

Mexico's National Forest and Soils Inventory 2015-2020

Comisión Nacional Forestal, Gerencia de Sistema Nacional de Monitoreo Forestal

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Identification

SURVEY ID NUMBER

MEX_2015_INFyS_v01_M_v01_A_ESS

TITLE

Mexico's National Forest and Soils Inventory 2015-2020

ABBREVIATION OR ACRONYM

INFyS 2015

COUNTRY

Name	Country code
Mexico	MEX

STUDY TYPE

Forest resource survey

SERIES INFORMATION

Mexico has previously conducted the National Forest and Soils Inventory for the periods 2004-2007 and 2009-2015.

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

Plots of lands

Scope

NOTES

INFyS data collection follows a modular design. An information module is a particular set of variables linked to a certain data elements of interest that are used on a specific object of study. Since INFyS studies diverse populations, each group receives a unique set of information modules based on specific criteria. This ensures relevant data collection for each population.

The following modules for data collection are considered:

Module A: Silvicultural ecological variables. Data collected includes information on the physical, ecological, and forest characteristics of the Primary Sampling Unit or conglomerate.

Module B: Biodiversity: Data collected includes information on flora and invasive species.

Module C: Carbon and fuel load: Data collected is used to estimate biomass and carbon stocks, as well as fuel loads in tracks established in Secondary Sampling Units.

Module D: Forest health: Data collected include variables related to forest health conditions, such as the presence of agents

(pests, diseases, fires, etc.) and the severity of damages.

Module E: Soils: Data collected includes physical and chemical data of forest soils.

Module F: Hemispheric photos: In tree-covered Primary Sampling Units, hemispheric photos of canopy and understory are taken.

Module G: Mangroves and associated communities. Data collected includes interstitial water properties, physicochemical characteristics, and forest-structural variables in mangroves and associated aquatic communities.

Module H: Arid and Semi-arid Zones. Data collected includes physiognomic and structural assessment of xerophytic and scrub vegetation communities in arid and semi-arid zones.

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

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/2019/ANEXO_Procedimientos_de_muestreo_2019.pdf

DEVIATIONS FROM THE SAMPLE DESIGN

If a conglomerate or primary sampling unit (UMP) cannot be found at the assigned coordinates due to physical or social conditions, the center of the conglomerate can be relocated within a radius of up to 450 meters from the assigned coordinates, if possible. If relocation is not possible, the cluster is considered inaccessible. Out of the 26,220 conglomerates at the national level, 144 were displaced in the third cycle, which is equivalent to 0.55%.

RESPONSE RATE

Between 2015 and 2020, only 42% of the conglomerates of the national sampling grid were sampled. This was mainly due to financial limitations. Other sampling plots were not sampled because they 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
2015-07-06	2019-11-22

DATA COLLECTION MODE

Field measurement [field]

data_processing

DATA EDITING

The field data for INFYS is captured digitally using Capture Client, which is a custom software designed for INFYS by CONAFOR. This software, based on Java, serves as a tool for data entry and management. To ensure data quality, dedicated personnel conduct random checks within Capture Client to detect inconsistencies or errors. Additionally, a separate program using C#.net is utilized to consolidate data from individual SQLite databases, created by Capture Client, into a central Microsoft SQL Server database. SQL scripts are employed for automated data analysis within the SQL Server database. The

data is then exported from the SQL Server in tabular formats such as .csv or Excel, with sections organized by tabs to facilitate further analysis and calculation of forest indicators using tools like Microsoft Excel and/or R scripts.

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 2015-2020, 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_2015_INFyS_v01_M_v01_A_ESS_FAO

PRODUCERS

Name	Abbreviation	Affiliation	Role
Jimena Saucedo Miranda		Food and Agriculture Organization	Metadata producer
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_2015_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

Documento estratégico rector del Inventario Nacional Forestal y de Suelos

title Documento estratégico rector del Inventario Nacional Forestal y de Suelos
country Mexico
filename DOCUME_1.PDF

Procedimientos de muestreo

title Procedimientos de muestreo
country Mexico
filename ANEXO_Procedimientos_de_muestreo_2019.pdf

Procedimientos administrativos y de operación

title Procedimientos administrativos y de operación
country Mexico
filename ANEXO_Procedimientos_administrativos_y_de_operacion_2019.pdf

Sistema de Aseguramiento y Control de Calidad

title Sistema de Aseguramiento y Control de Calidad
country Mexico
filename ANEXO_Sistema_de_Aseguramiento_y_Control_de_Calidad_2019.pdf

Manual para realizar las colectas botánicas del Inventario Nacional Forestal y de Suelos de México

title Manual para realizar las colectas botánicas del Inventario Nacional Forestal y de Suelos de México
country Mexico
filename Manual_para_realizar_colectas_botanicas_del_inventario_forestal.pdf

Ejemplares de herbario: helechos, monocotiledóneas y cactáceas arborescentes

title Ejemplares de herbario: helechos, monocotiledóneas y cactáceas arborescentes
country Mexico
filename Ejemplares_de_herbario_cactaceas_y_otros_Abr_2017.pdf

other_materials

Acuerdo por el cual se determina al Inventario Nacional Forestal y de Suelos como Información de Interés Nacional

title Acuerdo por el cual se determina al Inventario Nacional Forestal y de Suelos como Información de Interés Nacional

country Mexico

filename DOF-Diario_Oficial_de_la_Federacion.pdf
