

Mexico's National Forest and Soils Inventory 2009-2014

Comisión Nacional Forestal, Gerencia de Sistema Nacional de Monitoreo Forestal

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Identification

SURVEY ID NUMBER

MEX_2009-2014_INFyS_v01_M_v01_A_ESS

TITLE

Mexico's National Forest and Soils Inventory 2009-2014

ABBREVIATION OR ACRONYM

INFyS 2009-2014

COUNTRY

Name	Country code
México	MEX

STUDY TYPE

Forest resource survey

SERIES INFORMATION

Mexico has previously conducted the National Forest and Soils Inventory for the period 2004-2007.

ABSTRACT

The National Forest and Soil Inventory System (INFyS), established by Mexico's General Law for Sustainable Forest Development, serves as a critical national forestry policy instrument. Implemented by the National Forestry Commission (CONAFOR), INFyS generates comprehensive data on Mexico's forest resources and soil conditions. This data plays a vital role in informing sound decision-making for forestry policy, ultimately promoting sustainable forest management practices.

Undertaken every five years, INFyS employs a rigorous assessment and monitoring methodology to evaluate the status and dynamics of Mexico's forest ecosystems. Following comprehensive field data analysis, INFyS publishes results reports detailing the extent, location, and composition of forest and other wooded lands; providing information on various forest vegetation types, formations, and classes; and reporting the changes in the nation's forest cover over time.

INFyS data extends beyond domestic needs, contributing significantly to national reporting that fulfills international commitments. For instance, it supports reporting under the Forest Resources Assessment (FRA). Furthermore, INFyS data is instrumental in accounting for greenhouse gas (GHG) emissions within the forestry sector, aligning with the Paris Agreement. This includes quantifying emissions reductions achieved through deforestation and forest degradation mitigation efforts. By providing this crucial information, INFyS plays a central role in promoting sustainable forest management practices in Mexico.

KIND OF DATA

Sample survey data [ssd]

UNIT OF ANALYSIS

Fields/plots

Scope

NOTES

The INFyS is a multipurpose and comprehensive inventory. In the second cycle, 36 quantitative variables and 171 qualitative variables were incorporated in each sampling unit, depending on the ecosystem and the year of collection. These variables are grouped according to the sampling level and type of information, and are divided into 24 sections.

1. General information
2. Species diversity by stratum
3. Epiphyte diversity in trees
4. Bodies of water
5. Environmental impacts
6. Additional information on fires

7. Additional information on pests
8. General information
9. Trees (forest and jungle)
10. Trees (other communities)
11. Subsample
12. Reforestation (forest and jungle and other communities)
13. Minor vegetation (other communities)
14. Cover (saplings, shrubs, herbs)
15. Minor vegetation and soil cover
16. General information
17. Soil cover by vegetation
18. Water erosion with soil loss
19. Wind loss
20. Soil works
21. Minor fuels
22. Major fuels
23. Canopy cover
24. Leaf litter

Note. Data collection for each module depends on the availability of financial resources.

TOPICS

Topic
forest inventory
forest assessment
forest survey
timber production

KEYWORDS

Keyword
forest resources
forest ecosystem
forest land cover
forest area
forest vegetation
tree-species diversity
forest type
mangroves
forest health
forest growth
forest soils
biomass
carbon stocks
volume
timber
deadwood
canopy cover
forest regeneration

land use
land-use change
wildfires

Coverage

GEOGRAPHIC COVERAGE

National coverage

UNIVERSE

INFyS is a land-based survey that covers all types of forests and other forest lands in the country. The target population of INFyS includes all naturally occurring forest vegetation in the country, comprising temperate and tropical forests, and vegetation in arid and semi-arid zones, palm groves, mangroves, hydrophilic communities, and other forest areas.

