



Non-detriment finding on *Guaiacum sanctum* in Mexico

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Guaiacum sanctum L. (Zygophyllaceae)

- About 20 m tall and 60 cm DBH
- Shade tolerant species
- Long life cycle
- Low mortality, high reproductive values
- Tropical dry forest from Florida to Central America with heterogeneous distribution
- IUCN (ENC2a), NOM-ECOL (Pr); CITES App II.
- Main threats: habitat lost and harvesting
- Medicinal. Timber species used in the ship building industry



NDF's procedure

- Based on two sources of information
- NDF completed by CONABIO (SA)

Parameters used

1.- Biological criteria

- Distribution and abundance

- Population

- i) Population structure

- ii) Number of commercial trees per ha

- iii) Seed production and recruitment

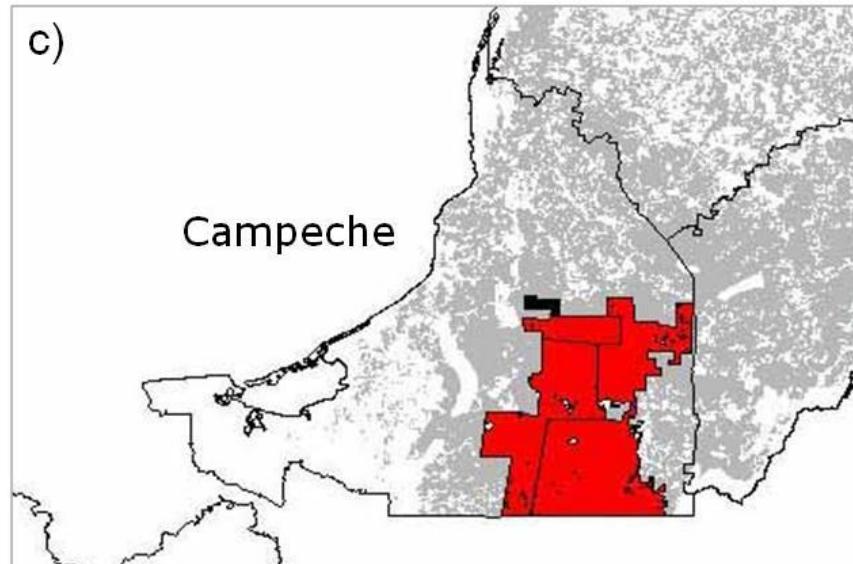
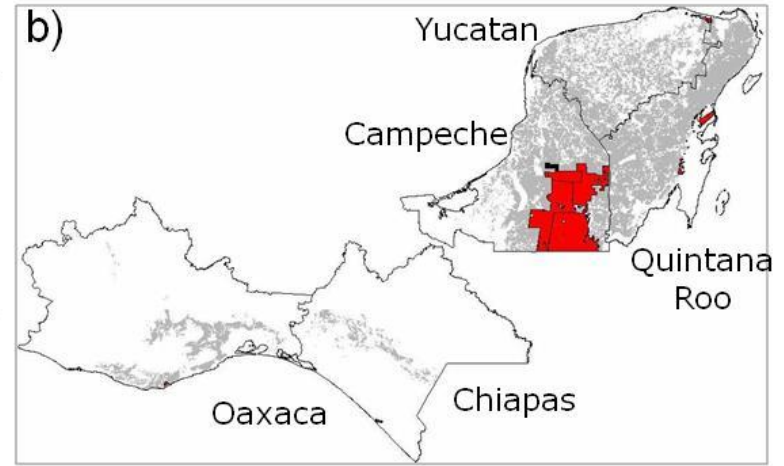
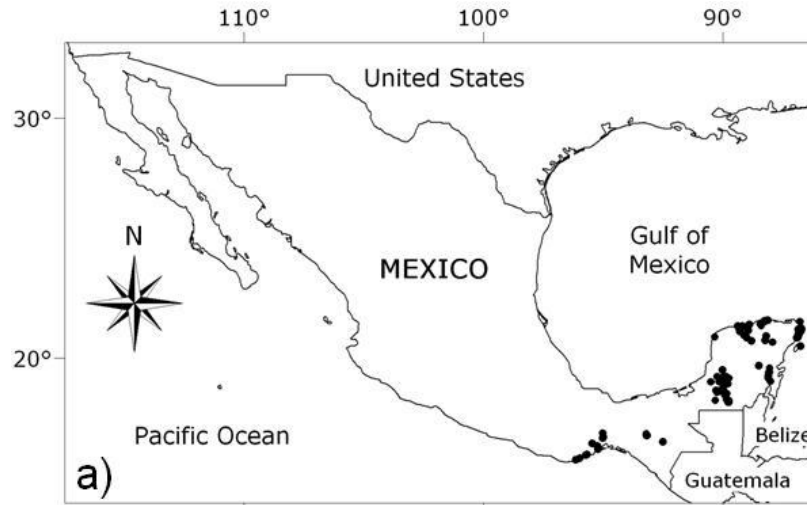
- iv) Growth (dbh and height)

