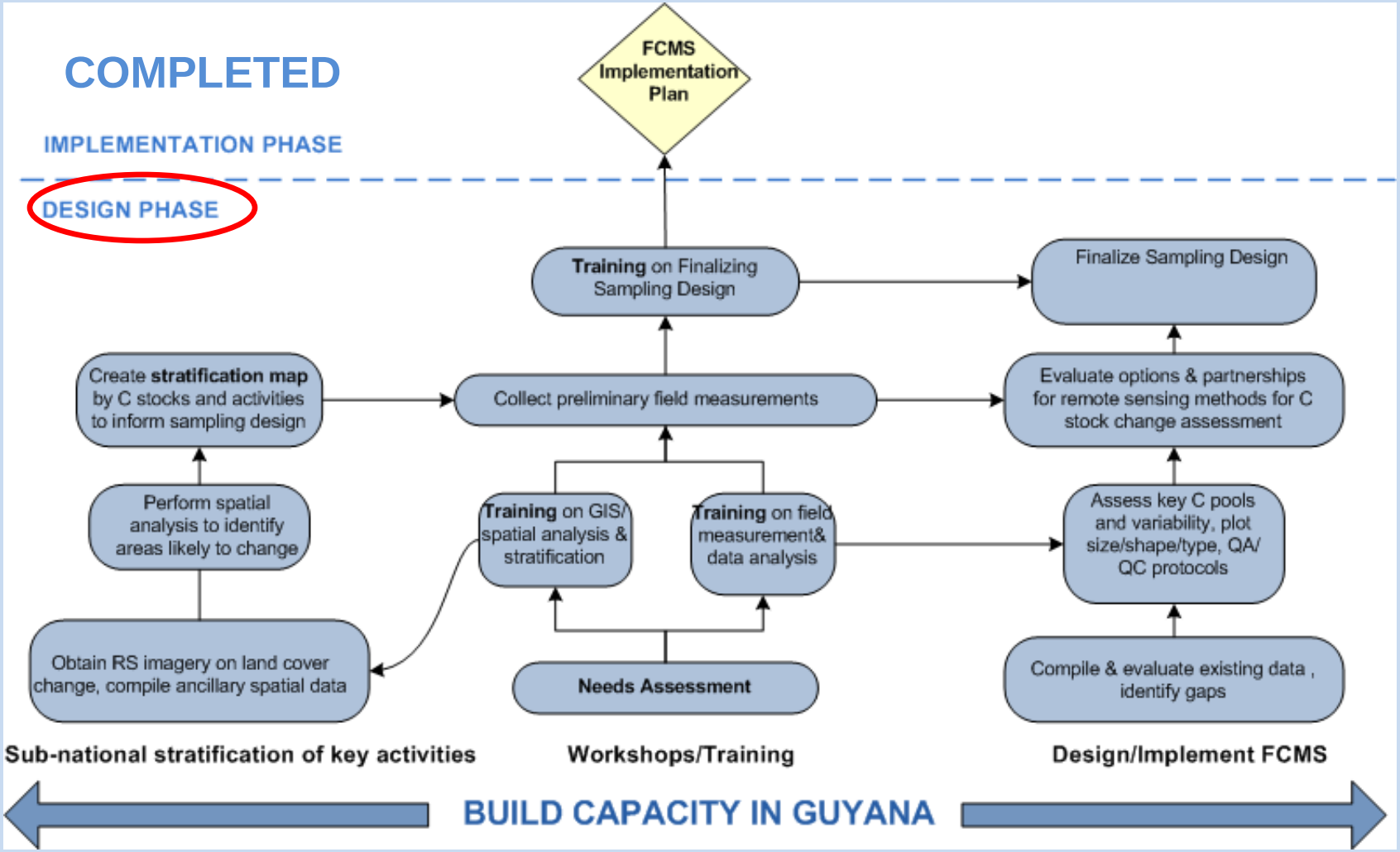
- Forest Degradation
- Enhancement of C stocks
  - Net balance of additions to and removals from a carbon pool
  - Data needed
    - Gains: annual rates of growth
    - Losses: data on tree harvests and damage factors

