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United States Department of Agriculture

Forest Inventory and Analysis

Fiscal Year 2015 Business Report

Forest Service FS-1053 June 2016

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United States Department of Agriculture

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Prepared by

J.T. Vogt, Forest Service Research and Development,
Southern Research Station,
Forest Inventory and Analysis, Knoxville, Tennessee

and

W. Brad Smith, Forest Service Research and Development,
Forest Inventory and Analysis, Washington, DC

Cover photo: *Forest Inventory and Analysis (FIA) field photo of Dave Mellot in Zion National Park, Utah, courtesy of Anna Arnold, Rocky Mountain Research Station, Interior West FIA Program field staff.*

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Contents

List of Figures and Tables

Executive Summary

For more than 80 years, the Forest Inventory and Analysis (FIA) program has played an integral role in providing the information vital to managing the Nation's forest resources. In recent years, an increased number of major decisions affecting the Nation's forests have been made with reference to and reliance on FIA findings and forest resource evaluations. Contemporary topics include carbon sequestration, forest product sector and employment trends, biomass availability, land cover and land use change, pollutant effects, and fire risk.

In 1999 (Farm Bill, Public Law 105–185) and again in 2014 (Farm Bill, Public Law 113–79), Congress directed the Forest Service, an agency of the U.S. Department of Agriculture (USDA), to reevaluate its statewide inventory mission and to make the transition from an approach in which each State is surveyed periodically to one in which each State is inventoried annually. FIA developed these plans, in concert with its partners, to carry out the congressional mandate. FIA's *Strategic Plan for Forest Inventory and Analysis* includes a requirement for an annual business report that outlines the status and progress of the national annual inventory program.

This annual business report, our 18th, tells the taxpayers, partners, and clients what the program has accomplished with the financial resources provided and what the program will accomplish in the coming year with budgeted financial resources. This relationship with taxpayers, partners, and clients is integral to FIA's continued success because accountability is our first priority. Some key findings of this annual report are—

Annualized progress. In fiscal year (FY) 2015, FIA maintained annualized inventory activity in all 50 States including the Tanana Valley in interior Alaska. Travel restriction, late budget allocations, and hiring delays contributed to a lag in FIA annual plot production in FY 2015. The total area currently sampled represents about 90 percent of all U.S. forest lands, with interior Alaska outside the Tanana Valley representing the remaining 10 percent of the Nation's forest area.

Funding. Total funding from all sources for the FIA program in FY 2015 was $80.5 million, a net increase of $4.4 million from FY 2014 (appropriated funding increased $3.2 million). FY 2015 funding consisted of $70.0 million appropriated by Congress plus $0.8 million in net adjustments from the previous fiscal year, special funding of $0.7 million, and $9.0 million in partners' funds. State partners' funds are used to maintain an annual measurement and 5-year State report cycles. In FY 2015, total appropriated funding was 22 percent less than the amount needed for full program implementation of 2014 Farm Bill options A through C.

Partners' support. Partners contributed $9.0 million to the program in FY 2015. Using cost share, 37 States contributed $3.2 million toward buying down their measurement and reporting cycles to 5 years or to intensify their plot network. Overall, partners' contributions increased by $1,138,707 from FY 2014.

Grants and agreements. When external cooperators can complete critical FIA work with equal quality for less cost, FIA contracts for these services—a total of $14.7 million was spent in this way in FY 2015. Table 2 summarizes FIA funding activity to and from States from FY 2007 through FY 2015 for data collection, and appendix table B-5 provides details on all FIA grants.

Data availability. Data for 48 States and coastal Alaska are now online and less than 2 years old. These data supplied information for 604 spatial data requests and 170,407 online data requests.

Five-year reports. By FY 2015, FIA had completed at least one 5-year report or periodic report for 96 percent of the States and 100 percent of the islands since annualized inventory began in 1999. In all, FIA had 236 publications, 122 of which were peer reviewed in FY 2015.

Quality assurance. FIA field-checked 10 percent of all field plots measured in FY 2015 to ensure that FIA databases comprise only the highest quality data. All plots are further checked for consistency when loaded into the FIA database.

Users groups. FIA relies heavily on periodic meetings with users and clients to ensure that the program is providing the highest quality service and meeting its planned objectives. In 2015, FIA held one national and six regional users group meetings to gauge how well it is meeting the goals stated in the strategic plan and the previous year's annual report.

Personnel. FIA, directly and through cooperators, employed 523 people in FY 2015. Cooperators are integral to the efficient delivery of the FIA program, comprising 185 of the 523 employees, or 35 percent of the total workforce. Total employment was down nearly 50 positions in 2015

as the program struggled to get new hires and replacement hires in place. Of the total workforce, 171 were employed in information management, techniques research, or resource analysis; they provided 1,350 consultations (13,806 hours) to help users and clients effectively use FIA data.

Other program features. Although plot-based field surveys provide most FIA data, additional questionnaires and surveys are conducted to report on timber product output (TPO), logging utilization, fuelwood production, the characteristics and management objectives of the Nation's private woodland owners through the National Woodland Owners Survey (NWOS), and several indicators of forest health. Since FY 2000, FIA has collected such data from more than 85,000 surveys and questionnaires. This information, in concert with FIA plot data, is critical to monitoring the sustainability of the Nation's forest resources.

New FIA Strategic Plan. On February 7, 2014, Congress passed the 2014 Farm Bill. Section 8301 requires the FIA program to revise its previous strategic plan and submit the new plan to the Committee on Agriculture of the House of Representatives and the Committee on Agriculture, Nutrition, and Forestry of the Senate. The new *Strategic Plan for Forest Inventory and Monitoring* is forward looking and attempts to balance emerging client demands for new information, tools, and values with necessary decisions on priorities and budget constraints. The new strategic plan, like previous FIA strategic plans, was developed in cooperation with partners and stakeholders and identifies the base program, enhancements to the base, priorities for new programs, and areas for increased flexibility in the future, and it addresses 11 specific provisions outlined in the Farm Bill for FIA to consider. The full plan sent to Congress is available at http://www.fia.fs.fed.us/library/bus-org-documents/strategic-plans/index.php.

In brief, the provisions to be addressed in the new plan include: (1) complete the transition to a fully annualized forest inventory program; (2) implement an annualized inventory of trees in urban settings; (3) report on renewable biomass supplies and carbon stocks; (4) engage State foresters and other users in evaluating core FIA data; (5) improve the timeliness of the TPO program and database; (6) foster greater cooperation among FIA, research station leaders, and State foresters; (7) promote availability of and access to non-Federal resources to improve information management; (8) collaborate with other agencies to integrate remote sensing, spatial analysis techniques, and new technologies into FIA; (9) understand and report on changes in land cover and use; (10) expand existing programs to promote sustainable forest stewardship through increased understanding of the more than 10 million family forest owners; and (11) implement procedures to improve the statistical precision of estimates at the sub-State level.

The plan, with details on five options for moving the program forward to fully implement the 2014 Farm Bill provisions, was delivered to Congress in March 2015. More detail of the plan is provided in the Long-Term Strategic Direction section at the end of this report.

Looking to 2016. FIA had a productive year in FY 2015 and looks forward to further progress in FY 2016. Important goals for FY 2016 include—

- Continue annualized inventory of 50 States, including the Tanana Valley in interior Alaska and compilation of data for the inventory of Hawaii.
- Official estimates of U.S. forest carbon reported to the United Nations Framework Convention on Climate Change.
- Begin preliminary work on the 2017 *Forest Resources of the United States* report for the Resources Planning Act (RPA).
- Continue or add urban inventory for a total of 14 cities
- Print the *Forest Atlas of the United States* (FIAtlas).
- Post on the Web the FIA *Strategic Plan for Forest Inventory and Monitoring* submitted to Congress.
- Complete at least 10 State 5-year reports.
- Publish NWOS report based on 2011 through 2013 survey data.
- Implement the new TPO data-collection system and publish the 2012 and 2013 National Pulpwood reports.
- Continue to implement the Image-Based Change Estimation project to improve land cover and land use change classification and analysis.
- Prepare FIA Database 7.0 User Guide and implement *National Core Field Guide 7.0.*
- Maintain the Forest Inventory Data Online and Evalidator systems and release DATIM version 5.

For additional detail, see Comparing FY 2014 Plans With FY 2015 Accomplishments and FY 2016 Plans.

Introduction

The Forest Inventory and Analysis (FIA) program of the Forest Service, an agency of the U.S. Department of Agriculture (USDA), provides the information needed to assess the status, trends, and sustainability of America's forests. This business report, which summarizes program activities in fiscal year (FY) 2015 (October 1, 2014, through September 30, 2015), gives our customers and partners a snapshot of past activities, current business practices, and future program direction. It is designed to increase our accountability and foster performance-based management of the FIA program. (Note: This business report does not include statistical information about the forests of the United States. Those who want to obtain such information should contact the appropriate regional or national FIA office listed in appendix A of this report or go to http://www.fia.fs.fed.us.)

The FIA program has been the Nation's continual forest census since 1930. We collect, analyze, and report 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 and how the trees and other forest vegetation are growing, how much has died or been removed, and how the harvested trees have been used in recent years. This information can be used in many ways, such as in evaluating wildlife habitat conditions, assessing sustainability of current ecosystem management practices, monitoring forest health, supporting planning and decisionmaking activities undertaken by public and private enterprises, and predicting the effects of climate change. The FIA program combines this information with related data on insects, diseases, and other types of forest damage to assess the current health and potential risks to forests. These data are also used to project how forests are likely to appear in 10 to 50 years under various scenarios to evaluate whether current forest management practices are sustainable in the long run and to assess whether current policies will enable our grandchildren and their grandchildren to enjoy America's forests as we do today.

Changes From Previous Years' Business Reports

The FIA program continues to seek performance measures that accurately reflect the program's progress toward meeting the goal of annualized inventory in all 50 States. This report includes more precise information about whether field plots were part of the base 7- to 10-year Federal program or were intensification plots (spatial or temporal).

Urban Inventory. A section on urban forest inventory has been added to the "Other Program Features" section to highlight this new feature of the program included in the 2014 Farm Bill.

Image-Based Change Estimation. Progress on this land cover/land use change monitoring and analysis system is highlighted in the Accomplishments section of this report.

Fire Transfer. For the first time since 2008, FIA was tapped for funds to help offset the agency cost of a dealing with record fire year in the West. Loss of these funds impacts FIA's field capabilities and lowers the productivity of affected units. The loss in FY 2015 was the equivalent cost of about 300 forested field plots. See appendix table B-2 to view transfers by unit.

Fiscal Year 2015 Program Overview

In FY 2015, the FIA program completed the 16th year of implementing the annual inventory system as outlined in the *Strategic Plan for Forest Inventory and Monitoring,* written in response to the Agricultural Research, Extension, and Education Reform Act of 1998 (Public Law 105–185). The FIA program includes two basic sample levels: Phase 1 (P1), which consists of remote sensing for stratification to enhance precision; and Phase 2 (P2), which is based on the original set of FIA forest measurement plots (approximately one plot per 6,000 acres). A subsample of P2 plots may also be measured for a broader set of forest ecosystem indicators. The number of plots with various ecosystem indicators is noted in appendix table B-9. Our primary goal is to implement an annual FIA program that measures at least 10 percent of all P2 sample locations per year in the Western United States, and 15 percent of P2 sample locations per year in the Eastern United States. Table 1 shows the overall distribution of P1 and P2 elements of the FIA sample for the United States. The numbers in this table are for illustrative purposes only and do not include possible additional plots that may be required because of partially forested sample locations, which can add 15 to 20 percent more plots that have to be visited to collect data.

The base program includes annual compilations of the most recent year's information, with full State-level reporting at 5-year intervals. All States have the option to contribute the resources necessary to bring the program up to the full sample intensity of 20 percent per year, or to make other value-added contributions, such as funding new measurements or additional sample locations. In FY 2015, the total appropriated funding was $17 million below the target level outlined in the new FIA strategic plan[1] to complete the transition of the base program to full implementation of options A through C and $33 million below funding needed to implement options A through E. The following sections highlight current outputs and products, program resources, and partners' contributions.

Table 1. Overview of land area, FIADB forest area, RPA forest area, estimated P1 pixels and estimated P2 plots by region in FY 2015.

Region	Land area	Forest area (FIADB)	Forest area (RPA)	Forest	All P1*	All P2
	Mil. acres	*Mil. acres*		*Percent*	*Mil. pixels*	*Plots*
North	607	182	182	30	39.5	101,140
South	533	267	245	50	34.8	88,839
Interior West	548	154	125	27	35.6	91,282
Pacific Coast (California, Oregon, Washington)	204	85	84	42	13.2	33,944
Coastal Alaska	39	14	14	35	2.7	6,507
Interior Alaska	327	114	114	35	21.0	3,373
Islands (including Hawaii)	7	4	4	53	0.5	1,163
Total	2,264	821	768	33	147.2	326,247

FIADB = Forest Inventory and Analysis Database. FY = fiscal year. P1 = Phase 1. P2 = Phase 2. RPA = Resources Planning Act.
*MODIS 250-meter pixels at 15.4 acres each.

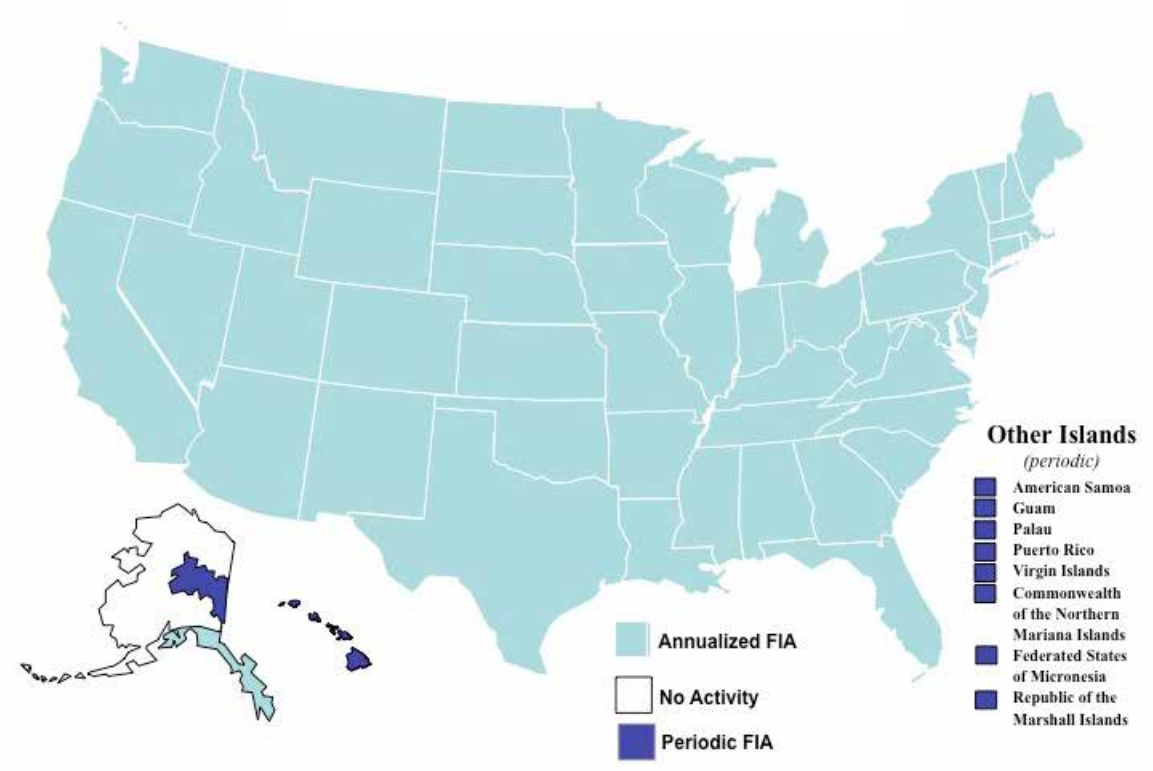
[1] U.S. Department of Agriculture, Forest Service. 2015. Forest Inventory and Analysis Strategic Plan: A document fulfilling requirements of Section 8301 of the Agriculture Act of 2014. Delivered to the Committee on Agriculture of the House of Representatives and the Committee on Agriculture, Nutrition, and Forestry of the Senate on March 2, 2015.

Outputs and Products

Appendix table B-1 shows some comparisons across FIA regional units in the rates, costs, and performance of implementing the FIA program. In FY 2015, we were active in 49 States plus the coastal and Tanana Valley of Alaska (fig. 1), measuring 35,648 base P2 sample locations (14,100 forest and 21,548 nonforest) from the base grid, or 12 percent of the total. At the end of FY 2015, all States were covered by some level of annual FIA program activity, but only 49 States (98 percent) were fully implemented, with interior Alaska having funding to support only the Tanana Valley. Appropriated funding saw an increase of $3.2 million in FY 2015, and partners' support increased $1,138,707. FIA's congressional mandate, under the Renewable Resources Research Act of 1978 (Public Law 95–307), states that the Nation's Trust Territories and Freely Associated States are to be treated as States for research purposes. Since 2000, in compliance with this mandate, periodic inventories have been completed in the Commonwealth of Puerto Rico, U.S. Virgin Islands, Federated States of Micronesia, American Samoa, Guam, the Republic of Palau, the Republic of the Marshall Islands, and the Commonwealth of the Northern Mariana Islands, all of which are exempt from the annualized system and have periodic inventories. Reinventory of the islands continued with work in American Samoa in 2015.

The FIA program produced 236 reports and publications in FY 2015, just 2 fewer than in FY 2014. Of these publications, 70 were core publications consisting of reports specific to a complete survey unit, or a complete State, national forest, or national report. Core reports include 5-year State reports as required by legislation. FIA also published 122 articles in peer-reviewed journals and 12 articles in proceedings from scientific meetings and conferences. FIA staff participated in 1,350 significant consultations with FIA customers, requiring 13,806 hours of staff time—equivalent to more than six full-time staff positions. The FIA technical staff met on several occasions to further refine the national core FIA program, resulting in continued improvement of the FIA *National Core Field Guide* and enhancement of Internet tools for accessing and analyzing FIA data, including the National Information Management System (NIMS), which provides a single national platform for processing FIA data and posting it on the Web. Our Internet resources processed more than 170,000 data retrievals in which FIA customers obtained user-defined tables, data downloads, and maps of interest. This number was slightly down from the previous year as the program brought new interactive tools and refinements online. It is expected that online retrievals will continue on their upward track in 2016 and beyond.

Figure 1. FIA implementation status, FY 2015.



FIA = Forest Inventory and Analysis. FY = fiscal year.

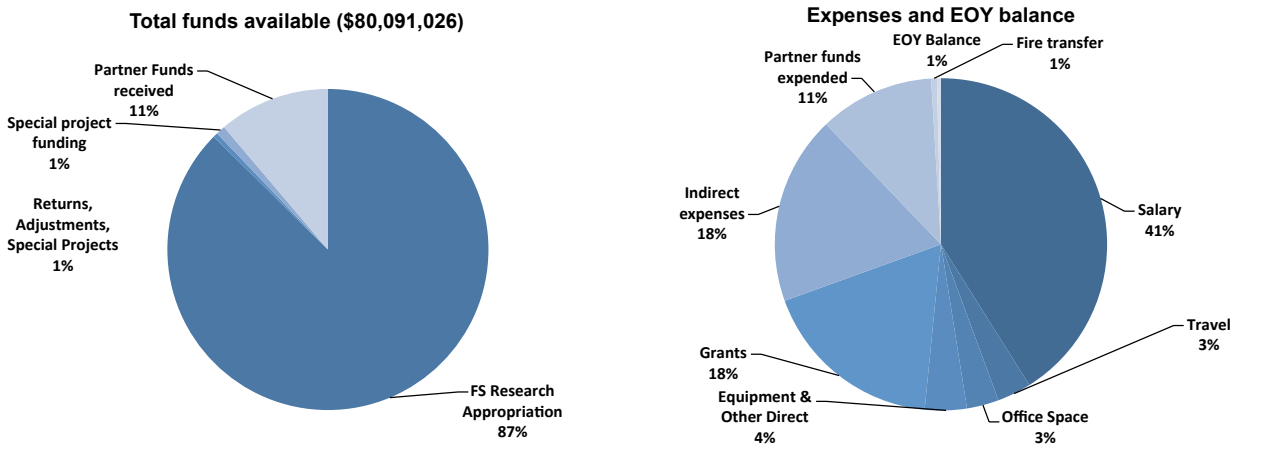
Program Resources

Congress appropriated funds for the FIA program in one Forest Service deputy area: Research and Development (R&D), which had $70 million in appropriated funds in FY 2015, a net increase of $3,195,000 from FY 2014 (appendix table B-12). In FY 2015, States and other partners provided an additional $8,972,036 for plot intensification and other program enhancements. Total available program funding, including $763,644 in pre-year adjustments and special funding, was $80,478,786 in FY 2015 (fig. 2).

In its annual appropriation, Congress intends for FIA to make funds available for cost-sharing with States to help implement the FIA program. In turn, States take advantage of FIA's on-the-ground resources, contracted or dedicated, to contribute funds for additional data collection to meet their local needs. Table 2 demonstrates the financial side of this partnership in the Grants section. Nearly one-third of all FIA fieldwork is accomplished using these partnerships.

Across FIA regions, cost and productivity figures differ because of the cyclical nature of the current inventory system and because of differences among field units in operational

Figure 2. FIA program available funds and expenses by category, FY 2015.



FIA = Forest Inventory and Analysis. FY = fiscal year.

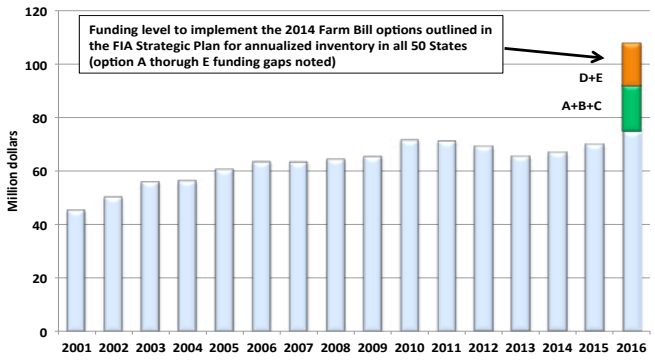
Table 2. Annual FIA appropriations and allocation of FIA-appropriated and State-contributed funds for fieldwork only for FYs 2007–2015.

Category	Fiscal Year								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
	Thousand dollars								
Total FIA appropriation	63,605	64,641	65,536	71,817	71,452	69,186	65,567	66,805	70,000
FIA data collection grants to States	**6,146**	**5,590**	**6,971**	**7,278**	**8,002**	**7,475**	**5,338**	**7,098**	**5,173**
Number of States receiving grants	**18**	**18**	**19**	**20**	**17**	**18**	**16**	**17**	**16**
Average grants to participating States	**341**	**311**	**367**	**364**	**471**	**415**	**334**	**418**	**323**
Percent of appropriated funding granted to States for data collection	*10%*	*9%*	*11%*	*10%*	*11%*	*11%*	*8%*	*11%*	*7%*
State contributions for leveraged data collection	**5,824**	**3,783**	**4,594**	**5,039**	**6,192**	**5,567**	**3,962**	**3,919**	**4,324**
Number of States contributing funds	**41**	**41**	**44**	**45**	**40**	**41**	**38**	**36**	**37**
Average contribution from States	**142**	**92**	**104**	**112**	**155**	**136**	**104**	**109**	**117**

FIA = Forest Inventory and Analysis. FY = fiscal year.

methods and ease of access to property. Rates of effective indirect expenses in FIA field units in 2015 ranged from 11 to 15 percent across the country (appendix table B-2), reflecting differences in both sources of funding and in research station indirect expense assessment practices. The National FIA Program Office has a 67-percent rate of indirect cost because that budget item includes the USDA overhead and programwide charges to the Albuquerque Service Center ($6,550,000) and expenses related to the Information Resources Direction Board ($2,363,000) in FY 2015. Overall, the program's indirect expenses were 20.7 percent of the total expenses. Inclusion of Albuquerque Service Center charges would take total program indirect expenses to 30.1 percent of appropriated funds. Figure 3 shows the total appropriated funding for FIA from FY 2001 through FY 2015 and the FY 2015 target. Appendix table B-12 shows the trend data in FIA performance measures for FY 2008 through FY 2015.

Figure 3. FIA-appropriated funding level, FYs 2001–2016 (projected).

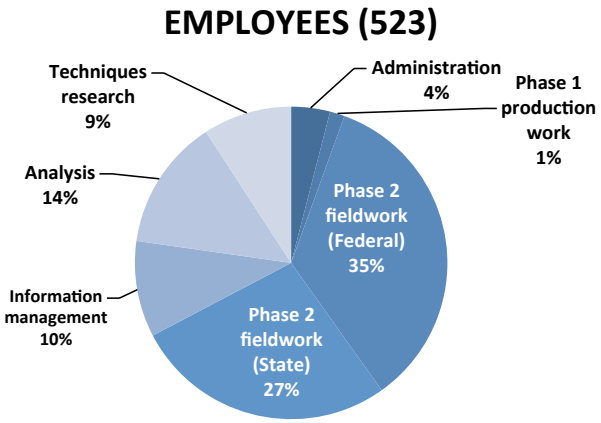


FIA = Forest Inventory and Analysis. FY = fiscal year.
* Estimated total funding to fully achieve the 2007 Strategic Plan was $77.7 million. The 2014 Farm Bill required a new Strategic Plan with added items requiring about $15 million more to fully achieve Plan options A through C, and to fully fund Plan options A through E will require $30 million more annually. Gaps are noted in the green and orange segments on 2016 bar.

In FY 2015, FIA Federal program staffing consisted of 366 Federal person-years of effort (appendix table B-3a), the same as in FY 2014. Cooperators, especially State forestry organizations, using grants and agreements, accomplish much of the work done by FIA, and they added 185 employees for a total workforce of 523. The additional cooperator employees included 142 State or cooperator field employees, 12 information management specialists, 10 analysts, 21 researchers, and 1 administrative specialist. Cooperator employees constitute 35 percent of the total FIA workforce in FY 2015.

Of all Federal and cooperator FIA employees, approximately 62 percent were involved in data collection and field support, 24 percent in analysis and information management, 9 percent in techniques research, 4 percent in program management and administration, and 1 percent in P1 production work (fig. 4).

Figure 4. FIA program employees by job group, FY 2015.



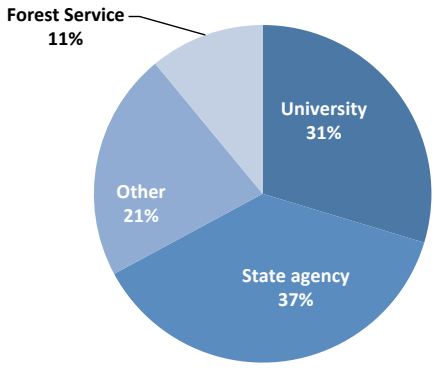
FIA = Forest Inventory and Analysis. FY = fiscal year.

FIA Grants and Partners' Contributions

The complete FIA program envisioned by Congress was to be a Federal-State partnership, in which both Federal and State partners contribute resources to accomplish the work. Congressional guidance indicates that the base Federal commitment is an inventory program that collects data from 10 percent of the sample locations in the Western United States (10-year cycle) and 15 percent of the sample locations in the Eastern United States (7-year cycle) annually, with comprehensive, analytical reports for all States produced at 5-year intervals. The following discussion summarizes program grants and partners' contributions.

Grants and Agreements. Each year, FIA units enter into various grants and cooperative agreements with partners to accomplish specialized work in support of the FIA mission. In some cases, partners provide expertise that is not available within FIA; in other cases, they share the workload. Appendix table B-5 lists 119 grants and agreements for FY 2015, comprising $14,674,615. This number fluctuates from year to year, but it demonstrates the reliance of the FIA program on collaborations with external partners to efficiently complete the work. Most of these grants and agreements were with State agencies (37 percent) and university partners (31 percent) (fig. 5).

Figure 5. Grants and agreements by recipient group, FY 2015.



FY = fiscal year.

Additional cooperators included other Federal and Forest Service offices (11 percent) and non-Federal partners (21 percent) supporting grant collaboration in data collection, information management, and research in techniques development. We expect to continue to make significant use of grants and agreements to augment FIA staff capacity in the analysis and reporting of annual FIA data for individual States.

Partners' Contributions. At their discretion, partners may contribute the resources that are needed to bring the FIA program up to the full 20-percent measurement per year (5-year cycle) that is described in the authorizing legislation. In addition to that choice, or as an alternative, partners may choose to contribute resources for other purposes that add value to the FIA program from their perspective, such as intensifying the base FIA sample location grid to support analysis at finer spatial resolution, funding additional types of measurements on FIA sample locations, or providing analyses or reporting beyond that provided by FIA. The willingness of partners to contribute resources demonstrates the inherent value of the FIA program as a flexible framework on which to address other issues of interest.

Appendix table B-4 lists 89 partners that have contributed resources to the FIA program in FY 2015, either to achieve the 20-percent level of cost-sharing envisioned by Congress or to add value to FIA in other ways. These resources include staff time, vehicle use, office space, equipment, travel costs, and other noncash items that support or add value to the FIA program. Contributions are valued for reporting purposes in terms of what it would have cost the Federal FIA staff to provide the same service, which may not necessarily be the same as the actual cost to the partner making the contribution. Overall, partners contributed $3.7 million toward the full 20-percent of target plots measured annually and another $5.3 million in contributions that add value to the FIA program, for a total of $9.0 million in partners' contributions. These contributions amount to $1,138,707 more than partners contributed in FY 2014. Experience has shown that as Federal funds decline, partners' contributions tend to follow. The source of partners' contributions depends on the region of the country and the ability of States and partners to contribute. In the West, where forest land ownership is primarily Federal, the major cost-sharing partners tend to be Federal land managers.

Since 2000, FIA has provided grants of nearly $185 million to efficiently carry out annualized inventory, and partners have contributed more than $125 million to leverage Federal dollars to reduce inventory cycles and provide for other annual inventory enhancements. Table 3 summarizes FIA grants and partners' contributions by organization.

