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Ministerio Federal de Cooperación Económica y Desarrollo

PROYECTO BIO MARCC

Carbon stocks in mangroves of Costa Rica

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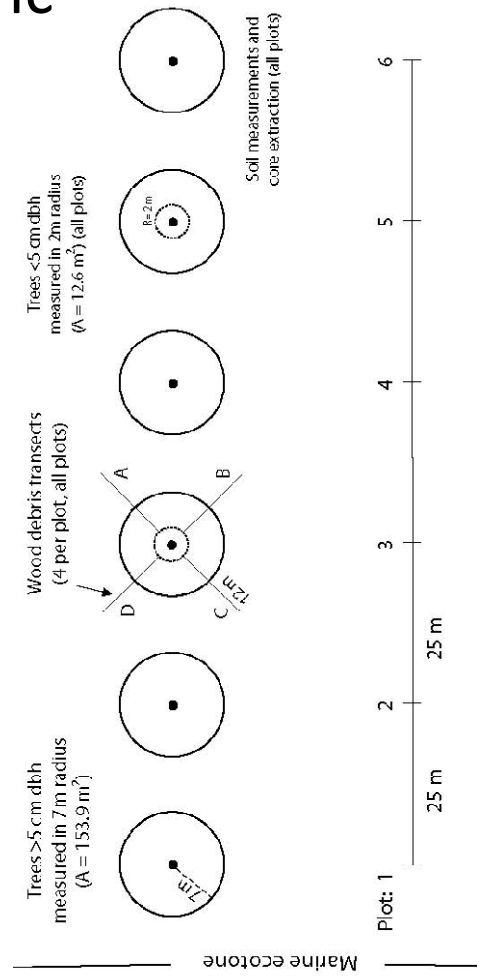
March 19-24, 2012

Outline

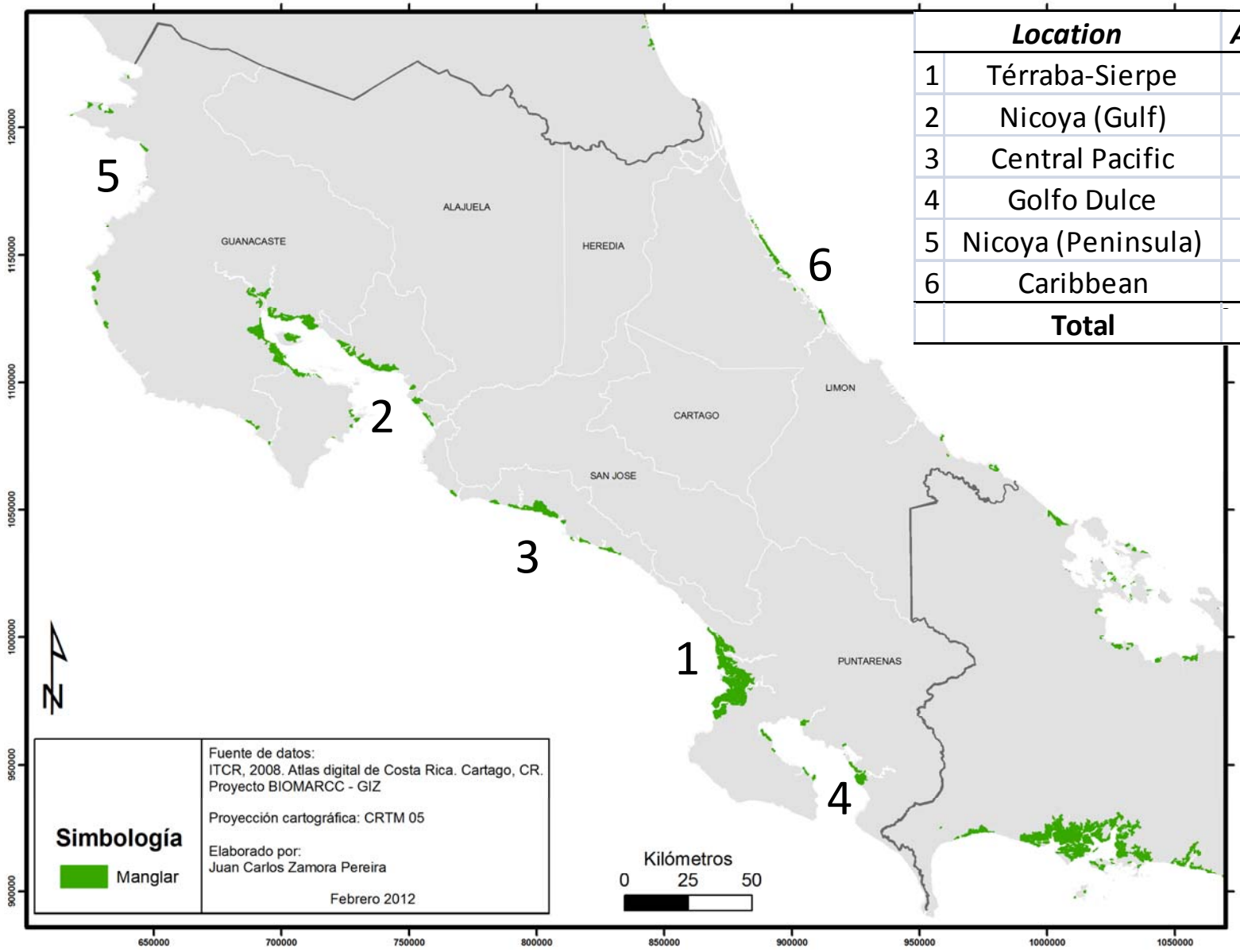
- Ongoing research
- Preliminary results
- Steps forward