Forest Lands of Guyana—produced AD

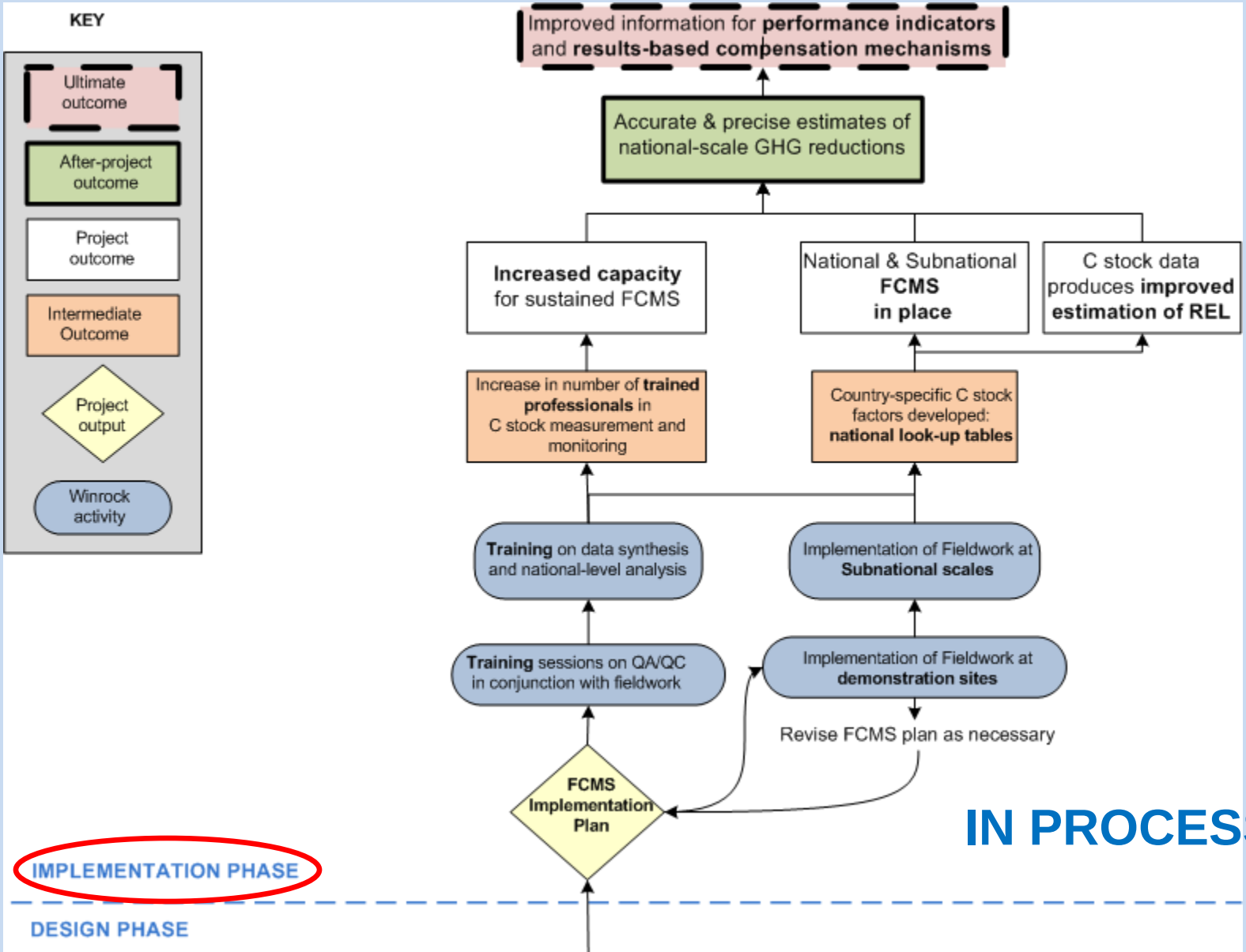




Phase 1: Design for FCMS



Phase 2: Implementation for FCMS



IN PROCESS

Key outcome of FCMS: national lookup tables of emission factors to meet standards

- Standards for level of uncertainty (e.g. precision of ground data)
- Produce QA/QC plans for all data collection and analyses

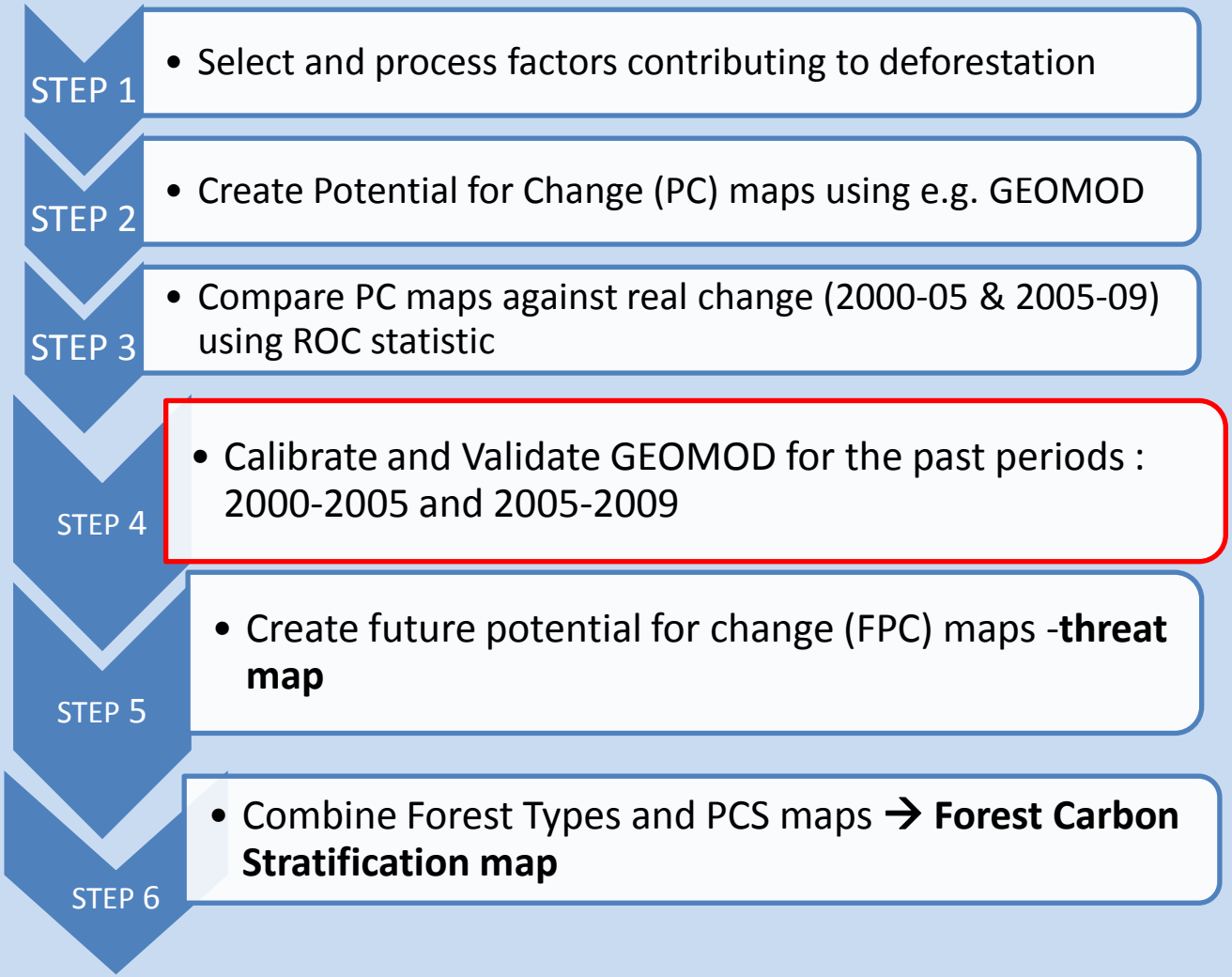
Stratum	Change agent/Driver – Deforestation (stock change)				
	Mining (>1 ha in size) (t CO_2e ha^{-1})	Infrastructure (t CO_2e ha^{-1})	Logging Infrastructure (t CO_2e ha^{-1})	Agriculture (t CO_2e ha^{-1})	Fire (t CO_2e ha^{-1})
Mixed forests high potential for change					
Mixed forest medium potential for change					