FIA Data Availability

In 2015, FIA completed migrating its data and data-processing procedures to the new Forest Service corporate servers in Kansas City, MO. The overall goal of this migration was to move the Forest Service to a more reliable and

Table 3. FIA grants and partners' contributions, FY 2000 through FY 2015.

Group	Total FIA grants	Average annual grants	Percent of grants	Total partner contibutions	Average annual contributions	Percent of contributions
	Dollars			*Dollars*		
States/islands	99,544,300	6,221,519	54%	88,634,114	5,539,632	71%
Universities	51,111,024	3,194,439	28%	7,482,202	467,638	6%
Forest Service	15,607,932	985,291	9%	24,259,751	1,516,234	19%
Other Federal	1,496,824	99,788	1%	4,320,248	270,015	3%
Other partners	17,441,538	1,090,096	9%	409,603	25,600	0.3%
Total	**185,201,619**	**11,591,133**	**100%**	**125,105,919**	**7,819,120**	**100%**

FIA = Forest Inventory and Analysis. FY = fiscal year.
Note: Percentages may not add to totals because of rounding.

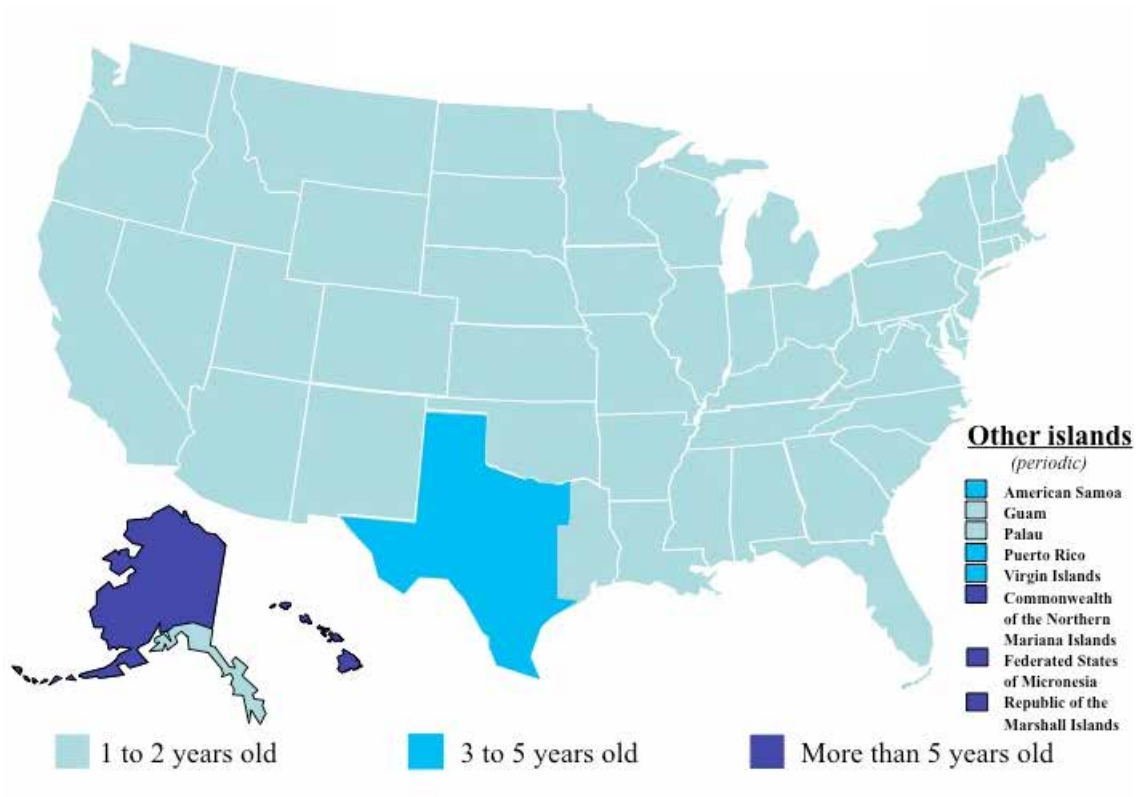
modern infrastructure with improved platform tools, better response times, better documentation, and, of course, lower total life-cycle cost. Using optimized scheduling, the FIA units were able to complete the initial migration with only minor data-loading and access delays. Many significant challenges remain in the new corporate-server environment, but the first major hurdle is behind us. FIA has overcome the initial hurdles of the migration, and online data access has begun to return to normal levels that are commensurate with FIA's high customer service standards (appendix table B-7).

The FIA program is designed to provide continually updated, accurate, and reliable information on status and trends in the Nation's forested resources. Obtaining current information is one chief interest of FIA customers. Our program objectives include: (1) providing annual access to current data for all forested lands sampled as part of the annual inventory system, and (2) producing analytical reports for all States on a 5-year cycle.

As we move through the transition to full program implementation, one key performance measure is how well we are satisfying program objectives. Figure 6 shows, for each State, the age of FIA data accessible in our public database as of September 30, 2015—the end of FY 2015. Virtually all States now have data that are less than 2 years old available in the database. Interior Alaska and Hawaii remain outliers, but the current Hawaii inventory is wrapping up and data will soon be available for Hawaii and the Tanana Valley in interior Alaska. Some island data may be older because the islands' periodic inventory cycles are predominantly 10 years. Continued improvements in data processing and NIMS are now paying dividends by enabling us to establish a more routine loading schedule.

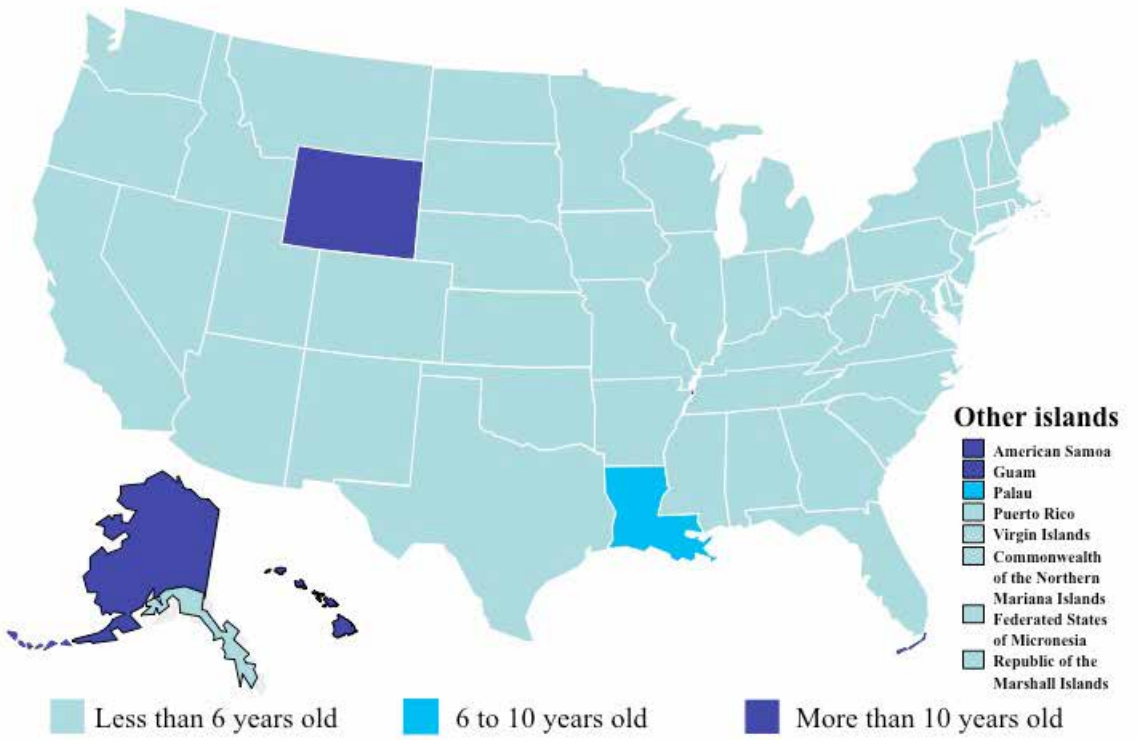
Figure 7 shows the age of the most recently published statewide FIA report for each State. States with publications based on data that are less than 6 years old—the program objective—are shaded light blue. States with publications 6 to 10 years old are shaded medium blue, and States where the most recent publication reports are based on data more than 10 years old are shaded dark blue. Only two States now have State reports more than 6 years old, excluding interior Alaska (fig. 7). FIA made significant strides in catching up with the backlog of 5-year reports in recent years and should soon complete the process of full compliance with its legislative mandate. As noted earlier, some islands will have reports more than 6 years old because of longer inventory cycles. The goal, however, is not to exceed 10 years in these areas.

Figure 6. Availability of online FIA data, FY 2015.



FIA = Forest Inventory and Analysis. FY = fiscal year.

Figure 7. Publication status of State reports, FY 2015.



FY = fiscal year.
Dates are dates of publication, not dates of data shown in the publication.

Quality Assurance

FIA is committed to producing and delivering complete, accurate, and unbiased information with known precision, representativeness, comparability, and accuracy. The FIA Quality Assurance (QA) program supports this goal using a framework that promotes consistency during all stages of the national core FIA inventory process. The FIA *National Core Prefield Guide and National Core Field Guide* document the protocols, ensuring consistent prefield and field collection of core program data items. FIA's national field data entry program, the Mobile Integrated Data Acquisition System (MIDAS) is integrated into the overall FIA information management structure and provides consistent logic and error checking in the field. The NIMS database and NIMS Compilation System (NIMS-CS) provide additional error checks and consistently calculate a variety of derived variables using estimation equations that are described in general technical reports. The National Quality Assurance Coordinator works with the National FIA Program Office and the regional and national indicator advisors to provide direction and coordination for the FIA QA program.

The FIA program promotes process transparency and consistency by extensively documenting methods and procedures, including—

- The FIA *National Prefield Guide* and rigorous QA protocols define a nationally consistent process to collect information about FIA plots before field visits.
- Up-to-date FIA *National Core Field Guides* ensure consistent core program data collection.
- The field *QA Check Procedures Guide* promotes field QA consistency from region to region.
- *The Forest Inventory and Analysis Database: Database Description and User Guide* provides detailed information to users about published FIA data.
- The Forest Inventory and Analysis Database (FIADB) displays standardized output tables and is accompanied by detailed documentation in a recently updated *Database Description and User Guide.*
- The analytical *QA Guide* outlines steps for checking compiled data for accuracy and completeness before releasing them to the public.
- A *National FIA QA Plan* describes the overall QA process.

New and ongoing QA tasks in FY 2015 will be aimed at identifying errors and increasing efficiency and consistency in the national inventory, including—

- Expanding FIA analysts' toolbox by distributing regionally developed analytical QA error-checking applications to FIA State analysts nationally.
- Developing systematic edit checks of data before public release, including MIDAS logic checks and NIMS load error checks.
- Defining rigorous national cold-check field and scoring procedures to allow for equivalent field crew assessments across regions and crew types.
- Documenting and implementing national data collection staff training standards.
- Developing well-defined prefield canopy cover measurement training procedures and training material.
- Developing and documenting NIMS tables and NIMS-CS, a consolidated FIA data processing system.

Regional Program Accomplishments for FY 2015

This section provides information on FIA results, accomplishments, and outcomes throughout the country by FIA unit. More detailed information is available from the respective FIA unit, as shown below. (Contact information for each FIA unit also appears in appendix A.)

Northern Research Station FIA Program

Finding: Young forest habitat health needs to be studied in the Northeast and Midwest.

Accomplishment: Northern Research Station FIA scientists have begun studying many aspects of early-succession forests. Young growth is becoming the new old growth. Early-succession forests in the Northeast and Midwest now account for only 8 percent of total forests, becoming considerably less common.

Outcome: Over time, there has been a buildup of late-successional forest in the Northeast and Midwest that will soon start taking on old-growth characteristics. Today's late-succession and old-growth forests will eventually need replacement following major disturbances, such as catastrophic mortality. However, young forests have now become very rare across the landscape (fig. 8). To address a lack of information on young forest habitat quality, the Northern Research Station's FIA program initiated a study to address questions about regeneration adequacy, wildlife habitat, biodiversity, and pristineness to better characterize young forest. Research is ongoing and includes cooperation with State agencies, universities, and other Forest Service research projects. The study is important because early-succession forests are vital habitats for birds such as the golden-winged warbler, other wildlife, and unique resource values. Creating new young forests is challenging because of existing drivers and stressors that were not present when today's older forests were established, such as invasive plants and pests, forest fragmentation, climate change, and deer over-browsing of tree seedlings. This information will inform forest managers, policymakers, and others tracking threats to the region's early-succession forests and help them make better plans and assessments of this critical resource.

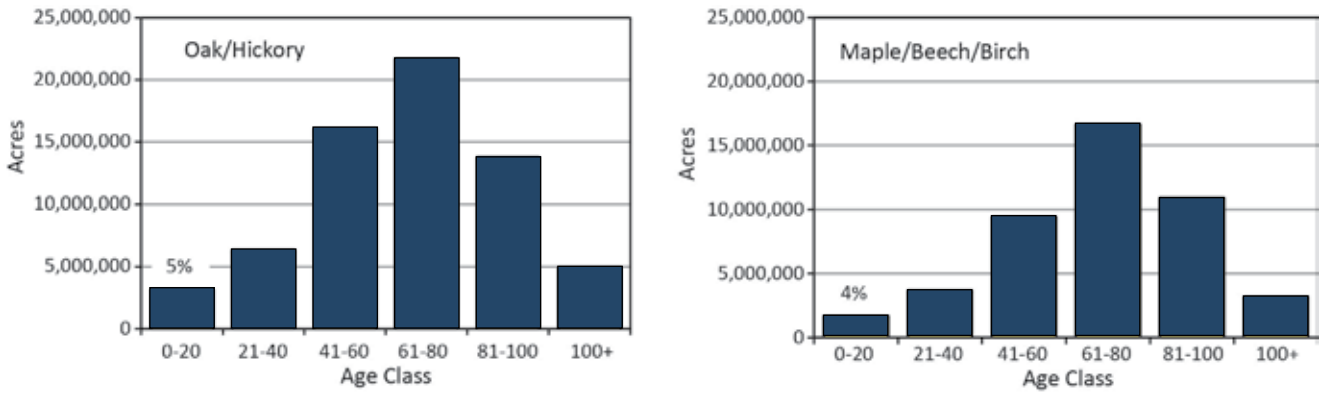
Contact: Will McWilliams, wmcwilliams@fs.fed.us

Finding: Eastern redcedar forests are expanding in the central United States.

Accomplishment: Monitoring change in our Nation's forest resources is an important aspect of the work of FIA in the Northern Research Station, where scientists analyzed more than 8,000 sites and found that eastern redcedar has been increasing its numbers in the Central United States.

Outcome: Eastern redcedar (ERC), a native juniper that can be found across much of Eastern North America, is one of the most commonly planted windbreak species in the Central United States, an area dominated by agricultural land use (cropland and grazing) with pockets of scattered forests. These forests have been experiencing an increase

Figure 8. Area of forest land by forest type and age class in the Northern Research Station territory, 2014.



in ERC for several decades, and natural regeneration from planting ERC for windbreaks has resulted in new ERC forests. An analysis of data collected by FIA from 2000 to 2012 indicates that forest land dominated by ERC is increasing in area, volume, and density (fig. 9), with the largest gains occurring in Missouri, Nebraska, and Kansas (fig. 10). An analysis of seedling abundance by species indicates a possible shift in future forest composition with ERC, hackberry, and chokecherry abundance on the rise with abundance of oak, elm, maple, and other species declining. Indicators of tree diversity show that as the presence of ERC in the region increases, the overall tree species diversity decreases (fig. 11). An analysis of more than 8,000 forested sites provides a comprehensive picture of the extent and rate at which ERC is expanding and influencing the composition of forests in the Central United States.

Contact: Dacia Meneguzzo, dmeneguzzo@fs.fed.us

Finding: Forest Inventory and Analysis is looking for new solutions for distributing research data.

Accomplishment: The FIA program is distributing data to Web-based mapping platforms and supporting the U.S. Government Open Data Policy.

Outcome: Technology is changing the way the public receives and uses information. Mapping applications have become ubiquitous, and there is demand for spatial data that can be viewed and analyzed to suit individual needs. Along with these changes, the U.S. Government has established an open data policy and launched geoplatform.gov and data.gov to improve public access to Federal data. The Northern Research Station's FIA program has traditionally produced printed maps, reports, and research articles, and provided downloadable pdf and electronic data files. Recently, a team of FIA staff scientists began to deliver information in new digital formats. Several FIA-produced geospatial datasets,

Figure 9. Difference in forest land area by forest type for an eight-State region (Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota) based on forest inventory estimates from 2005 and 2012.

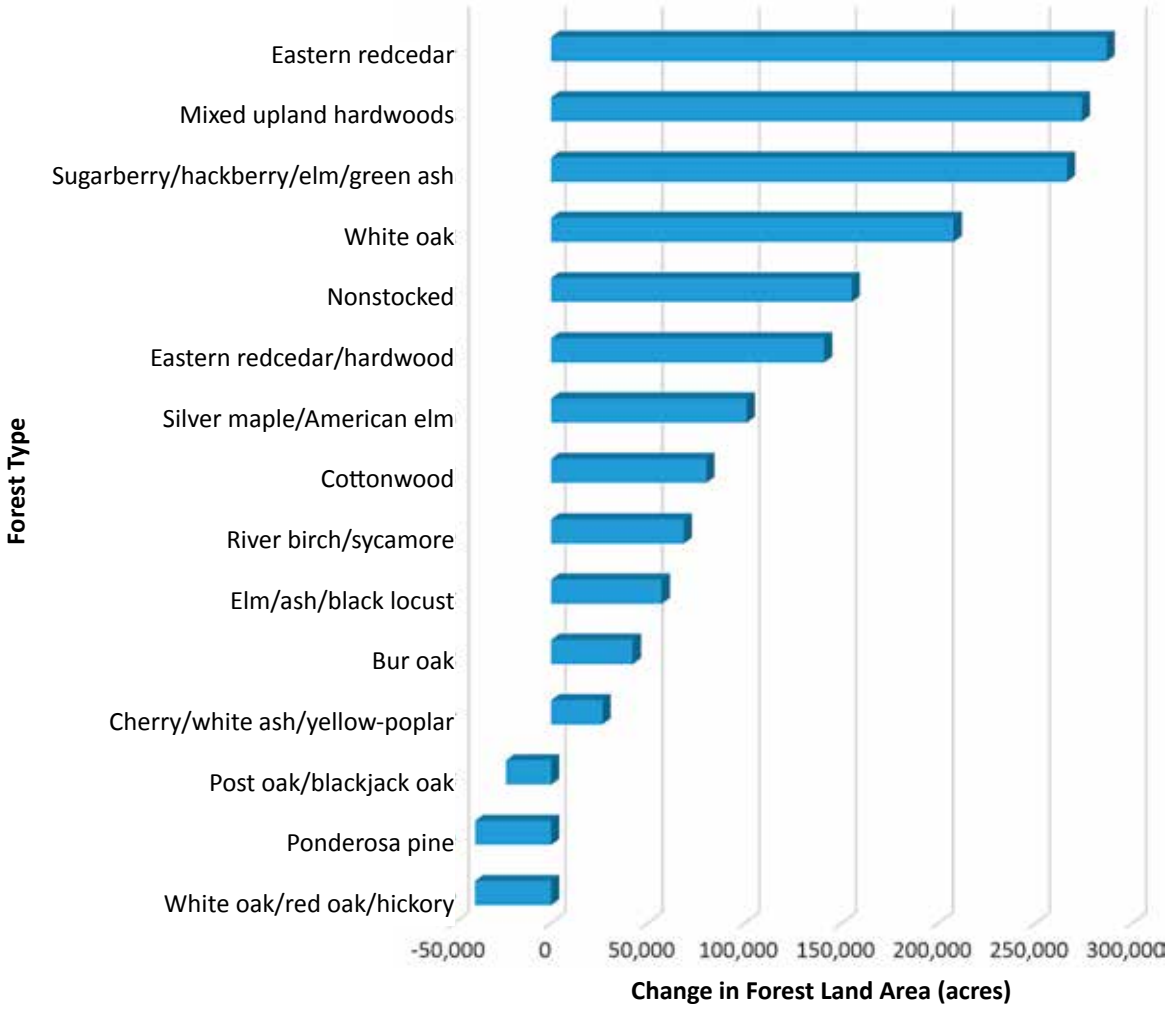


Figure 10. Average number of eastern redcedar (ERC) trees per acre of forest land, 2005 and 2012. Error bars represent a 68-percent confidence interval around the estimate.

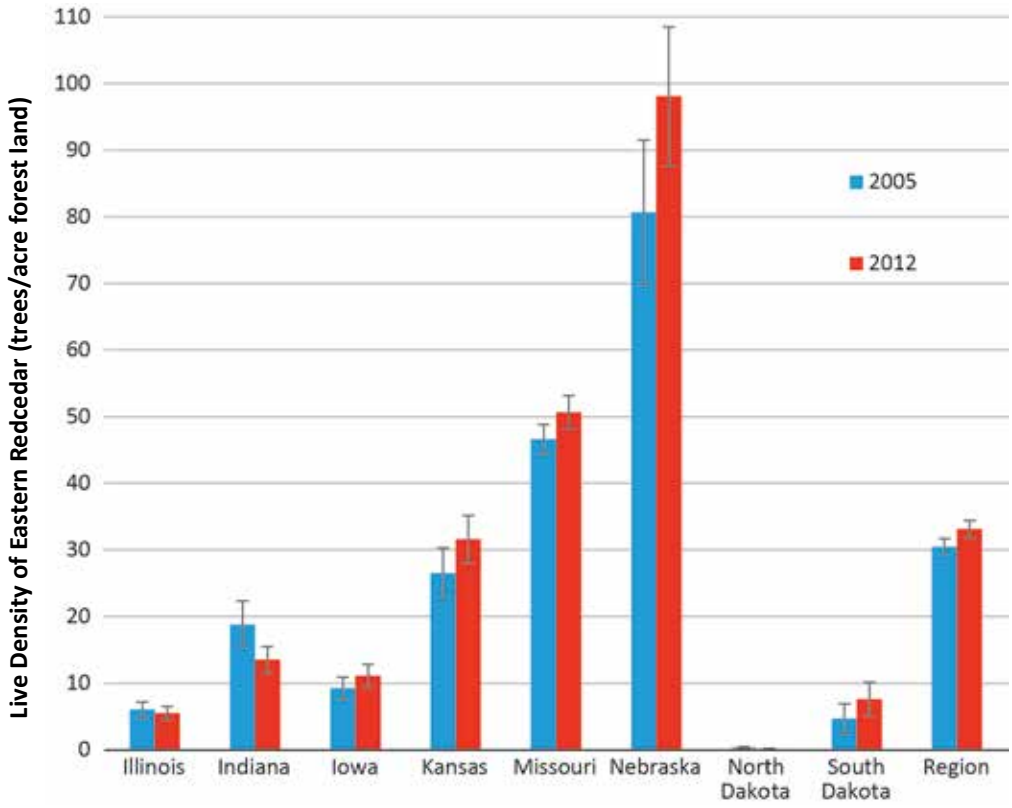


Figure 11. Species accumulation curves based on tree species data collected on field plots in Illinois, Indiana, Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota. The 95-percent confidence intervals are indicated by the bands surrounding each line.

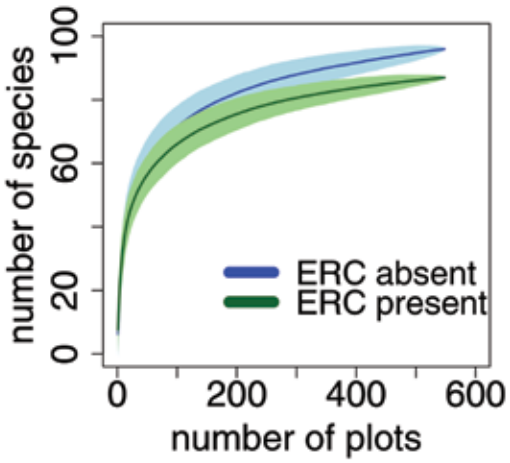


Figure 12. Raster Data Warehouse Web site displaying Forest Land Ownership data for the Lower 48 States. FIA created the dataset in partnership with the University of Massachusetts.

including historical (1873) woodlands, forest ownership, and forest carbon stocks, are hosted by the Forest Service's Enterprise Data Warehouse and Raster Data Warehouse (fig. 12). These services allow the public to view and interact with data in a Web browser. Data can also be combined with other geospatial data in a familiar map interface or be used in specialized geographic information systems (GIS) software. Data can also be accessed using the ESRI (Environmental Systems Research Institute) ArcGIS Online portal (fig. 13). In addition, these datasets, along with the FIA database, have dedicated pages on geoplatform.gov and data.gov, which deliver authoritative Federal data to the public.

Contact: Richard McCullough, rmccullough01@fs.fed.us

Finding: Quantifying changes in land use and land cover over space and time provides a means to understand complex interactions between human and biophysical systems and project future conditions. There is no scientifically reliable protocol to consistently classify and analyze land use and land cover changes across all landscapes in the United States with a permanent monitoring system.

Accomplishment: FIA, in a partnership with the Forest Service Remote Sensing Application Center (RSAC), has developed the Image-Based Change Estimation (ICE) monitoring program that implements a protocol and data collection system that will allow us to rapidly assess and report land use, land cover, and agent of change on all FIA base grid inventory plots across the lower 48 States.

Outcome: As a precursor to the 2014 Farm Bill, FIA and RSAC developed an ICE pilot program to determine the feasibility of rapidly assessing land use, land cover, and change using the two most recent sets of National Agriculture Imagery Program (NAIP) aerial imagery. This was implemented in three States—Colorado, Georgia, and Washington. The results were promising, which gave us a path forward for a larger implementation. Once the Farm Bill was passed in FY 2014, FIA and RSAC compiled a national team to develop a production ICE project. The team evaluated the procedures, data results, and deficiencies of the pilot and designed more robust protocols that could be implemented across the country. Recognizing that data collected from an above view (photointerpretation) is different than field data, the new protocols were designed to allow for a crosswalk between the FIA field data and the ICE pilot program data. This way, the data collected with the new ICE protocols would allow for an examination of, and comparison to, data the field crews collect and photointerpreted data. It also maintains, to some extent, the ability to incorporate the pilot data. When the updated protocols were near completion, RSAC began developing a software program that would allow for rapid assessment and attribution of high-resolution imagery in order to assign land use, land cover, and change to every FIA base grid inventory plot in the lower 48 States. Shortly after the beginning of FY 2015, the protocols were finalized and the program became fully functional. At that point, we began production work in 6 States–Maryland, Nebraska, New Hampshire, Texas, Utah, and Vermont. As we move into FY 2016, we plan to implement the inventory on 14 new States, while we

Figure 13. ArcGIS Online displaying the same Forest Land Ownership map in an interactive format.

wrap up the remaining plots in the States that have yet to be completed in FY 2015. In addition, we will begin preliminary assessment of the finalized data for New Hampshire and Vermont. This will allow us to report out numbers for land use, land cover, and change for these two States and will give us a template for future ICE reports as States are completed. Our goal is to establish a baseline of land use, land cover, and change for all lower 48 States and then update that information for each State in line with the NAIP imagery schedule of every 2 to 3 years.

Contact: James Blehm, jblehm@fs.fed.us

Pacific Northwest Research Station FIA Program

Finding: Seedlings of most tree species in California, Oregon, and Washington have shifted toward areas colder than those occupied by mature trees.

Accomplishment: Climate change is predicted to cause systematic changes in the distribution of tree species. Those changes pose a major risk for conservation efforts, so determining whether they are currently occurring and estimating their magnitude is crucial for large-scale policy and management decisions. For trees, tracking the warming climate depends on seedling colonization of newly favorable areas. Thus, we compared the distribution of seedlings and mature trees for all but the rarest tree species in California, Oregon, and Washington. Across all forest lands in the region, the mean annual temperature of the range of seedlings is 0.120°C colder than that of the range of mature trees (fig. 14). Individual species followed the same pattern, except for some species common in California mixed conifer forest. For most species, the estimated shift is less than the increase in temperature during the last decades, suggesting that tree migration may be lagging temperature increases.

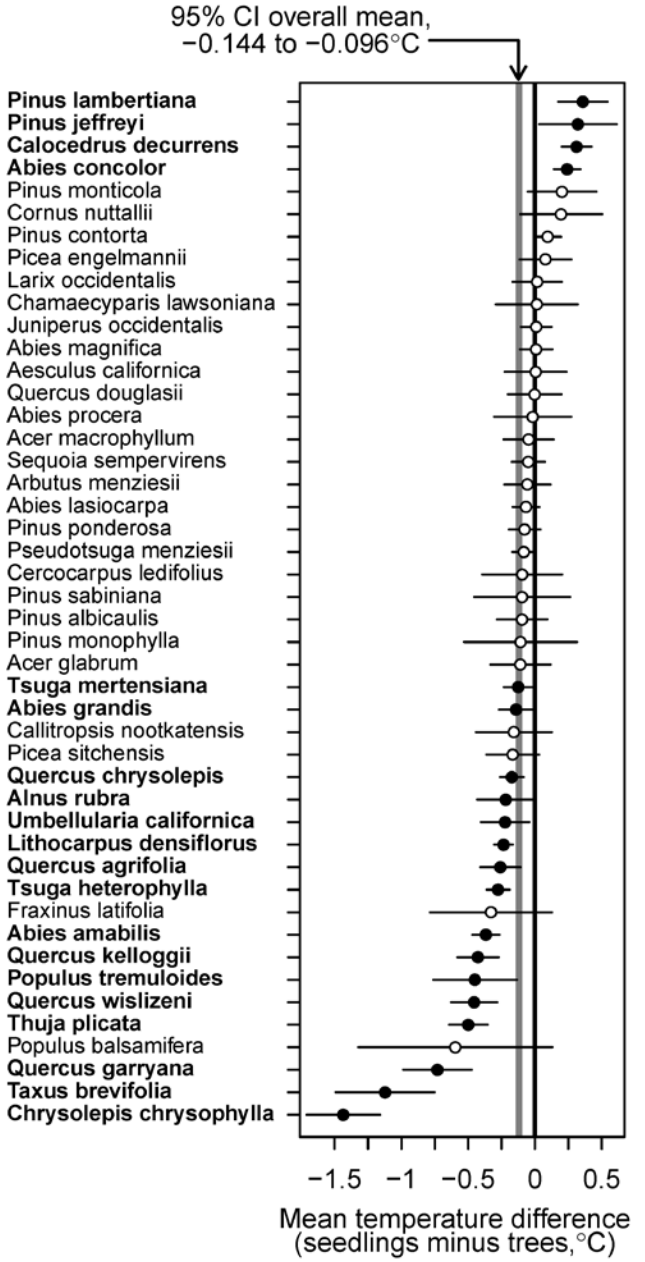
Outcome: Examining changes in geographic range can be misleading. Elevational and latitudinal range shifts run in opposite directions for the majority of these species, probably because those variables are not biologically meaningful. The broad scale, variety of disturbance regimes, exhaustive sampling of tree species, and direct relationship between temperature response and a warming climate, provide strong evidence to attribute the observed shifts to climate change.