Carbon stocks in Costa Rica

- No country-wide inventory
  - Initial inventories: 1 in Caribbean, 2 in Pacific
- Standard methods (Kauffman & Donato)
  - Transects
  - Nested circular plots
  - Downed wood transects
  - Soils
- Components measured
  - Above-ground only vs. ecosystem-level



Mangroves in Costa Rica



	Location	*Area (ha)*
1	Térraba-Sierpe	18753
2	Nicoya (Gulf)	17217
3	Central Pacific	4932
4	Golfo Dulce	2909
5	Nicoya (Peninsula)	2432
6	Caribbean	2056
	Total	48299

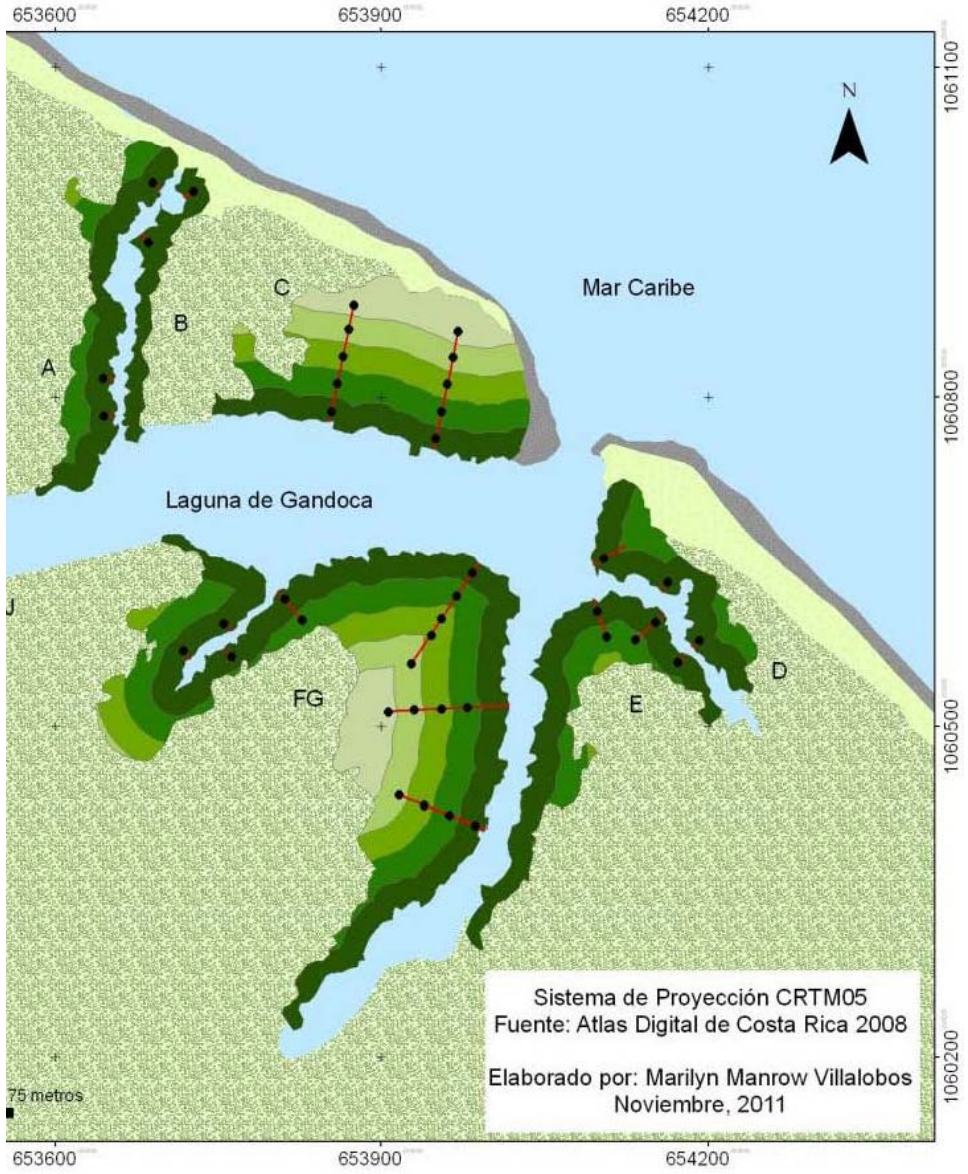
Carbon stocks – Caribbean

- Manrow (2011)
  - Sites

Carbon stocks – Caribbean

Gandoca & Moín:

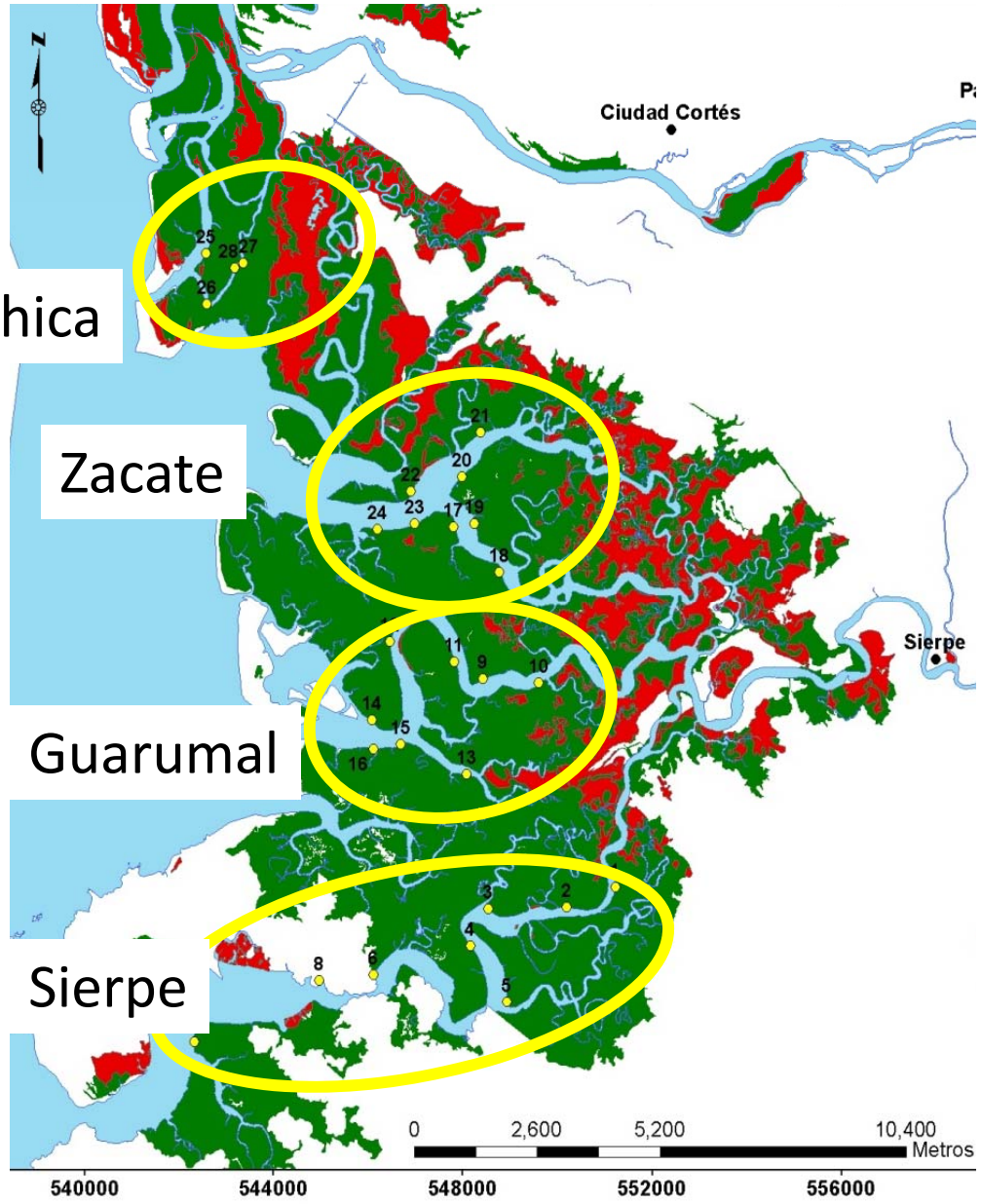
- Map areas with GIS
  - Sampled ±1% of total
- Sampling design
  - Transects
  - Nested plots
  - Species composition
  - Aboveground stocks
    - ≥ 5 cm dbh



