Forest Inventory & Analysis
What is Forest Inventory and Analysis?

FIA Fact Sheet Series

Mission. The Forest Inventory and Analysis (FIA) program of the USDA Forest Service has been in continuous operation since 1930 with a mission to:

> *"make and keep current a comprehensive inventory and analysis of the present and prospective conditions of and requirements for the renewable resources of the forest and rangelands of the US."*

The FIA Program collects, analyzes, and reports information on the status and trends of America's forests: how much forest exists, where it exists, who owns it, and how it is changing, as well as how the trees and other forest vegetation are growing and how much has died or has been removed in recent years. This information can be used in many ways, such as in evaluating wildlife habitat conditions, assessing the sustainability of ecosystem management practices, and supporting planning and decision-making activities undertaken by public and private enterprises.

The FIA Program combines this information with related data on insects, diseases, and other types of forest damages and stressors to assess the health condition and potential future risks to forests. The program also projects what the forests are likely to be in 10 to 50 years under various scenarios. This information is essential for evaluating whether current forest management practices are sustainable in the long run and whether current policies will allow future generations to enjoy America's forests.

Background. FIA, initially known as the Forest Survey, was conceived almost 100 years ago when the Congress acknowledged the need for information on the supply and condition of the Nation's timber resources. The Organic Act of 1897, which established the National Forest System, included provisions for inventory and management of these lands. Later the Forestry Research Act (McSweeney-McNary) of 1928 directed the Secretary of Agriculture to make and keep current a comprehensive inventory and analysis of the nation's forest resources. The Resources Planning Act of 1974 (RPA, PL 93-378) amended the earlier research act and directed the Secretary to:

> *"make and keep current a comprehensive inventory and analysis of the present and prospective conditions and of the requirements for the renewable resources of the forests and rangelands of the United States."*

The Forest and Rangeland Renewable Resources Research Act of 1978 (PL 95-307), which replaced the earlier Forestry Research legislation, repeated the amendment contained in the RPA and instructed the Secretary to:

> *"...obtain, analyze, develop, demonstrate, and disseminate scientific information about protecting, managing, and utilizing forest and rangeland renewable resources in rural, suburban, and urban areas."*

Further, the National Forest Management Act of 1976 (PL 94-588) directed the USDA Forest Service to:

> *"insure research on and (based upon continuous monitoring and assessment in the field) evaluation of the effects of each management system..."*

Vision. The USDA Forest Service delivers current, consistent, and credible information about the status and condition of America's forests. We summarize and report the most current information about forest health and productivity in each State every five years. We collect and analyze a consistent core set of ecological data on all forests so that comparable information and trends exist for all regions and ownership categories. In each region, we collect additional data beyond the core set and customize analyses to address specific regional and local issues. Consequently, our information and trends are important indicators of the conservation and sustainable management of America's forests.

We use the latest technologies to acquire data through remote sensing and field activities. We use experts from universities and elsewhere to augment our research and analytical capabilities and to help us develop new inventory and monitoring techniques. We use rigorous quality assurance procedures to verify the accuracy of our estimates and validate our analytical results. Consequently, State, Federal, and international agencies, industries, environmental organizations, private landowners and consultants can rely on the credibility of our information to make critical land management, policy, and investment decisions.

Our partners are an integral part of our forest inventory and monitoring activities. Without their contributions of personnel and funding and their

continued support, this vision cannot be attained.

Customer Needs. Key customer groups include:

- State and national forest policy decision makers
- State foresters
- Industry and consultants
- Environmental organizations
- Forest Service officials
- Researchers
- Journalists
- Interested private citizens

Taken together, the legislative mandate from Section 253 of PL 105-185 and recommendations of the Second Blue Ribbon Panel, identified the following needs:

- Data collected annually, analyzed promptly, and used to produce individual State Reports every 5 years;
- Consistent core data and analyses across political and administrative boundaries and different land ownerships;
- Current information that is consistent with historical information;
- Data sets and analytical results that include a wide array of forest ecosystem parameters that address the health status and condition of the forests in addition to traditional productivity measures;
- Data that can be post stratified and analyzed in numerous ways;
- Data that are readily available in elemental, summarized, and analyzed forms, targeted at different audiences;
- Data that are reliable and credible because data quality attributes are fully documented;
- Analyses and interpretations of trends in the data, including making projections that look ahead 20 years.