Monleon, V. J.; Lintz, H. E. 2015. Evidence of tree species' range shifts in a complex landscape. Plos ONE 10(1): e0118069. http://www.treesearch.fs.fed.us/pubs/48819.

Contact: Vicente Monleon, vjmonleon@fs.fed.us, Resource Monitoring and Assessment Program

Partners: Oregon State University

Figure 14. Difference between the mean temperature of the range of seedlings and that of mature trees. A positive number indicates that the mean temperature of the seedling range is warmer than that of trees. The circles represent the estimated difference for each species, and the horizontal lines represent 95-percent confidence intervals (C.I.) for the difference. Solid circles and bold species name indicate that the 95-percent C.I. does not include 0 (difference significant at the 0.05 level). The gray band is a 95-percent C.I. for the overall mean difference, across all species.



Finding: Pacific Northwest Research Station FIA scientists developed a method to efficiently estimate and monitor species groups and carbon storage of moss and lichen layers in boreal and temperate forests.

Accomplishment: Mat-forming ''ground layers'' of mosses and lichens often have functional impacts disproportionate to their biomass and are responsible for sequestering one-third of the world's terrestrial carbon (fig. 13) as they regulate water tables, cool soils, and inhibit microbial decomposition. Without reliable assessment tools, the potential effects of climate and land use changes on these functions remain unclear. Therefore, we implemented a novel ''Ground Layer Indicator'' method as part of the FIA program. Nondestructive depth and cover measurements were used to estimate biomass, carbon, and nitrogen content for nine moss and lichen functional groups among eight contrasted habitat types in the Pacific Northwest and boreal Alaska. Bootstrap resampling revealed that 32 microplots per site were adequate for meeting data quality objectives. We presented a nondestructive, repeatable, and efficient method (sampling time of approximately 60 minutes per site) for gauging ground-layer functions and evaluating responses to ecosystem changes.

Outcome: Ground layer cover, volume, standing biomass, carbon content, and functional group richness were greater in boreal forest and tundra habitats of Alaska compared to Oregon forest and steppe. Biomass of up to 22,769 kilograms per hectare in upland black spruce forests was nearly double other reports, likely because our method included viable, nonphotosynthetic tissues. Functional group richness was greatest in lowland black spruce forests. High biomass and functional distinctiveness in Alaskan ground layers highlight the need for increased attention to currently under-sampled boreal and arctic regions, which are projected to be among the most active responders to climate change.

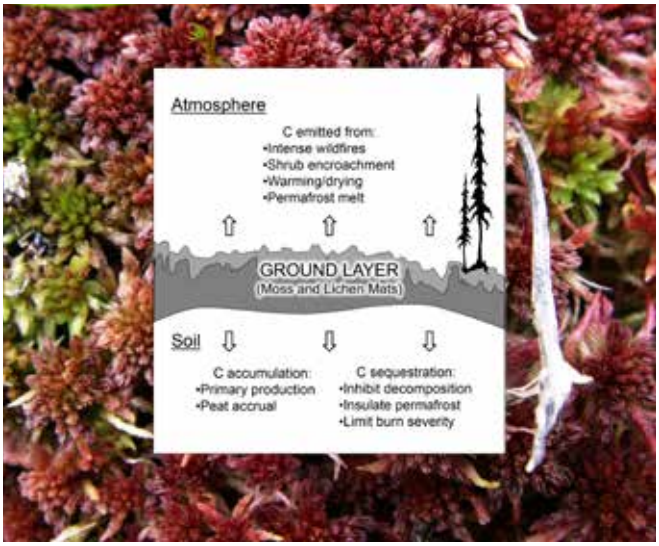
Smith, R.; Benavides, J.; Jovan, S.; Amacher, M.; McCune, B. 2015. A rapid method for landscape assessment of carbon storage and ecosystem function in moss and lichen ground layers. The Bryologist. 118: 32-45.

Contact: Sarah Jovan, sjovan@fs.fed.us, Resource Monitoring and Assessment Program

Partners: Oregon State University

Finding: Unmanned aerial vehicle (UAV)-based, high-resolution, oblique and lateral imagery enables precise crown form and dimensionality measurements for individual trees.

Figure 15. Moss and lichen mats play a critical role in regulating carbon emissions and sequestration in the boreal forests of interior Alaska, where most of the forest carbon is in the soil.



Accomplishment: Mapping specialists use UAV platforms equipped with imaging systems operationally and internationally for the assessment and mapping of natural resources, including forests. We processed imagery exhibiting substantial field-of-view overlap between sequentially acquired frames at nadir or near-nadir view angles with photogrammetry-based algorithms to generate point clouds that represent scene objects. Owing to elevated occlusion rates, the representation of lateral and lower crown parts in point clouds generated from UAV imagery over forested landscapes is usually incomplete or is missing completely. By enabling customized, albeit autonomous, UAV flight trajectories that involve descending into and proceeding along the periphery of canopy openings and using camera view angles adjusted dynamically during the flight from vertical to oblique to horizontal, we were able to achieve a comprehensive representation of all crown parts of targeted trees (fig. 16). Sets of heuristics based on findings from extensive experimentation have reduced the post-flight computational load substantially. Open-source software and code written specifically for the needs of this study supported flight control and imagery processing. Evaluation of retrieved crown dimensions against measurements obtained by using laborious survey methods suggest that this inexpensive and largely automated approach supports precise and accurate crown reconstructions.

Outcome: Information on individual tree crown dimensionality and form is essential for models estimating tree growth and competition, for assessing biomass, and other purposes. Tree crown characteristics are usually absent from forest inventory field data collection protocols, and

their assessment via space or airborne imagery is imprecise in most biomes, especially for the lower placed crown components. Precision improves substantially with airborne LIDAR (a surveying technology using lasers, denoted by a combination of "light" and "radar") data, but this alternative is costly and requires prolonged prior planning. The UAV-based approach is inexpensive, fully automated, flexible, and it can be deployed on demand. It is, therefore, well suited to obtaining detailed crown dimensionality information over small areas of interest and for complementing forest inventory field data collection.

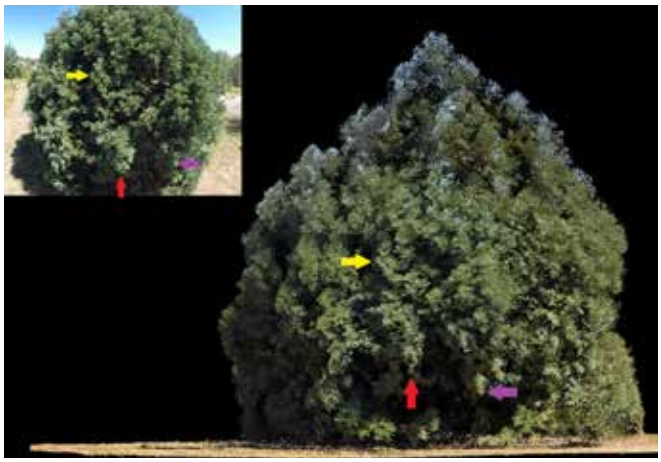
Gatziolis, D.; Liénard, J.F.; Vogs, A.; Strigul, N.S. 2015. 3D tree dimensionality assessment using photogrammetry and small unmanned aerial vehicles. PLoS ONE, 10(9): e0137765. doi:10.1371/journal.pone.0137765, 21 p. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0137765.

Liénard, J.F.; Vogs, A.; Gatziolis, D.; Strigul, N.S. Embedded, real-time UAV control for improved, image-based 3D scene reconstruction. Measurement. (in press).

Contact: Demetrios Gatziolis, dgatziolis@fs.fed.us, Resource Monitoring and Assessment Program

Partners: Intel Corporation, Washington State University

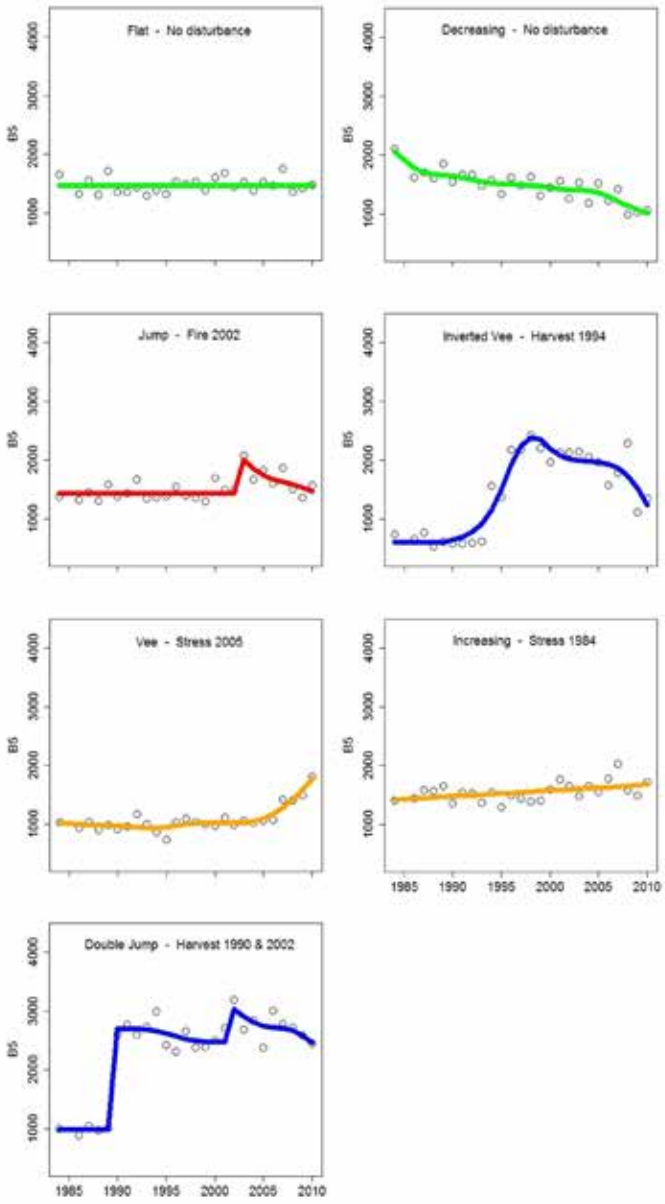
Figure 16. The three-dimensional tree-crown reconstruction obtained from a sequence of unmanned-aerial-vehicle images. Inset shows one of the image frames used, and colored arrows show the spatial correspondence of characteristic crown components on the point cloud and image frame respectively.



Rocky Mountain Research Station, Interior West FIA Program

Finding: Interior West FIA scientists developed a new methodology for fitting nonparametric shape-restricted regression splines to time series of Landsat imagery for the purpose of

Figure 17. Seven possible "shapes" describing temporal patterns in Landsat bands and indices. Flat and decreasing shapes are often associated with stable or growing forest conditions. Jumps and inverted V's often reflect a rapid reduction in forest canopy due to events like harvest and fire. V's and increasing shapes often capture slow-onset disturbances such as insect and disease or drought. A double jump enables capture of two disturbance events in one trajectory.

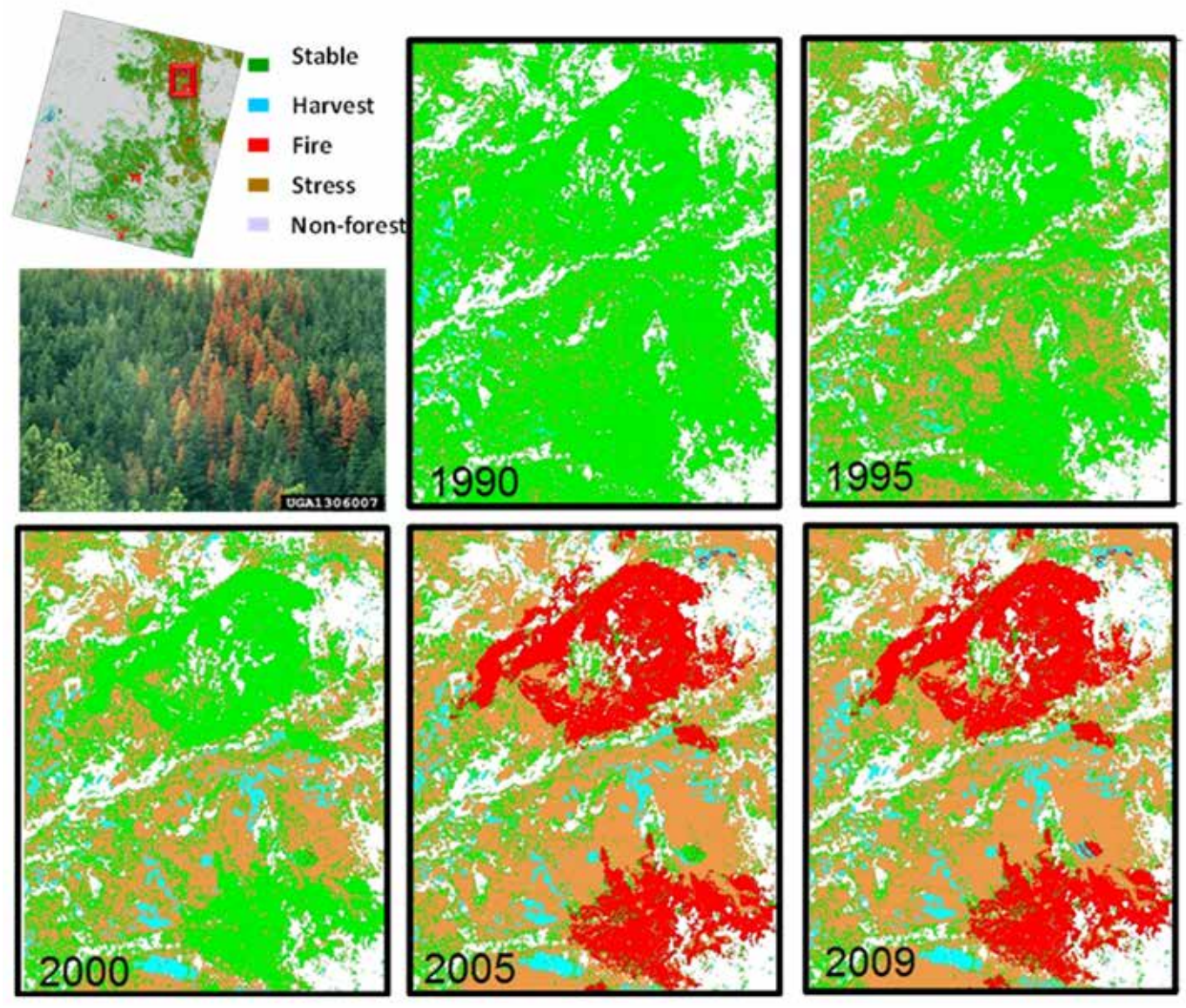


modeling, mapping, and monitoring annual forest disturbance dynamics over nearly three decades. For each pixel and spectral band or index of choice in temporal Landsat data, our method delivers a smoothed rendition of the trajectory constrained to behave in an ecologically sensible manner, reflecting one of seven possible "shapes" (fig. 17). It also provides parameters summarizing the temporal pattern including year(s) of change, magnitude of change, and pre- and post-change rates of growth or recovery (figs. 17 and 18). Through a case study featuring fire, harvest, and bark-beetle outbreak, we illustrate how resultant fitted values and parameters can be fed into empirical models to map disturbance causal agent and tree canopy cover changes coincident with disturbance events through time.

Accomplishment: Understanding trends in forest disturbance and their effects on forest parameters such as tree canopy cover and biomass is important for carbon assessments, as well as for forest management decisions and scientific investigations across the globe. Data from the Landsat suite of remote sensing satellites offer a historically robust collection of Earth observations that can be used to understand forest dynamics at a variety of spatial and temporal scales. An automated statistical technique that is not band, index, or even application dependent and can be run consistently for a wide variety of land cover changes while maintaining the capability of detecting more subtle changes that occur in response to periods of prolonged drought and/or insect and disease outbreaks is needed.

Outcomes: Output from the shapes algorithm is providing the driving variables in empirical models of forest disturbance nationally. This output is also showing great promise in models of continuous forest attributes like tree canopy

Figure 18. Predicted disturbance agent over the small clip for a sample of 5 years in the time series.



cover and biomass through time. The shapes algorithm has been applied to the conterminous United States using annual Landsat data 1984–2011 and is available to collaborators. The code is provided in the R package ShapeSelectForest on the Comprehensive R Archival Network.

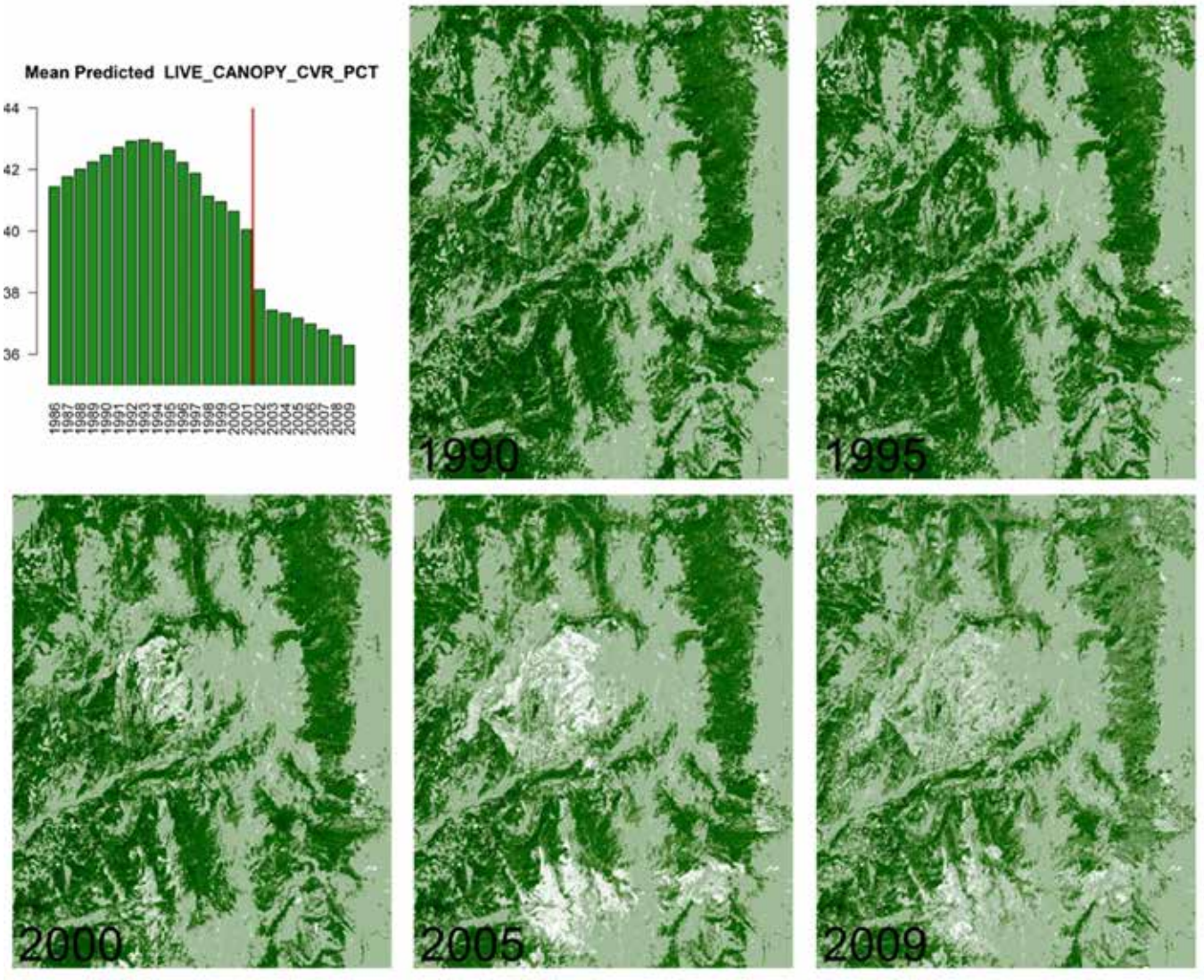
Partners: Forest Service, Rocky Mountain Research Station: Karen Schleeweis, Elizabeth Freeman, Chris Toney
Colorado State University, Department of Statistics: Mary Meyer, Xiyue Liao
U.S. Geological Survey, Earth Resources Observation Systems Data Center: Todd Schroeder
National Aeronautics and Space Administration (NASA), Ames Research Center: Jennifer Dungan

Contact: Gretchen Moisen, gmoisen@fs.fed.us

Finding: Plot-level data from plots measured during both historical and current inventories can provide reliable information about changes in forest attributes, while comparisons of broad-scale changes that do not account for changing inventory methods can produce misleading results about forest trends in Western States.

Accomplishment: This study demonstrated an appropriate method of comparing historical to current forest inventory data. Both historical and current forest inventories allow plot-level evaluation of tree attributes per unit area. Tree volume, growth, and mortality per unit area can be compared to assess change over time. In contrast, comparisons of broad-scale forest attributes that are based on entire inventories may show changes in volume, growth, and mortality that differ in magnitude and sometimes in direction (gain or loss) from comparisons based only on plots surveyed at both

Figure 19. Predicted percent tree canopy cover for a sample of years over that same small clip of the Colorado scene. The graph in the upper left illustrates the mean predicted percent tree canopy by year, aggregated over this clip. The gradual reduction in 1994–2001 is driven by insect outbreak. The large drop in 2002 is a result of fire.



time periods. These discrepancies illustrate that historical inventories may provide an inaccurate picture of reference conditions in some Western States.

Outcome: This study demonstrated a method for making reliable and appropriate comparisons of tree volume, growth, and mortality over time. Forest managers and policymakers often rely on forest inventory data collected and compiled by the FIA program to provide information about changes in forest characteristics. Trends in forest attributes are typically assessed using long-term forest inventories with the assumption that forest inventory methods were consistent over time, yet this assumption is not always valid. Since 2000, FIA's definitions, sample designs, field protocols (e.g., fig. 20), and estimation procedures have remained consistent, but they differed from those of historical inventories, which were often biased toward timber forest types and specific ownership groups (e.g., fig. 21). Therefore, FIA cautions users against making comparisons between historical and recent inventory estimates without accounting for differences in protocol. Instead, using plots measured during multiple inventory periods, FIA can evaluate changes in tree attributes for specific species, forest types, or ownership groups of interest.

Contact: Sara Goeking, sgoeking@fs.fed.us

Finding: Analysis of standing live, standing dead, downed woody material (DWM) on approximately 25 percent of the FIA plots in the Interior West States (mostly in Arizona, Colorado, Idaho, Montana, and Utah) revealed strong patterns of DWM abundance along climatic gradients and with stand age.

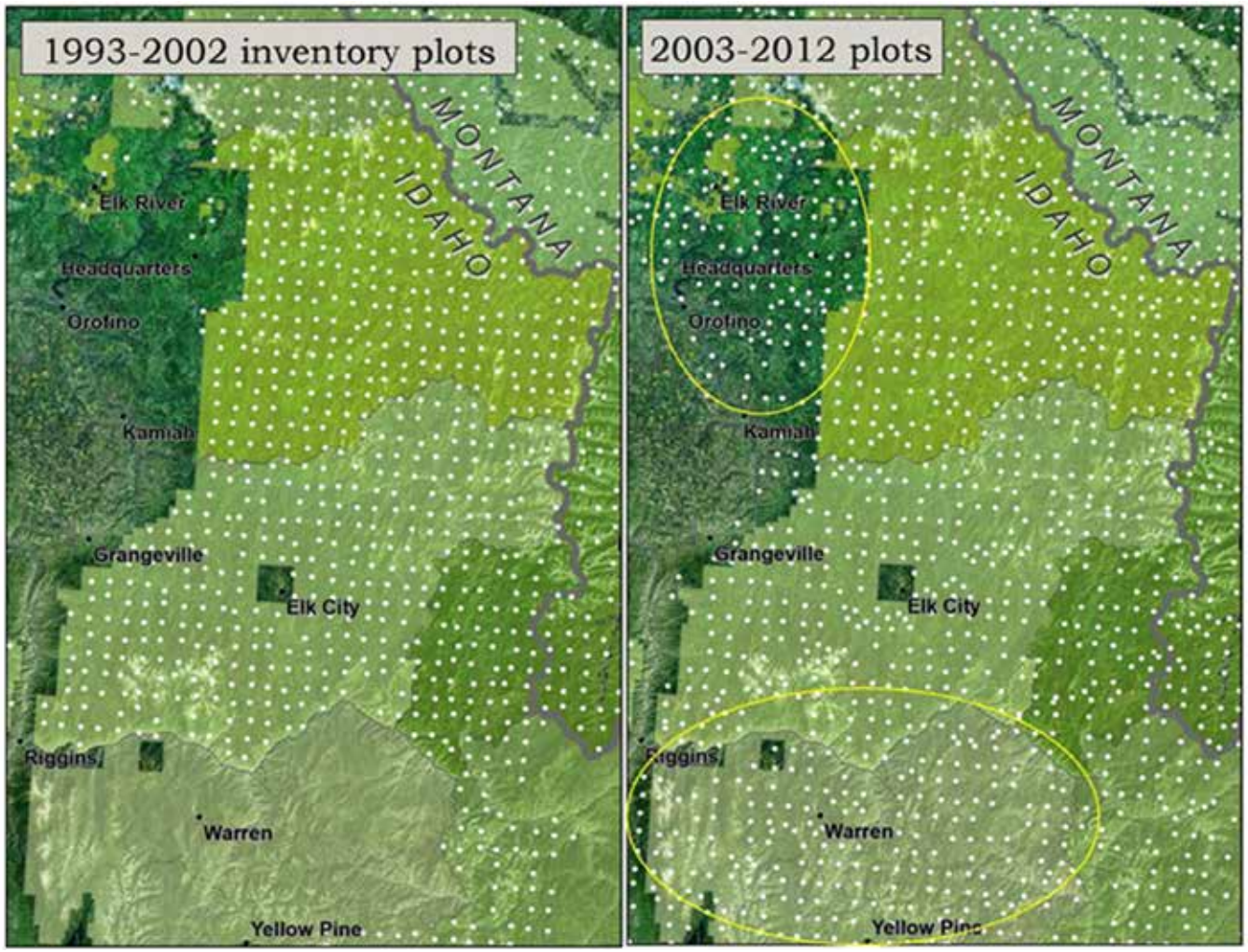
Figure 20. Forester Steve Hughes demonstrates how to measure a woodland tree species at root collar.

Accomplishment: This study was designed to answer two basic questions with respect to the abundance of DWM in forest stands: (1) How does downed woody material (logs and smaller litter) abundance vary across environmental gradients of temperature and precipitation, and (2) how do all woody components vary with stand age? These questions had never been addressed using a comparably wide-ranging dataset, and they have mostly been described conceptually. Results of the study showed that climatic gradients and stand age chronosequences produce relatively strong patterns of woody component abundance. These results represent one of the most comprehensive empirical analyses of such patterns over such a wide range of conditions.

Outcome: This study demonstrated important applications value of the FIA DWM protocol and analysis. In general, average DWM abundance followed the abundance of standing live volume, which in turn is closely associated with more favorable climatic conditions (higher levels of moisture during the growing season). Moist forest types, such as lodgepole pine and spruce-fir, contained 5 to 10 times more volume of woody components overall as compared with dry forest types such as pinyon-juniper. However, distribution of woody components varied widely and ranked differently at different stages of stand development. All forest types showed some level of "legacy" standing dead and downed dead material after stand-replacing events (that is, when stand age = 0) (fig. 22). Downed dead material started at relatively low levels in regenerated stands, but did not show substantial change in quantity over a period of at least 150 years. In comparison, the standing dead legacy (snags resulting from the death of trees in the preceding stand) represented the majority of all woody volume at stand age 0 and gradually diminished over a period of about 40 years. After reaching the minimum volume around age 40, standing dead volume gradually increased over time through at least age 150 but never accounted for more than a small fraction of stand volume. Knowledge of the variation in woody components across climatic gradients and stand age should be valuable when addressing a variety of resource objectives, including the management of forest fuels, biomass, and carbon. Future research on this topic will consider the range of variation that was found within forest types and stand age classes and will include a nearly complete sample of plots (n~29,000) in all Interior West States.

Garbarino, M.; Marzano, R.; Shaw, J.D.; Long, J.N. 2015. Environmental drivers of deadwood dynamics in woodlands and forests. Ecosphere. 6(3):30. http://dx.doi.org/10.1890/ES14-00342.1.

Figure 21. Plots measured during two forest inventory periods show that the historical inventory did not sample large areas on private lands (upper left circle) and on some national forests (lower left circle).