Ecosystem Carbon - Pacific

Térraba-Sierpe:

- 140 plots in 28 transects
- Ecosystem-level stocks
- Soil C to 1m
- Species composition



Ecosystem Carbon - Térraba-Sierpa

- 140 plots in 28 transects
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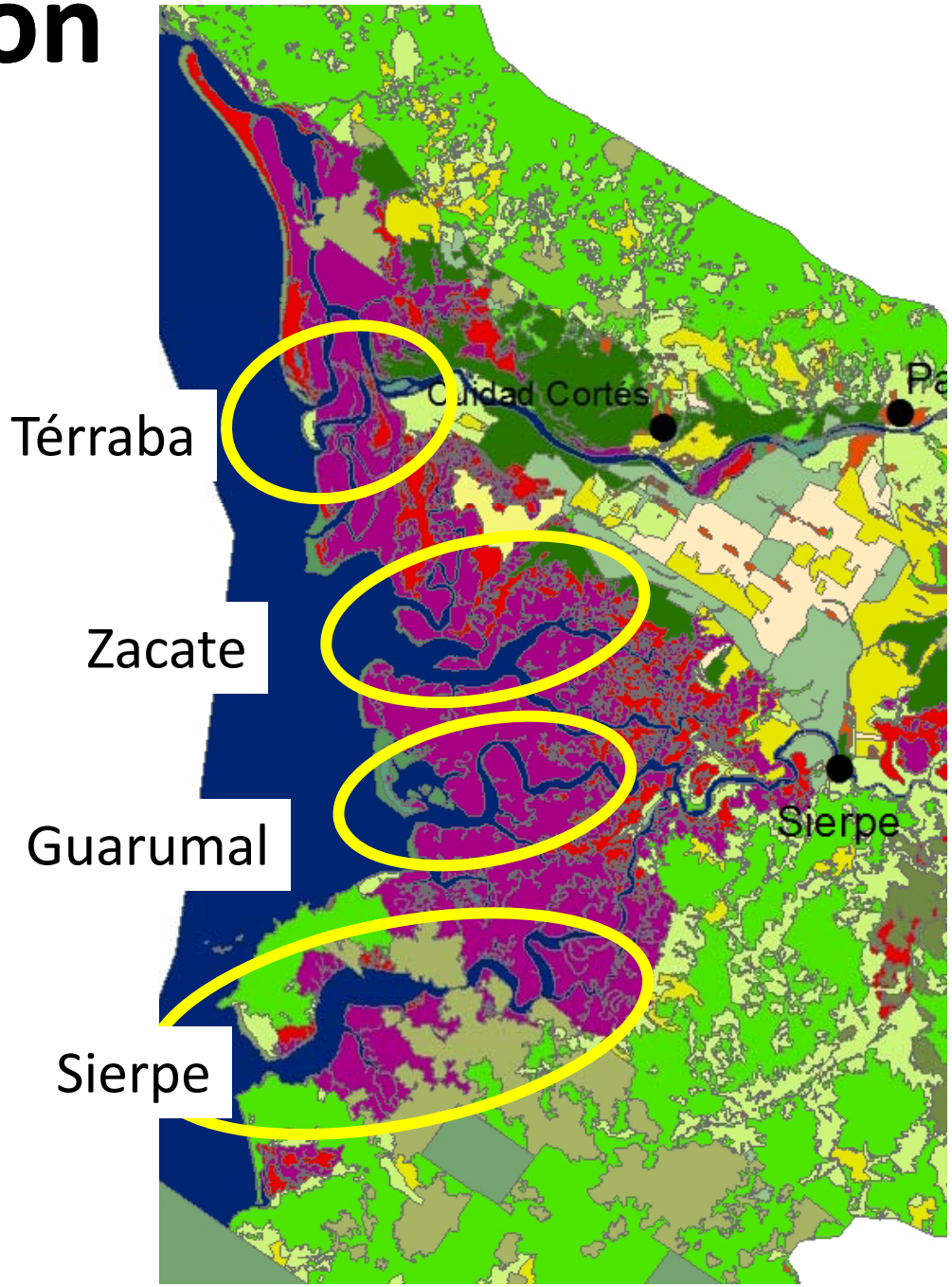
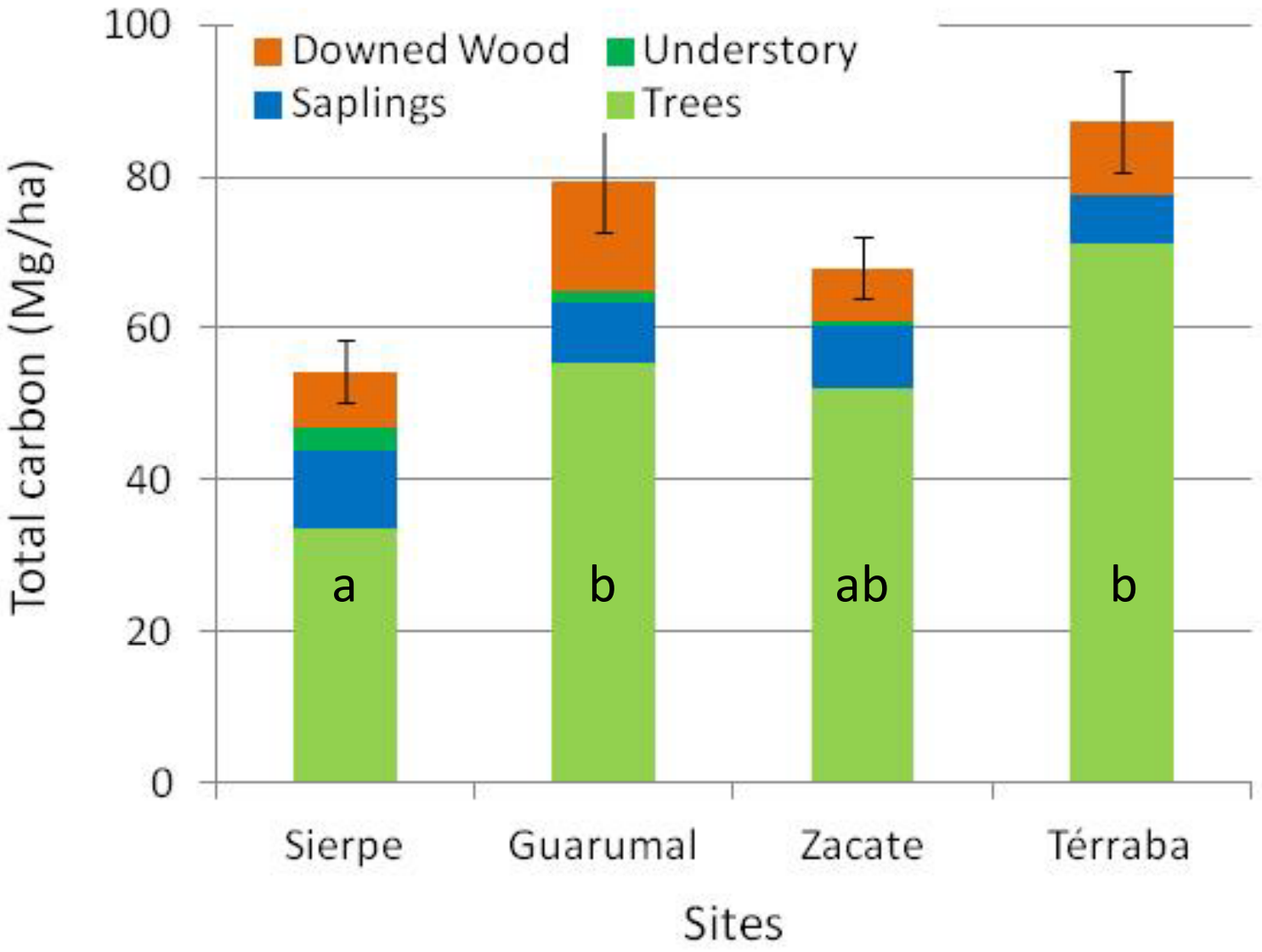