- Table will be filled in with EF based on ground data collection and analysis
- It will be used with activity data to generate estimates of emissions of GHG

Main drivers of deforestation and forest degradation

- Identify main drivers as affect selection of pools and post D&D stocks
  - Mining—small to large scale
  - Forestry--for timber production
  - Infrastructure—roads, settlements
  - Agriculture—permanent and shifting cultivation
  - Fire

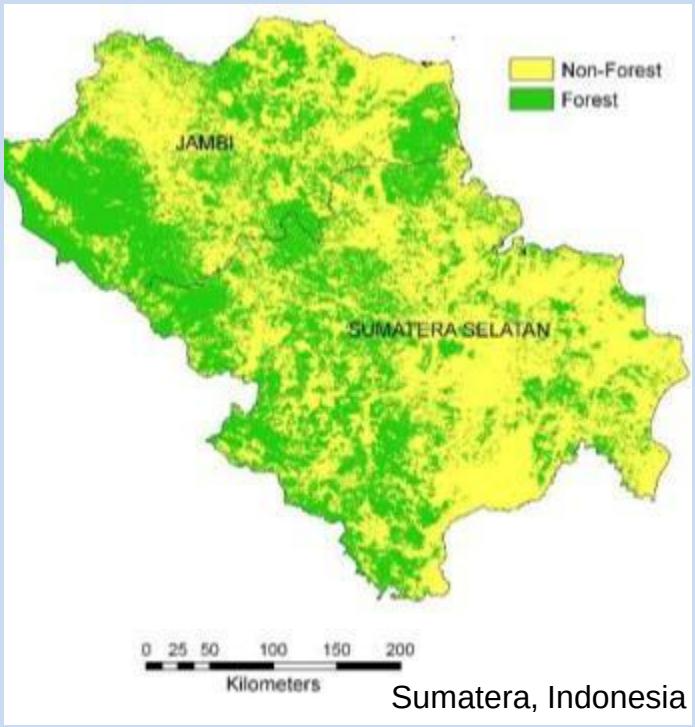
Create a forest carbon stratification map



Why do we stratify by threat?

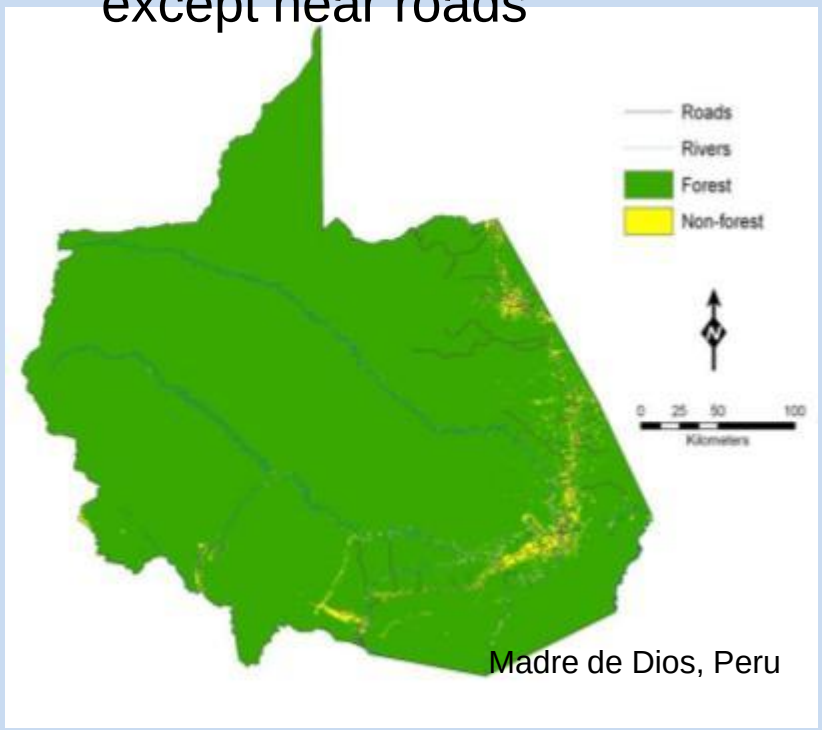
- Not all forests are under immediate threat of conversion

Mosaic-type landscape: high accessibility and high threat



Sumatera, Indonesia

Frontier-type landscape: low accessibility and low threat except near roads



Madre de Dios, Peru

Benefits of threat stratification

- Allows for measuring and monitoring areas where changes have occurred and likely to occur in future
- Reduces sampling effort while maintaining accuracy and precision in estimates of emission factors
- Allows for wise spending of resources
- Requires detailed collaboration between RS/GIS team and carbon team

Develop sampling design

- Use a stratified two-stage clustered sampling design
- From existing data and preliminary measurements determine variation in C stocks of strata and estimate number of sample plots to achieve desired precision (90% confidence ± 10% of the mean is common
- Decide on number of plots (4 in this case in a “L” shape) in a cluster per strata
- Randomly select number of grids per strata (primary sample units) based on number of clusters
- Use temporary plots