Partners: Universitá Politecnica delle Marche, Ancona, Italy
Universitá degli Studi di Torino, Turin, Italy
Utah State University, Logan, Utah

Contact: John D. Shaw, jdshaw@fs.fed.us

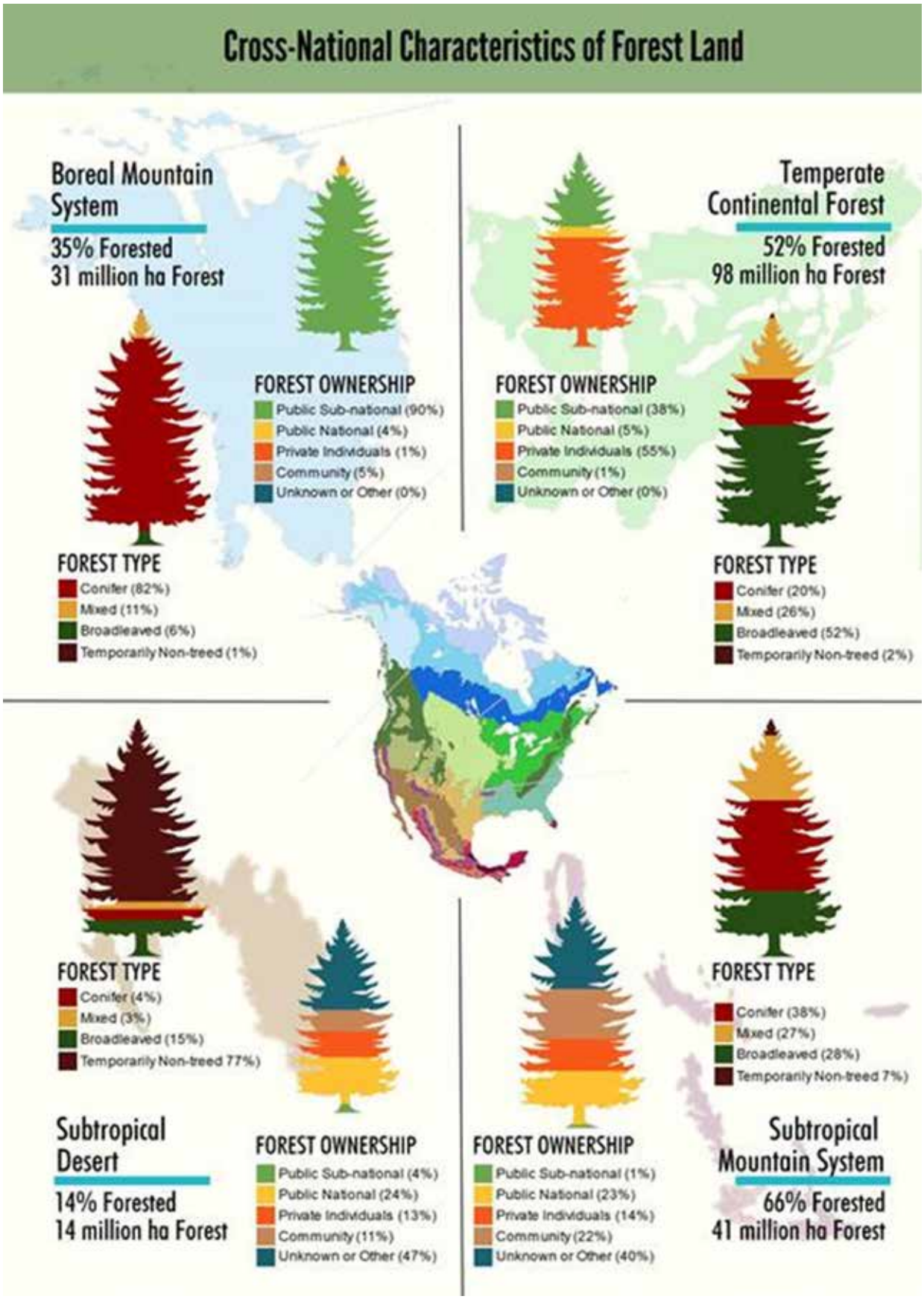
Southern Research Station FIA Program

Finding: The Forest Service FIA is working closely with scientists from the Mexican Forest Service (CONAFOR) in Mexico and the Canadian Forest Service (NRCAN) to develop a borderless forest inventory database for North America.

Accomplishment: The Forest Service FIA has worked closely with Canada and Mexico as part of the North American Forestry Commission (NAFC) Inventory and Monitoring Working Group to create a database of forest resources that spans the three countries. The database, referred to as the North American Forest Database, allows

Figure 22. Young, post-fire lodgepole pine stand in Montana with substantial legacy of standing dead wood that is gradually transitioning to downed woody material.

Figure 23. Example of output from the North American Forest Database, as presented in Durban, South Africa, at the World Forestry Congress.



ha = hectare

users to summarize continental data by ecological region. NAFC demonstrated outputs from the database at the World Forestry Congress 2015 in Durban, South Africa.

Outcome: Ecological regions span international borders, and there has been a need for a forest database that would allow data summary and analysis across North America. This effort resulted in a database that uses an ecozone map that was produced in concert with the United Nations Food and Agriculture Organization and the Commission on Environmental Cooperation as a basis for ecological division. Completing phase one of the database in the fall of 2015, we made a presentation and released a brochure at the World Forestry Congress in Durban, South Africa, in September 2015. Sample released output is presented in figure 23. Phase one demonstrated the ability of the three countries to harmonize definitions and collaboratively work to assemble data. We are translating the brochure into three languages and will make it available on the Web. We are also writing a journal article. Phase two will begin in late May 2016 at the next meeting of the NAFC.

Contact: Sonja Oswalt, soswalt@fs.fed.us.

Finding: Fusiform rust continues to present a significant risk in pine stands of the Southeastern United States.

Accomplishment: Slash and loblolly pine are the two most important commercial timber species in the Southeastern United States, and both species are highly susceptible to a devastating disease known as fusiform rust (fig. 24). Beginning in the 1970s and continuing to the present, FIA has assessed fusiform rust incidence on its network of ground plots in the Southeastern United States. Analyses of these data showed that current fusiform rust incidence varied by State, forest type, and stand origin and that across all stand ages, rust incidence was approximately equal in planted and natural stands of loblolly pine but was higher for planted versus natural stands of slash pine. Decreases in rust incidence over the last 30–40 years were evident in young planted loblolly pine stands but not in young planted slash pine stands.

Outcomes: Updated rust hazard maps (fig. 25) are intended to help guide deployment of rust-resistant seedlings and silvicultural management decisions made by landowners and forest managers. Revised data collection protocols which re-establish data collection of rust incidence on saplings (trees 1 in. to 5 in. DBH or diameter at breast height) will strengthen future analyses of rust hazard.

Cowling, E.; Randolph, K. 2013. Potentials for mutually beneficial collaboration between FIA specialists and IEG-40 pathologists and geneticists working on fusiform rust. *Forests*. 4:1220–1231. http://www.treesearch.fs.fed.us/pubs/45899.

Randolph, K.C.; Cowling, E.B.; Starkey, D.A. 2015. Long-term changes in fusiform rust incidence in the Southeastern United States. *Journal of Forestry.* 113(4):381-392. http://www.treesearch.fs.fed.us/pubs/47982.

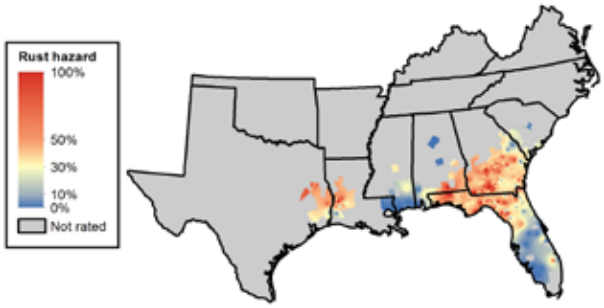
Partners: North Carolina State University: Ellis Cowling
Southern Forest Health Protection: Dale Starkey (retired)

Contact: KaDonna Randolph, krandolph@fs.fed.us

Finding: The reliability of LIDAR for estimating tree canopy height was investigated across the Southeastern United States. Utilizing FIA data and LIDAR measurements from 76 different projects across the Southeast, researchers demonstrated a strong relationship between height measured on the ground and height derived from the LIDAR data, demonstrating feasibility and paving the way for further research on other physical variables of interest.

Figure 24. Multiple branch cankers such as those pictured here are symptomatic of fusiform rust disease.

Figure 25. Estimated fusiform rust hazard for slash pine based on fusiform rust incidence assessments on FIA plots in FY 2010–2015.

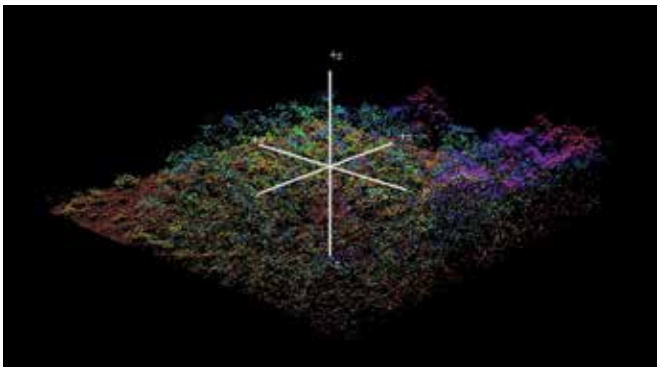


Accomplishment: Canopy height is a key physical variable of our forests. The FIA program has traditionally relied on field-measured tree heights along with a suite of other forest inventory variables. The heights of the canopy along with other parameters are requisite to estimating and monitoring a suite of other variables such as biomass. LIDAR has always been an attractive remote sensing product because it provides a direct measurement of height. However, LIDAR projects are typically small in geographic extent making broad-scale tests difficult and costly, particularly across varied landscapes. In this project, we developed a library of 76 different LIDAR projects across the Southeastern United States. Using data from the LIDAR library and the FIA program, we developed a model to relate LIDAR height measurements (fig. 26) to field height measurement (R2=0.74, RMSE=3m). These results are reasonable given the variability in LIDAR acquisition parameters.

Outcome: This study is one of the first to demonstrate the usefulness of LIDAR data collected with different parameters (e.g., different point density of LIDAR returns) over broad scales for predicting forest characteristics. Research is underway to develop predictive models of down woody material in forests and tree canopy cover across all land uses.

Gopalakrishnan, R.; Thomas, V.; Coulston, J.; Wynne, R. 2015. Efficacy of using heterogeneous LIDAR datasets in predicting canopy heights over a large region. Remote Sensing. 7(9): 11036-11060. doi:10.3390/rs70911036.

Figure 26. LIDAR canopy height map surrounding an FIA plot location.



Partners: Virginia Tech: Ranjith Gopalakrishnan, Valerie Thomas, Randolph Wynne

Contact: John Coulston, jcoulston@fs.fed.us

National FIA Program Office

The National FIA Program Office helps guide and coordinate the FIA field units in implementing the enhanced FIA program. Most of the National Office accomplishments include making presentations, preparing policy white papers and budget justifications, and providing input to reports for national and international organizations.

Other FY 2015 accomplishments in collaboration with field units—

- Provided budget coordination, briefings, and guidance for FIA field units.
- Facilitated one FIA management team meeting, six conference calls, and dozens of briefings for internal and external partners, customers, collaborators, and supporters.
- Collaborated with the Society of American Foresters and participated in the ninth national users group meeting for FIA customers, which was held in Roanoke, VA, in June 2015.
- Published the *Forest Inventory and Analysis Fiscal Year 2014 Business Report.*
- Submitted the revised FIA Strategic Plan required by Section 8301 of the 2014 Farm Bill (Public Law 113-79) to Congress in March 2015.
- Revised a Memorandum of Understanding (MOU) with the National Forest System (NFS) guiding FIA partnership with NFS.
- Worked with the Global Resource Data Strategy Team representing the Forest Service on the Interagency Council on Agricultural and Rural Statistics Land Use Working Group.
- Participated in SilvaCarbon, a flagship program under U.S. fast-start financing for Reducing Emissions from Deforestation and Forest Degradation Plus, or REDD+, which is a U.S. contribution to the Forest Carbon Tracking task of the intergovernmental Group on Earth Observations.

Contacts: Greg Reams, greams@fs.fed.us; Brad Smith, bsmith12@fs.fed.us

FIA Data Requests and Access

The FIA Spatial Data Services (SDS) team provides spatial data services to clients and operates as a virtual SDS Center with staff located at FIA units throughout the country.

Partners

The SDS team worked with a variety of partners including: NASA, Oregon State University, the University of Maryland, the University of Minnesota, other universities and groups within the Forest Service. MOU agreements continue to be put in place for those clients where access to the confidential data is critical for the project and it clearly benefits FIA. Most data requests do not require an MOU and are handled by SDS personnel working with the client to provide the information needed. New agreements were put in place this year with the University of New Hampshire, the State of West Virginia, and Boston University.

FY 2015 Spatial Data Requests

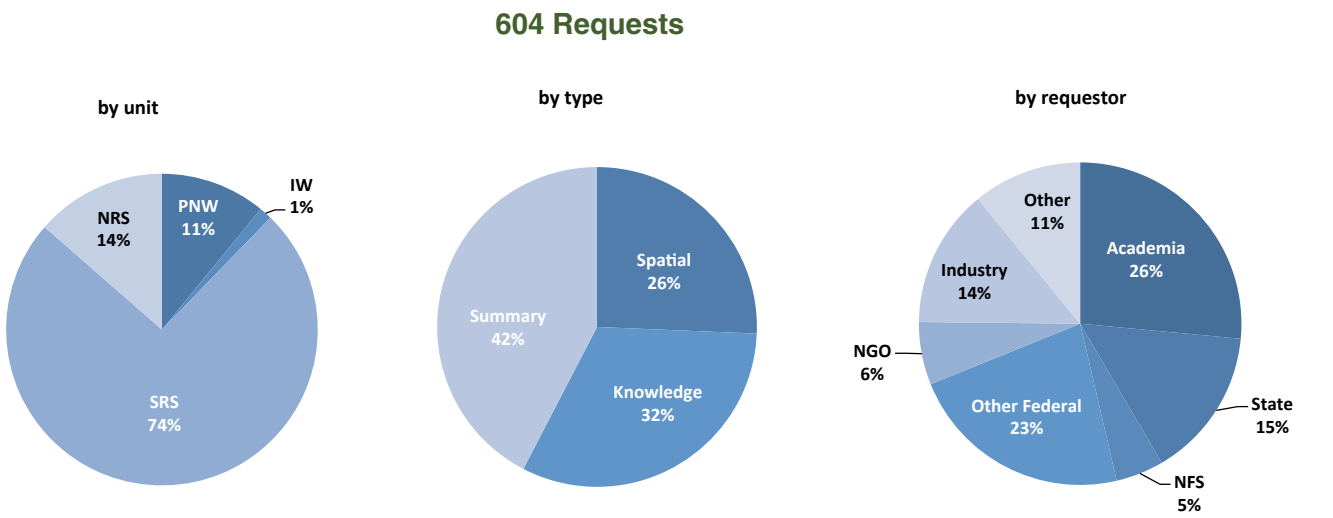
In FY 2015, 604 requests were active, as detailed in figure 27. National or multiregional data requests accounted for 19 percent of the total number of requests. Of the received requests, 99 percent were completed by the end of the fiscal year, and 1 percent remain in progress. Requests are cataloged by type and are fairly evenly divided among knowledge, summary, and spatial types. In FY 2015, public agencies were the largest group of spatial data requestors, with 43 percent of all new requests, followed by academia with 26 percent and industry with 14 percent.

FY 2015 Web Tools

The FIA program has been providing data to the public since 1996 through a variety of Web tools.

The first database retrieval program FIA released in 1996 was the FIA Data Base Retrieval System (DBRS). The DBRS allowed the public to query regional FIA data sets in Eastwide/Westwide format. In 2002, the Forest Inventory Mapmaker program was introduced, allowing the public to generate estimates from national FIA data in the newly created FIADB. The current generation of data retrieval programs produces estimates and their associated sampling errors. Forest Inventory Data Online (FIDO) was introduced in 2008 and the EVALIDator Web application was introduced in 2009. In FY 2015, the ability to create multiple reports using a batch function was introduced to EVALIDator. This

Figure 27. Requests made to the FIA Spatial Data Services Center in FY 2015.



FIA = Forest Inventory and Analysis. IW = Rocky Mountain Research Station, Interior West. NFS = National Forest System. NGO = nongovernmental organization. NRS = Northern Research Station. PNW = Pacific Northwest Research Station. SRS = Southern Research Station.

feature allows users to create multiple reports for an existing dataset quickly and easily.

In FY 2015, the total number of FIDO retrievals was 47,263. Analysis of the Internet addresses showed that, although the source of 51 percent of the requests could not be determined, academia accounted for 36 percent of the users, corporate users were 11 percent, government users (State and Federal combined) were 1 percent, nongovernmental organizations (NGOs) were 1 percent, and users outside the United States were 1 percent.

For EVALIDator in FY 2015, 44 percent of users could not be determined, academia accounted for 41 percent and corporate for 15 percent. The total number of EVALIDator users was 36,532. The batch EVALIDator was used to produce 33,882 reports—the majority for Forest Service staff.

Both FIDO and EVALIDator are being actively "crawled" by various Web search engines—with a significant number of page hits resulting from this activity that are not included in the totals above.

The TPO program collects and reports data related to timber harvest for industrial products, logging residues, and mill residues. The TPO program also provides valuable information on timber harvesting activities, growth and drain relationships, residential fuelwood use, timber-processing firms, and the economic impacts of timber harvesting and wood products manufacturing. There were approximately 66,000 queries for TPO data in FY 2015, down from 69,600 in FY 2014.

The TPO program has been restructured as a national program. TPO program staff have successfully incorporated data into the national structure for: (1) all of the Southern States; (2) historical data for the Northern States for years 1990–2012; and (3) historical data for all the Western States, except Hawaii (no data), for 1992–2013. They are currently incorporating data for all States that completed TPO surveys in 2013 and 2014.

In 2009, staff developed a Web application that allowed querying of the NWOS database. In FY 2015, 2,068 retrievals were completed. The FIA DataMart was revised in 2009 to include the ability to download FIADBs by State as Microsoft Access database files. The Access databases contain a reporting tool (the EVALIDator-PC) that allows the user to generate reports. These reports are not included in table 4 but undoubtedly number in the thousands or tens of thousands.

In FY 2010, users downloaded 18,026 Zip files that contained data from one or more FIADB tables. In FY 2011, users downloaded 24,576 Zip files for a single file. In FY 2011, users downloaded 2,544 Zip files containing the entire set of text files for a given State. In FY 2012, 1,512 Zip files were downloaded. In FY 2013 a total of 7,383 files (State and individual files combined) were downloaded from FIA's DataMart. The number of downloads increased dramatically in FY 2014 to 19,768. In FY 2015, 18,544 data downloads occurred.

In 2003, the FIA Mapmaker program added a module that allowed the user to download FIA data in Forest Vegetation Simulator (FVS) format. This feature was lost with the retirement of the Mapmaker program in 2009. The FVS format is now available through a tool developed by the Forest Management Service Center. The FIA2FVS program is used to extract data fields from the FIADB into an FVS-ready database. The FIA2FVS program can be downloaded from http://www.fs.fed.us/fmsc/fvs/software/data.shtml.

The National Reporting and Data Distribution (NRDD) team has been providing Webinars and in-person trainings on our Web tools. In FY 2010, the team provided a single Webinar and three trainings. In FY 2011, the NRDD team held six Webinars and collaborated with Purdue University on another set of Webinars covering the use of FIA data and our tools. The NRDD team also provided in-person training at three meetings in FY 2011. In FY 2012, the NRDD team again provided Webinars and training. In addition, the NRDD team hosted a booth at the annual Society of American Foresters and Ecological Society of America meetings, providing information and publications to the public. In recent years, budget reductions have prevented the NRDD team from in-person outreach and trainings but virtual outreach in the form of Webinars and online presentations continues.

Table 4. Number of database retrievals using FIA Web applications by fiscal year.

	Fiscal Year											
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of retrievals	26,548	56,475	24,335	26,615	59,609	90,974	101,643	132,413	94,027	103,211	186,175	170,407

FIA = Forest Inventory and Analysis. FY = fiscal year. NFS = National Forest System. NGO = nongovernmental organization

Consultations by FIA Staff

Consulting with FIA customers is a growing part of our business. Just as we have increased the amount of information (both data and analyses) made available on the Web, our FIA staff are increasingly in demand by customers seeking either to understand more about the FIA program and our results, or seeking to address a specific question not obviously addressed through other means. Questions pertaining to a single administrative unit (e.g., to a single State or national forest) often are referred to partners within that administrative unit (e.g., State foresters and national forest analytical staff) who can often provide better context and who prefer to maintain their contacts with their customers. When questions span multiple administrative units, FIA staff will try to help the customer find an answer. FIA does not compete with private-sector consultants; rather, we answer questions about our methods and help customers (including private consultants) use FIA data to answer their own or their clients' questions. Appendix table B-6 shows the number of significant consultations that FIA staff provided in FY 2015, by unit and by type of customer. A significant consultation is defined as any dialogue with a customer outside of FIA that requires more than 1 hour to address and that is not part of our normal course of business in collecting, analyzing, and reporting on FIA information.

Combined, FIA staff addressed 1,350 significant consultations, which required 13,806 staff hours to complete (table 5)—equivalent to 4 full-time staff years. Of the consultations, 557 were conducted with other government agencies, such as State agencies and other Federal agencies, accounting for 56 percent of the time. The staff also had internal discussions within the Forest Service. Other major client groups included academic clients (approximately 25 percent of the consultations and 25 percent of the time), industry (15 percent of the consultations and 7 percent of the time), and NGOs (9 percent of the consultations and 4 percent of the time). The data also show some regional variations. For example, State government organizations are consistently the major clients throughout the country. FIA data indicate that industry and academic customers are the second most prominent clients (appendix B-6).

Table 5. Number and hours of significant consultations by FIA staff, by customer group, FY 2015.

Customer group	Number	Percent	Hours	Percent
Academic	331	25%	3,431	25%
Government	557	41%	7,744	56%
Industry	205	15%	990	7%
NGO	115	9%	613	4%
NIPF	37	3%	170	1%
Media	22	2%	43	0%
Other	83	6%	816	6%
Total	**1,350**	**100%**	**13,806**	**100%**

FIA = Forest Inventory and Analysis. FY = fiscal year. NGO = nongovernmental organization. NIPF = nonindustrial private forest.

National Inventory and Monitoring Applications Center

The National Inventory and Monitoring Applications Center (NIMAC) was formed in 2006 during the merger of the North Central and Northeastern Research Stations. Although NIMAC is part of the Northern Research Station FIA program, it is responsible for providing national technical assistance on planning, conducting, processing, and analyzing forest inventories to FIA's broad range of customers, which include NFS other Federal agencies, State governments, and other countries.

National Forest System Collaboration

In FY 2002, the Deputy Chief for R&D and the Deputy Chief for the NFS signed an internal MOU providing for permanent inclusion of all national forest lands within the FIA program. This inclusion was a significant step forward for FIA customers, guaranteeing the availability of consistent FIA information across the entire United States. Under the terms of the agreement, NFS provides permanent funding to help cover the cost of the FIA program on their lands, and in return, the FIA program agrees to implement the program in a manner consistent with other forested lands within the same State and to load FIA data into the NFS vegetation database—FSVeg for use in forest planning and other landscape and regional assessments. FIA also provides advice for and assistance in developing forest and regional sampling protocols linked to FIA, and collaborates with national forests that want to contribute resources for additional sampling.

NFS continues to fund FIA's NIMAC to develop the Design and Analysis Toolkit for Inventory and Monitoring (DATIM). The design tool helps identify inventory information needs, sampling designs (including intensification of FIA samples), and the development of monitoring plans as part of NFS forest plans, as required by the new Planning Rule. The analytical tools enable NFS to quickly analyze an enhanced form of existing FIA data that better serves their needs by adding NFS attributes computed using the FVS. These analyses can be localized using GIS, and map attributes can be used in the analysis. DATIM received additional funding to develop online training modules for each of its tools. We released version 3 in 2015 and are developing version 4. These versions are currently available only to Forest Service employees. We hope to make version 5 available to all FIA customers in 2016.

With support from NIMAC, the Southern Region used the design tool to determine intensification plans for about one-half of the national forests in the region. The Southern Station FIA has supported the region with these intensifications through agreements with State partners. Funding has limited further intensification at this time. Similarly, the Eastern Region intensified the FIA sample on all forests. The Southern and Eastern Regions are interested in working with the existing and intensified FIA data to develop status and trend reports for all national forests.

In 2013, the Pacific Northwest Region FIA Information Management and Reporting staffs worked with the Pacific Northwest Region to conduct extensive quality assurance and load regional intensification data into FSVeg. The Pacific Southwest Region has expressed strong interest and support for the project. The Pacific Northwest and Pacific Southwest Regions continue to work with Pacific Northwest FIA to collaborate in crew training, contract administration, data collection, and data processing. The Northern Region and Intermountain Regions have collaborated with Rocky Mountain Region Internal West FIA, and the Alaska Region has collaborated with Pacific Northwest FIA, to further expand current FIA protocols to include collecting information on all land types, not just the forested portion. Both regions are using an intensification system that integrates with the Internal West FIA base data yet enables the regions to use NFS applications to collect intensified data and store them in the NFS vegetation database (FSVeg).

FIA is collaborating on an agency-wide effort to improve inventory, monitoring, and assessment, such as developing National Management Questions, which will be used to drive information needs. As part of the USDA all-land approach and the new Planning Rule, FIA data will be more heavily used by NFS and by other partners. For example, each national forest must now complete a Climate Scorecard—a significant portion of which can be addressed using FIA data. In collaboration with NASA and the Forest Service R&D Climate Change program, FIA has provided the scorecard results for all forests.

Based on feedback from the nine NFS regions, FIA is meeting many of the needs of NFS partners. The development of streamlined vegetation and DWM protocols for use on all plots has helped the western regions define and collect a consistent set of regional variables on NFS lands to meet their needs. More effort is needed in getting FIA data from NFS lands into the hands of NFS staff and in developing data presentations, analyses, and reports tailored to the specific needs of NFS managers. The DATIM developers are working to help automate this process and to create a more comprehensive and accessible database. FIA will continue to work on these issues in FY 2016. Increasing demands from NFS customers for additional forest planning data and increasing emphasis on individual forest and regional forest monitoring plans will likely require changes in current financial arrangements with NFS. Stronger funding support at the national level, including additional NFS funding for requirements beyond the core FIA program, would be needed.

The NFS inventory specialists continue to have the following priorities for the FIA program:

- Implement the annual system in all States.
- Collect data on all lands, including reserved lands and rangelands.
- Collect a full suite of vegetation and associated information.
- Transfer data from the National Information Management System into FSVeg within 1 year from the end of the data collection season.
- Follow standard protocols across all NFS lands.
- Allow for a la carte protocols with local and regional funding support.
- Allow for increasing the intensity of the core grid as needed.
- Provide an inventory compilation and analysis package that meets NFS business needs.
- NFS has participated in the process to help define the updated FIA strategic plan.

Other FIA Program Features

Urban Forest Inventory

The 2014 Farm Bill included direction for FIA to begin implementation of nationwide inventory of urban tree landscapes.

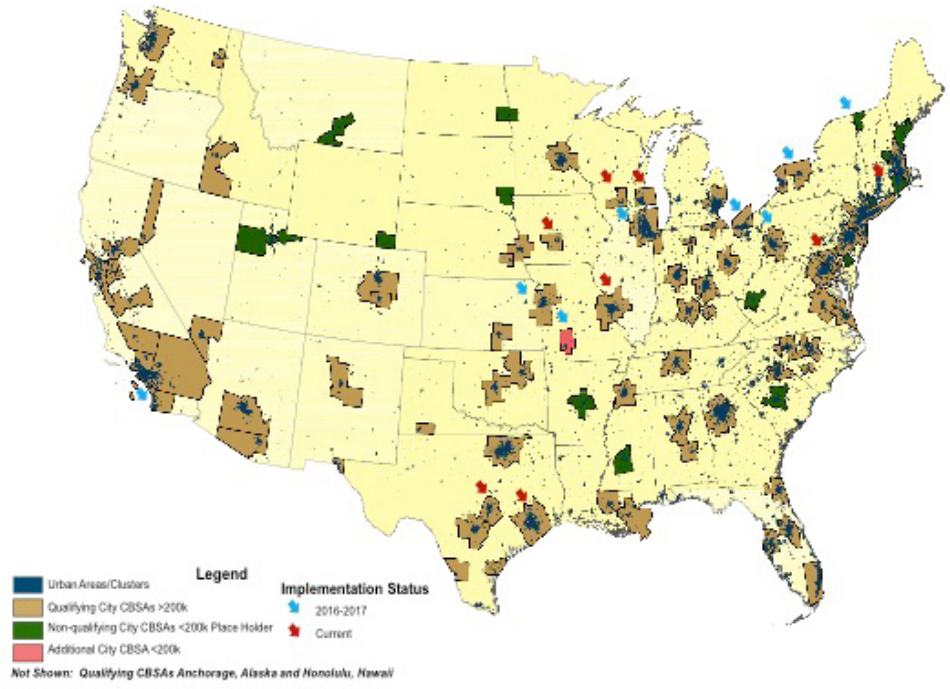
What is an urban forest? Urban forests are the trees and other vegetation growing along streets and waterways, around buildings, and in the backyards and parks of our cities and towns. They are critical to the function and livability of these human habitats. For the purposes of FIA sampling, urban forests are those treed areas nested within U.S. Census Bureau's core based statistical areas (metropolitan areas), urban areas and clusters, and city/places. The distribution of urban areas is seen on map in figure 28.

Why monitor urban trees? Urban trees and natural spaces are critical to human health and well-being. A neighborhood's trees moderate air and water pollution, reduce heating and cooling costs, and provide shade and shelter from the hot summer sun. Healthy trees can provide wildlife habitat and improve real estate values. Research shows that trees improve mental health, strengthen social connections, and reduce crime rates. Trees, parks, and other green spaces get people outside, helping to foster active living and neighborhood pride. We can all appreciate these benefits. The more we know about the trees in our cities and towns, the better we can nurture them and sustain their benefits. Yet, despite all their benefits and the need to know more about them, urban forests are not currently covered by a continuous wall-to-wall inventory and monitoring system like rural forests.