- v) Population growth rate (λ)



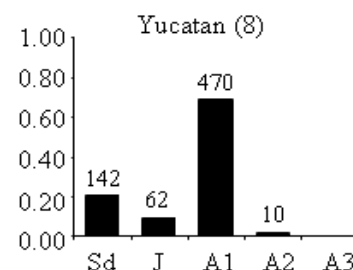
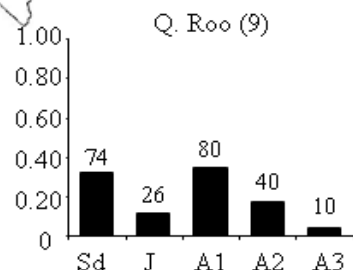
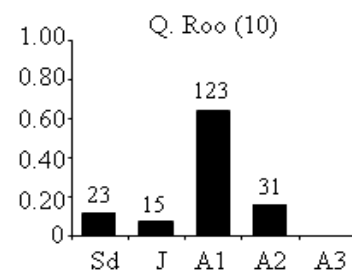
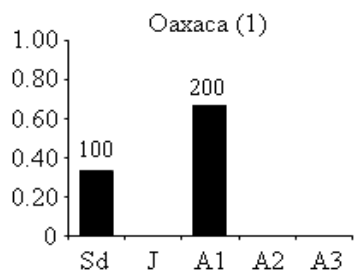
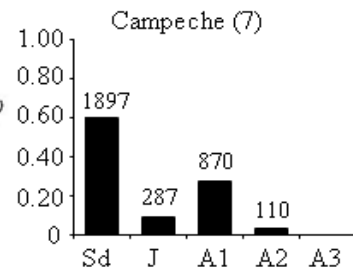
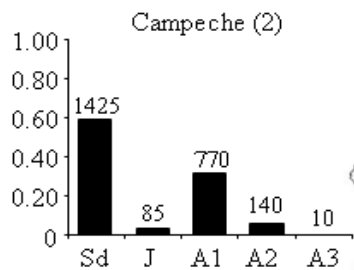
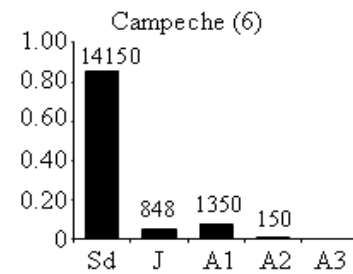
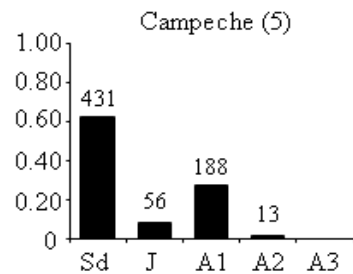
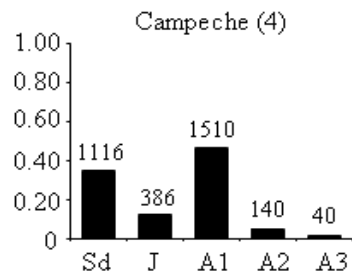
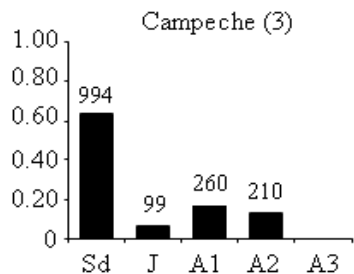
Distribution