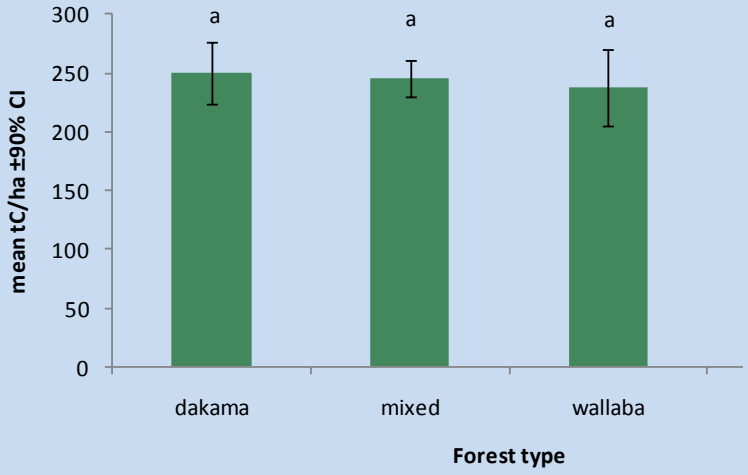
Preliminary field data

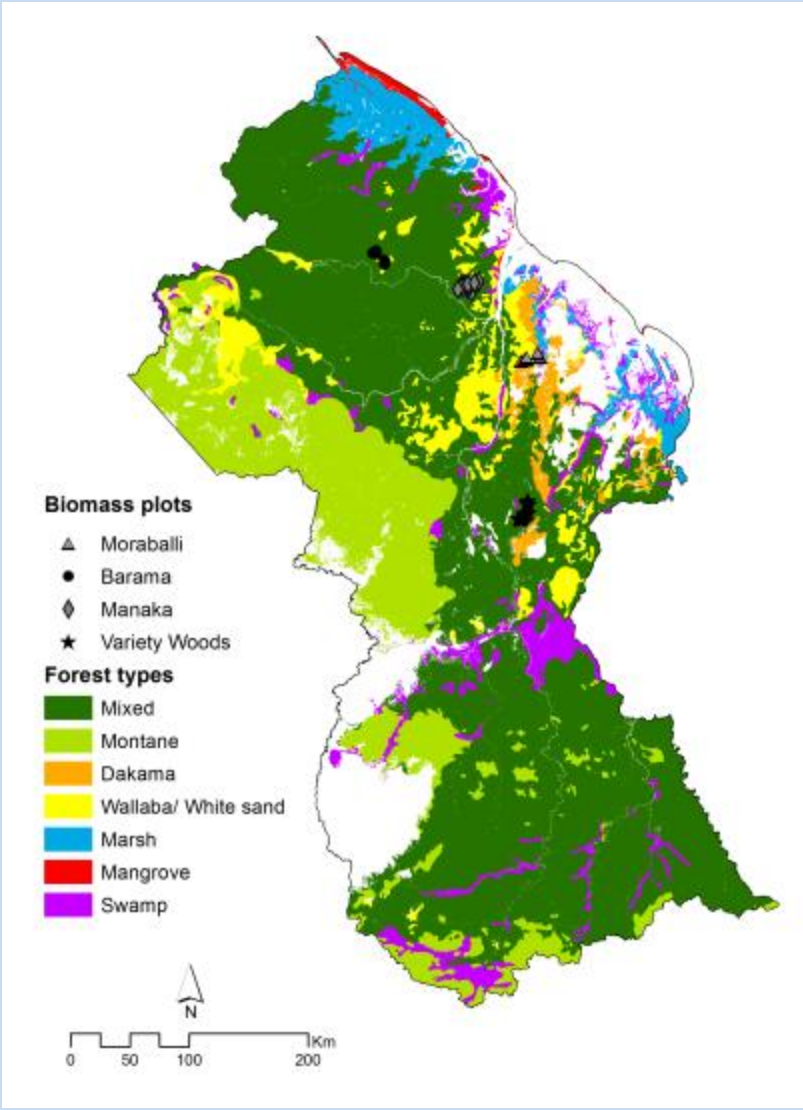
24 Single Plots

Carbon Pool	Carbon Stock (t C ha^{-1})	% of Total
Aboveground tree biomass	192.9 ± 29.9	71.2
Belowground tree biomass	45.2± 7.0	17.2
Saplings*	7.0 ± 1.3	2.7
Dead wood (standing)#	1.1 ± 1.0	0.4
Dead wood (lying)#	17.3 ± 7.1	6.6
Total	**279.3 ± 25.2**	**100**

29 Cluster Plots

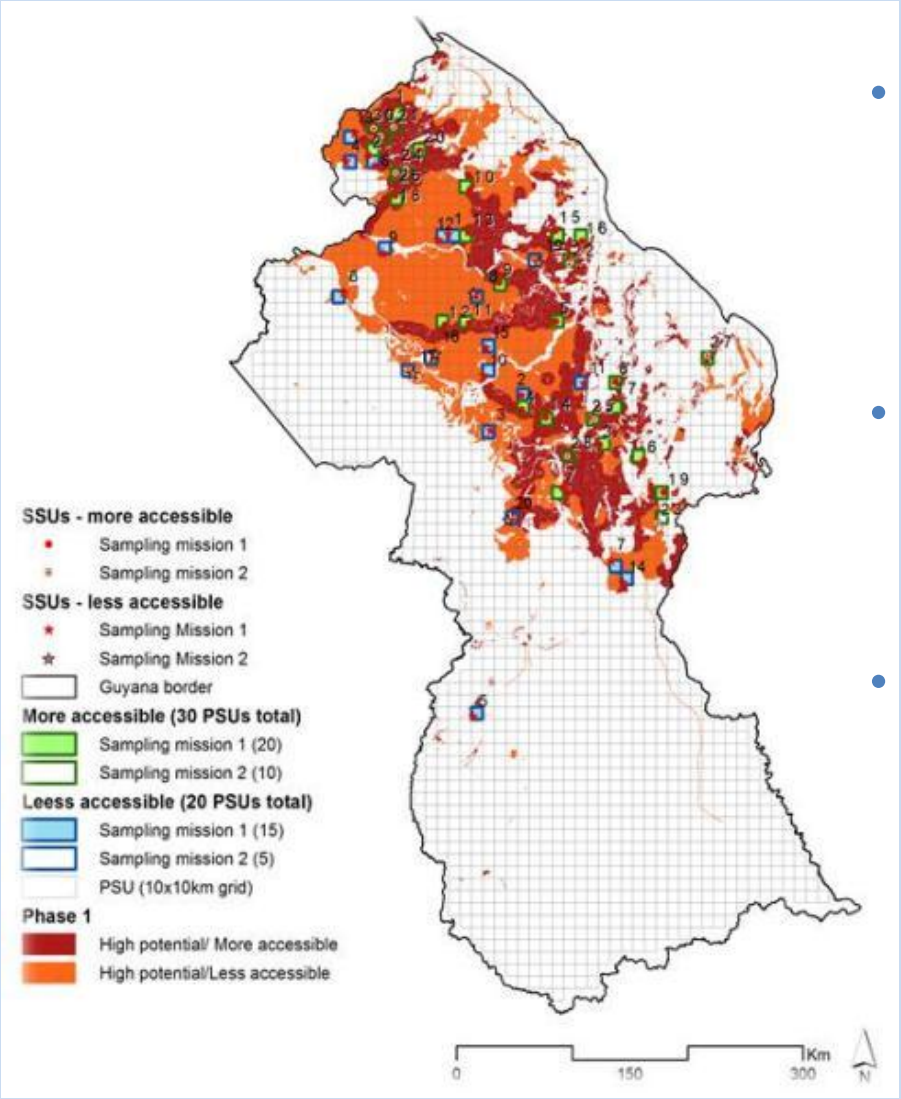
Carbon Pool	Carbon Stock (t C ha^{-1})	% of Total
Aboveground tree biomass	190.6 ± 12.88	72.4
Belowground tree biomass	44.8± 3.0	17.0
Saplings*	5.2 ± 0.6	2.0
Dead wood (standing)#	3.3 ± 1.4	1.3
Dead wood (lying)#	19.3 ± 3.1	7.3
Total	**263.2 ± 9.3**	**100**