Producers and sponsors

PRIMARY INVESTIGATORS

Name
Comisión Nacional Forestal
Gerencia de Sistema Nacional de Monitoreo Forestal

PRODUCERS

Name	Abbreviation
Instituto Nacional de Estadística y Geografía	INEGI
Centro de Geociencias - Universidad Nacional Autónoma de México Campus Juriquilla, Qro. MX	UNAM
Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias	INIFAP
Instituto Nacional de Ecología y Cambio Climático	INECC

FUNDING AGENCY/SPONSOR

Name	Abbreviation
Secretaría de Medio Ambiente y Recursos Naturales	SEMARNAT
Comisión Nacional Forestal	CONAFOR

Sampling

SAMPLING PROCEDURE

INFyS uses systematic-stratified sampling design in two phases, in which 26,220 primary sampling plots (conglomerates) are located; sampling plots location is based on a systematic 2.5 x 2.5 km national sampling grid. Following this grid, 26,220 sampling plots or Primary Sample Units (UMP) are located in three sampling strata and intensities as follows: 5x5 km for temperate, sub-humid, and humid forests; 10x10 km for semi-arid forest-vegetation types; and 20x20 km for arid forest-vegetation types. The 2.5 x 2.5 km national sampling grid allows for implementing state and/or municipal forest inventories with greater detail.

Each UMP is a circular plot of one hectare (56.42 m in radius), with four secondary sampling units (UMS) geometrically arranged as an inverted "Y" with respect to north. UMS number 1 is also the center of the UMP and UMS 2, 3 and 4 are peripheral. The distance from the center of UMS 1 to each of the other secondary sampling units is 45.14 m. The azimuth to locate sites 2, 3 and 4 from the center of the site 1 is 0°, 120°, and 240° respectively.

Within the conglomerate, measurements and observations are made on the different elements of vegetation and soil. Secondary sampling units (SSU) have a nested design with sampling sub-sites of different dimensions, according to the

object of study. In UMS, specific information such as tree diameter at breast height (dbh) and height, species, tree damages and severity; and other dasometric features for trees with dbh equal to or greater than 7.5 cm is collected. In the case of vegetation of arid zones, data for larger individuals (with height equal to or greater than 25 cm, with the exception of globose life forms where the threshold is 10 cm in height) is recorded. In the center of each UMS, a 12.56-square meter circular subplot is established to collect data from trees with dbh less than 7.5 cm and height greater than or equal to 25 cm. Finally, in the center of each UMS, a 1-square meter (1 m x 1 m) plot is established to collect information on shrub and other non-tree species, such as grasses, ferns, and lichens; data on soil condition, presence of organic matter, dead wood and erosion is also recorded. A full description of the field methodology for data collection can be found at:

https://www.conafor.gob.mx/apoyos/docs/externos/2022/DocumentosMetodologicos/2010/Manual_remuestreo_infys_2010.pdf

DEVIATIONS FROM THE SAMPLE DESIGN

5% of the national sample (1,131 UMP), are conglomerates called satellite monitoring, since prior to sampling and after a feasibility analysis based on inaccessibility information in the first sampling cycle and geospatial inputs, they were excluded from the office for falling into inappropriate physiographic conditions for access.

RESPONSE RATE

Between 2009 and 2014, 85.5% of the conglomerates of the national sampling grid were sampled. This was mainly due to sampling plots were located in inaccessible areas, permission was not granted by landowners, or due to security or other reasons (e.g. land tenure or social conflicts).

WEIGHTING

The ratio estimator statistical method is utilized to estimate key forest indicators (such as volume, biomass, carbon stocks, basal area, and tree density, among others), as outlined in Velasco et al. (2003), available at <http://cienciasforestales.inifap.gob.mx/index.php/forestales/article/view/882>. This method offers data on a per-hectare basis for relevant indicators, using the ratio of two sampled values to estimate a population parameter. In the context of forest inventories, this technique commonly involves using the proportion of sampling units containing a specific attribute of interest (e.g., trees, volume, or basal area) to estimate the total proportion of the population possessing that attribute; information on confidence intervals and the relative sampling error is also provided by this statistical method. Forest indicators are calculated at the national level by weighing, taking into account the area of each stratum. This ensures that the indicators accurately represent the composition and variability of the entire forest resource across the country.