What is the Urban FIA plan? It is time to fill this information void by extending the FIA sampling frame to urban areas. The FIA plan is to begin with the metropolitan areas of two major cities, then add more city metropolitan areas as funding allows until all urban forests in the Nation are covered. Here is the current status of urban FIA:

- In 2014, FIA selected Baltimore, MD, and Austin, TX, as the first Urban FIA cities because of the Forest Service's established relationships with the City of Baltimore and the State of Texas. The expressed enthusiasm and willingness on the part of these long-standing partners to collabo-

Figure 28. Urban forest inventory implementation status in FY 2015 and FY 2016.



rate and ensure the effort's success made them a logical starting point. FIA's work in Baltimore and Austin has helped to refine Urban FIA methodologies and reporting and pave the way for the future cities to be added.

- In 2015, FIA continued to collect data collection in both Austin and Baltimore and expanded collection efforts to include Milwaukee and Madison, WI; Houston, TX; Des Moines, IA; Providence, RI; and St. Louis, MO.
- In 2016, FIA expects to expand data collection into Burlington, VT; Rochester, NY; Pittsburgh, PA; Cleveland, OH; Chicago, IL; as well as Kansas City and Springfield, MO.
- In 2017, FIA expects to add San Diego, CA, and continue conversations with additional cities across the Nation.

The project's initial and continued success would not have been possible without the overwhelming support from each city and State forester, Washington Office R&D Urban Research program, and the Northern and Southern Research Stations. Urban FIA and its cooperators are exploring various business models in terms of data collection around the country. The program is currently using Federal crews and contractors, mixed Federal/State crews, mixed Federal/university crews, as well as State crews and contractors.

Forest Products, Utilization, and National Woodland Owner Survey Studies

FIA is charged with monitoring and reporting on the status, condition, and trends of all the Nation's forests. Although plot-based field surveys provide most of this information, additional questionnaire and field-based surveys are conducted to report on TPO, fuelwood production, and characteristics and management objectives of the Nation's private woodland owners. The number of surveys is listed in appendix table B8, followed by a brief overview of each survey type.

Primary mill surveys. FIA conducts TPO studies to estimate industrial and nonindustrial uses of roundwood in a State. To estimate industrial uses of roundwood, all primary wood-using mills in a State are canvassed. TPO questionnaires are designed to determine location, size, and types of mills in a State; the volume of roundwood received by species and geographic origin; and the volume, type, and disposition of wood residues generated during primary processing.

Logging utilization studies. Logging utilization studies provide the information to convert TPO volumes to inventory volume. Utilization factors developed from the data translate a standard unit of product (1,000 board feet of sawlogs, one cord of pulpwood, etc.) into a common volume unit and type of tree harvested. Estimates are made of how much product came from sawtimber growing stock, poletimber growing stock, and nongrowing stock sources such as cull trees, dead trees, saplings, and limbwood. The overall process provides a cross-section of logging operations to characterize the sites logged, trees cut, products taken, and residues left behind.

More detailed information on forest products studies may be found in Smith (1991), Blyth and Smith (1979), and Morgan et al. (2005). Additional information and online data from all these surveys are available at http://www.fia.fs.fed.us.

Fuelwood surveys. Studies of fuelwood production from roundwood are necessary to provide information to forest managers and users about the fuelwood harvest and its effect on the resource. The amount and source of fuelwood harvested from forest land, urban areas, fence rows, windbreaks, or other sources are estimated from these studies.

National Woodland Owner Survey. The owners of forest land, working within biophysical, sociopolitical, and economical constraints, will ultimately determine the fate of our forests. As part of the FIA program, we implement the NWOS as a social complement to our biophysical forest inventory in order to better understand who owns the forest, why they own it, what they have done with it in the past, and what they intend to do with it in the future. This work is made possible through a joint venture with the University of Massachusetts-Amherst, which has enabled us to create the Family Forest Research Center (http://www.family-forestresearchcenter.org) and through which most NWOS personnel are employed.

We have processed the data from the latest (2011 through 2013) iteration of the NWOS. During this last iteration, we received responses from nearly 11,000 private forest ownerships and had a cooperation rate of over 50 percent. Current NWOS-related activities are focused on generating and disseminating the results. Accomplishments include:

- Creating an estimation engine and automated tools for generating tables and summary documents.
- Completing the final tables, including rerunning of the 2006 NWOS data for better comparisons.
- Publishing a brochure summarizing the results.
- Writing a general technical report that documents the design, implementation, and estimation techniques.
- Developing a resource bulletin containing summaries of all of the NWOS questions by State, region, and the Nation.
- Writing a journal article summarizing the results and examining trends over time.

Other products being worked on are a revamped NWOS Table Maker program, a one-page document summarizing the results for policymakers, two-page State-level summaries aimed at forestry agencies and other conservation professionals, articles for placement in landowner magazines and newsletters, and a series of peer-reviewed journal articles examining specific topics, such as landowner engagement. We are also working to build new tables in the FIA NIMS to permanently store all of the NWOS information.

Planning for the next iteration of NWOS is progressing with the Office of Management and Budget (OMB) approval package. The proposal for the next iteration of the NWOS ensures strong trend data in addition to using science modules to explore new topics, such as climate change, wildfire, and invasive species, and expanding to new populations, such as urban forest owners. We expect to begin collecting ownership survey data for the next cycle in 2017.

For updates and more information about NWOS, visit http://www.fia.fs.fed.us/nwos.

Other feature references:

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Ecosystem Health Indicator Surveys

FIA began implementing a nationwide, field-based forest ecosystem health indicator monitoring effort in the 1990s, and it currently collects forest health measures in 47 States. Most indicators are well documented in terms of sampling protocols, data management structures, and estimation procedures (Bechtold and Patterson 2005). Field data and indicators from most sample years are available online with numerous analytical examples published both internally and externally. Field protocols associated with each indicator are available in the National Core Field Guide (USDA Forest Service 2006).

Crown condition. Tree crowns are an important component of net primary production, and deteriorating foliage is a visible sign of stress that often precedes reduced growth and increased mortality. For this indicator, measurements are recorded on all sampled trees greater than 12.7-cm diameter at breast height, including uncompacted live crown ratio, crown diameter (for some years), crown density, foliage transparency, crown dieback, crown light exposure, and canopy position. The crown indicator is described in Schomaker et al. (2007).

Lichen communities. Long-term observation of epiphytic (i.e., treedwelling) lichen communities indicates changes in air quality, climate, and land use. For this indicator, field crews observe the presence of lichen species, estimate the abundance of each species, and collect specimens for identification by a specialist. Lichen community measurements are made within a 37-meter radius of each plot center (approximately 0.38-hectare area). The lichen indicator is described in Will-Wolf (2011).

Forest soils. Environmental stressors that interfere with soil function have the potential to influence the productivity, species composition, and hydrology of forest ecosystems.

For this indicator, crews complete ocular estimates of the percentage and type of soil compaction or erosion, and they check for the presence of restrictive layers within the top 50 cm of soil. The crew then collects five soil samples—three forest floor samples to measure organic matter and carbon content, and a mineral soil core collected at two depths: 0 to 10 cm and 10 to 20 cm. Soil samples are sent to the laboratory immediately after collection and stored for future physical and chemical analysis. The soils indicator is described in O'Neill et al. (2005) and Amacher and Perry (2010).

Vegetation diversity. The vegetation diversity and structure indicator is designed to evaluate the composition, abundance, and spatial arrangement of all vascular plants and for assessing wildlife habitat, site productivity, and the effects of invasive species. For this indicator, crews with previous botanical experience record both species and overall structural data for vascular plants, including their total canopy cover and cover in different height zones (0 to 2 m, 2 to 5 m, and more than 5 m). Specimens of species not readily identified in the field are collected for future identification by a specialist. The vegetation indicator is described in Schulz et al. (2010).

Down woody material. The DWM indicator is designed to estimate detrital aboveground biomass in the form of coarse woody debris, fine woody debris, litter, and duff pertaining to important fire, wildlife, and carbon issues. For this indicator, coarse woody debris (greater than 7.5 cm in diameter) is sampled on a series of transects across the plot totaling 88 m in length. Fine woody debris between 2.5 and 7.5 cm is sampled on a series of transects totaling 12 m in length. Fine woody debris less than 2.5 cm is sampled on a series of transects totaling 7 m in length. Duff and litter depth measurements are taken at 12 points located on the plot. The DWM indicator is described in Woodall and Monleon (2008).

Ozone injury. Ozone is a widely dispersed pollutant that reduces tree growth, changes species composition, and predisposes trees to insect attack and disease. Because ozone injury causes direct foliar injury to particular forest plant species, these species are used as bioindicators to identify the presence and severity of local air pollution. Ozone injury is not observed directly on the FIA plot network because indicator species are not always present and openings in the canopy are necessary to obtain useful results. For this indicator, crews evaluate up to 30 individual bioindicator plants for amount and severity of ozone damage. The ozone injury indicator is briefly described in Will-Wolf and Jovan (2008).

Other indicators. Other key indicators of forest health such as tree mortality and growth and the abundance of invasive and nonnative tree species are found in the basic plot data and subsequent remeasurements.

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Beyond Standing Trees: The Evolution of FIA Ecosystem Health Indicators

For more than a decade, FIA has conducted a so-called Phase 3 inventory program in which a subset of Phase 2 plots were sampled to characterize aspects of the forest other than standing trees using the previously listed indicators. FIA recently revised sampling techniques for these indicators in response to fluctuating budgets, the need for more efficient field operations, emerging user needs, and evolving forest health science.

Some of the new enhanced forest indicators of DWM, understory vegetation, and crown conditions) were implemented in FY 2013 in a "Phase 2 Plus Program/Ecosystem Indicator Program" (included, but not separate, in appendix table B7). The P2 sampling scheme facilitates the collection of a national core set of indicator information on more plots for less cost than the original indicator protocols, with sampling as a systematic subsample of each subpanel that can change in response to budgetary fluctuations (i.e., flexibility) without compromising long-term analytical capabilities. Although the enhanced indicator protocols collect less detailed information on each sampled plot, substantially more plots are sampled, potentially increasing the statistical power of future forest health analysis.

These changes represent a continuation of efforts to address current budget realities and adapt for the future while continuing to meet customer needs. FIA will work closely with clients to ensure a successful transition from the previous indicator program to a fully integrated Enhanced Forest Indicator Program that continues to provide a comprehensive survey of forest biomass, carbon pools, and ecosystem health in addition to the "traditional" function of the FIA program.

Special Partnerships Spanning Cultures

There are an estimated 18 million acres of tribal forest lands located on 305 reservations across 24 States, based on FIA data and reported in the 2013 report "Assessment of Indian Forests and Forest Management in the United States" (http://www.fs.fed.us/spf/tribalrelations/pubs_reports/). For management, tribes need a broad spectrum of information, from timber to fuel loading to wildlife habitat to surveys of forest stewardship objectives. Tribes realize these needs have environmental, social, and economic consequences related to forest sustainability and the unique place of forests in tribal life.

FIA is committed to developing partnerships with tribes and has assisted many tribes in assessing resource status, historical conditions, resource availability, and regional context for tribal forests. Recent efforts have included:

- Ongoing partnership with the Alaskan Native Chiefs to implement forest inventory in interior Alaska.
- Ongoing partnership with native Pacific Islanders to conduct inventory and monitoring work in the tropical Pacific Islands.
- Partnering with Ojibwa Tribes of the Great Lakes to assess the supply and quality of paper birch within the territories ceded in the treaties of 1836, 1837, 1842, and 1854.
- Creating custom databases for the Quinault Indian Nation and Sealaska Corporation in Alaska and Tribal Lands in Nevada.
- Providing data to quantify woodland resources for the San Carlos Apache Tribe, allowing managers to make informed decisions about tree-cutting regulations.
- Partnering with the Eastern Band of Cherokee Reservation to assist with timber cruising and prescribed burns.
- Examining traditional and nontraditional harvest methods for edible and medicinal forest products and their impacts on plant populations, in collaboration with Eastern Band of Cherokee, North Carolina Arboretum, and Virginia Tech University.
- The FIA Tribal Liaison, Rachel Riemann, participated the 2014 Shifting Seasons Summit held in Keshena, Wisconsin, a collaboration between the College of Menominee Nation's Sustainable Development Institute and Northern Arizona University's Institute for Tribal Environmental Professionals and Michigan State University.
- Collaborating with the Lac Courte Oreilles band of Ojibwe to revise and create environmental curricula for the primary and secondary schools.

FIA will continue to explore partnerships with tribes to better serve this community of users.

Program Safety

FIA takes safety very seriously and considers it a top priority. People in FIA cover hundreds of thousands of miles in travel each year while conducting business, and they work in very difficult terrain across all types of plant and forest communities. FIA remains focused on creating an entire workforce culture that seeks to protect FIA and our partner employees from daily exposure to hazards that threaten safety and health. Table 6 summarizes the program's safety record for FY 2015. Figures 20 and 21 show program safety trends by incident type for FY 2008 through FY 2015, followed by regional safety highlights for FIA units in FY 2015.

Standard safety training is mandatory and is conducted at each field unit. Safety training and equipment are provided for headquarters offices, field offices, and field crews, including driver training, first aid kits, and cell phones. In regions with special circumstances, such as the need for aircraft, access to large areas of wilderness, or exposure to potentially dangerous wildlife or remote difficult-to-access areas, additional training and equipment are provided. Information on specific safety training and criteria are available online at http://www.fia.fs.fed.us.

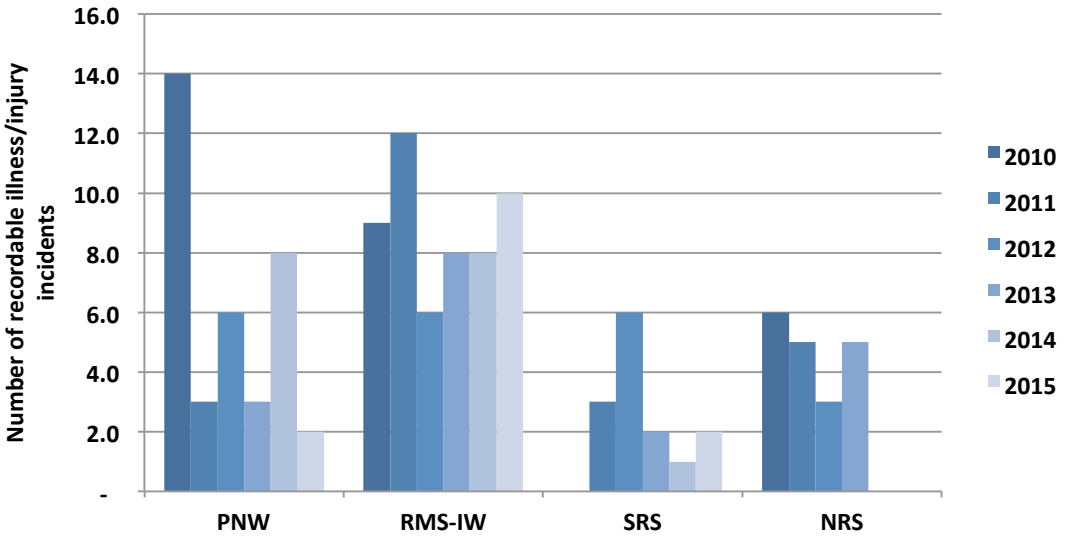
As a demonstration of our commitment to safety, FIA units have now completed three consecutive annual safety engagements as part of the ongoing Chief's Safety Journey, giving all employees a voice toward improving policies and procedures around safety.

Table 6. Base safety reference data, recordable incidents, and incident frequency by FIA unit, FY 2015.

	FIA Unit					
Category	**PNW**	**RMS-IW**	**SRS**	**NRS**	**NO**	**Total**
Base data						
Federal FTE equivalents[a]	76	86	78	95	4	338
Total estimated hours worked[b]	157,872	179,088	161,907	196,768	8,320	703,955
Total vehicle miles driven	329,675	580,322	706,352	768,536		2,384,885
Total flight hours logged	189	44	-	-	-	233
Recordable incidents by class						
Time lost illness/injury incidents	2	10	2	-	-	14
Motor vehicle accidents	5	1	2	1	-	9
Aircraft accidents	-	-	-	-	-	-
Safety incident frequency rate						
Time lost illness/injury rate per 100 FTEs	2.6	11.6	2.6	-	-	4.1
Motor vehicle accidents per million miles driven	15.2	1.7	2.8	1.3	-	3.8
Aircraft accidents per 100,000 flight hours	-	-	-	-	-	-

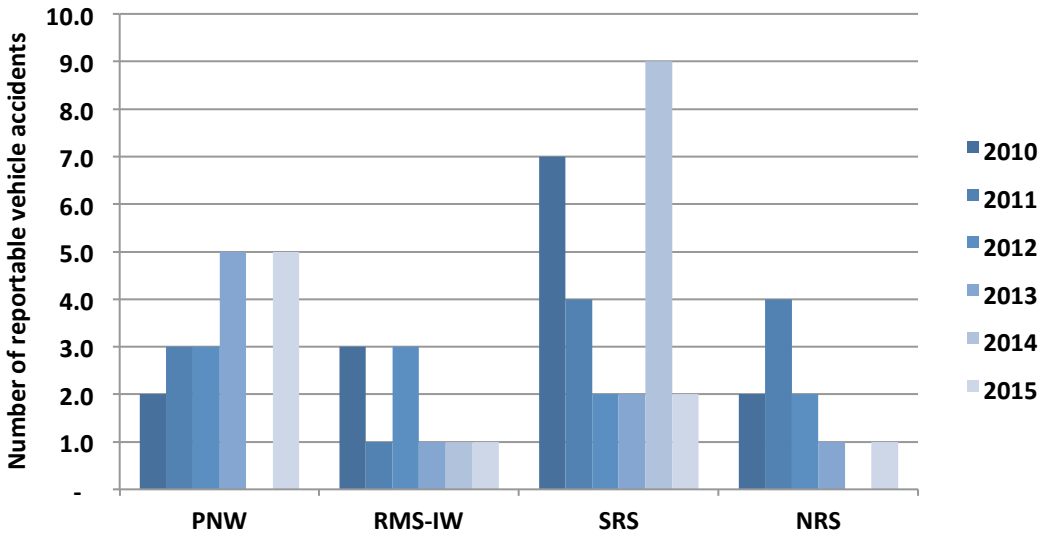
FIA = Forest Inventory and Analysis. FY = fiscal year.
[a] Based on appendix table B-3 number of Federal employee estimated full-time equivalents (FTEs).
[b] Based on appendix table B-3 number of Federal employees times 2,080 hours per FTE; small percentage of overtime not included in estimate.

Figure 29. Number of recordable illness and injury incidents by FIA unit, FYs 2010–2015.



FIA = Forest Inventory and Analysis. FY = fiscal year. NRS = Northern Research Station. PNW = Pacific Northwest Research Station. RMS = Rocky Mountain Research Station. SRS = Southern Research Station.
Notes: Work-related injury or illness resulting in any of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, and loss of consciousness. Value for NRS for FYs 2009 and 2010 is 0.

Figure 30. Number of reportable motor vehicle accidents by FIA unit, FYs 2010–2015.



FIA = Forest Inventory and Analysis. FY = fiscal year. NRS = Northern Research Station. PNW = Pacific Northwest Research Station. RMS = Rocky Mountain Research Station. SRS = Southern Research Station.
Notes: Any occurrence involving the use of a Government-owned or Government-leased motor vehicle (automobile, truck, or bus) that results in a total combined damage of $500 or more. This definition also applies to privately owned vehicles when used on official Government business.

Regional Safety Highlights for FY 2015

Northern Research Station FIA Safety Highlights

Northern Research Station FIA continues to have staff involved in safety committees at the unit and station levels. Ongoing safety training continued with the completion of the annual Cardio-Pulmonary Resuscitation/first aid/driver's training for office and field staff. Earlier in the year, hands-on self-defense training was completed by all field staff. To ensure continued certification, field staff attended two regional Wilderness First Aid courses.

Specific accomplishments include the following:

- Updated Job Hazard Analyses (JHAs) and included it on the Northern Research Station FIA Web site.
- Created a new Urban Field Data Collection JHA for the added urban plots the field crews are completing.
- Reviewed all levels of station FIA staff and signed the specific JHAs that applied to their position.
- Provided safety-toed boots to all field staff who will be completing wood utilization plots as a proactive measure to prevent foot and ankle injuries on active logging sites.
- Required all field staff to take a USDA online course on fire extinguisher use.

There is a continued effort to replace safety items that expire or are depleted. New replacement first aid kits were purchased for all field offices, vehicles, and field backpacks. Hard hats are replaced every 2 years for all field staff due to extensive use and exposure and every 5 years for office staff. Safety glasses and gloves are replaced as needed. Sunscreen, insect repellent, hydration drink powder, and hand warmers are provided as needed.

The FIA Safety Team was able to obtain approval to offer aerosol defense spray to field staff who choose to carry canisters for defense against wild and domesticated animals. Two field supervisors attended training on the proper use of the defense spray. All field employees are scheduled to receive training from their respective field supervisors regardless of whether they choose to carry a canister. After completing training, all field staff will sign the Aerosol Defensive Spray JHA.

FIA continues to have an active full-time dispatcher to monitor scheduled or landowner contact check-ins via the Satellite Emergency Notification Device (SEND), cell phone text messages, phone calls, or smartphone emails. One individual is the primary dispatcher, but when that individual is scheduled to work in the field or is on leave, other field employees or supervisors fill in so the dispatcher role is never unoccupied. A successful SEND drill was conducted during 2015.

The Data Collection Team (DCT), group lead, and field supervisors conduct a weekly call that includes safety planning, safety equipment, injuries or near-misses, and safety training schedules. Ensuring that employee contact and health information is current, this group oversaw an effort that included notification information if a crewmember was delayed in the field and wouldn't return home at his or her normal schedule. The DCT initiated having plot location imagery included in the MIDAS Data Collection Web site. Prior to this, if a crewmember were lost or injured and an image needed to be obtained, someone from St. Paul, MN, would have had to provide it. With this new addition, any crewmember can obtain the image.

The St. Paul Wellness Committee continues with active FIA involvement. Many employees are involved in the weekly walking club or take part in the wellness reimbursement program. In a continuous effort to get sedentary employees moving, four more standup stations were purchased.

Pacific Northwest Research Station FIA Safety Highlights

The FIA unit of the Pacific Northwest Research Station Resource Monitoring and Assessment Program continues its commitment to a culture of safety and wellness to improve the lives of employees by strengthening our program of work. This year, empowered and engaged employees provided valuable input to refine our existing safety systems using annual safety surveys and near-miss reporting, and our communication and field procedures evolved in an unpredictable fire season.

Preparation and Learning. Near misses continued to be reviewed regularly by the safety committee and the leadership team as a proactive approach to potentially prevent new

incidents from occurring. Dangers from driving continued to generate the greatest number of near misses for the DCT in Washington, Oregon, and California, so the team hosted a hands-on, peer-facilitated "driving rodeo" at the annual spring training. Various stations at the rodeo dealt with skills such as how to put chains on a tire to how to effectively give feedback to coworkers regarding driving habits and safety.

The Coastal Alaska project embraces the spirit of the Near Miss program on a daily basis by reviewing concerns, hazards, and activities from the previous workday during morning briefings. This has not been well reflected in near-miss submissions because of the lack of Internet access in the field. As a result, they are developing a new model to track near misses from the morning briefing discussion. Sharing and tracking this information in a near-miss format will assist others in learning from past experience, heighten awareness, and provide a new way to review options for risk mitigation.

The Data Collection South Team Leader won the Pacific Northwest Station Director's Excellence in Safety Award for the progressive handling of safety in the face of an unprecedented fire season in 2015. It was recognized that fire behavior was far different than in the past and that current safety procedures may not be adequate. The team leader echoed the station's safety stand down, and the team drafted a new set of procedures, incorporating information such as fuel moisture readings, smoke forecasts, and flammability indexes. With this information, staff were moved out of areas hazardous due to risk of rapid spread of new ignitions or unhealthy levels of smoke.

Portland and Alaska office staff participated in the Great Shakeout Earthquake drill, an earthquake preparedness seminar, and active shooter awareness training. These events engaged employees and increased awareness of the importance of physical and mental preparedness in the face of potential natural disasters or violence in the workplace.

Thirty-one of our employees walked more safely in FY 2015 by taking advantage of the Forest Service Safety Boot Reimbursement program. Suggestions for such a program were voiced on numerous occasions, particularly on our annual safety survey, so a formal safety boot program implemented at the national level was welcomed.

In the past, the Alaska team has tried to provide a "water ditching" course to FIA employees through an outside source. In 2015, we were able to qualify one of our own as a certified trainer for the course. The course is important with the amount of overwater flying the coastal inventory requires. This solution will help provide the specialized training not only in-house, but to other employees within the Alaska Region.

Strategic Risk and Awareness. The FIA unit continues to review and update JHAs annually. In 2015, a collaborative effort was made to author a new JHA for river crossing and working in stream beds, using an innovative risk assessment matrix developed by one of our field crew leaders. A paddle craft JHA was created for the unusual event that our staff would be floating to plot.

The Alaska team annually prepares Project Aviation Safety Plans for any project involving aviation. This year, three FIA aviation operations were evaluated: (1) a helicopter reconnaissance project in Hawaii to determine if plots previously determined to be inaccessible via ground could be accessed, (2) completion of the Hawaii plots determined to be accessible via helicopter, and (3) the basic Coastal Alaska project. Each project had unique safety challenges and included risk assessments and mitigations to ensure the safety of employees.

We developed the Emergency Action Plans for all Alaska FIA projects, including Coastal Alaska, Hawaii, and the Pacific Islands.

The Resource Monitoring and Assessment Program safety newsletter got a facelift this year. A new, condensed version titled "The Careful Cliff Notes" is sent out monthly, highlighting pertinent near misses, wellness, and safety information.

Agreements. This year a Web-based version of the check-in check-out system was piloted to replace the increasingly error-prone telephone-based version. Collaboration with the Interior West Research Station FIA has led to innovation with two-way SEND communication devices in the field, and a pilot was initiated to complement the Pacific Northwest Research Station FIA safety communication plan.

The Alaska team has made strides in improving the safety and wellness of employees on a number of fronts, including a successful overtime cap in our Pacific Islands (with employees appreciating this work/life balance), and a strategy to do the same for the Coastal Alaska project in the coming year.

A new, exclusive-use boat and helicopter contract awarded for the Coastal Alaska project greatly improved the safety of our operation and the wellness of our crews. Moving away from a vendor that had been used for 20 years was not easy, but the benefits were immediately apparent with a stepped-up eye on safety, professionalism, and service provided by the new vendor.

The safer we are, the more successful we are.
The concept of wellness and safety going hand in hand has become commonly accepted. In FY 2015, many employees

successfully completed the fourth annual Station Wellness Challenge. The station's wellness plan is becoming more popular as employees and managers value wellness and work/life balance as integral pieces of a productive and healthy workforce.

The FIA units have put the concept of resiliency into action, embodying a commitment to safety and wellness. Introduced during the most recent round of the Chief's safety learning journey, resiliency (as it relates to wellness and stress management) is being woven into the safety culture.

We continue to update our JHAs annually. This year, we worked with the Pacific Northwest Station Safety and Health Manager Tammy Verhunc on a pilot template JHA that includes risk analysis. We explored the hazards of working in areas where wildfire may become active. Our team also created a new JHA for canoe travel on flat water.

We reformatted our field notes to include dedicated space for crews to document information regarding worksite hazards. This format was developed to ensure future crews are aware of hazards when planning reentry this season or at the next cycle.

Agreements. Our check-in and checkout system for all staff was further refined, incorporating input from both office and field employees for streamlining the process and closing perceived gaps. This refinement sparked an initiative to improve communication between remote field staff and NFS units they may be working in or passing through while conducting the inventory. Now crews have points of contact at each NFS unit to notify while working in the area to help improve response times if an emergency arises.

Our crews in Alaska face unique challenges when traveling by helicopter. We have mitigated safety concerns by implementing a dedicated follower for helicopter operations while conducting fieldwork in interior Alaska instead of relying on a remote dispatch unit hundreds of miles away in Anchorage. We also outfitted a significant mobile emergency/trauma kit for use at the base of helicopter operations. Our helicopter contract was amended to include an onsite, on-duty helicopter mechanic for daily maintenance and safety inspections at our remote base locations.

Alaska office personnel are working with municipal officials in Anchorage to try to install crosswalks across the busy street between the office building and the parking lots. The Anchorage Lab conducted an analysis of egress routes from the lab building in the event of an emergency that requires exiting to higher ground. The analysis included an assessment of access feasibility and hazards of all available routes that one could follow to get out of the low-lying area where the Anchorage Lab is located. We also participate in the Great Alaska Shakeout earthquake drill and awareness, which takes place annually in October. The Anchorage Lab updated its phone tree list to be kept in emergency kits.

This year was our first experience using the new "conversation and discussion-based Safety Program Evaluation Checklist (SPEC) review," and we piloted an approach for electronically filling out documentation. This project engaged a representative from all teams in our program, and not only did we score an "Outstanding" rating, but we also received kudos from the Station Safety and Health Manager for "the best SPEC binder assembled by a program since [she] started conducting these reviews." This review process gives a baseline of the success of our safety program. It enables us to identify areas in which we are excelling (like providing and evaluating safety training) and areas that could be improved (such as safety training attendance tracking). Reflecting on the SPEC review, learning from other FIA units around the country, compiling results from the most recent safety survey, and continuing to focus on near-miss reports will help direct our efforts toward an even safer and healthier FY 2016.

Rocky Mountain Research Station, Interior West FIA Safety Highlights

The Rocky Mountain Research Station Interior West FIA Program is committed to developing a proactive safety culture by modeling and reinforcing safety as our core individual and organizational value. This goal requires building trust, learning from and sharing our mistakes, understanding human performance, and thoughtful, intentional response to people, situations, and accidents. Our focus is people.

This year the program rolled out its Field Safety Skill Sets, which include a training guide, checklist, and pocket cards. The skill sets define safety-related training standards and areas of responsibility, set curriculum, and establish certification methods for the Interior West FIA Program. The skills it addresses are critical to safety, and some have not previously been trained or tracked, such as properly fitting a backpack or aerial photography interpretation–invaluable but sometimes not intentionally addressed skills. We seek to ensure employees possess this group of essential skills. The training guide serves as a framework and a syllabus for employees conducting training for new employees and can be used to certify that returning employees have the necessary skills to perform their duties safely.