Carbon stocks - Sierpe

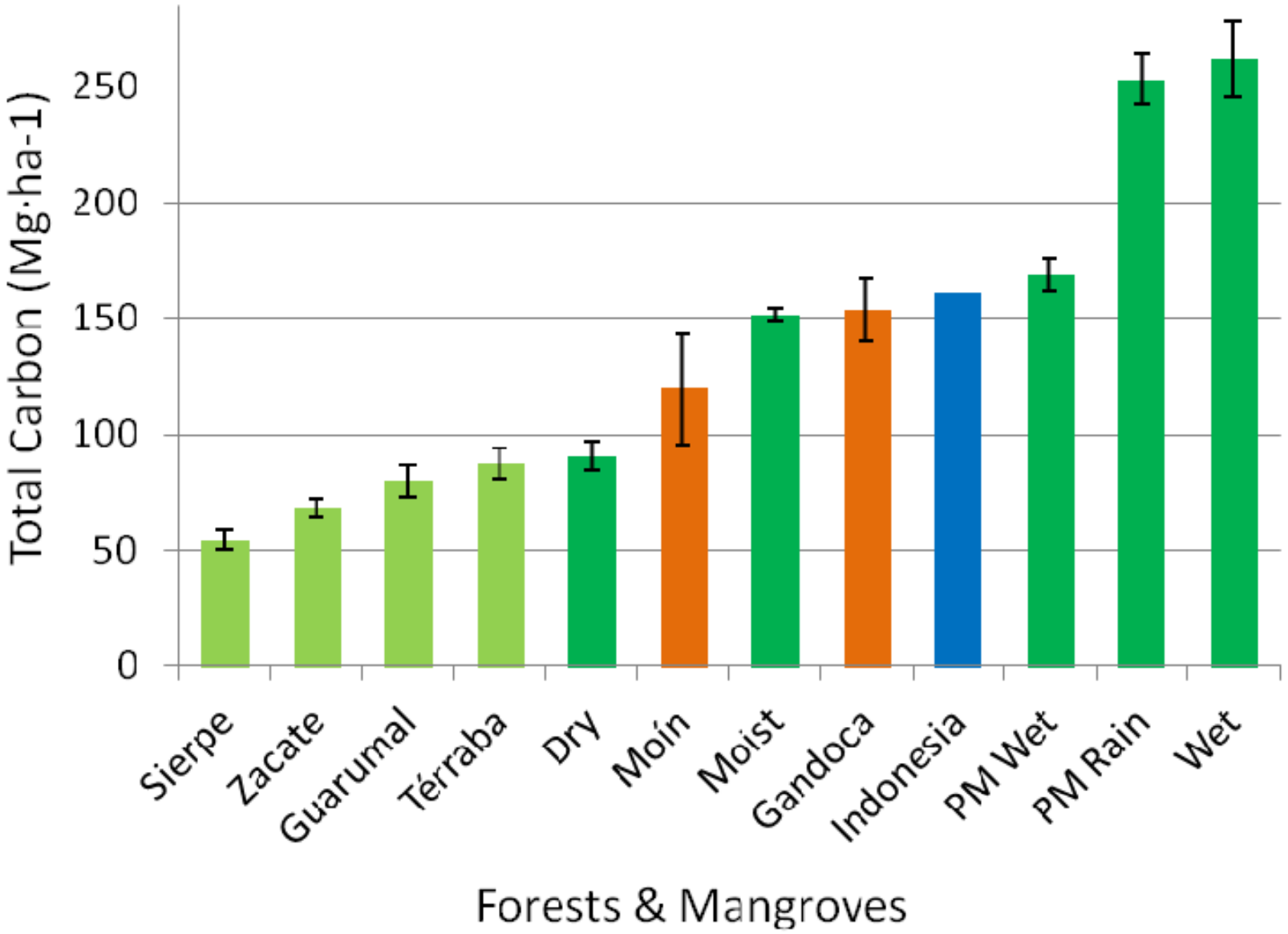
- No differences along transects

- South-North gradient
  - Sierpe
  - Guarumal
  - Zacate
  - Térraba

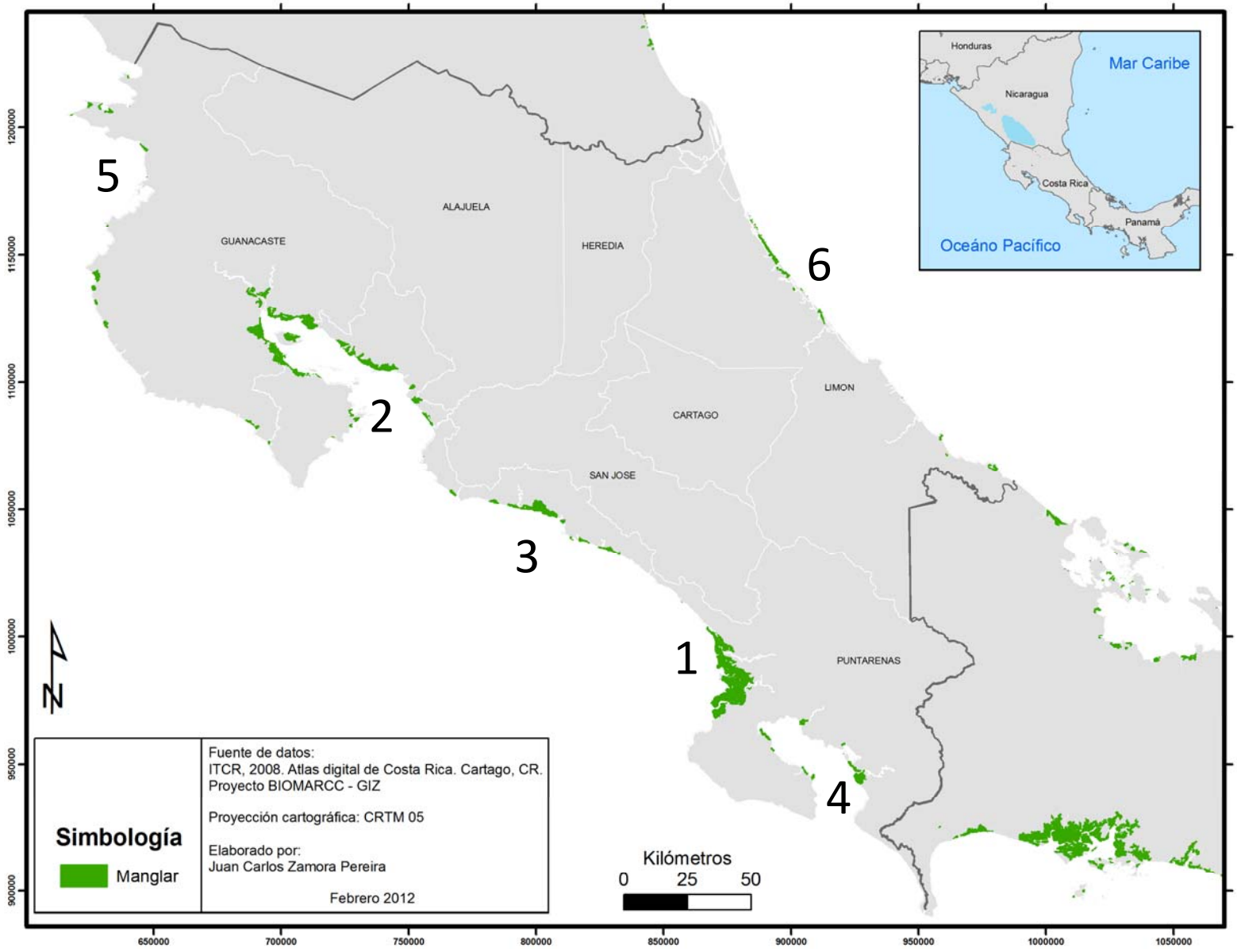
Carbon stocks - Sierpe



Sierpe vs. other stands



Country-scale mangrove stocks



Carbon stocks in Costa Rica

	Location	*Area (ha)*	*C density*	*C stocks (Tg)*
1	Térraba-Sierpe	18753	72.3	1.36
2	Nicoya (Gulf)	17217	72.3	1.24
3	Central Pacific	4932	72.3	0.36
4	Golfo Dulce	2909	72.3	0.21
5	Nicoya (Peninsula)	2432	72.3	0.18
6	Caribbean	2056	136.3	0.28
Total 2012		**48299**		**3.62**

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Total 2012		**48299**		**3.62**
Total 1990		**52130**		**3.91**

Current challenges

- Technical capacity (being solved)
- Absence of local factors
  - Allometric equations