- Potential distribution (modelled with GARP)



Abundance

Rapid field assessments



NDF's procedure

Parameters used

2.- Management criteria

- i) Model of harvesting
- ii) Minimum diameter cutting
- iii) Cutting methods
- iv) Frequency of harvesting
- v) Skid trails (extract logs)



Harvesting matrix model

- i) Harvesting commercial adult trees
- ii) Damage to non-commercial adult trees
- iii) Frequency of harvesting

Effects on:

- a) Population growth rate (λ)
- b) Number of commercial adult trees for harvesting

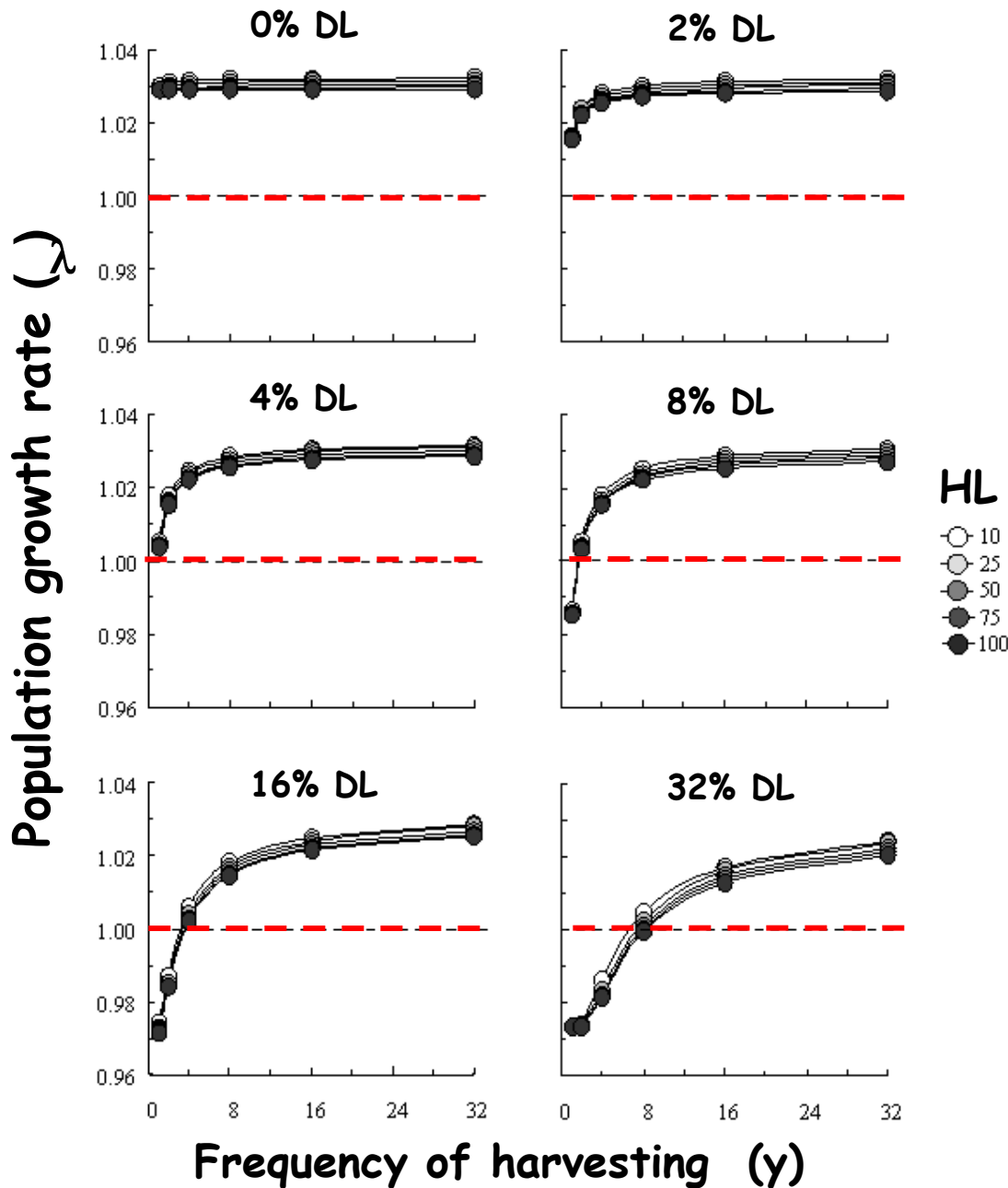
Stage at time $t+1$

	Sd	J	A1	A2	A3
Sd	0	0	F_{13}	F_{14}	F_{15}
J	G_{21}	S_{22}	S_{23}	S_{24}	0
A1	0	G_{32}	S_{33}	S_{34}	S_{35}
A2	0	G_{42}	G_{43}	S_{44}	S_{45}
A3	0	0	G_{53}	G_{54}	S_{55}

Stage at time t

$$\begin{pmatrix} \text{Sd} \\ \text{J} \\ \text{A1} \\ \text{A2} \\ \text{A3} \end{pmatrix} \times \begin{pmatrix} \text{Sd} & \text{Sd} & \text{Sd} & \text{Sd} & \text{Sd} \\ \text{J} & \text{J} & \text{J} & \text{J} & \text{J} \\ \text{A1} & \text{A1} & \text{A1} & \text{A1} & \text{A1} \\ \text{A2} & \text{A2} & \text{A2} & \text{A2} & \text{A2} \\ \text{A3} & \text{A3} & \text{A3} & \text{A3} & \text{A3} \end{pmatrix} = \begin{pmatrix} \text{Sd} \\ \text{J} \\ \text{A1} \\ \text{A2} \\ \text{A3} \end{pmatrix} \frac{1}{N} + \dots + \begin{pmatrix} \text{Sd} \\ \text{J} \\ \text{A1} \\ \text{A2} \\ \text{A3} \end{pmatrix} \frac{1}{N} - \lambda - CT$$

Effects on (λ)