The program continued to engage employees in ongoing safety improvement projects. The field equipment team was tasked with improving field equipment, including communications tools. This year, the team implemented

several new communications tools. The program equipped every field-going employee with his or her own inReach SE, a new SEND device with greater technology capabilities than the previously used Satellite Positioning and Tracking (SPOT) devices. The inReach not only give users the ability to check in from remote areas providing message recipients with up-to-date location information, but also allows for tracking and is equipped to send and receive custom SMS (Short Message Service) text messages. Older satellite phones are slowly being replaced with satellite phones that are GPS (Global Positioning System)-enabled, able to send text messages, and have a one-touch emergency SOS button. The team reduced the weight crew leaders had to carry daily by replacing the hardcopy manuals, identification books, reference materials, and cameras with either a tablet or large smart phone. The tablets also provide another navigation aide for crews, and as applications continue to develop, will surely provide other functions.

Another project team focused on improving and streamlining the plot planning process for employees. This team developed a best practices guide for plot planning called Plot Planning Tips as well as a document to assist crew leaders with mastering their numerous responsibilities. The plot planning team also reviewed the process by which plot packets are created and distributed and identified possibilities for reducing the time required for distribution.

The program had very few vehicle-related and no backing accidents reported this year. Although driving remains our highest risk activity, most injuries are associated with slips, trips, and falls and the repetitive motions of hiking. Though the program had a similar number of injuries reported as previous years, there were no lost workdays and fewer light-duty days recorded, meaning the injuries were less serious or perhaps reported earlier before injuries could become more serious. Proper conditioning, cross-training muscle groups, stretching, varying workloads, and proper equipment (e.g., good quality hiking boots and hiking poles) are key to preventing these injuries. The program fully embraced the national safety-boot reimbursement program and even set standards for minimally qualified boots to further help reduce injuries. The program encourages all field-going employees to use this benefit.

Increasing the sharing of personal safety experiences and building trusting relationships remains a focus for the FIA program. Throughout the year, many employees shared work and personal near-miss and accident stories through our monthly newsletter and other means. Program leadership made multiple field visits with the data collection team that proved to be very fruitful. People remain our strongest defense against accidents and injuries. We will continue to focus on systematically preparing our employees for the risks to which we are exposed through planning and analysis, training, employee involvement and empowerment, hazard recognition, prevention and reduction, and sharing and learning from our experiences.

Southern Research Station FIA Safety Highlights

The Southern Research Station FIA remains committed to developing and maintaining a proactive safety culture by reinforcing safety as a core value. We continue to learn from mistakes and empower ourselves to identify, communicate, and minimize risk. The Safety Committee elected a new chair and vice-chair for the year, and continues to be active, meeting once a month, and soliciting suggestions and discussion items from everyone in the unit prior to each meeting.

We took advantage of the 2015 Safety Engagement to gather all field personnel and some office personnel for an extended period of training and discussions around safety and other topics. We discussed items such as defensive sprays, working along the Texas-Mexico border and other remote areas that present safety and communication challenges, and hazardous weather policy. Field employees expressed a desire for defensive sprays when encountering animals. A risk analysis was completed, taking into account frequency of attacks, risks associated with sprays, and several other factors. We interpreted the Health and Safety Code Handbook (FSH 6709.11) as allowing use of defensive sprays on Federal lands only with station director approval. To date, use of defensive sprays in Southern Research Station FIA has not been approved by management. Although with recent developments at Northern Research Station, we are collaborating with the management and safety staff and reexamining this issue. We hope to have final resolution in FY 2016. Vehicle replacements were also discussed, with about half our employees asking for smaller pickups because of the small country back roads they work in. However, we are sometimes restricted in what we can offer. In FY 2015, we were unable to obtain small pickup models, but this changes from year to year. Our hazardous weather policy was discussed, and field employees were encouraged to contact their supervisors if they felt local road conditions in their region/State were dangerous. Employees asked if they could be contacted when the Knoxville, TN, office was closed. Our safety and occupational health specialist will contact them by text beginning in FY 2016.

In 2015, we were able to begin equipping field vehicles with backup cameras as they have become a reasonably priced option on new vehicles. While still obeying Forest Service instructions on clearing a vehicle before moving, we do believe that the cameras will reduce backing incidents in the future. All our FIA vehicles purchased in FY 2016 and

following fiscal years will be equipped with this feature, budgets permitting.

We conducted a risk analysis on working in remote areas, such as southern Texas near the border with Mexico, taking into account as many means of maintaining communication and mitigating risk as possible. We developed a JHA specific to working in remote and/or potentially hazardous areas that includes SPOT device tracking usage as well as increased communication with local law enforcement such as border patrol and/or sheriff departments. We also elected to purchase a satellite phone and make it available for crews working in areas where other means of communication are not sufficient. These measures, along with continuing education and training, will help our personnel maintain communication and remain safe as they do their work. We are looking forward to deploying new SPOT technology in FY 2016 as these instruments provide texting capability as an expanded functionality. With our current SPOT devices, we have added email and phone alerts for employees so they have confirmation that messages were successfully sent.

One of our quality assurance foresters brought forth concerns about the condition of our boat fleet during FY 2015, with specific concerns about our Boston Whaler and suggestions for a checklist for when boats change possession. Our data acquisition leadership gathered additional input and ideas from staff. We conducted another thorough inventory of our boat equipment and personal protective equipment, following up on an effort that began in FY 2014. We purchased new floatation devices and upgraded our life vests. We are looking into options for covered storage of our boats when they are not in use to better maintain the boats and the equipment that accompanies them. As a result of discussions within the Safety Committee, we are considering Coast Guard boating safety training for all of our personnel in addition to the basic boat safety training that we provide.

Our tick collection project in cooperation with the University of Tennessee continues to pay dividends. A subset of collected ticks are being screened for various tick-borne diseases. Recently, two species of ticks, previously unknown in the region, were found in Texas and Florida. A poster on the project was presented at the Southern Forest Insect Work Conference, July 21–24, Fayetteville, AR. We continue to encourage our employees to collect ticks as they are encountered without interfering with regular work duties. Outside funding is being sought to potentially expand the collection effort beyond Federal crews.

Looking ahead, we have two major training efforts in the works for 2016. In conjunction with the upcoming Safety Engagement, we intend to conduct an indepth session on Wilderness Recovery and First Aid. We feel this class would be very beneficial should an employee get into a difficult situation while working in a remote area. Working in the office is also not without risks. With active shooter incidents in the news, we are considering local law enforcement or Federal Bureau of Investigation training to provide our office employees training on what to do in such a situation. While we believe we are relatively secure in our Knoxville location, we want to be prepared for any situation. The Safety Committee familiarized itself with the Safety Management Systems approach but did not close this effort out in FY 2015. We will make it a priority in FY 2016. Much discussion took place around a draft charter for the committee, and many iterations were circulated—this is another effort that will conclude in FY 2016.

Comparing FY 2014 Plans With FY 2015 Accomplishments and FY 2016 Plans

In the FY 2014 business report for FIA, we included a section stating our plans for FY 2015. In the following table, we show how our actions in FY 2015 matched our plans from FY 2014 and our plans for FY 2016.

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Base Inventory and Reporting		
Continue base inventories in 49 States, coastal Alaska, and Tanana Valley inventory in interior Alaska as budget allows.	Continued base inventories in 49 States and initiated inventory in Tanana Valley, AK.	Continue base inventories in 49 States and Tanana Valley, AK.
Publish 5-year State reports for Arizona, Arkansas, Colorado, Connecticut/ Rhode Island/ Massachusetts (combined), Florida, Georgia, Indiana, Iowa, Louisiana, Maine, Minnesota, Mississippi, Missouri, Nevada, New York, North Carolina, Oregon, South Carolina, Utah, and Washington, and for American Samoa.	Published 5-year reports for Arkansas, California, Colorado, Connecticut/ Rhode Island/ Massachusetts (combined), Georgia (2009), Indiana, Iowa, Maine, Minnesota, Mississippi, Missouri, Nevada, New York, North Carolina, South Carolina, Utah, and West Virginia. Publications for Florida, Louisiana, Oregon, Washington, and American Samoa were delayed due to personnel losses and realignments of duties.	Publish 5-year State reports for American Samoa, Arizona, Delaware, Florida, Georgia (2014), Idaho, Louisiana, Maryland, Michigan, Montana, New Jersey, North Dakota, Oregon, Pennsylvania, Washington, and Wisconsin.
Continue the interior Alaska inventory on a smaller scale in 2015. Approximately 30 to 40 plots are planned.	Completed additional FIA plots in interior Alaska that are co-located on historical Annual Resource Inventory System plots. This was a cooperative venture with the State of Alaska and University of Alaska, Fairbanks.	Continue the interior Alaska inventory in cooperation with the State of Alaska, University of Alaska Fairbanks, and National Aeronautics and Space Administration.
Remeasure the Commonwealth of the Northern Mariana Islands (CNMI) in 2015.	Completed remeasurement of CNMI in March 2015.	Remeasure FIA plots in the Federated States of Micronesia and implement the Micronesia Challenge.
Propose recommendations for incorporating modified protocols nationally and submit change proposals as needed.	Implemented modified protocols for down wood, vegetation, and crowns in the East. Compiled recommendations for modified protocols for the Ecosystem Indicators and presented to the regions for evaluation.	Continue implementing modified protocols for down wood, vegetation, and crowns in the East. Evaluate proposed regional modifications to the Ecosystem Indicators for sampling intensity and assessment levels, combine final recommendations, and submit official change proposals to national FIA teams (Bands) for consideration.
Continue implementing modified protocols for soils in the North.	Implemented soil remeasurement along with a power analysis of change detection.	Recommend protocol adaptations based upon the power analysis.
Initiate standard FIA reporting templates for 5-year reports for use nationally.	Continued efforts to streamline and standardize content in 5-year reports to facilitate timely delivery and maintain a consistent look to FIA publications. Standard templates have proven to be difficult.	Continue work by Analysis Band to examine ways to streamline and standardize report content and data delivery.
Respond to questions from Congress and stakeholders regarding the new strategic plan.	Vetted the FIA Strategic Plan, required by the Farm Bill, by the agency and U.S. Department of Agriculture (USDA) and sent it to Congress in March 2015.	Begin implementation of strategic plan.

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
National Woodland Owner Surveys and Timber Products Surveys		
Continue to load and process all regional timber product output (TPO) data into the national TPO data management and processing system.	Loaded and processed all regional TPO data into the national TPO data management and processing system.	Continue to implement national TPO data management and processing system and deploy the data query system.
Publish 2012 National Pulpwood Report; begin work on 2013 National Pulpwood Report. Deploy the national TPO data query system.	National pulpwood reports were delayed. Published State and regional reports for Alaska 2011, California 2012, South Carolina 2011, and the Southern Pulpwood Report for 2012. Oregon 2013 TPO data were loaded and processed.	Publish 2012 and 2013 National Pulpwood Reports, Oregon 2013 TPO, Hawaii nontimber forest product report, Southern Pulpwood Report for 2013, and 2013 Southern States TPO update. Data collection is ongoing for all Pacific Northwest States.
Implement the beta version of the large corporate forest ownership survey.	Designed the corporate ownership survey and are awaiting approval from the Office of Management and Budget (OMB) to test and implement.	Finalize implementation of corporate ownership survey and publish documentation.
Publish the National Woodland Owners Survey (NWOS) tables, documents, and other basic materials.	Published the basic summary brochure (NRS-INF-31-15) and submitted summary tables, overview journal articles, and documentation for publication.	Prepare and publish additional summary materials and journal articles. Work with landowner organizations and others to prepare outreach materials.
Launch the revised NWOS online data access tool and incorporate NWOS data into FIA's National Information Management System (NIMS).	Started updating the NWOS online tool and made progress in integrating the NWOS data into NIMS.	Update and release the next iteration of the NWOS TableMaker tool.
Submit NWOS review package to OMB.	Submitted the NWOS package to OMB.	Obtain OMB approval and implement new NWOS and continue integration of the NWOS into NIMS.
Continue to work with partners to further the analysis of NWOS.	Worked with scientists within and outside the Forest Service to analyze specific ownership topics.	Pre-test the questionnaires, including the base survey, urban survey, and corporate survey, contingent upon receiving OMB approval. Begin logistical preparations for getting the NWOS back in the field in FY 2017. Identify States interested in collaborating (i.e., intensifying and customizing). Obtain and update national parcel ownership data and create a standardized list of large private forest ownerships. Add a new condition-level Timber Investment Management Organization/ Real Estate Investment Trust (TIMO/ REIT) variable into NIMS.
Urban Inventory		
Determine cause for Colorado delays processing iTree data and move to get preliminary data to Rocky Mountain Research Station, Interior West FIA unit. Process the data and prepare report on Urban FIA pilot work in Colorado.	This subproject has been terminated.	

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Publish an urban report for Austin, TX, and continue urban activity in Austin, TX, and Baltimore, MD. Expand monitoring to Milwaukee, WI; Providence, RI; and Houston, TX.	Completed and published the first Urban FIA report—"Urban Forests of Austin." Continued urban activity in Austin, TX, and Baltimore, MD, and expanded monitoring to Houston, TX; Milwaukee and Madison, WI; Providence, RI; Des Moines, IA; and St. Louis, MO.	Continue urban monitoring activities in Austin and Houston TX; Baltimore, MD; Milwaukee and Madison, WI; Des Moines, IA; and St. Louis, MO, as well as expand urban monitoring activities into Springfield and Kansas City, MO; Chicago, IL; Cleveland, OH; Pittsburgh, PA; Rochester, NY; and Burlington, VT. Initiate statewide urban areas inventories in both Wisconsin and Vermont. Publish Austin report and prepare Houston report for publication.
Remote Sensing Projects		
Develop new uncertainty measures for gradient nearest neighbor (GNN) imputation maps based on bootstrapping, which can help guide map users.	Used nonparametric bootstrapping to assess uncertainty at the pixel-level (0.22 acres) in forest attribute maps based on GNN imputation in western Oregon where geographic variation in management, biogeography, and disturbance all appear to contribute to variability in mapped estimates of forest structure.	Implement uncertainty mapping to the GNN workflow for map production, resulting in maps of estimated precision across Pacific Northwest forests for a subset of forest attributes.
Complete full production of National Land Cover Dataset (NLCD) Tree Canopy Cover data for contiguous United States and conduct NLCD Tree Canopy Cover project with California, Oregon, and Washington.	Completed full production of NLCD Tree Canopy Cover data for contiguous United States. In collaboration with the Remote Sensing Applications Center and Virginia Tech, started methodological testing in two pilot areas for the NLCD 2015 Tree Canopy Cover product, including change in cover. Freeman, E.A.; Moisen, G.G.; Coulston, J.W.; Wilson, B.T. 2015. Random forests and stochastic gradient boosting for predicting tree canopy cover: comparing tuning processes and model performance. Canadian Journal of Forest Research. (Published on the Web on 4 August 2015).	Finalize methods and implement nationwide production. Publish article in Photogrammetric Engineering and Remote Sensing journal.
Implement the Image-based Change Estimation (ICE) project in California, Maryland, New Hampshire, Texas, Vermont, and Utah.	Began implementation of ICE in Maryland, New Hampshire, Texas, Vermont, and Utah. California was delayed.	Complete implementation of ICE in Maryland, New Hampshire, Texas, Vermont, and Utah. Begin ICE implementation in States across the country where National Agriculture Imagery Program imagery was flown in FY 2015.
Complete publications and datasets resulting from the collaborative North American Forest Database project, mapping annual forest disturbance and cause during the past 25 years (Rocky Mountain Research Station).	Produced the beta version of nationwide dataset of annual forest disturbance agents at 30 m resolution 1984–2011. Drafted two methods papers. Partnered with three research groups to test the nationwide attribution product in carbon and forest futures applications. Began work on using attribution map and by-products in FIA estimation.	Publish papers describing how the nationwide attribution product was built, publish the national attribution dataset, and develop an estimation algorithm for incorporating this product in estimates of forest population totals and change. Continue to work with existing and new partners on use of this new data.

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Continue collaborative work under the Landscape Change Monitoring System, an interagency effort to integrate disturbance data (Rocky Mountain Research Station and Pacific Northwest Research Station).	Finished pilot studies across six areas of the United States, cooperating with several Federal and non-Federal partners. Established a new way to integrate alternative maps to produce a better product. Worked with Google, contributing code and expert advice, to enable cloud processing of Landsat time series. Finalized with U.S. Geological Survey a shared reference data collection process to cover the entire United States.	Map historical change across the United States through Google Earth Engine using seven alternative algorithms and the Landsat archive. Begin implementation of shared data collection process, nationally. Publish papers on study results. Collaborate with SilvaCarbon, the official Federal contribution to international carbon monitoring, to expand change detection maps internationally.
Forest Carbon		
Compile and analyze the field remote-sensing data collected in the Tanana Valley in 2014. Statistical estimators for a multilevel sampling design—using both field and remote-sensing data—will be developed and used to report status of forest resources.	Compiled and analyzed remote sensing and field data collected in the 2014 Tanana study. Compared and evaluated several statistical estimators for this multilevel sampling design—including both design-based and model-based approaches.	Publish results from Tanana study and use results to inform future plans for FIA inventory in interior Alaska.
In cooperation with the University of Washington, establish 250 to 300 (total) specialized plots within the LIDAR strips that will be used to develop LIDAR-biomass predictive models.	Established approximately 300 field plots at six sites throughout the United States (South Carolina, New Jersey, Maine, Minnesota, Colorado, Oregon) and used them in combination with LIDAR and Landsat satellite imagery to develop predictive models for aboveground biomass.	Analyze both model-based and model-assisted approaches to LIDAR-based estimation of aboveground biomass using field and remote sensing data. Use results from this study to inform the development of REDD+MRV programs—Reducing Emissions from Deforestation and Forest Degradation in Developing Countries+Measurement, Reporting, and Verification—in developing countries. Specialized field data will be integrated with LIDAR data and Landsat time series data to estimate carbon stocks back to a 1990 baseline.
Continue implementing the Forest Carbon Management Framework (ForCaMF), helping National Forest System (NFS) include carbon assessment in the planning process as mandated by the Climate Change Performance Scorecard and the new Planning Rule.	Completed carbon assessments for NFS Northern, Southern, and Pacific Southwest Regions. Completed mapping and Forest Vegetation Simulator work for all regions. Ported computing system to Amazon Cloud Services to alleviate processing bottleneck. Conducted several tech transfer activities, appraising national forest planners of ForCaMF reports.	Roll out ForCaMF results for all regions, working with Office of Sustainability and each region. Prepare publication summarizing, nationally, the relative impact of different types of disturbance and management on national forest carbon storage.
Initiate collaborative project translating forest change to carbon emissions/removals and linking disturbance projects, biomass maps, and carbon cycle modeling in a comprehensive carbon monitoring framework.	Developed and adopted a new framework for National Carbon Accounting for implementation in FY 2016. The publication, NRS-GTR-154, documents the new framework.	Increase transparency, documentation, and characterization of uncertainty in the new carbon accounting system.
Contribute to a number of expected improvements for the 2016 National Greenhouse Gas Inventory (NGHGI).	Developed a new accounting system which allows attribution of carbon flux to disturbance and land use change. Completed development of a new litter model based on in situ measurements that was included in the 2016 National Greenhouse Gas Inventory report. Completed development of a new soil organic carbon (SOC) model based on in situ measurements that was included in the 2016 NGHGI report.	Conduct research into downscaling estimates from the new carbon accounting system. Begin research into the length of time that land remains in a conversion category and develop a mechanism to implement a new accounting framework. Refine estimates of down dead wood and understory carbon based on litter and SOC methodology.

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Prepare tree ring samples for lab processing and climate sensitivity analysis. Continue to sample during the 2015 field season in California, Oregon, and Washington.	Collected and are processing more than 300 increment cores by Pacific Northwest Research Station field crews in 2015.	Continue collaboration by the Pacific Northwest Research Station with the Rocky Mountain Research Station, Interior West tree-ring lab to process and analyze cores.
Continue development of the tree-ring database, with continuing growth and climate analysis and internal testing of an FIA database extension in which all ring records will be accessible by plot, species, growth year, etc.	Started processing an additional 388 Douglas-fir increment cores collected in 2014 and adding them to the growth and climate database extension.	Continue to have the Pacific Northwest Research Station cores on plots in 2016 field season.
Experimental Forests and Ranges		
Continue projects on an ad hoc basis.	Assisted in data collection on the Sinkin Experimental Forest in Missouri (Northern Research Station field staff).	Continue projects on an ad hoc basis.
Complete FIA process documentation for distribution. Developers will design check-scoring application and analytical quality assurance tools. Initiate a beta version in FY 2015.	Completed and posted Forest Inventory and Analysis Database (FIADB) 6.0.2 based on version 6.0 of the national field guide.	Continue Information Management and Distribution—Forest Inventory Data Online.
Implement growth accounting; enhance growth, removal and mortality measures (GRMs) by adding macroplot remeasurement, biomass estimates, and carbon estimates.	Improved growth accounting examples and documentation for users. Created new models for height and diameter growth to enhance the GRMs, worked with University of Montana on revised nationally revised biomass/carbon equations. Adapted regionally specific models of diameter growth by Pacific Northwest Research Station FIA into FIA's national GRM compilation system, allowing for inclusion of large macroplot trees in the national system.	Will continue to work with the University of Montana on biomass and carbon equations under new contract. As data become available, implement changes to include estimates of net growth, removals, and mortality of volume for Western States. Continue to have Pacific Northwest Research Station analysts and information management staff test and update the GRM module to improve Western States' accuracy in large diameter trees and forests.
Conduct data outreach via Web, tools, and hands-on workshops. Conduct training Webinars as needed.	Conducted a data distribution Webinar focused on business analytics dashboards and numerous informal outreach and educational efforts. Hosted an FIA session at the Society of American Foresters/Canadian Institute of Forestry meeting in Salt Lake City, UT, and conducted a deep review of the database for Colorado State employees. Conducted one FIA.edu data workshop by the Pacific Northwest Research Station with a general client audience and held a joint NFS–FIA workshop targeting the use of FIA data for forest planning.	Host a Rocky Mountain Research Station, Interior West user group meeting, and possibly a joint "Western User Group" meeting in cooperation with Pacific Northwest Research Station FIA unit.
Begin work on FIADB User Guide based on version 7.0 of the National Field Guide.	Worked with FIA field and analysis staffs to understand changes for version 7.0 of FIA field guide. Continued to contribute to the national effort.	Complete work on FIADB User Guide based on version 7.0 of the National Field Guide.
Continue to implement EVALIDator general online tool improvements.	Continued to implement EVALIDator general online tool improvements.	As data become available, implement necessary changes to FIADB and data distribution tools for field guide version 7.0. Also, as data become available, implement changes necessary to include estimates of net growth, removals, and mortality of biomass and carbon.

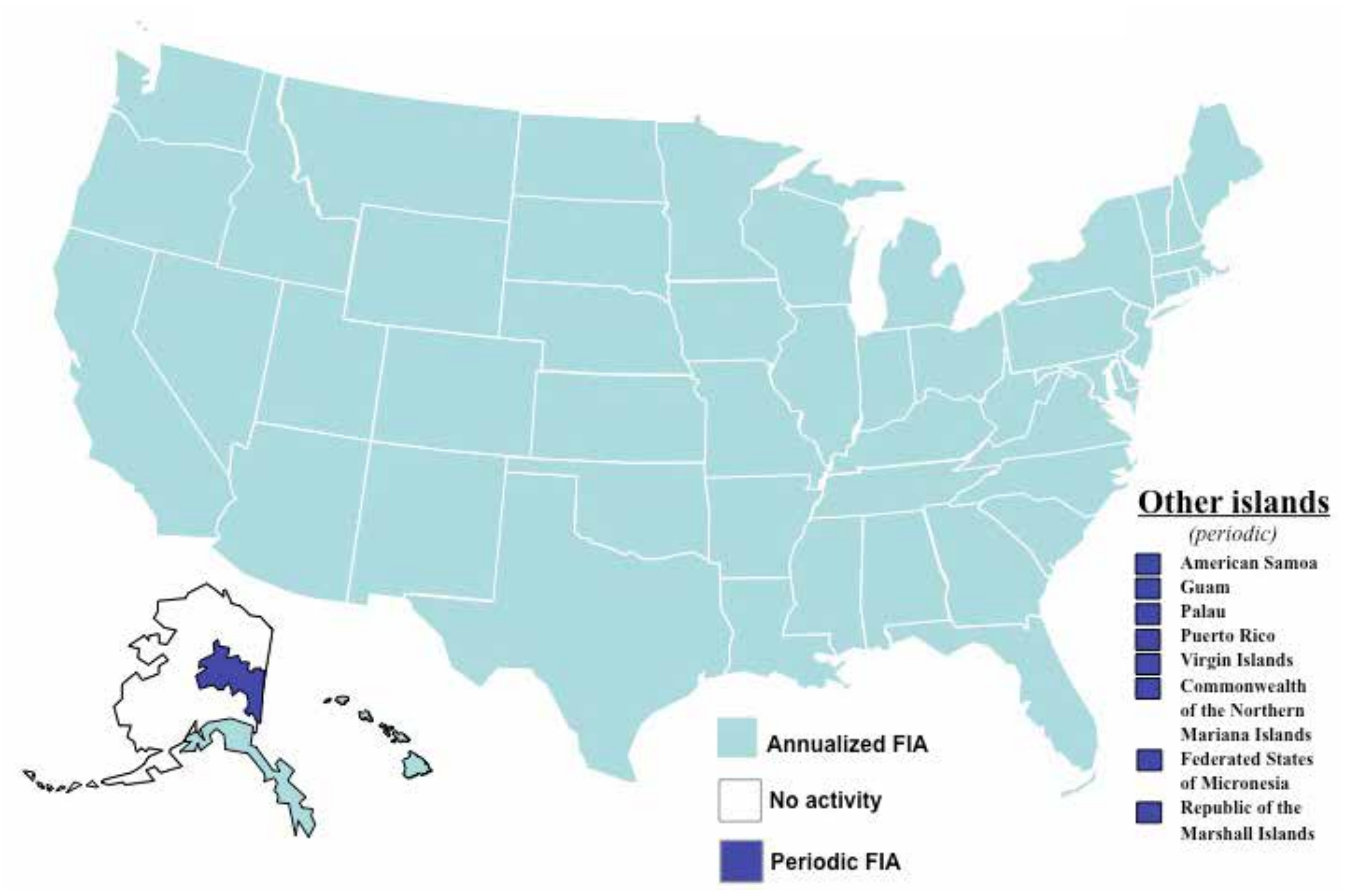
In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Information Management and Distribution—MIDAS		
Begin programming Mobile Integrated Data Acquisition System (MIDAS) for changes to be implemented in version 7.0 of the National Core Field Guide.	Delivered programming changes to MIDAS to implement version 7.0 of national field guide.	Begin work to transfer more complete plot information, photos, and ownership information online and reduce paper copies in the field.
Information Management and Distribution—NIMAC		
Conduct post-training review with representatives in Mexico.	Conducted review in Mexico to follow-up on training and provide additional technical assistance. Hosted a study tour in the United States for Mexico representatives that focused on inventory methods and techniques.	Continue to provide through National Inventory and Monitoring Applications Center (NIMAC) technical assistance, training, and software tools in five regions (Africa, Asia, North America, Central America, and South America) as part of the SilvaCarbon effort.
Process and make completed panels of data available with EVALIDator for Missouri and Wisconsin and continue to provide assistance to Indiana Department of Natural Resources on an as-needed basis.	Processed and made available next panel of data for Wisconsin, and assisted Indiana Department of Natural Resources on technical problems. Missouri delayed due to field work issues.	Process and make available completed panels of continuous forest inventory data via EVALIDator for Missouri and Wisconsin. Update field guide and portable data recorder (PDR) program for Wisconsin and Indiana.
NIMAC will deliver Massachusetts inventory data in PC EVALIDator and will train them on how to load new data and analyze the database using PC Evalidator.	Populated PC EVALIDATOR with long-term Massachusetts State forest inventory data.	Deliver final product, documentation, and training to Massachusetts.
Release the second and third versions of DATIM for use within the Forest Service and will begin developing version 4 for all FIA customers.	Completed second and third versions of DATIM. Fourth version in development for 2016 release.	Release version 4 of DATIM for FIA customers. Begin development of version 5 for late 2016 release to the public.
NIMAC will complete the information needs and sampling and plot designs for the U.S. Fish and Wildlife Service in the Northeastern Region.	Completed via NIMAC the information needs and testing of PDR and analysis programs. Design work will be completed after pilot testing in three refuges.	Complete via NIMAC the sampling and plot designs and finalize PDR and analysis software for the U.S. Fish and Wildlife Service in the Northeastern Region.
NIMAC will continue to provide technical assistance and software tools in three continents (Africa, Asia, and South America) as part of the SilvaCarbon effort.	Provided technical assistance and software to more than 15 countries in 3 continents via NIMAC and the SilvaCarbon program of work.	Continue to provide technical assistance and software tools to other countries through the SilvaCarbon program.
Information Management and Distribution—NIMS-CS		
Continue implementing NIMS-CS and FIADB version 6.0 at the national data center.	Implemented NIMS-CS and FIADB version 6.0 at the national data center and began work to move to a new and more secure data center. Began work to implement NIMS-CS 7.0 and FIADB version 7.0.	Implement NIMS-CS and FIADB version 7.0.
Continue the effort to document NIMS-CS data tables.	Drafted initial documentation of NIMS-CS data tables.	Implement changes to GRM packages to implement GRM estimates for Rocky Mountain Research Station and Pacific Northwest Research Station plot remeasurements.
FIA Atlas Project		
Complete new policy and technical reviews with Washington Office and USDA.	Completed new policy and technical reviews with Washington Office and USDA. Determined policy review procedures to be completed for print atlas in January 2016.	Complete policy and technical reviews for print and Web editions.
Complete design and layout of remaining features. Print FIAtlas.	Completed layout of 90 percent of print atlas. Final printing delayed.	Complete layout of remaining print features and publish the Forest Atlas of the United States.

