Global Forest Biodiversity Initiative Conference & GFBI-FECS Joint Symposium 2017
Forest Research in the Big Data Era
Mexican network of permanent sample plots for monitoring forest growth and change: first results

J. Javier Corral Rivas/Mexico

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Outline

• Overview of Mexican forests
• Objectives of plots
• Sampling design for plot establishment and remeasurement
• The Web-based Permanent Sample Plot Database (Monafor)
• Plot description
• First Results/publication
• Conclusions
Overview

• 141.7 Million hectares of Mexico is forest land (32% of the country).

• 38 Million ha are temperate forests (mixed and uneven-aged pine-oak forests)

• 16 Million ha are tropical forests.

• 87.7 Million ha are arid areas.

• Forest land property: 80% community forests, 15% private forests, and 5% state forests.
México is considered one of the most mega-diverse countries of the world. With over 200,000 different species, Mexico is home of 10–12% of the world's biodiversity. It ranks:

- **1st** in biodiversity in reptiles with 707 known species.
- **2nd** in mammals with 438 species.
- **4th** in amphibians with 290 species.
- **4th** in flora, with 26,000 different species (71 species of pine and 135 of oak).
Many people of Mexico live in or near the forested areas and depend on the forests for their livelihood (about 11 Million). Thus, these natural resources are very important for the social, economic and environmental development of the country.
Currently a total 3591 permanent sample plots, have been established between 2007 and 2014, on the temperate and tropical forests in Mexico.

Data from the PSPs can be used to define stand structures at specific points in time, develop or calibrate stand or individual tree growth models, and validate/invalidate projections made with such models.
Objetives of the plots

- to provide data on the effect of specific silvicultural treatments on tree growth of commercial tree species, and on soil.

- to analyze changes on spatial forest structure and diversity.

- to develop key indicators for sustainable forest management in Mexico.

- to get the forest management certification.
Sampling design for plot establishment and remeasurement

- Each of the permanent field plots covers 2500 m².
- They are distributed systematically (with some exceptions), with a variable grid ranging from 3 to 5 kilometers.
The Permanent Sample Plot Procedure Manual uses 4 forms for establishing and remeasuring the plots:

1. Form F-01: Plot and site information (44 records)
The Permanent Sample Plot Procedure Manual uses four forms for establishing and remeasuring the plots:

2. Form F-02: Tree measurements (16 records of each tree)
Sampling design for plot establishment and remeasurement

3. Form F-03: Understory subplots (12 records)
4. Form F-04: Soil information (8 records + lab results)
Among other variables, tag number, species code, breast height diameter (d, cm), total tree height (h, m), height to the live crown (m), azimuth (°) and radius (m) from the centre of the plot of all trees equal or larger than 7.5 cm in diameter are recorded. Currently, the database includes such measurements for more than 710,539 records of trees on 3591 sample plots.

We have developed an app for mobile devices that work under the android environment and collects the data in accordance with our manual
A web-based system was created for data management and reporting. Online tools are used to facilitate access and transform the raw data into information using meaningful, built-in calculations and a flexible graphical user interface. Monafor is updated annually with new measurement data from the PSPs and can be used easily via the Internet.
Monafor has proved to be very useful for data validation. But also for generating reports that presents an overview of the PSPs. Outputs from the system include estimation of stand variables like volume, basal area periodic annual increment, calculation of some diversity indices by plot.
The Permanent Sample Plot Database (Monafor)
The Permanent Sample Plot Database (Monafor)
The Permanent Sample Plot Database (Monafor)

### Sistema Nacional de Sitios de Monitoreo Forestal y de Suelos

#### Importar y auditor
- Captura
- Importar desde Excel
- Exportar a Excel
- Descarga de archivos

#### Consulta gráfica
- Reportes
- Catalogos

#### Usuario: CORRAL RIVAS JAVIER

**Select the state and inventory to export**

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<th>Inventario 2</th>
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[Exportar >>]
a) In the temperate forests more than 90 tree species are being studied within the plots, including the genera *Pinus*, *Juniperus*, *Abies*, *Pseudotsuga*, *Cupresus*, *Picea*, and *Quercus*.
b) An example from tropical forest.
### Description/spatial structure

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<th>$Mi$</th>
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<th>$Ri$</th>
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<td><strong>Mean</strong></td>
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<td><strong>Standard deviation</strong></td>
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![Bar chart for Lena](image1.png)

![Bar chart for Lena](image2.png)

![Bar chart for Lena](image3.png)

![Bar chart for Lena](image4.png)
First Results

Durango
First results

Durango


Conclusions

- During the next two years a total of 2580 research sites should be remeasured in Mexico.
- Researchers of different disciplines and of different countries are needed to interpret and monitor ecosystem dynamics of these complex forests.

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Número de sitios a remedir en total por inventario: 3591
Conclusions

- The network of permanent forest observational studies, described in this talk, aims to collect data over a long period of time. Opportunities already exist for short-term studies, but the real value of this network will emerge after a continued series of remeasurements.

- Cooperation between research institutions and the government is indispensable for achieving the objectives of the Mexican network.
¡Many thanks for your comments!

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