Uncertainty in allometry

Locality	n	Chave Clim	Observed Biomass	Chave et al., 2005 Type I	Chave et al., 2005 Type II	Brown 1989	West et al., 1999	Zianis 2008	Muller-Landau et al., 2006
AraL	84	wet	135458.9	-30.7	-31.1	-7.9	66.4	-34.9	-43.1
AraP	22	wet	14180.1	-12.1	-13.9	15.4	17.8	-43.9	-52.7
AraT	53	wet	139815.1	-22.3	-22.8	3.6	[illegible]	-38.5	-46.2
Bcal	14	wet	2635.7	-15.8	-18.6	9	32.3	-27.5	-40.7
CarOp	22	wet	33856.3	-24.5	-11.9	0.3	112.4	-15.1	-25.7
CariS	20	dry	6098	15.1	413.9	28.6	213.1	49	27.5
BPRico	17	dry	4047.5	-10.4	335.8	-0.8	94.5	0.2	-15.6
Pied	13	wet	12348.6	-32.3	-13.9	-10.7	60.6	-29.6	-39.8
Porce	87	moist	226008.1	21.7	47.5	18.9	190.1	-1.7	-11.7
Rmelc	161	wet	95123.9	-27.8	-21.3	-5.6	52.6	-28.6	-39.2
Shel	31	wet	6248.7	-36.3	-10.5	-18.3	45.8	-19.1	-33.2
SCRion	28	wet	40536.7	42.4	53.9	90.9	247.3	27.2	12.9
Svic	14	moist	9710.1	-4.2	52.9	5.3	95.6	-9.8	-23.4
Tona	12	wet	824.2	-4.1	83.7	21.6	247.6	101.6	65.4
Mean (%)				-10.1	60.3	10.7	109.3	-5.1	-19.0
sd				22.8	139	26.6	80.7	40.1	33.3

Alvarez et al (i2012)

Current challenges

- Technical capacity
- Absence of local factors
  - Allometric equations
  - BEFs & root:shoot ratios
  - Carbon concentrations
  - Wood specific gravity
- Taxonomy

The way forward

- Supplement measurements
  - Ecosystem-level carbon
- Expand coverage
  - area & ecosystem types
- Remote sensing/GIS and modeling
  - Activity data
  - Emission factors
- Additional studies & integration
  - Ecology of mangrove forests
  - Valuation & Ecosystem services

Long-term monitoring & Regional integration

¡Gracias!

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