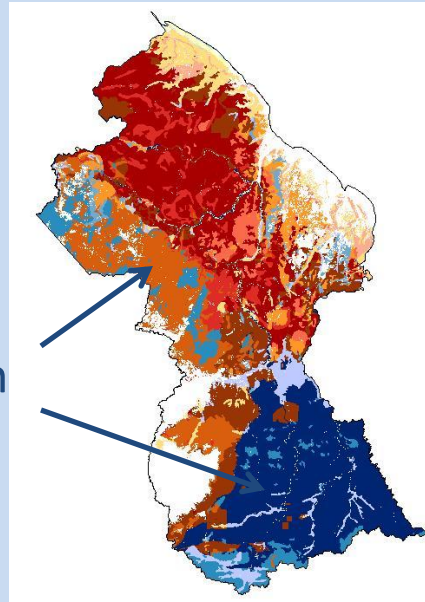


Sampling plan for high threat forests

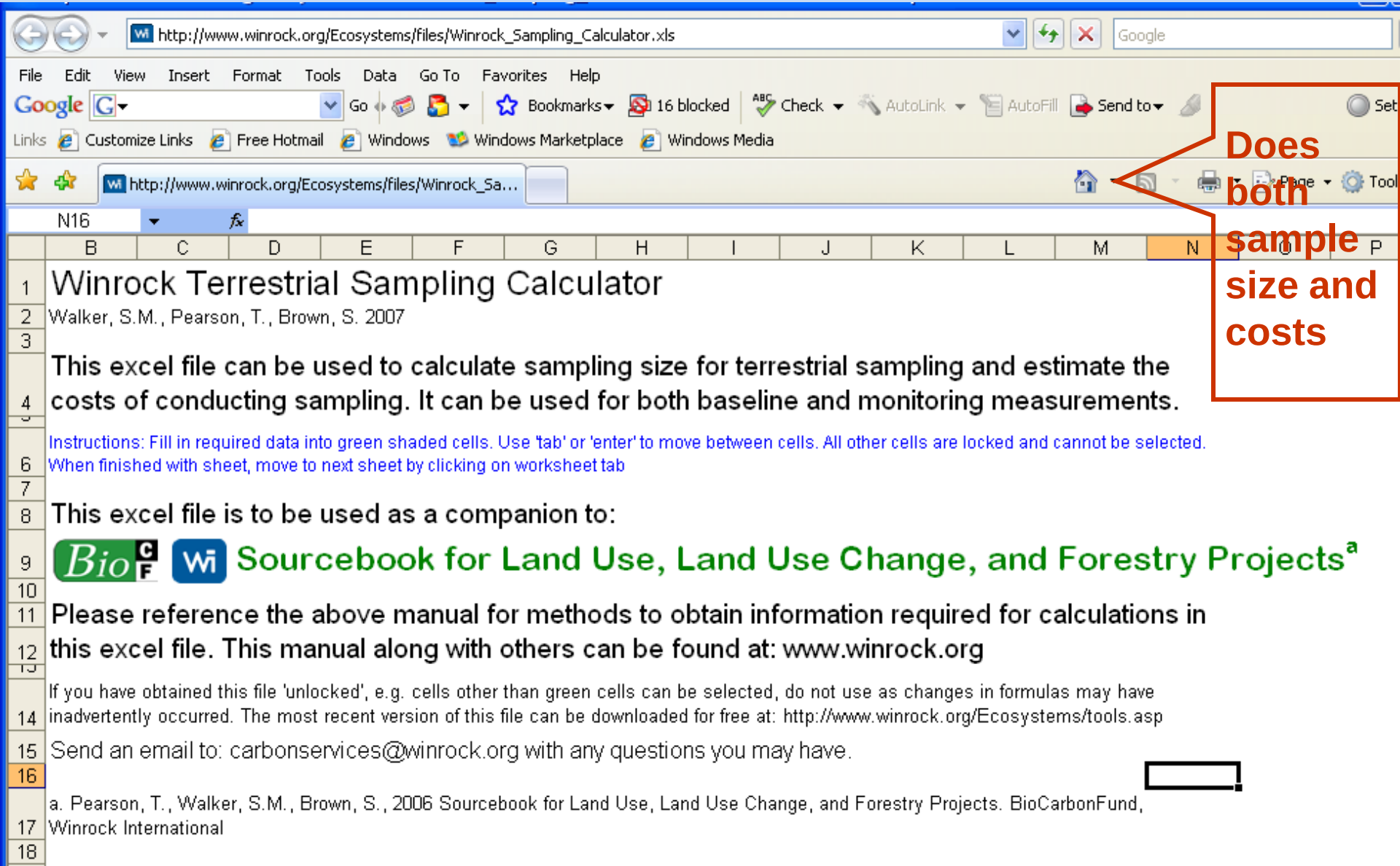
Forest areas under high threat overlain with a 10 km x 10 km grid



- Randomly selected number of grids in which to install plot clusters by high threat strata based on targeted precision (+/- 10% mean)
- Takes into account accessible versus less accessible forests in sampling design for cost effectiveness
- Repeat process for medium and low threat in phased approach



Develop tools to calculate sample size



Does both sample size and costs

Develop standards for field measurements for QA/QC

Standard Operating Procedures for the Forest Carbon Monitoring System of Guyana

Sarah Walker[1], Timothy Pearson[1], Felipe Casarim[1], Nancy Harris[1], Sean Grimland[1], Silvia Petrova[1] and Sandra Brown[1]