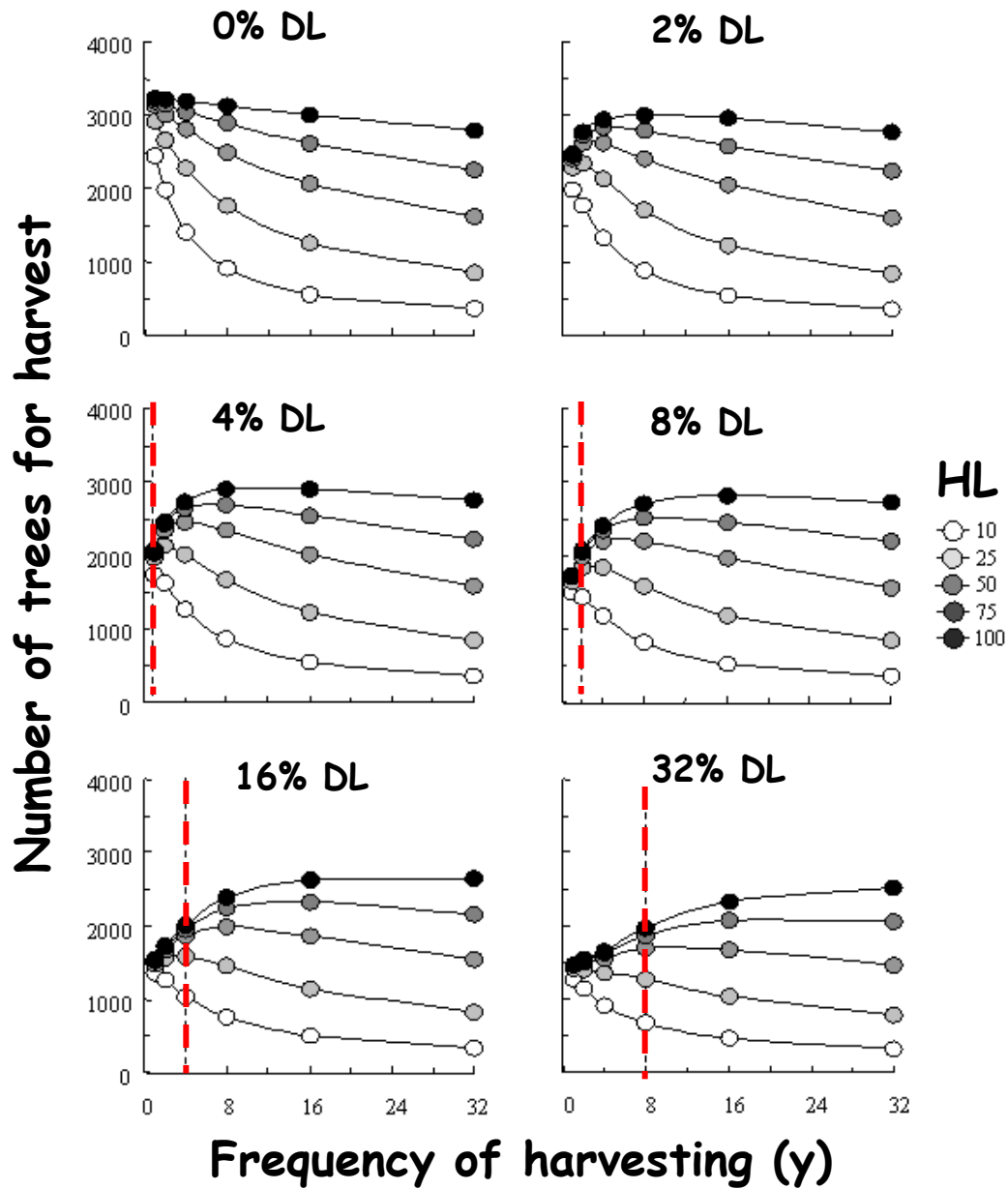


Damage to non-commercial trees (1-25 cm dbh) might be more important than harvesting of commercial trees (>35 cm dbh)

Best scenario

- a) $DL \leq 8\%$
- b) Harvesting of commercial trees up to 100% (<50%)
- c) At least frequencies > 16 y

Effects on the number of trees



Best Scenario

Damage \leq 8%

Harvesting 50-75%

Frequency \geq 16 ys

HL

- 10
- 25
- 50
- 75
- 100

Conclusions

Sustainable use for *G. sanctum* is achievable

- Recruitment of new individuals to population
- Population growth rate > 1
- Minimum diameter cutting 35 cm DBH
- Harvesting intensity $\leq 50\%$
- Damage level (non commercial trees) $< 8\%$
- Frequency of harvesting ≥ 10 ys
- Previous and post-harvesting monitoring of managed populations
- Silvicultural treatments not required



Data quantity and quality

-The best available information in Mexico

-Four years data with a big range of information (geographic, ecologic, genetic)

-Information at national level, insights at regional level, very good info at population level



Problems, challenges or difficulties

- Demographics studies are time consuming but population structures might provide good information
- Taxonomy of the genus still unclear
- Impossible to distinguish timber from *G. sanctum* and *G. coulteri*



Acknowledgements



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