Data collection

DATES OF DATA COLLECTION

Start	End
2009-01-03	2014-12-12

DATA COLLECTION MODE

Field measurement [field]

data_processing

DATA EDITING

CONAFOR contracted external providers to conduct cluster sampling for the INFyS. Specialized field crews were responsible for collecting data in physical formats. After a general review of the collected data by camp supervisors, if no errors were found, the data was organized. Subsequently, this data had to be digitized using the Capture Client software, specifically designed for INFyS. This Java-based software serves as a tool for data entry and management.

To ensure data quality, specialized CONAFOR personnel conducted random audits within Capture Client to detect inconsistencies or errors. The consolidated data was stored in a central Microsoft SQL Server database, where SQL scripts were applied to perform automated analyses. Finally, the data was exported in .csv or Excel formats, facilitating analysis in statistical software such as R and Microsoft Excel for the calculation of forest indicators.

data_appraisal

ESTIMATES OF SAMPLING ERROR

The quantitative data analysis provides important dasometric indicators such as tree density, crown cover, above-ground biomass, carbon stocks, and timber volume. Statistical methods are used to generate reports for these indicators. The estimation of these relevant indicators is based on the ratio estimator (ER) approach, a statistical methodological approach developed to improve the accuracy of average values of relevant forest indicators based on the sampled area (Velasco, et. al., 2003; available at <http://cienciasforestales.inifap.gob.mx/index.php/forestales/article/view/882>)

DATA APPRAISAL

Some issues were encountered during data collection. The main problems included the inaccessibility of primary sampling units, leading to biased estimations of indicators. Errors in field data collection included mainly misidentification of tree species by scientific names, inconsistencies between tree height and diameter, and mislabeling of vegetation types.

Access policy

CONTACTS

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CONFIDENTIALITY

Personal data provided by contacts in the field are confidential and therefore classified as reserved and these are not provided to any person who requests information about the INFyS. The Policy for the Management of Confidentiality in Statistical and Geographic Information (PGCIEG) establishes the general measures that must be implemented to manage the statistical confidentiality of the data provided by the System Informants (SI) under the National Statistical and Geographic Information System (SNIEG). The PGCIEG is mandatory for all State Units responsible for the generation and management of Information of National Interest (IIN), under the SNIEG criteria. PGCIEG is available at https://dof.gob.mx/nota_detalle.php?codigo=5634105&fecha=29/10/2021#gsc.tab=0. CONAFOR is mandated to implement the PCMSIG, as it is the institution responsible for INFyS implementation which was determined as IIN, by an agreement published on May 28, 2014, in the Official Gazette of the Federation, available at https://www.dof.gob.mx/nota_detalle.php?codigo=5346488&fecha=28/05/2014#gsc.tab=0. The PCIEG sets out measures to ensure the confidentiality of the data provided by the system's informants. The policy aims to protect the privacy of informants and ensure that the individual information they provide is kept confidential and used solely for statistical and geographic purposes.

ACCESS CONDITIONS

Data available from an external repository

CITATION REQUIREMENTS

"CONAFOR, (year of consultation). Database of the National Forest and Soils Inventory 2009-2014, Mexico"

Disclaimer and copyrights

DISCLAIMER

As an authorized end user of the INFyS database, you agree to the following terms:

CONAFOR is not responsible for how you interpret or apply the information from the database. Any decisions based on your interpretation release CONAFOR from responsibility. CONAFOR is also not responsible for discrepancies due to precision, rounding, numerical truncation, or technical changes that may affect the results.