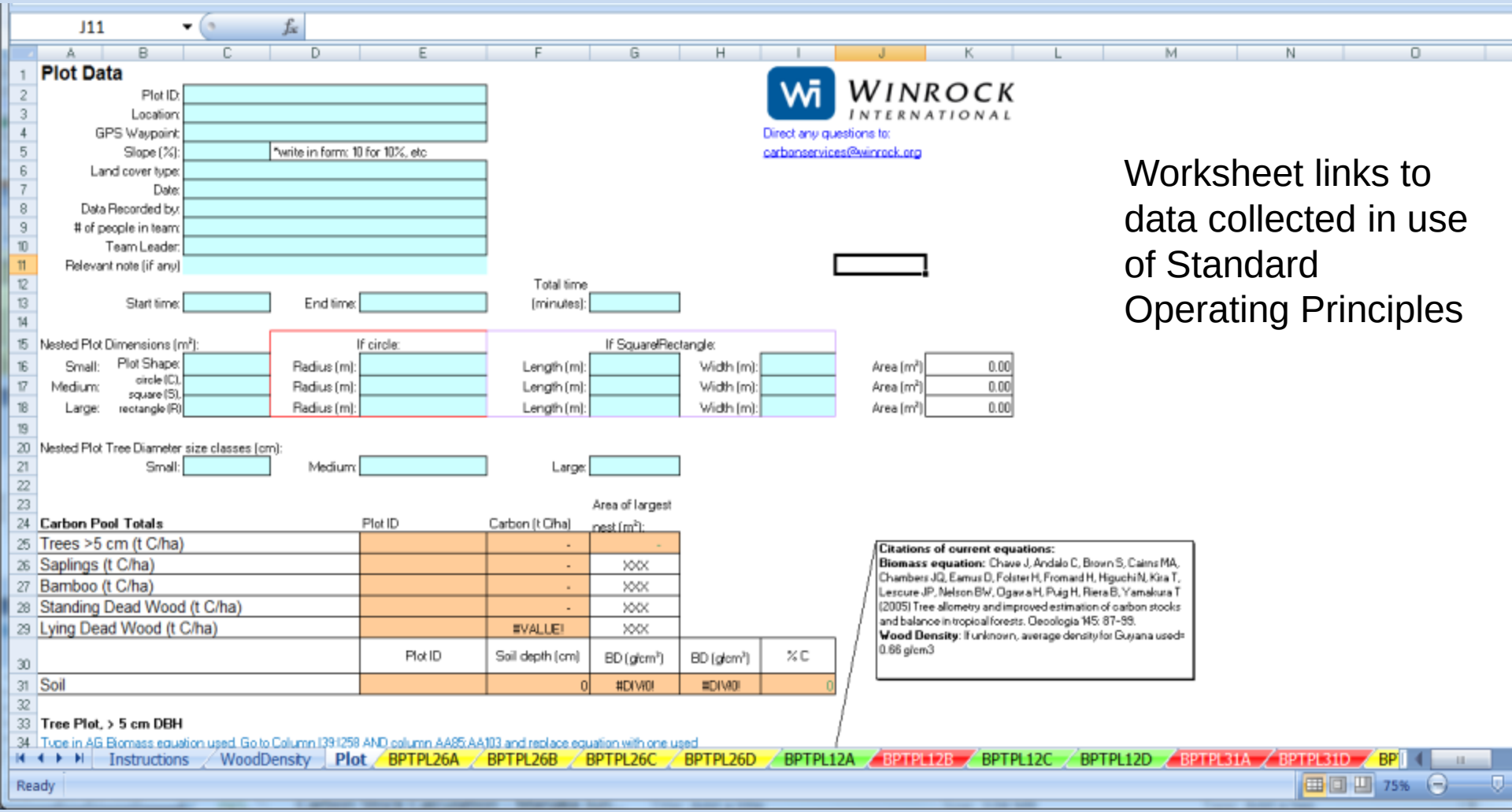
In collaboration with:

Hansrajie Sukhdeo[2] and Carey Bhojedat[2]

[1]Winrock International [2]Guyana Forestry Commission

Section Break (Next Page)

Develop tools to automate calculations of C stocks from field data



Plot Data

WINROCK INTERNATIONAL

Direct any questions to:
carbonservices@winrock.org

Plot ID:	
Location:	
GPS Waypoint:	
Slope (%):	*write in form: 10 for 10%, etc
Land cover type:	
Date:	
Data Recorded by:	
# of people in team:	
Team Leader:	
Relevant note (if any)	

Start time: End time: Total time (minutes):

Nested Plot Dimensions (m^2):

	Plot Shape: circle (C), square (S), rectangle (R)	If circle:	If Square/Rectangle:		Area (m^2)
Small:		Radius (m):	Length (m):	Width (m):	0.00
Medium:		Radius (m):	Length (m):	Width (m):	0.00
Large:		Radius (m):	Length (m):	Width (m):	0.00

Nested Plot Tree Diameter size classes (cm):
Small: Medium: Large:

Carbon Pool Totals	Plot ID	Carbon (t C/ha)	Area of largest nest (m^2):
Trees >5 cm (t C/ha)		-	-
Saplings (t C/ha)		-	XXX
Bamboo (t C/ha)		-	XXX
Standing Dead Wood (t C/ha)		-	XXX
Lying Dead Wood (t C/ha)		#VALUE!	XXX

	Plot ID	Soil depth (cm)	BD (g/cm³)	BD (g/cm³)	%C
Soil		0	#DIV/0!	#DIV/0!	0

Tree Plot, > 5 cm DBH
Type in AG Biomass equation used. Go to Column I39:I258 AND column AA85:AA103 and replace equation with one used

Citations of current equations:
Biomass equation: Chave J, Andalo C, Brown S, Cairns MA, Chambers JQ, Eamus D, Folster H, Fromard H, Higuchi N, Kira T, Lescure JP, Nelson BW, Ogawa H, Puig H, Riera B, Yamakura T (2005) Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia 145: 87-99.
Wood Density: If unknown, average density for Guyana used= 0.66 g/cm3