For more information regarding the FIA Program:

- See our "FIA Contacts" Fact Sheet
- Visit our national FIA website: www.fia.fs.fed.us

Forest Inventory & Analysis
Program History

FIA Fact Sheet Series

Legislative and Administrative Actions. As with all Federal agencies, it requires an act of Congress to provide general guidance and direction to the various programs. The legislative actions for Forest Inventory and Analysis (FIA) have been extensive and have changed through time although the core component of FIA has not changed.

Legislative Actions on Inventory and Monitoring:

* *The Organic Administrative Act of 1897* – Although the founding legislation for the National Forests , this law also included provisions for the inventory and monitoring of these lands.

* *McSweeney-McNary Forest Research Act of 1928 (P.L. 70-466)* – This law directed the Secretary of Agriculture to make:

> *"… a comprehensive survey of the present and prospective requirements for timber and other forest products of the United States…".*

This law and the preceding law were the founding legislation of inventory and monitoring activities with the USDA Forest Service.

** The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (P.L. 93-378)* – This act amended the earlier research legislation and directed the Secretary of Agriculture to:

> *"…to make and keep current a comprehensive inventory and analysis of the present and prospective conditions of and requirements of the forest and range lands of the United States …"*

This act also included specific language to include National Forest Systems in the inventory and monitoring effort and also added non-timber attributes.

** The Forest and Rangeland Renewable Resources Research Act of 1978 (P.L. 95-307)* – The act replaced earlier research legislation but repeated the language to conduct broad-scale resource inventories.

** The Forest Ecosystems and Atmospheric Pollution Research Act of 1988 (P*.L. 100-521) – This act although not directed at natural resource inventory included a section that directed the Secretary of Agriculture to:

> *"…increase the frequency of forest inventories in matters that relate to atmospheric pollution and conduct such surveys as are necessary to monitor long-term trends in the health and productivity of domestic forest ecosystems."*

This is also the enabling legislation for the Forest Health Monitoring (FHM) Program.

** Agriculture Research, Extension, and Education Reform Act of 1998 (16 USC 1642(e))* – This legislation mandated an annual measurement of 20% of all plots on all forest land ever year, with a nationally consistent, core set of measurements and analytical products, and production of State reports every 5 years. In addition, the integration of the FIA and FHM plots was required into a single program.

FIA History. In response to the McSweeney-McNary Act, the USDA Forest Service organized regional Forest Survey Projects starting in 1930 in the western US. Surveys were conducted on a state-by-state basis and by the 1960's inventories were completed for the lower 48 states. More heavily forested states had been re-inventoried at least once by this dated.

It was during these initial years that procedures were developed that related to the data collection, summarization, and reporting on timber resources were prepared. By the late- to mid-1960's and into the 1970's, customers were requesting more non-timber information and at a more frequent interval.

There has always been a strong demand for timely, consistent, and reliable forest inventory and monitoring information of the type provided by the USDA Forest Services FIA and FHM programs. Recently the demand has been growing. Customers want more recent information, covering a broader scope of forest attributes, with more analysis and reporting and easier access to program databases. Many of these demands were expressed in the Agriculture Research, Extension, and Education Reform Act of 1998 (16 USC 1642(e)).

In response, the USDA Forest Service is significantly enhancing the FIA program by changing from a periodic survey to an annual survey, by increasing our capacity to analyze and publish data, and by merging the FIA and FHM plots into a single three-tiered (or phases) FIA system. Phase 1 is the traditional aerial photography and/or remote sensing activity used to characterize the acreage of forest and non-forest land in the US. Phase 2 is the traditional FIA ground plots that focus on forest and tree information as it relates to timber but not exclusively.

Phase 3 is the ground plots from the FHM program and are a subset of the phase 2 plots. It is on phase 3 plots that information relating to forests from a broader perspective is collected.