In the FY 2014 business report, we said that in FY 2015 we would—	In FY 2015, we—	In FY 2016, we will—
Complete development and delivery of companion Web content through increased collaboration with ESRI (Environmental Systems Research Institute).	Established contract with ESRI to facilitate improvement of Web delivery configuration.	Continue collaboration with ESRI via design, implementation, reporting, and training support, including all Web features.
Collaboration and Partnerships		
Continue collaborative stewardship of the FIA program by holding users group meetings in all regions of the country and at the national level and holding regional management team meetings in all regions of the country.	Continued collaborative stewardship of the FIA program by holding users group meetings in all regions of the country and at the national level and holding regional management team meetings in all regions of the country.	Continue collaborative stewardship of the FIA program by holding users group meetings in all regions of the country and at the national level and holding regional management team meetings in all regions of the country.
Finalize FIA Science Symposium arrangements, organize invited and proposed sessions and papers, publish proceedings, and prepare to host meeting in early FY 2016.	Completed symposium arrangements and agenda and held symposium in Portland, OR, in December 2015. More than 200 attendees, 13 invited plenary talks, 124 contributed presentations, and 13 posters over 3 days. Proceedings in press.	Begin planning for FY 2017 Symposium.

Fiscal Year 2016 FIA Program Direction

The FY 2016 budget, as in many recent years, has considerable uncertainties. The FY 2016 budget is set at $75.0 million, all in R&D, which exceeds for the first time the FIA budget high-water mark in FY 2010 of $71.8 million. The FIA program will continue inventory operations in 49 States, coastal Alaska, and the Tanana Valley of interior Alaska (fig. 31). Other major activities planned for 2016 include obtaining full compliance of State 5-year reports; completing publication of the recent iteration of the NWOS; continuing to modernize the program's TPO operations and reporting; continuing implementation of the Image-Based Change Estimation, or ICE, project for improving land cover and land use classification; expanding urban forest inventory; and publishing the FIAtlas. Accomplishment of these goals will depend on the continued strong support of our partners and their commitment to an efficient and productive FIA.

Figure 31. Planned FIA implementation status, FY 2016.



FIA = Forest Inventory and Analysis. FY = fiscal year.

Long-Term Strategic Direction

The FIA program initially intended to implement the S*trategic Plan for Forest Inventory and Analysis* by achieving a base Federal program of 10 percent per year in the West and 15 percent per year in the East by FY 2003 (see base Federal FIA program in glossary). Aggressive financial support from partners has enabled FIA to achieve full implementation and 5-year cycles throughout most States from the Great Plains eastward. This support has been impacted as Federal budgets continue to fluctuate, and along with recession impacts on State governments, partners' matching funding has been affected also. Stronger Federal support is needed to continue and expand as partners find exceptional value in leveraging Federal resources to provide improved information and service to their constituents. Recent budget increases have provided stability and a platform to move forward with new Farm Bill demands.

In late 2013, FIA began drafting a new strategic plan to update the current plan that was published in 2007. The new plan is being developed in response to preliminary language that eventually formed the final text of the recently passed 2014 Farm Bill and its requirements for FIA. The new plan is forward looking and attempts to balance emerging client demands for new information, tools, and values with necessary decisions on priorities and budget constraints. FIA developed the new FIA strategic plan in cooperation with partners and stakeholders, identifying the base program, potential enhancements to the base, priorities for new programs, and areas for increased flexibility in the future. The final plan was delivered to the agency and USDA in mid-2014 with a final submission delivered to Congress in March 2015.

Passage of the 2014 Farm Bill and FIA Requirements. On February 7, 2014, Congress passed the Agricultural Act of 2014 (Public Law 113–79), also referred to as the 2014 Farm Bill. Section 8301of this legislation requires the Forest Inventory and Analysis program to revise its previous strategic plan, approved by Congress in 1999, and submit the new plan to the Committee on Agriculture of the House of Representatives and the Committee on Agriculture, Nutrition, and Forestry of the Senate within 180 days of the passage of the law.

Farm Bill provisions to be addressed in the revised strategic plan:

1. Complete the transition to a fully annualized forest inventory program and include inventory and analysis of interior Alaska.
2. Implement an annualized inventory of trees in urban settings, including the status and trends of trees and forests, and assessments of their ecosystem services, values, health, and risk to pests and diseases.
3. Report information on renewable biomass supplies and carbon stocks at the local, State, regional, and national levels, including by ownership type.
4. Engage State foresters and other users of information from the forest inventory and analysis in reevaluating the list of core data variables collected on forest inventory and analysis plots with an emphasis on demonstrated need.
5. Improve the timeliness of the TPO program and accessibility of the annualized information in that database.
6. Foster greater cooperation among the FIA program, research station leaders, State foresters, and other users of information from the forest inventory and analysis.
7. Promote availability of and access to non-Federal resources to improve information analysis and information management.
8. Collaborate with the USDA's Natural Resources Conservation Service, NASA, National Oceanic and Atmospheric Administration, and U.S. Geological Survey to integrate remote sensing, spatial analysis techniques, and other new technologies in the FIA program.
9. Understand and report on changes in land cover and use.
10. In partnership with other Federal agencies, expand existing programs to promote sustainable forest stewardship through increased understanding of the more than 10 million private forest owners, their demographics, and the barriers to forest stewardship.
11. Implement procedures to improve the statistical precision of estimates at the sub-State level.

FIA Backdrop. During its entire history of more than 85 years, FIA has cost the U.S. taxpayers a grand total of approximately $1 billion. During that time, multibillions of dollars have been invested by forest industries and tens

Goal	Performance measure	2010 level (%)	2011 level (%)	2012 level (%)	2013 level (%)	2014 level (%)	2015 level (%)	Target level (%)
Inputs								
Maintain sufficient funding to support the base Federal FIA program[1]	Percentage of total Federal funding necessary for annualized inventory received	90	92	89	85	85	89	100
Outputs								
Include 100 percent of U.S. forest lands in the FIA sample population	Percentage of Nation's forest land included in the target FIA sample population	100	100	100	100	100	100	100
Keep fieldwork current	Percentage of States actively engaged in the annualized inventory program	98	100	100	100	100	100	100
Make data accessible to national forest customers	Percentage of national forest land for which FIA data are loaded into NRIS	100	100	100	100	100	100	100
Outcomes								
Keep analysis current	Percentage of States with FIA State report less than 6 years old	74	92	92	88	90	94	100
Keep online data current	Percentage of States with FIA online data less than 2 years old	84	92	92	92	96	96	100
Customer satisfaction	Percentage of customers rating service as satisfactory or better	87	87	87	87	87	87	100
Partners' participation	Partners' financial contributions expressed as percentage of total program funds	10	11	11	13	10	10	20

FIA = Forest Inventory and Analysis. NRIS = Natural Resource Information System.
[1] Revised percentages based on new congressional target of $77,761,000 (prior to 2015 Farm Bill where full funding target for new FIA Strategic Plan options A, B, and C is approximately $90 million and FY 2015 funding is 78 percent of that target).

of thousands of jobs created from logging; primary wood processing; and manufacturing, construction, and retail sales of wood-based products. Since 2000, FIA has provided grants totaling in excess of $185 million to partners, including States, dozens of universities, and NGOs, to collect data, conduct research, and perform analyses to improve program efficiency and support client information needs. Since 2000, FIA partners have contributed more than $125 million to leverage the program to collect and process more data and information to meet local needs. FIA is a proven, cost-efficient partnership program that has consistently delivered significant value added to the taxpayers for more than eight decades. The following summaries outline the range of implementation opportunities provided in the new strategic plan. In the coming year, Congress will review these options, ask questions, and suggest adjustments that will determine its future support for the FIA program.

OPTIONS A and B, Status Quo Option: This option maintains the 7-year East (15 percent), 10-year West (10 percent) paradigm for measurement, and these combined options place the program at the previous strategic plan target funding level.

OPTION C, National Core Option: This option maintains the 7-year East (15 percent), 10-year West (10 percent) paradigm for measuring base plots with improved remote-sensing support plus continuing the timber product output and ownership studies with enhancements and urban forest survey.

OPTIONS D and E, Full Farm Bill Option: This option implements the full 5-year (20 percent) measurement program nationally for base plots with improved remote sensing, continued timber product output and ownership

studies with enhancements, and all the other items except small-area estimation based on sample intensification.

OPTION F, Leveraged Partner Option: This option is a partner opportunity. Currently, States and other partners contribute nearly $8 million annually to intensify data collection, research, and analyses to improve estimates for smaller planning areas. FIA processes, maintains, and distributes the enhanced data and information.

The Government Performance and Results Act (GPRA) of 1993 directs Federal entities to develop long-term goals and performance measures to monitor progress toward those goals. Although intended for application at the agency level, the GPRA framework also provides an excellent tool for guiding progress at the project level. The preceding table shows our key goals, performance measures, and benchmarks for the FIA program for 2008 through 2015 and targets for a fully implemented program. In future business reports, we will repeat this table to show how we are progressing toward our goals.

Conclusions

We continue to operate in a new era of partnership and collaboration in which Federal and State agencies and other colleagues work together to plan, manage, implement, and continually improve the FIA program. We are gathering and disseminating information on a wider array of ecological attributes, while continuing to serve our traditional customers who require timely information on forest resources. We are increasing the timeliness of our surveys and of our reporting to provide a continually updated, publicly accessible information base that includes meaningful reports, analyses, and elemental data for others to use. We are exploring and using the latest technology to expand the scope of our products and to deliver them more efficiently. We are also openly reporting on our progress, accomplishments, successes, and challenges.

In summary, we are committed to working collaboratively with our partners to deliver the best program possible with the resources that we have at our disposal. We hope this report gives you a transparent view of the business practices of the FIA program, and we encourage you to help us improve the program with your feedback.

Glossary of Terms Used in Appendixes

base Federal FIA program. A level of FIA program delivery that includes sampling 10 percent of base grid (Phase 2) plots per year in the Western United States, 15 percent of base grid plots per year in the Eastern United States, with data compiled and made available annually and complete State analyses done every 5 years. A subsample of these plots also provides data on key ecosystem health indicators.

base grid plots sampled. The base grid consists of one sample location per approximately 6,000 acres (Phase 2) and one location per approximately 96,000 acres and provides data on key ecosystem health indicators. Some partners chose to intensify beyond the base grid.

buy down. Plots installed at State expense to reach a 20-percent implementation level of the base grid.

core reports. A class of publications that summarizes forest status and trends for a complete administrative unit, such as a whole State or a national forest. Examples include survey unit reports, State statistical and analytical reports, and national forest reports. Congressionally required 5-year State reports are part of the FIA's core reporting.

direct expenses. All expenses directly attributable to the FIA unit incurred as a part of doing FIA business. Excludes indirect business costs (such as rent, telephones, and administrative overhead outside the FIA unit staff), which are included in the "effective indirect expenses" definition. Includes work done for other units as a normal part of FIA business and the following items:

equipment. Costs for durable goods used for FIA. Includes the following—

computer/telecommunications. Computer hardware, software, communications costs.

imagery. Aerial photos, satellite imagery data files.

field equipment. Measurement tools and equipment, such as data recorders, carried by field crews.

other. Any cost that does not fit into one of the previous equipment categories.

vehicles. All vehicle costs, including items such as operating costs, depreciation, and leases.

grants and agreements. Cost of cooperative grants and agreements that directly support the FIA mission.

office space and utilities. Charges for rent, lease, or other real estate costs for FIA staff, plus utilities.

other direct expenses. Any cost that does not fit into one of the previous categories, including training costs, unemployment, office supplies, postage, awards, moving expenses, and other expenses related to delivering the FIA program.

publications. Costs for laying out, editing, printing, and distributing publications.

salary. Includes direct salary and costs, plus benefits charged to the FIA unit, broken into the following categories:

administration. Program manager, project leader, and clerical staff.

analysts. Staff who analyze data and write publications.

Phase 1 production. Aerial photo-interpreters, satellite image analysts engaged in Phase 1 stratification.

data collection. All staff spending at least 50 percent of their time measuring regular plots.

field support. Field-crew supervisors who spend less than 50 percent of their time measuring plots; others involved in supporting and coordinating field crews.

information management. Programmers, data compilers, computer system support staff.

QA (quality assurance) crews. All staff spending at least 50 percent of their time doing QA fieldwork.

techniques research. Mainly research staff who conduct FIA-related research on methods and techniques.

travel. Broken into the following categories:

field/QA travel. Travel costs for field crews and QA crews.

office travel. Travel costs for all staff except field crews and QA crews.

effective indirect expenses. Include items such as research station management and administrative salaries, operating expenses, research station budget shortfalls, and other items for which the FIA unit is assessed by the research station. Each station has its own means for determining these assessments. Rather than reporting the different rates, we simply calculate the "Effective Indirect Expenses" item by subtraction:

Effective indirect expenses = (total available funds) – (total direct FIA expenses + end-of-year balance)

effective indirect rate. Effective indirect expenses divided by total available funds, which is not necessarily the same as the standard station overhead rate; instead, this rate reflects the total indirect cost as a fraction of the total funds available to FIA.

ecosystem indicators. Data collected on a subset of Phase 2 sample locations, previously referred to as Phase 3, measured for a more extended set of ecosystem attributes, including tree crown condition, lichen community diversity, soil data, and down woody debris.

FRIA (Forest Resource Inventory and Assessment). An account created by Congress within the State and Private Forestry portion of the Forest Service budget to provide funds to support forest inventory and analysis collaboration with States. This account was permanently zeroed out in FY 2013.

FY (end-of-the-year) balance. Funds reported in the previous fiscal year business report as unspent at the end of that fiscal year and presumably available for use in the current fiscal year.

intensification. Plots installed at the expense of State, National Forest System, or other partner to achieve higher quality estimates for smaller areas or to buy the base Federal sample down to a 5-year cycle.

management meetings held. Number of national or regional management team meetings held by each FIA unit. A management team for each FIA region consists of partners who share in funding and implementing the FIA program. The team typically consists of representatives from the FIA unit, National Forest System regional offices, State and Private Forestry offices, and State forestry agencies.

NGO (nongovernmental organization). A class of customers with whom FIA staff are asked to consult. Includes environmental organizations, professional societies, and other generally nonprofit organizations.

NIPF (nonindustrial private forest land owners). Private individuals or organizations that own forest land for purposes other than industrial operations.

percentage of full funding. Total available funds divided by the funding needed to fully implement the base Federal program for a given year's target funding.

percentage of region covered by annual FIA. Sum of forested acres in States currently implementing annual FIA, divided by the total number of forested acres in each FIA region; a measure of the degree to which the FIA region has moved from periodic to annual inventory.

percentage of total plots sampled. Total number of base grid plots sampled divided by the total number of plots in the base grid. In the East, the current target is 15 percent and, in the West, 10 percent annually as set by Congress.

Phase 1. Stratification of the land base into forested and nonforested classes by using remotely sensed imagery (aerial photographs or satellite imagery). Done to increase the efficiency of fieldwork and estimation.

Phase 2. A set of sample locations, approximately 1 for every 6,000 acres of land, measured for basic mensurational forest attributes.

Phase 3. *This term is no longer used; see ecosystem indicators.*

publications. Number of publications per unit, by type of publication, as reported in official agency attainment reports. Publications are among the major outputs of the FIA program. Types of publications include:

core reports. A report pertaining to reporting inventory results for a complete geographic entity. Includes the following:

national forest reports. A complete analysis for a single national forest.

national report. A report for the entire Nation, such as the Resource Planning Act report.

regional reports. A report for a group of States or other contiguous units larger than a single State, such as a regional assessment.

State resource reports. A complete statistical or analytical summary of the forested resources within a single State.

State timber product output (TPO) reports. A complete analysis of TPO data for a single State.

other. Publications that do not fit into any of the previous categories, such as abstracts, books, or other government publications.

other station publications. A manuscript published by the Forest Service, for example, a general technical report.

peer-reviewed journal articles. An article appearing in a refereed or peer-reviewed journal.

proceedings papers. An article appearing in the proceedings from a meeting or symposium.

significant consultations. Cases in which an FIA staff person spent at least 1 hour in discussion, analysis, or research to address a specific question or need raised by an external FIA program customer, and which is not part of our normal course of business in collecting, analyzing, and reporting FIA information.

total available funds. Total funds available for delivering the FIA program, including funds appropriated by Congress for the FIA program, other funds made available by Forest Service partners, and previous year carryover funds. These funds are a measure of Federal funding for the base Federal program.

users group meetings held. Number of users group meetings sponsored or attended by each FIA unit. A users group meeting is an open meeting in which a complete regional cross-section of FIA partners and customers are invited to attend. Users group meetings differ from the usual smaller meetings with one or two partners that all FIA units call as a normal course of business.

Appendix A: Contacts

For information about the status and trends of America's forests, please contact the appropriate office below.

Northern FIA Program
Program Manager, FIA
USDA Forest Service
Northern Research Station
1992 Folwell Avenue
St. Paul, MN 55108
651–649–5139

Southern FIA Program
(includes Commonwealth of
Puerto Rico and the U.S. Virgin Islands)
Program Manager, FIA
USDA Forest Service
Southern Research Station
4700 Old Kingston Pike
Knoxville, TN 37919
865–862–2000

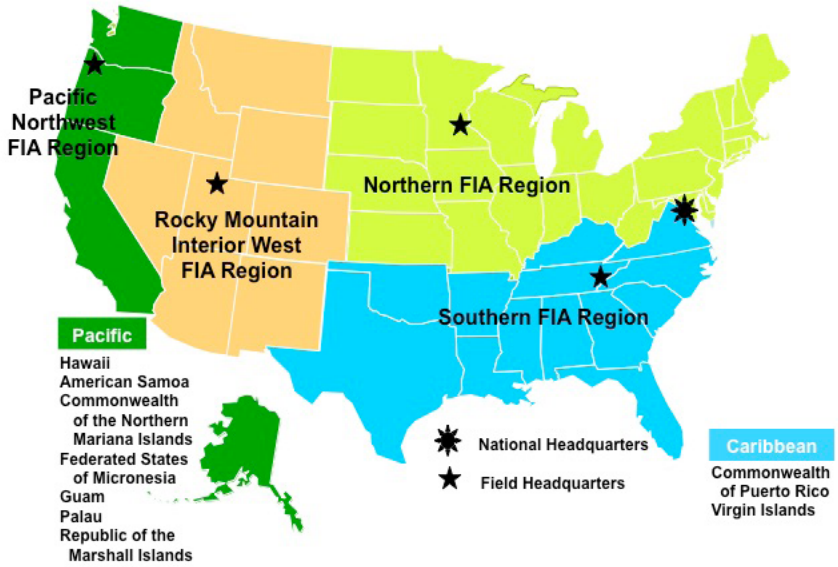
National FIA Program Office
National Program Leader, FIA
USDA Forest Service
201 14th Street, SW
Washington, DC 20250
703–605–4177

Rocky Mountain Interior West FIA Program
Program Manager, FIA
USDA Forest Service
Rocky Mountain Research Station
507 25th Street
Ogden, UT 84401
801–625–5407

Pacific Northwest FIA Program
Program Manager, Resource Monitoring and Assessment
Program (FIA)
USDA Forest Service
Pacific Northwest Research Station
620 SW Main St., Suite 400
Portland, OR 97205
503–808–2034

All of our regional Internet home pages and a wealth of statistical and other information are available through the national FIA home page at http://www.fia.fs.fed.us.

Figure A-1. FIA regions and headquarters.



FIA = Forest Inventory and Analysis.

Appendix B: Tables

Table B-1. Performance measures for the FY 2015 FIA program.

	Pacific Northwest	Interior West[a]	Southern	Northern	National Office	Total
Total available Federal funds, FY 2015	$14,143,050	$13,783,000	$16,407,809	$16,602,131	$10,183,000	$71,118,990
Total appropriated Federal funds, FY 2015	$13,834,000	$13,783,000	$15,761,000	$16,439,000	$10,183,000	$70,000,000
Appropriated as percent of 2014 Farm Bill target						78%
Contributions from partners:						
Supporting the 20% FIA program	$72,000	$294,695	$2,519,430	$830,765	$0	$3,716,890
Value-added contributions	$799,252	$853,755	$698,762	$2,441,530	$461,847	$5,255,146
Total contributions	$871,252	$1,148,450	$3,218,192	$3,272,295	$461,847	$8,972,036
Total all available funds, FY 2015	$15,014,302	$14,931,450	$19,626,001	$19,874,426	$10,644,847	$80,091,026
Base grid plots sampled (Federal 7/10 cycle):						
Forest[b]	1,580	2,493	5,141	4,886	-	14,100
Nonforest	3,177	6,540	4,777	7,054	-	21,548
Total base plots	**4,757**	**9,033**	**9,918**	**11,940**	**-**	**35,648**
Spatial and temporal intensification plots sampled:						
Forest[b]	943	-	1,359	1,944	-	4,246
Nonforest	47	-	986	2,296	-	3,329
Total intensification plots	**990**	**-**	**2,345**	**4,240**	**-**	**7,575**
Base grid plots sampled (Federal and partner):						
Forest[b]	**2,523**	**2,493**	**6,500**	**6,830**	**-**	**18,346**
Nonforest	**3,224**	**6,540**	**5,763**	**9,350**	**-**	**24,877**
Total base grid plots	**5,747**	**9,033**	**12,263**	**16,180**	**-**	**43,223**
Forest plots with one or more health indicators	2,396	2,149	5,969	6,311	-	16,825
Number of quality assurance plots (field checked)						
Forest	126	247	1,201	458	-	2,032
Nonforest	2	7	716	326	-	1,051
Total quality assurance plots	**128**	**254**	**1,917**	**784**	**-**	**3,083**
Percent forested quality assurance plots	5%	10%	18%	7%		11%
Special Study plots sampled:						
Forest[b]	175	65	78	23	-	341
Nonforest	38	39	196	205	-	478
Total special study plots	**213**	**104**	**274**	**228**	**-**	**819**
Total base grid plots and percent sampled[c]:						
Total base grid plots	41,463	91,341	89,205	101,342	-	323,351
Average percent of land with forest cover	37%	23%	46%	30%		36%
Estimated percent of base grid sampled	10%	12%	13%	16%		12%
Percentage of States with annual FIA activity[c]	100%	100%	100%	100%		100%
Number of publications:						
National forest reports	-	-	-	-	-	-
State/island resource reports	-	-	13	23	-	36
State timber product output reports	2	2	2	2	-	8
Regional reports	-	-	3	2	-	5
National reports	-	-	4	1	5	10
5-year State reports	1	3	5	2	-	11
Subtotal—core reports	3	5	27	30	5	70
Peer-reviewed journal articles	22	24	24	52	-	122
Proceedings articles	-	-	3	9	-	12
Other station publications	3	4	3	11	-	21
Other publications	-		4	6	1	11
Total, all reports	28	33	61	108	6	236
Number of publications per Federal FTE	0.37	0.38	0.78	1.14	1.71	0.70
Consulting activities:						
Number of significant consultations	83	152	448	629	38	1,350
Total hours of significant consultations	458	5,064	2,412	5,659	213	13,806
Meetings:						
User-group meetings held	1	2	1	1	1	6
Management meetings held	1	0	4	1	1	7

FIA = Forest Inventory and Analysis. FY = fiscal year. FTE = full-time equivalents.

[a] A unit of the Rocky Mountain Research Station. [b] Includes only plots where trees were measured, excludes denied access and hazardous plots where no trees measured.

[c] Base grid targets shown are 20 percent of samples per year as stated in the Farm Bill. Congressional conference notes recommended annual Federal targets of 15 percent in the East and 10 percent in the West. Interior Alaska, as well as the Caribbean and Pacific Island, inventories are periodic and excluded from the annualized mandate in compliance with congressional recommendations.

Table B-2. Financial statement for the FY 2015 FIA program Forest Service R&D funds.

	Pacific Northwest	Interior West	Southern	Northern	National Office	Total
Available funds:			*Dollars*			
Previous year end-of-year balance	(12,663)		5,703	3,300	-	(3,660)
Post-year adjustments[a]	321,713		150,000	(92,169)		379,544
Subtotal pre-year adjustments	309,050	-	155,703	(88,869)	-	375,884
FY appropriated funds						
Research (base)	13,759,000	13,783,000	15,436,000	16,364,000	10,183,000	69,525,000
R&D funds added to base[b]	75,000		325,000	75,000		475,000
Subtotal appropriated funds	**13,834,000**	**13,783,000**	**15,761,000**	**16,439,000**	**10,183,000**	**70,000,000**
Special project funding[c]			491,106	252,000		743,106
TOTAL AVAILABLE FEDERAL FUNDS	**14,143,050**	**13,783,000**	**16,407,809**	**16,602,131**	**10,183,000**	**71,118,990**
Direct expenses:						
Salary—	**7,324,145**	**7,341,744**	**7,800,487**	**10,011,113**	**416,000**	**32,893,489**
Administration	566,019	742,574	578,774	400,103	416,000	2,703,470
Phase 1 production	21,614	-	184,376	429,486	-	635,476
Field support	1,044,860	971,302	955,906	809,994	-	3,782,062
Data collection	2,430,127	2,402,438	739,147	2,638,605	-	8,210,317
Quality assurance	392,833	595,703	1,659,552	318,578	-	2,966,666
Information management	953,913	906,997	862,810	1,606,058	-	4,329,778
Analysis	1,198,382	1,000,763	1,867,865	2,839,682	-	6,906,692
Techniques research	716,397	721,967	952,056	968,607	-	3,359,027
Travel—	**845,268**	**666,118**	**467,837**	**460,562**	**25,000**	**2,464,785**
Office travel	101,082	110,190	60,316	131,612	25,000	428,200
Field/quality assurance crew travel	744,186	555,928	407,521	328,950	-	2,036,585
Equipment—	**446,028**	**741,311**	**288,933**	**359,292**	**-**	**1,835,564**
Imagery	-	284	-	18,300	-	18,584
Vehicles	181,401	361,222	288,933	242,008	-	1,073,564
Field equipment	148,491	82,417	-	42,306	-	273,214
Information technology/communications	116,136	156,112	-	48,671	-	320,919
Other	-	141,276	-	8,007	-	149,283
Publications	**10,293**	**10,588**	**34,460**	**107,110**	**6,000**	**168,451**
Grants and agreements[d]	**2,198,844**	**2,012,073**	**4,419,797**	**2,776,333**	**2,941,618**	**14,348,665**
Field work/data	*1,694,918*	*1,190,309*	*4,011,797*	*1,320,043*	*30,000*	*8,247,067*
Information management		*53,376*	*102,000*	*507,957*	*2,686,618*	*3,349,951*
Research	*503,926*	*768,388*	*306,000*	*948,333*	*225,000*	*2,751,647*
Office space and utilities	**855,570**	**512,721**	**532,162**	**592,199**	**-**	**2,492,652**
Other direct expenses	**128,715**	**339,920**	**923,042**	**55,522**	**-**	**1,447,199**
Total direct expenses	**11,808,863**	**11,624,475**	**14,466,718**	**14,362,131**	**3,388,618**	**55,650,805**
Fire transfer	**156,000**	**275,547**		**17,000**		**448,547**
Effective indirect expenses						
Total effective indirect[e]	**2,150,714**	**1,655,132**	**1,884,896**	**2,223,000**	**6,794,382**	**14,708,124**
Total effective indirect rate	15%	12%	11%	13%	67%	21%
End-of-year balance	**27,473**	**227,846**	**56,195**	**-**	**-**	**311,514**
TOTAL FEDERAL EXPENSE	**14,143,050**	**13,783,000**	**16,407,809**	**16,602,131**	**10,183,000**	**71,118,990**

FIA = Forest Inventory and Analysis. FY = fiscal year. R&D = Research and Development.

[a] Some bookkeeping is not completed until after the new fiscal year begins, which may affect beginning balances. These adjustments, including items such as carryover, return of fire transfer, return of unused prior year grants, station adjustments, etc., are accounted for here.
[b] Mid-year additions to base funding from FIA National Office.
[c] Includes secondary allocations of funds from the station director.
[d] Grants and agreements include general allocation of grants to basic thematic categories.
[e] Programwide charges for Albuquerque Service Center included in National Office indirect expense.

Table B-3a. Federal staffing (FTEs) for the FY 2015 FIA program.

	Pacific Northwest	Interior West	Southern	Northern	National Office*	Total
Administration	4.7	5.0	5.7	3.3	2.5	21.2
Phase 1 production work	0.2	-	2.7	4.9	-	7.8
Field support	11.9	12.8	8.3	7.3	-	40.3
Data collection	30.9	34.4	8.5	31.6	-	105.4
Quality assurance	4.7	6.6	20.0	3.6	-	34.9
Information management	8.6	9.2	7.8	14.3	-	39.9
Analysis	9.7	10.2	17.1	23.8	-	60.8
Techniques research	5.2	7.9	7.7	5.8	1.0	27.6
Total	**75.9**	**86.1**	**77.8**	**94.6**	**3.5**	**337.9**

FIA = Forest Inventory and Analysis. FTE = full-time equivalents.
* Techniques person is in unit funded by National Office at Research Triangle Park, NC.

Table B-3b. Estimate of cooperator staffing funded by FIA grants and agreements (FTEs) for the FY 2015 FIA program.

	Pacific Northwest	Interior West	Southern	Northern	National Office	Total
Administration	-		-	-	-	-
Phase 1 production work	-			0.4	-	0.4
Field support	0.2	1.0	0.9	1.8	-	3.9
Data collection	19.2	18.5	82.7	17.3	-	137.7
Quality assurance	-			0.2	-	0.2
Information management	-		1.0	5.1	6.0	12.1
Analysis	1.6	3.0	0.2	2.4	3.0	10.2
Techniques research	11.6			7.1	2.0	20.7
Total	**32.6**	**22.5**	**84.8**	**34.3**	**11.0**	**185.2**

FIA = Forest Inventory and Analysis. FTE = full-time equivalents.

Table B-3c. Estimate of total federally funded staffing (FTEs) for the FY 2015 FIA program.