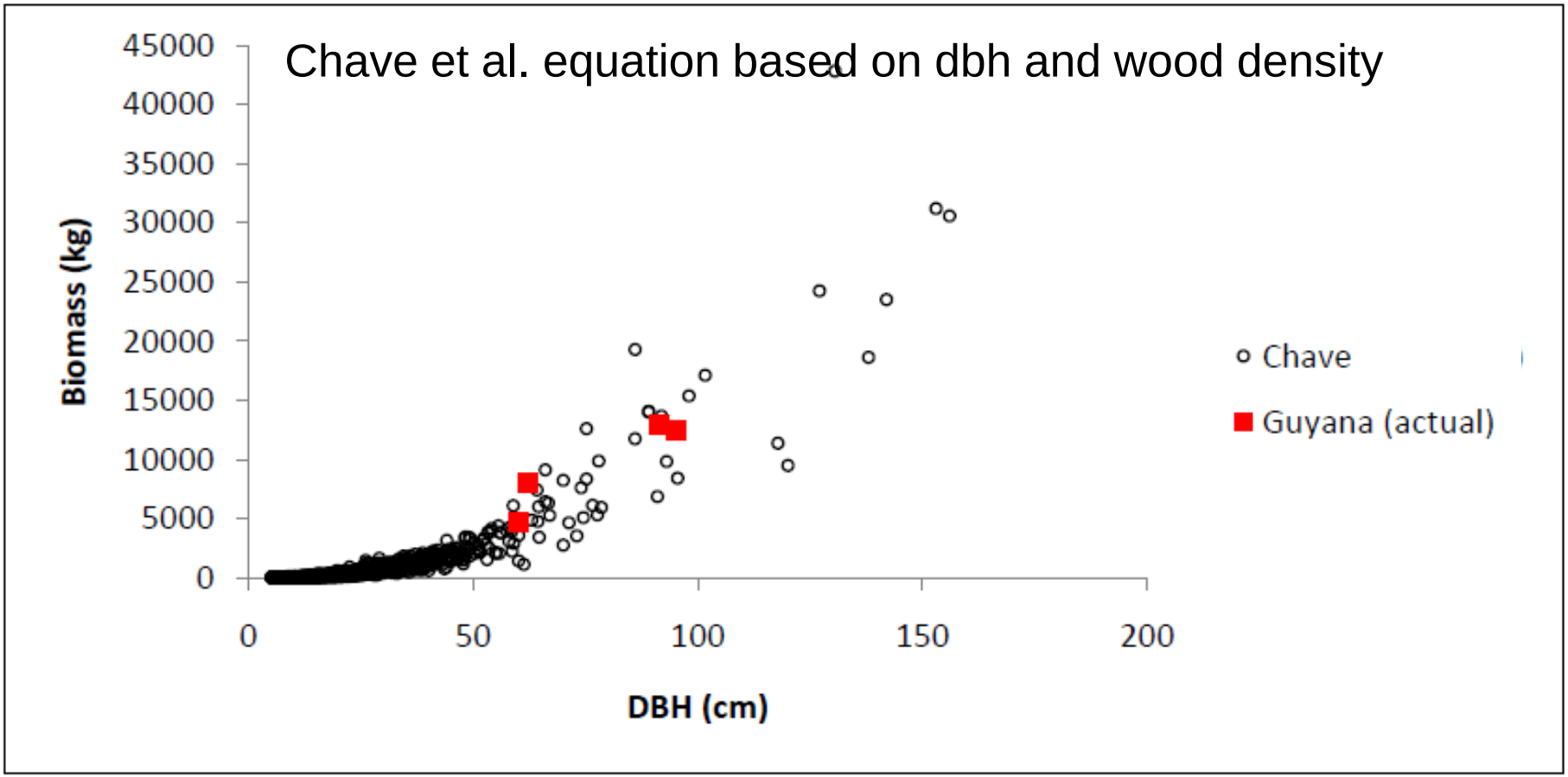
Instructions | WoodDensity | Plot | BPTPL26A | BPTPL26B | BPTPL26C | BPTPL26D | BPTPL12A | BPTPL12B | BPTPL12C | BPTPL12D | BPTPL31A | BPTPL31D | BP

Ready 75%

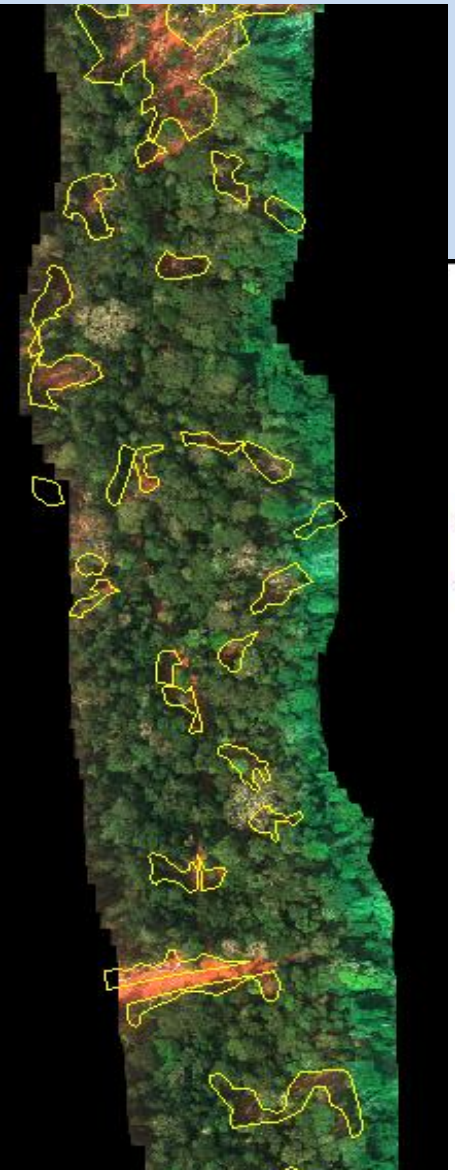
Worksheet links to data collected in use of Standard Operating Principles