As information needs have changed so have the types of information needed to answer the questions of the many and varied data users. It is the response to these needs that the FIA program is continually changing without losing the integral component of its history. Through the switching from periodic to annual inventories to an integrated plot system including FIA and FHM measurements, that the USDA Forest Service will be able to continually meet the demands for more, better, and faster information about the forests of the US.

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Forest Inventory & Analysis
FIA Data Uses

FIA Fact Sheet Series

Introduction Forests provide a wide range of products and services used by society. Some uses limit product extraction and reduce the quality of services provided. For this reason, society employs ways to gauge the status and trends in products, services, and uses of forests. As society's land uses grow with the human population, so does the demand for monitoring information. Forest resource data are used to monitor tree growth and harvests, but also tree species and land use patterns, forested wildlife habitat, mortality and other forest health attributes, regional biological processes, timber and nontimber forest products, and associated human activities.

History. Since the 1930's, the USDA Forest Service, Forest Inventory and Analysis Program (FIA) has conducted inventories and assessed the status and change in forest resources. Today FIA is the chief provider of forest statistics for broad geographic scales. Selected data are organized nationally in the Resources Planning Act RPA database, and regionally by state, ecoregion, and county. FIA program monitors a grid of approximately 6.5 million photo points and over 400,000 sample locations on private and public land across the United States. The field sample grid is being extended to western National Forests and selected reserved areas throughout the United States. In addition, FIA periodically surveys U.S. territories in the tropics, and conducts questionnaire surveys of forest owners, forest product industries, and forest users.

The earliest multiple resource surveys included forest land area estimates that referenced area relative to other land cover and uses. Summaries of these initial observations included forest type maps and tabular statistics of area with other resource uses. Answers to special data requests were secondary, but important products, of the survey effort. For example, when bark from an otherwise noncommercial tree was discovered as having anticancer properties, FIA data provided estimates of the species' range and extent (Bolsinger and Jaramillo. 1990. *Taxus brevifolia* Nutt. Pacific yew. USDA-FS Agr. Handbook 654.)

Over they years, legislation has broadened the FIA mission, and scientists inside and outside the agency have expanded the use of wood resource data, e.g., to address regional biodiversity conservation. On the horizon is multi-objective environmental monitoring—sharing of data collection efforts with other federal and state agencies. Underway is an effort to interpret land cover and land use with multi-agency objectives from periodic high resolution satellite image (MultiResolution Land Characterization) data. Tests have also explored combining plot-based FIA inventories with those of the Natural Resources Conservation Service, National Forests, and Forest Health Monitoring systems.

Present status. Constantly improving data documentation and dissemination have made much of the traditional forest resource data not only multi-resource, but multi-purpose, i.e., accessible to serve a number of questions.

Users may obtain summary tables or raw data directly from the FIA website fia.fs.fed.us . This and other websites also include links to associated online data summaries, such as a climate change atlas, regional forest assessments such as the Southwest forest assessment, and numerous state-level forest resource information sites.

Online data bases for regional assessments such as for the Southern Appalachians sunsite.utk.edu/samab/data/SAA_data.html extend traditional information commonly associated FIA surveys by combining the information with information from other disciplines. The Southern Forest Resources Assessment www.srs.fs.fed.us/sustain/data/index.htm includes an extended array of FIA data, such as fragment size, livestock grazing, landscape proximity, indices of fire, recreation, soils, water, wetlands, and wildlife habitat attributes.

FIA's measurement strategy has shifted toward more holistic ecological assessments with advancing technology and evolving objectives of the program's expanded clientele. At least one new Ph.D. thesis each year since 1991 has incorporated FIA data to address broader issues, e.g., aesthetics, fire management, detailed earth cover estimates from satellite imagery, soils, spatial constraints on forest management, tree species diversity, and urbanization. With geographic information science (GIS) tools, maps derived from FIA plot and satellite imagery now communicate the spatial relationship of more-than-timber resources. FIA statistical reports also now include temporal ecological processes, such as disturbances.

Specialized reports and analyses focus on forest-associated issues customized to the audiences served. Topics in recent years have included access to forest resources—and its reverse—remote and roadless forests. Old growth and tree species composition changes have been featured. Other studies reference forest resources impacted by anthropogenic factors, e.g., forest fragmentation, livestock

grazing, owner parcelization, population density, and urban development.