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Metadata production

DDI DOCUMENT ID

DDI_MEX_2009-2014_INFyS_v01_M_v01_A_ESS_FAO

PRODUCERS

Name	Abbreviation	Affiliation	Role
Dissemination and Outreach Team, Statistics Division		Food and Agriculture Organization	Metadata adapted for FAM
Development Economics Data Group	DECDG	The World Bank	Metadata adapted for World Bank Microdata Library

DDI DOCUMENT VERSION

Identical to a metadata (MEX_2009-2014_INFyS_v01_EN_M_v01_A_ESS) published on FAO microdata repository (<https://microdata.fao.org/index.php/catalog>). Some of the metadata fields have been edited.

data_dictionary

Data file	Cases	variables
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study_resources

technical_documents

Manual y procedimientos para el muestreo de campo

title Manual y procedimientos para el muestreo de campo
country Mexico
filename Manual_remuestreo_infys_2009.pdf

Anexo gráfico al manual de muestreo 2009

title Anexo gráfico al manual de muestreo 2009
country Mexico
filename Anexo_grafico_campo_infys_2009.pdf

Anexo fotográfico INFyS 2009

title Anexo fotográfico INFyS 2009
country Mexico
filename Anexo_fotografico_infys_2009.pdf

Manual y procedimientos para el muestreo de campo. Re muestreo 2010

title Manual y procedimientos para el muestreo de campo. Re muestreo 2010
country Mexico
filename Manual_remuestreo_infys_2010.pdf

Anexo Gráfico de Campo. Re muestreo 2010

title Anexo Gráfico de Campo. Re muestreo 2010
country Mexico
filename Anexo_grafico_campo_infys_2010.pdf

Anexo Fotográfico al Manual de Muestreo. Re muestreo 2010

title Anexo Fotográfico al Manual de Muestreo. Re muestreo 2010
country Mexico
filename Anexo_fotografico_infys_2010.pdf

Manual y procedimientos para el muestreo de campo. Re muestreo 2011

title Manual y procedimientos para el muestreo de campo. Re muestreo 2011
country Mexico
filename Manual_remuestreo_2011.pdf

Anexo gráfico conteo 2011

title Anexo gráfico conteo 2011
country Mexico
filename Anexo_grafico_conteo_2011.pdf

Anexo gráfico campo INFyS 2011. Re muestreo 2011

title Anexo gráfico campo INFyS 2011. Re muestreo 2011
country Mexico
filename Anexo_grafico_campo_infys_2011.pdf

Anexo Fotográfico al Manual de muestreo. Re muestreo 2011

title Anexo Fotográfico al Manual de muestreo. Re muestreo 2011
country Mexico
filename Anexo_fotografico_infys_2011.pdf

Manual y procedimientos de campo. Remuestreo 2012

title Manual y procedimientos de campo. Remuestreo 2012
country Mexico
filename Manual_remuestreo_2012.pdf

INDICADOR condición de copa. INFyS 2012

title INDICADOR condición de copa. INFyS 2012
country Mexico
filename Indicador_condicion_copa_2012.pdf

Guía pictórica de campo. Agentes de daño en los bosques de México

title Guía pictórica de campo. Agentes de daño en los bosques de México
country Mexico
filename Guia_pictorica_campo_2012.pdf

INDICADOR Daños al arbolado. INFyS 2012

title INDICADOR Daños al arbolado. INFyS 2012
country Mexico
filename Guia_danos_arbolado_2012.pdf

Anexo Gráfico de Campo. Re muestreo 2012

title Anexo Gráfico de Campo. Re muestreo 2012
country Mexico
filename Anexo_grafico_campo_2012.pdf

Anexo fotográfico al manual del muestreo. INFyS 2012

title Anexo fotográfico al manual del muestreo. INFyS 2012
country Mexico
filename Anexo_fotografico_muestreo_2012.pdf

Anexo procedimientos de muestreo INFyS 2013

title Anexo procedimientos de muestreo INFyS 2013
country Mexico
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Anexo procedimientos de muestreo INFyS 2014

title Anexo procedimientos de muestreo INFyS 2014
country Mexico
filename Anexo_procedimientos_muestreo_2014.pdf