Select allometric equation for biomass estimation

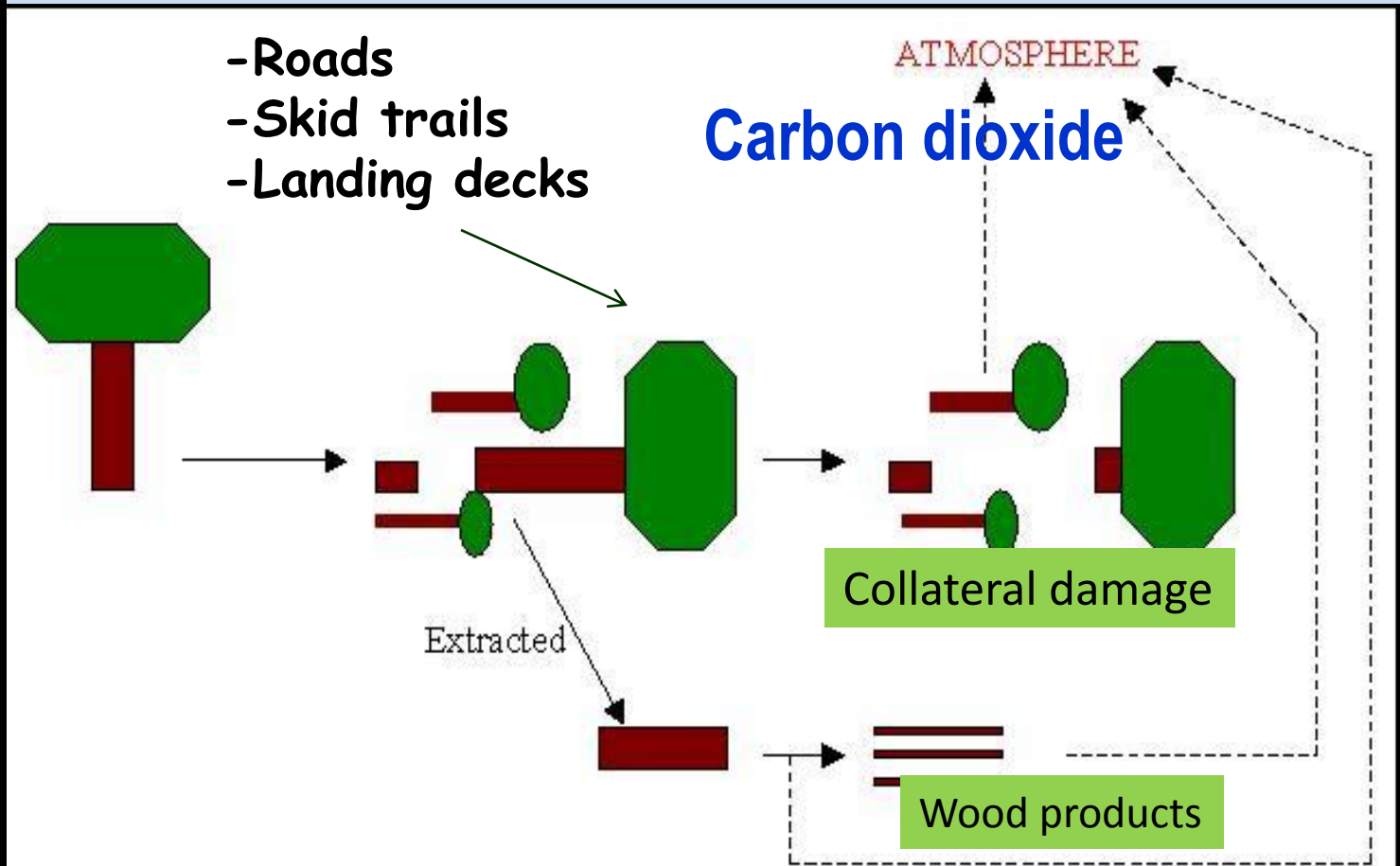
Validate existing equations with destructive sampling if possible



Develop methods for estimating emissions from degradation



- Selective logging main cause
- Use “change detection” to estimate carbon impact per area of gap and timber extracted



Estimating emissions from removals in selective logging

C emissions, t C/yr = [vol x WD x CF x (1-LTP)] +[vol x LDF] +[vol x LIF]

Where:

Vol = volume timber extracted over bark per logging block (m3)

WD = wood density (t/m3)

CF = carbon fraction

LTP = proportion of extracted wood in long term products still in use after 100 yr (dimensionless)

LDF = logging damage factor (t C/m3)—dead wood left behind in gap

LIF = logging infrastructure factor (t C/m3)—dead wood produced by construction

Estimating emissions from Selective Logging

t C/yr = **[vol x WD x CF x (1-LTP)]** + [vol x LDF] + [vol x LIF]

Estimating emissions from Selective Logging

t C/yr = [vol x WD x CF x (1-LTP)] + **[vol x LDF]** +[vol x LIF]

Where are we (1)?

- Three field trainings for GFC staff have been completed, including biomass carbon plots, logging plots, and regrowth plots
- Above and below ground trees, dead wood, and soil pools have been selected for the FCMS (other pools are insignificant)
- Changes in soil carbon pool will be estimated for those lands converted to permanent agriculture, mining, shifting cultivation, and roads
- Forest have been stratified (6 strata based on low to high threat for D&D and more or less accessible)

Where are we (2)?

- Preliminary field data for carbon stocks for deforestation activities have been collected and analyzed to estimate number of plots needed:
- Data for emission factors for logging have been analyzed (>120 logging gaps have been measured) and more are being collected to reach precision target
- Method for estimating regrowth in gaps after logging has been developed and data in process of being collected (chronosequence of logging gaps)
- Sampling design plan is finalized and in process of being implemented for deforestation and degradation due to logging

Ongoing challenges

- Quantify forest degradation –area and changes in carbon stock for activities other than selective logging—e.g. in buffers around infrastructure
- Impact of mining on soil carbon stocks
- How to estimate carbon impact of shifting cultivation and escaped fires

Achieved good progress

- Significant financial incentive
- Clear mandate for implementing agency (GFC) and REDD Secretariat under Office of President
- Commitment and strong leadership from GFC and REDD Secretariat and responsiveness of all staff
- Technical staff committed, learn quickly, fully engaged, and work hard in field
- Cooperation and transparency among all relevant land-based ministries and agencies (lands and Surveys, Mines and Geology, Agriculture)