On sampled plots, survey observations include nonwood attributes, such as distance from nonforest cover, evidence of human uses, invasive species, and nontimber forest products. Owner surveys commonly combine forest land estimates with owners' other resource production intentions. Exploratory studies are also underway to assess the growing market for nontimber forest products, such as ginseng.

Collaboration. Policy makers, forest industry consultants, researchers, and managers alike take advantage of the data to depict the status and change in forests relative to other uses, obtain evidence of likely hypotheses about forest ecosystems, and model aspects of regional processes. The following are some highlights:

U.S. Fish and Wildlife Service began the Gap Analysis Program (GAP) to describe the distribution of major vegetation cover types relative to conservation of terrestrial vertebrate animal species across the entire United States. GAP has made use of FIA data as secondary verification for remote sensing interpretation and mapping of wildlife habitat. In Utah, FIA's forest assessment included GAP-classified imagery to incorporate perspectives about timber resources within GAP-defined forest communities.

Attributes have been extracted from FIA data to estimate regional habitat for individual wildlife species such as the black bear, Mexican spotted owl, and red-cockaded woodpecker. Snag distributions important for primary cavity nesters, and hard and soft mast tree species distributions, have also been documented in several forest resource assessments.

The continued strength of FIA's sample design is linkage with detailed observations of limited areas and permanent sample points periodically revisited across a broad region. Scientists employ post stratification of FIA plots to develop process-oriented conceptual models calibrated with data from other sources, such as agricultural statistics, economic reports, projected climate change, satellite imagery, severance taxes, user surveys, and U.S. Census estimates.

Among recent models developed with FIA observations are those associated with acid deposition, biogenic emissions, global warming, recreation, scenic beauty, urban conversion probability of rural land, and woody and nonwoody biomass estimation.

Recent improvements in mapping technology have increased the readability of previously tabular FIA survey findings. FIA and collaborators have made extensive use of its plot information to lead in the advance of GIS, such as estimation of tree species distributions. Of wide interest are broad scale forest type maps derived from satellite imagery and associated forest area and change statistics.

A comprehensive review of specific FIA data uses are described and 421 literature citations are included in: Rudis 1991. Wildlife habitat, range, recreation, and related research using Forest Inventory and Analysis surveys: a 12-year compedium. USDA-FS-GTR-SO-84. An expanded searchable electronic version of the citations is at: srsfia3.fia.srs.fs.fed.us/RIS/RISWEB.ISA#TOPOFREFLIST.

Covering the period 1979 to present, an updated review has been drafted with over 1,000 new citation entries from a variety of sources. Another review focused on graduate studies includes an abstract or annotation, and indexes of more that 100 graduate reports. Progress-to-date appears at: www.msstate.edu/dept/forestry/biblio.html.

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Forest Inventory and Analysis
Southern FIA Program

FIA Factsheet Series

FIA Mission: The Forest Inventory and Analysis (FIA) program of the USDA Forest Service has been in continuous operation since 1930 with a mission to:

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The FIA program collects, analyzes, and reports information on the status and trends of America's forests. FIA information answers questions such as how much forest exists, where it exists, who owns it, and how it is changing. In addition, FIA data is used to determine how the trees and other forest vegetation are growing and how much has died or has been removed in recent years.

This information can be used in many ways, such as in evaluating wildlife habitat conditions, assessing the sustainability of ecosystem management practices, and supporting planning and decision-making activities by public and private enterprises. FIA combines this information with related data on insects, diseases, and other types of forest damages and stressors to assess the health, condition, and potential future risks to forests.

Southern States: Because of the importance of wood-using industries and forest values to the Southern U.S. economy, resource sustainability must be continually addressed. The Southern Research Station (SRS) FIA program provides important data about southern forests through annual inventories as a component of the National FIA Program. The SRS FIA program conducts the continuous forest census for the 13 Southern States, Puerto Rico, and the U.S. Virgin Islands. This inventory activity is accomplished in a collaborative manner with the Southern State foresters and their respective forestry organizations.

In addition, the SRS FIA program works collaboratively with forest industry groups, universities, and other governmental agencies to develop new procedures to improve the inventory process. Data and information are available through traditional sources such as reports and publications and the FIA interactive Web site which allow users to query the FIA database to answer their own questions.

History: In the past, permanent plots were established in each State and then revisited on roughly a 10-year schedule. This periodic inventory allowed each area to be assessed for current status as well as changes in forest area, growth, removals, and mortality.

State	Last Periodic Survey
Alabama	2000
Arkansas	1995
Florida	1995
Georgia	1997
Kentucky	1988
Louisiana	1991
Mississippi	1994
North Carolina	2002
Oklahoma	1993
South Carolina	1993
Tennessee	1999
Texas	1992
Virginia	1992
Puerto Rico	1990
U.S. Virgin Islands	None

The Forest Health Monitoring program was implemented in 1991 in the Southern U.S. to monitor annual and long-term changes in forest health. In 1998, the Farm Bill required FIA to institute dramatic changes to the inventory program. The 1998 Farm Bill mandated an annual inventory across all land ownerships including National Forest System lands in every State every year, nationally consistent data collection, and 5-year reports that included assessments of forest health. In collaboration with its State partners, SRS FIA initiated the transition from periodic to annual inventories in 1997. Within the Eastern U.S., FIA is funded on a 7-year cycle (except western TX which is on a 10-year cycle). Most Southern States have provided additional funds to collect inventory data on a 5-year cycle.

Currently, 11 States are in annual implementation in cooperation with the respective State forestry organization. Mississippi and Oklahoma have not been implemented due to budget limitations. Inventories in Puerto Rico and the U.S. Virgin Islands are still periodic due to the reduced numbers of plots and are completed in cooperation with the International Institute of Tropical Forestry.

SRS FIA Organization: The SRS FIA program is managed at unit headquarters in Knoxville, TN with additional personnel currently in Asheville, NC and Starkville, MS. Staffing and activities are focused in the following areas: data collection, information management, resource analysis, timber product output, and monitoring techniques research.

Core and Regional Measurements: National core measurements must be collected on all ground plots following standard data collection protocols (see *Phase 2 and Phase 3: Ground Measurements Fact Sheet*). These core measurements have been the focus of SRS FIA data collection since the passage of the 1998 Farm Bill. The national core measurements are augmented with a small number of regionally-specific measurements on inventory plots to address specific regional issues. Most regional noncore measurements are limited to those used for plot monumentation, reconciliation with past inventories, and tree quality

(tree grade, tree class, damage, etc.). SRS FIA also collects data to determine the distribution of selected nonnative invasive plants, and other nontimber related information.

Timber Products Output (TPO): A component of the SRS FIA program is TPO information which provides estimates of timber product output by State for all products. This includes saw logs, pulpwood, veneer logs, composite panels, other industrial products, and plant by-products. The SRS FIA program also conducts utilization studies by visiting active logging operations to determine the amount of wood being sent to the mill.

National Woodland Owner Survey (NWOS): NWOS results are used to address what services landowners intend to derive, manage, or provide from their forested acreage.

Partners and Clients: SRS FIA primary partners in implementing the FIA program are State foresters and their respective organizations. These groups are primarily involved in the data collection aspects of the annual inventory system. Other partners and clients include other Forest Service research programs; National Forest System and Forest Health Protection programs in the Southern region; other federal agencies such as the National Park Service, and Natural Resources Conservation Service; universities; environmental organizations; forest industry companies; and private landowners.

The needs of these groups help determine regional data needs, various resource analysis needs, and the kind of report or output produced. Input and collaboration from partners and clients are obtained in a variety of ways including annual client meetings, data requests, special working sessions, and cooperative agreements.

Factsheet Author: William Burkman

For more information about the SRS FIA program visit the following Web sites:

- Information specific to SRS FIA: http://srsfia2.fs.fed.us/
- Electronic copies of SRS FIA publications available at: http://www.srs.fs.fed.us/pubs/
- The National FIA database at: http://www.ncrs2.fs.fed.us/4801/FIADB/
- The National TPO database at: http://ncrs2.fs.fed.us/4801/fiadb/rpa_tpo/wc_rpa_tpo.ASP
- National Woodland Owner Survey: http://www.fs.fed.us/woodlandowners/

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