	Pacific Northwest	Interior West	Southern	Northern	National Office	Total
Administration	4.7	5.0	5.7	3.3	2.5	21.2
Phase 1 production work	0.2	-	2.7	5.3	-	8.2
Field support	12.1	13.8	9.2	9.1	-	44.2
Data collection	50.1	52.9	91.2	48.9	-	243.1
Quality assurance crew	4.7	6.6	20.0	3.8	-	35.1
Information management	8.6	9.2	8.8	19.4	6.0	52.0
Analysis	11.3	13.2	17.3	26.2	3.0	71.0
Techniques research	16.8	7.9	7.7	12.9	3.0	48.4
Total	**108.5**	**108.6**	**162.6**	**128.9**	**14.5**	**523.1**

FIA = Forest Inventory and Analysis. FTE = full-time equivalents.

Table B-4. Partner contributions toward implementing FIA in FY 2015.

Unit	Partner	Contributions toward the base program	Contributions that add value
		- - - - - - - - - *Dollars* - - - - - - - - -	
Interior West	Colorado State Forest Service	195,510	-
	Forest Service, Region 1	-	73,800
	Forest Service, Region 4	-	5,344
	BLM report	-	46,125
	NASA (North American Forest Dynamics Project)	-	153,130
	Forest Service, WO (for NFS/FIA Carbon study)	-	320,950
	Forest Service, WO (LANDFIRE)	-	100,000
	University of Montana, Bureau of Business and Economics Research	99,185	-
	University of Maryland (Annual monitoring of FIA using Forest Vegetation Simulator)	-	96,168
	University of Nevada at Reno (Tree ring analysis)	-	18,718
	Weber State University (Lichen Air Quality)	-	39,520
IW total		**294,695**	**853,755**
National Office	University of Massachusetts	-	43,869
	University of Nevada Las Vegas		417,978
NO total		**-**	**461,847**
Northern	Connecticut Dept. of Cons.	500	-
	Appalachian State	-	5,000
	Conservation Biology Institute	-	3,425
	Delaware Department of Agriculture	7,770	-
	Environmental Protection Agency	-	75,500
	Illinois Division of Forest Resources	2,336	-
	Indiana Department of Natural Resources	61,319	-
	Iowa Department of Natural Resources	17,645	-
	Kansas State Forest Service	3,494	-
	Maine Forest Service	158,156	233,905
	Maryland Department of Natural Resources Forest Service	12,300	-
	Massachusetts Department of Conservation and Recreation	8,200	-
	Michigan Division of Forest Management	40,200	-
	Michigan State University	-	23,750
	Minnesota Department of Natural Resources	140,041	340,164
	Missouri Department of Conservation	67,492	-
	NASA	-	24,000
	NatureServe	-	12,031
	Nebraska Department of Forestry, Fish, and Wildlife	5,853	-
	New Hampshire Department of Resources & Economic Development	20,400	-
	New Jersey Forest Service	7,333	110,130
	New York Department of Environmental Conservation	19,890	-
	North Dakota Forest Service	7,200	-
	Ohio Department of Natural Resources	11,345	-
	Pennsylvania Department of Conservation & Natural Resources	43,000	6,084
	Rhode Island Department of Environmental Management	6,137	-
	South Dakota Department of Forestry and Nat. Res. Mgmt.	7,252	-
	State University of New York/Davey Tree	-	40,000
	Texas A&M University	-	18,750
	University of Massachusetts	-	41,087
	University of Missouri	-	17,640
	University of Minnesota	-	79,278
	University of Vermont	-	14,150
	USDA Forest Service Research and Development	-	240,000
	National Forest System Region 9	1,500	598,175
	USDA Forest Service State & Private Forestry	73,800	-
	Vermont Department of Forests, Parks & Recreation	8,600	-
	University of Maine	-	23,750
	West Virginia Division of Forestry	49,300	-

Table B-4. Partner contributions toward implementing FIA in FY 2015 (continued).

Unit	Partner	Contributions toward the base program	Contributions that add value
	University of Arkansas	-	9,676
	University of Georgia	-	10,000
	Wisconsin Department of Natural Resources	49,702	515,035
NRS total		**830,765**	**2,441,530**
Pacific Northwest	Forest Service, PNW Research Directors Office for 2015 Science Finding Awards	-	10,000
	Forest Service, PNW Research Directors Office for the Civil Rights Advisory Group 2015 Scholorship Funding	-	18,710
	Forest Service, RMRS Research for Interior West Lichen Analysis Project	-	25,000
	Forest Service, RMRS Research Transfer to FIA Logging Utilization Studies in the West	35,000	-
	Forest Service, WO NFS Add-On Project	-	190,000
	NASA, Goddard Space Flight Center	-	448,884
	USDA Department of Lands and Natural Resources CNMI Forestry	-	28,589
	USDI, BLM for LIDAR Correlation Plots	-	49,509
	Forest Service, Region 5 State and Private Forestry Grants for CNMI Forest Inventory		18,560
	Hawaii Division of Forestry and Wildlife for Grid Plots	-	10,000
	Forest Service, Region 10, Interior Alaska Pilot Inventory	37,000	-
PNW total		**72,000**	**799,252**
Southern	Alabama Forestry Commission	124,760	-
	Appalacian State—Carbon Storage	15,914	-
	Arkansas Forestry Commission	107,029	100,574
	Carpenter's Elementary School—Signage Outdoor Learning Center	31,620	-
	Florida Department of Agriculture and Consumer Services	162,714	-
	Georgia Forestry Commission	218,934	12,845
	International Institute of Tropical Forestry (IITF)	-	100,000
	Kentucky Division of Forestry	86,455	-
	Mississippi Forestry Commission	192,289	-
	North Carolina Dept of Agriculture and Consumer Services	2,025	69,371
	Oklahoma Department of Agriculture and Forestry	99,206	-
	South Carolina Forestry Commission	139,524	-
	Special Technology Development Program		18,100
	Tennessee Department of Agriculture	53,410	-
	Tennessee State University—Improving Trees per Acre Estimates	31,000	15,500
	Texas A&M Forest Service	391,548	147,371
	Texas A&M Forest Service	474,400	-
	Texas A&M Forest Service—Image Change	23,667	-
	Texas A&M Forest Service—Ponderosa Pine Study	28,333	-
	University of Tennessee—"C" Carbon Project Modeling	21,750	-
	Virginia Department of Forestry	165,505	80,000
	VPI—NLCD Percent Tree Canopy—FRF4156	-	30,000
	VPI—Sustainable Management of Consumables—SPFH	-	125,000
	VPI—Assessing NTFP Inventory Using FIA Forest Inventory Data	12,200	-
	VPI—FIA Biomass and Carbon Database	40,681	-
	VPI—NLCD Percent Tree Canopy	20,900	-
	VPI—RPA Land Use Modeling	40,532	-
	VPI—Sustainable Management of Consumables	35,034	-
SRS total		**2,519,430**	**698,762**
Grand total, all FIA units		**3,716,890**	**5,255,146**

BLM = Bureau of Land Management. CNMI = Commonwealth of the Northern Mariana Islands. FIA = Forest Inventory and Analysis. LIDAR = Light Detection And Ranging. NASA = National Aeronautics and Space Administration. NFS = National Forest System. NLCD = National Land Cover Dataset. NTFP = Nontimber Forest Products. PNW = Pacific Northwest Research Station. RMRS = Rocky Mountain Research Station. RPA = Resources Planning Act. USDA = U.S. Department of Agriculture. USDI = U.S. Department of the Interior. VPI = Assessing NFTP Inventory using FIA Forest Inventory Data. WO = Washington Office.

Table B-5. Grants and agreements entered into by FIA units, FY 2015.

Unit	Amount	Recipient	Purpose
	Dollars		
Interior West	414,000	Colorado State Forest Service	Implementation of Annual FIA
	10,000	Forest Management Service Center	FVS model for forest cover changes on water output (WRENSS)
	59,655	North Carolina State University	FVS processing for the Forest Carbon Mgt. Framework
	35,000	Pacific Northwest Research Station	Logging utilization studies in the West
	15,000	Pacific Southwest Research Station	New Mexico lichen analyses
	44,100	Private contractors	New Mexico Plots
	115,814	Private contractors	Nevada Plots
	67,050	Private contractors	Idaho Plots
	56,845	Private contractors	Wyoming Plots
	50,000	RSAC	FIA to FVS conversion
	242,500	RMRS, forest and woodland ecosystems	FIA soils indicator, sampling, equipment replacement
	150,000	Southern Research Station	Support for the delivery of FIA
	43,031	University of Nevada, Reno	Tree ring analysis
	184,939	University of Maryland	Annual monitoring of FIA using FVS
	110,000	University of Montana	Timber product output, removals, industry analysis
	100,000	Forest Service TEAMS	Implementation of annual FIA
	134,468	Utah State University	Forest carbon framework (multiple studies)
	11,000	Utah State University	Soil characteristics analyses
	1,115	Utah State University	Spatial data processing
	159,079	Weber State University	Lichen pollution analyses
	5,101	Weber State University	FIA disturbance maps in water resource applications
	3,376	WO FIA	International reporting support
IW total	**2,012,073**		
National Office	1,633,585	University of Nevada Las Vegas	Database agreement
	260,000	RSAC	FIA Forest Atlas
	125,000	RSAC	Transportation Research Board work projects
	175,000	Redcastle Resources, Inc.	FIA Forest Atlas
	75,000	RSAC	Landscape Change Monitoring System project
	159,993	University of Massachusetts	National Woodland Owners Agreement
	7,500	CoreLogic Spatial Solutions, LLC	Digital plot ownership information
	132,500	Digital Map Products Inc.	Digital parcel layer for all 50 States
	7,500	Test/Development Tablets (“paperless push”)	Test/development tablets (“paperless push”)
	539	Forest Service Human Resources Management: CIO	Security Investigations
	200,000	Eastern Forest Environmental Threat Center (EFETAC)	SRS 4854 EFETAC ISA
	35,000	Conservation Biology Institute	Protected areas database maintenance
	30,000	Auburn University	Tree planting data
	25,000	Virginia Tech University	FIA legacy data work
	75,000	GPO	FIA printing account deposit
NO total	**2,941,618**		
Northern	10,380	Access Ability, Inc.	Prefield document imaging services
	20,000	Appalachian State	Carbon Pool Science Understory
	60,605	Chestnut Ridge Forestry	New York Plots
	63,597	Chestnut Ridge Forestry	West Virginia Plots
	29,640	Chestnut Ridge Forestry	Delaware Plots
	30,000	Chestnut Ridge Forestry	Maryland Plots
	30,000	Chestnut Ridge Forestry	New Jersey Plots
	13,700	Conservation Biology Institute Inc.	Protected Database

Table B-5. Grants and agreements entered into by FIA units, FY 2015 (continued).

Unit	Amount	Recipient	Purpose
	76,158	Daniel Huberty	Kansas Plots
	160,000	Davey Tree Expert Company	Enhancing ITREE spatial simulation
	87,150	Environmental Systems Research Institute	Annual services and additional learning credits
	5,000	Forest Products Lab	Cull estimation technology test
	48,300	Glenn Summers	West Virginia Plots
	50,000	GPO	Atlas Project
	94,875	Indiana Department of Natural Resources	Implementation of annual FIA
	10,800	Joel Fyock	Illinois-Missouri Plots
	249,000	Maine Forest Service	Implementation of annual FIA
	87,055	Mark Webb	Ohio Plots
	95,000	Michigan State University	FIA Biomass Study
	333,624	Minnesota Department of Natural Resources	Implementation of annual FIA
	10,000	National AgroForestry Center	Trees outside forest
	48,124	NatureServe	Rev National Vegetation Classification FIA databases
	110,000	Northern Research Station Grand Rapids	Soil analyses
	52,769	Quercus Consultations, Inc.	Nebraska Plots
	21,675	Student Conservation Association	Summer Student Hires for NY
	21,675	Student Conservation Association	Summer Student Hires for WV
	75,000	Texas A&M University	Urban FIA analytical support
	29,452	Tom Bergstrom	North Dakota Plots
	38,703	University of Arkansas System	Bayesian temporal and spatial analysis
	40,000	University of Georgia	FIA Biomass Study
	95,000	University of Maine	FIA Biomass Study
	164,346	University of Massachusetts	NWOS/Family Forest Research Center
	49,983	University of Minnesota	FIA advanced data visualizations
	52,000	University of Minnesota	Biometrical refinements of U.S. forest carbon accounting
	149,856	University of Minnesota	Shared biometrics position
	24,000	University of Minnesota	Carbon Tool
	41,270	University of Minnesota	FIA biomass estimation data access
	20,558	University of Missouri	Small area estimates
	50,000	University of Missouri	Tree Regeneration Adequacy Metrics for the Central States
	56,600	University of Vermont	Carbon effects science
	70,438	Wilfred Previant	Michigan Plots
NRS total	**2,776,333**		
Pacific Northwest	150,000	Alaska Department of Natural Resources	Implementation of Tanana Valley FIA, Alaska
	1,156,558	Alaska Boat/Helicopter Contract	Implementation of FIA, Alaska
	63,000	University of British Columbia	Fire effects and ecosystem recovery after forest wildfire on FIA plots
	185,452	Individual Purchase Order Contracts FIA plots	Implementation of FIA
	40,860	Oregon State University	Lichen and bryophyte indicators and roles in forests
	56,000	Oregon State University	Regional Carbon Models linking field measurements & satellite change detection
	20,000	Portland State University	Bio-Monitoring urban forests
	25,000	Portland State University	Implementing water conservation strategies on national forest lands
	107,992	The Student Conservation Association, Inc.	Implementation of base FIA
	24,751	University of Alaska	Pilot Project of Tanana Valley FIA, Alaska
	113,915	University of Alaska	Growth, mortality, and climatic impacts via tree ring analysis on FIA plots
	17,686	University of Hawaii	Developing statewide report on nontimber forest product use
	34,157	University of Montana	Implementation of FIA, Alaska timber-product output studies

Table B-5. Grants and agreements entered into by FIA units, FY 2015 (continued).

Unit	Amount	Recipient	Purpose
	10,448	Forest Service, Pacific Northwest Region 6	Okanogan-Wenatchee National Forest, Methow Valley RD stock support
	73,326	University of Washington	Carbon monitoring development
	59,717	USDI, National Business Center, Aviation Management	Implementation of FIA, Hawaii
	59,982	Washington State University	Evaluation of visual structure from motion technology for forest inventory field operations
PNW total	**2,198,844**		
Southern	369,106	Alabama Forestry Commission	Implementation of annual FIA
	316,812	Arkansas Forestry Commission	Implementation of annual FIA
	301,002	Florida Department of Agriculture and Consumer Services	Implementation of annual FIA
	406,408	Georgia Forestry Commission	Implementation of annual FIA
	249,265	Kentucky Division of Forestry	Implementation of annual FIA
	321,231	Mississippi Forestry Commission	Implementation of annual FIA
	342,063	North Carolina Dept. of Agric. and Consumer Services	Implementation of annual FIA
	297,617	Oklahoma Dept. of Agriculture Food and Forestry	Implementation of annual FIA
	244,619	South Carolina Forestry Commission	Implementation of annual FIA
	263,154	Tennessee Department of Agriculture	Implementation of annual FIA
	479,223	Texas A&M Forest Service	Implementation of annual FIA
	281,297	Virginia Department Forestry	Implementation of annual FIA
	65,000	International Institute of Tropical Forestry (IITF)	Experimental Forest Study
	30,000	Appalachian State University	Carbon storage
	10,000	Auburn, Purdue, Idaho University	Tree Seedling Planting Survey
	22,000	Carpenter's Elementary School	Signage—Outdoor Learning Center
	71,000	Texas A&M Forest Service	Image Change Project
	75,000	Texas A&M Forest Service	Ponderosa Pine survey & plot data
	40,000	Texas A&M Forest Service	Urban forestry
	15,000	The University of Tennessee	"C" Carbon project modeling
	80,000	The University of Tennessee	Information Management—Cooperative Research
	20,000	Virginia Tech University	Assessing NTFP Inventory using FIA Data
	60,000	Virginia Tech University	FIA Biomass and Carbon Database
	60,000	Virginia Tech University	RPA Land Use Modeling
SRS total	**4,419,797**		
Grand total	**14,348,665**		

FIA = Forest Inventory and Analysis. FVS = Forest Vegetation Simulator. GPO = Government Publishing Office. NTFP = Nontimber Forest Products. NWOS = National Woodland Owners' Survey. RMRS = Rocky Mountain Research Station. RPA = Resources Planning Act. RSAC = Remote Sensing Applications Center. USDI = U.S. Department of the Interior. WO = Woodland Owner.

Table B-6. Number and hours of significant consultations by FIA staff by customer group, FY 2015.

Customer group	Pacific Northwest		Interior West		Southern		Northern		National Office		Total	
	No.	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*
Academic	18	80	40	2,051	116	544	154	736	3	20	331	3,431
Government	39	310	66	2,435	172	1,007	265	3,917	15	75	557	7,744
Industry	12	24	16	293	65	453	107	195	5	25	205	990
NGO	10	38	7	110	33	162	57	238	8	65	115	613
NIPF	4	6	1	6	5	112	25	36	2	10	37	170
Media			12	23	2	3	5	7	3	10	22	43
Other			10	146	55	131	16	531	2	8	83	816
	83	**458**	**152**	**5,064**	**448**	**2,412**	**629**	**5,659**	**38**	**213**	**1,350**	**13,806**

FIA = Forest Inventory and Analysis. FY = fiscal year. NGO = nongovernmental organization. NIPF = nonindustrial private forest landowner.

Table B-7. FIA data access by online tools and spatial data center requests, 2007–2015.

Indicator	Number of annual accesses									Total 2007–2015
	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Online tools										
MapMaker	24,073	20,834	25,000	-	-	-	-			69,907
Forest Veg Simulator (FVS)	497	683	-	-	-	-	-			1,180
Fuel Treatment Evaluator (FTE)	1,995	50	-	-	-	-	-			2,045
Forest Inventory Data Online (FIDO)		38,092	55,494	70,943	72,946	52,099	57,567	57,974	47,263	452,378
National Woodland Owners Survey (NWOS)			6,560	1,700	2,070	5,515	4,502	2,994	2,068	25,409
EVALIDator			3,920	29,000	55,468	34,901	33,759	35,839	36,532	229,419
National Timber Products Output Tool (TPO)								69,600	18,544	88,144
DATA downloads			2,014	3,033	1,929	1,512	7,383	19,768	66,000	101,639
Total	**26,565**	**59,659**	**92,988**	**104,676**	**132,413**	**94,027**	**103,211**	**186,175**	**170,407**	**970,121**
Spatial data requests										
Academia	138	140	109	114	121	168	143	155	160	1,248
State	44	48	49	47	36	45	29	55	91	444
NFS	15	29	16	32	17	46	31	32	29	247
Other Federal	182	135	105	116	92	169	175	131	136	1,241
NGO	21	34	41	31	23	41	35	31	38	295
Industry	39	29	28	35	34	61	41	94	84	445
Other	54	68	57	48	91	75	67	88	66	614
Total	**493**	**483**	**405**	**423**	**414**	**605**	**521**	**586**	**604**	**4,534**

FIA = Forest Inventory and Analysis. NGO = nongovernmental organization. NFS = National Forest System.

Table B-8. Mill, fuelwood, and ownership surveys processed and utilization sites visited, 2000–2015.

Survey or site	Year initiated	Number of annual survey questionnaires or sites										Total 2000–2015
		2000-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Timber products	1947	12,302	2,473	1,131	2,657	1,727	3,521	1,375	2,675	1,142	2,750	24,996
Fuelwood	1947	1,400	1,519	-	-	-	-	-	2,360	-	-	3,163
Ownership surveys	1978	17,281	-	-	-	-	7,960	4,028	5,262	-	-	8,569
Utilization sites	1947	625	147	486	17	66	58	162	189	105	216	48,804

Table B-9. Forest health indicator, year of initiation, and number of samples collected 2000–2015.

Indicator	Year initiated	Number of annual samples										Total 2000–2015
		2000-2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
Crowns	1991	6,299	1,006	962	1,177	761	-	1,510	5,031	3,813	4,437	24,996
Lichens	1998	2,496	182	127	150	167	-	33	-	-	8	3,163
Soils	1999	5,438	227	349	201	266	2	595	565	439	487	8,569
Veg	2001	10,860	2,386	2,100	2,125	2,097	1624	7,145	6,703	7,098	6,666	48,804
Ozone	1994	7,146	958	948	1,003	1,018	107	-	-	-	-	11,180
DWM	2001	14,601	4,288	1,448	2,152	1,392	1414	6,263	8,271	8,635	8,186	56,650
Mortality[a]	2001	34,069	12,122	12,594	13,892	15,293	15,858	20,275	13,859	17,308	16,825	172,095

[a] Number of remeasured annual inventory plots from which tree mortality can be estimated.

Table B-10. Status of FIA Atlantic and Pacific island inventories which are excluded from annualized inventory.

Region and area	Land area in inventory	Forest area	Percent forest	Number of major islands	Year of current inventory	Year of published report	Total Phase 2 plots[a]	Total Phase 3 plots	Available online data
Pacific (PNW):	- - - - - Acres - - - - -								
American Samoa	48,434	43,631	90	4	2013	2004	21		Yes
Guam	135,660	63,833	47	1	2013-2014	2004	46		Yes
Palau	110,028	90,685	82	10	2014	2007	54		Yes
Commonwealth of the Northern Mariana Islands	75,546	51,009	68	3	2004	2011	35		Yes
Federated States of Micronesia	161,917	143,466	89	4	2005-2006	2011	73		Yes
Marshall Islands	33,182	23,230	70	10	2008	2011	44		Yes
Hawaii[b]	4,141,469	1,990,000	48	8	2010-2019	1988	685		No
Atlantic (SRS):									
Commonwealth of Puerto Rico	2,272,920	1,219,177	55	4	2009	2013	307	141	Yes
U.S. Virgin Islands	82,164	46,967	55	3	2009	2013	41	42	Yes
Total	**7,061,320**	**3,671,998**	**604**	**47**			**1,306**	**183**	

FIA = Forest Inventory and Analysis.

[a] Partial suite of health indicator data collected on all plots in Pacific region.

[b] Hawaii plans to implement annualized design.

Table B-11. Land and forest area and FIA annualized implementation status by State and region, FY 2015.[a]

Region and State	Bureau of the Census land area	Forest land area defined by current FIADB	Forest land area defined by 2012 RPA Assessment	Annual inventory entry date	State annualized as of 2015
		Thousand acres		*Year*	
Northern	***606,841***	***182,325***	***182,299***		***24***
Connecticut	3,099	1,712	1,712	2003	Yes
Delaware	1,247	340	340	2004	Yes
Illinois	35,532	4,848	4,848	2001	Yes
Indiana	22,929	4,830	4,830	1999	Yes
Iowa	35,749	3,014	3,014	1999	Yes
Kansas	52,326	2,502	2,502	2001	Yes
Maine	19,739	17,660	17,660	1999	Yes
Maryland	6,252	2,461	2,461	2004	Yes
Massachusetts	4,992	3,024	3,024	2003	Yes
Michigan	36,185	20,127	20,127	2000	Yes
Minnesota	50,961	17,371	17,371	1999	Yes
Missouri	43,995	15,472	15,472	1999	Yes
Nebraska	49,167	1,576	1,576	2001	Yes
New Hampshire	5,730	4,832	4,832	2002	Yes
New Jersey	4,707	1,964	1,964	2004	Yes
New York	30,161	18,966	18,966	2002	Yes
North Dakota	44,161	760	734	2001	Yes
Ohio	26,151	8,088	8,088	2001	Yes
Pennsylvania	28,635	16,782	16,782	2000	Yes
Rhode Island	662	360	360	2003	Yes
South Dakota	48,519	1,911	1,911	2001	Yes
Vermont	5,899	4,591	4,591	2003	Yes
West Virginia	15,384	12,155	12,155	2004	Yes
Wisconsin	34,661	16,980	16,980	2000	Yes
Southern	***533,031***	***267,214***	***244,716***		***13***
Alabama	32,413	22,877	22,877	2001	Yes
Arkansas	33,303	18,755	18,755	2000	Yes
Florida	34,447	17,461	17,461	2001	Yes
Georgia	36,809	24,768	24,768	1998	Yes
Kentucky	25,271	12,472	12,472	1999	Yes
Louisiana	27,650	14,712	14,712	2000	Yes
Mississippi	30,031	19,542	19,542	2007	Yes
North Carolina	31,115	18,588	18,588	2003	Yes
Oklahoma	43,901	12,646	12,256	2008	Yes
South Carolina	19,239	13,120	13,120	1998	Yes
Tennessee	26,390	13,942	13,942	1999	Yes
Texas	167,188	62,425	40,318	2000	Yes
Virginia	25,274	15,907	15,907	1998	Yes
Interior West	***547,691***	***154,093***	***124,614***		***8***
Arizona	72,700	18,643	10,795	2001	Yes
Colorado	66,331	22,837	19,995	2002	Yes
Idaho	52,892	21,448	21,247	2004	Yes
Montana	93,149	25,573	25,169	2003	Yes
Nevada	70,260	11,169	8,121	2010	Yes

Table B-11. Land and forest area and FIA annualized implementation status by State and region, FY 2015[a] (continued).

Region and State	Bureau of the Census land area	Forest land area defined by current FIADB	Forest land area defined by 2012 RPA Assessment	Annual inventory entry date	State annualized as of 2015
New Mexico	77,631	24,840	16,615	2008	Yes
Utah	52,589	18,135	11,866	2000	Yes
Wyoming	62,140	11,448	10,807	2010	Yes
Pacific Northwest	***573,389***	***215,182***	***214,605***		***5***
Alaska, Coast	39,041	14,426	14,426	2004	Yes
Alaska, Int.	326,575	114,151	114,151		
California	99,699	32,618	32,057	2001	Yes
Hawaii	4,110	1,748	1,748	2010	Yes
Oregon	61,432	29,804	29,787	2001	Yes
Washington	42,532	22,435	22,435	2002	Yes
TOTAL	***2,260,953***	***818,814***	***766,234***	**-**	***50***
Forest area performance measure, excluding interior Alaska					100%
Forest area performance measure, including interior Alaska					90%
State activity performance measure, includes all active States					100%

[a]Based on area defined as forest in FIADB plus area defined as forest by 2012 RPA Assessment.

FIA = Forest Inventory and Analysis. FIADB = Forest Inventory and Analysis Database. FY = fiscal year. RPA = Resource Planning Act

Table E-1. FIA summary statistics and performance measures, 2008–2015.

	2008	2009	2010	2011	2012	2013	2014	2015
AVAILABLE PROGRAM FUNDS								
Appropriated funds[1]	64,641	65,536	71,817	71,452	69,186	65,567	66,805	70,000
Other Federal funds[2]	1,559	3,320	930	856	528	2,668	3,077	743
Total Federal funds	**66,200**	**68,856**	**72,747**	**72,308**	**69,714**	**68,235**	**69,882**	**70,743**
Total partner funds	6,505	6,494	7,516	9,109	10,129	7,772	7,833	8,972
Total available funds	**72,705**	**75,350**	**80,263**	**81,417**	**79,843**	**76,007**	**77,715**	**79,715**
Percent full Federal appropriated funding	**83%**	**84%**	**92%**	**92%**	**89%**	**84%**	**86%**	**78%**
PROGRAM EXPENSES AND BALANCES								
Administration	2,785	2,999	3,262	3,233	2,735	2,854	3,036	2,703
Image processing	1,198	1,102	916	724	519	589	597	635
Field support	3,357	3,003	3,594	3,917	3,946	4,151	4,082	3,782
Data collection[3]	22,989	25,243	26,162	27,057	24,387	22,559	23,590	22,807
Information management[3]	6,108	7,623	7,476	6,794	6,740	5,933	6,737	7,680
Analysis	5,147	5,354	5,357	6,105	6,570	6,695	7,058	6,907
Research[3]	5,033	5,881	6,903	5,444	6,075	6,690	7,072	6,111
Miscellaneous/other	3,406	3,909	4,473	4,417	3,882	3,652	3,864	5,025
Total direct expense	**50,023**	**55,115**	**58,143**	**57,692**	**54,854**	**53,124**	**56,037**	**55,651**
Total Indirect expenses	**13,586**	**12,653**	**14,189**	**13,958**	**14,180**	**14,704**	**13,461**	**14,708**
Indirect rate	*21.0%*	*19.3%*	*19.8%*	*19.5%*	*20.5%*	*22.4%*	*20.2%*	*21.0%*
Total Federal expense	**63,609**	**67,768**	**72,332**	**71,650**	**69,034**	**67,828**	**69,498**	**70,359**
Fire Transfer	**2,318**							**449**
Total end-of-year balance	**273**	**1,089**	**415**	**658**	**680**	**407**	**384**	**312**
Total Federal funds	**66,200**	**68,856**	**72,747**	**72,308**	**69,714**	**68,235**	**69,882**	**71,119**
Other measures								
Percent States with annual activity	94	94	100	100	100	100	100	100
Percent States with FIADB 1-2 yrs old	90	90	88	94	94	94	96	96
Federal employees	389	381	392	397	372	366	366	338
Other employees	173	201	205	201	203	184	204	185
Total employees	**562**	**582**	**596**	**598**	**575**	**550**	**570**	**523**
P2/3 base forest plots	18,208	21,545	19,272	21,233	19,673	21,263	19,789	18,346
P2/3 base nonforest plots	29,351	21,996	25,238	27,568	27,131	27,683	24,094	24,877
Total plots	**47,559**	**43,541**	**44,510**	**48,801**	**46,804**	**48,946**	**43,883**	**43,223**
All quality assurance plots	4,860	3,597	4,020	4,550	4,417	5,465	2,312	3,083
Percent quality assurance plots	10%	8%	9%	9%	9%	11%	5%	7%
All publications	172	206	203	204	272	238	234	236
Journal publications	65	38	74	62	90	90	87	122
Percent journal publications	38%	18%	36%	30%	33%	38%	37%	52%
Consultations, number	1,659	1,399	991	1,753	848	824	945	1,350
Consultations, hours	6,656	8,603	10,381	8,584	8,807	8,124	7,987	13,806
User/management meetings	10	11	10	14	15	12	14	13
Spatial data requests filled	483	405	423	414	605	605	586	604
Online accesses	59,659	92,988	104,676	132,413	94,027	94,027	186,175	170,407

[1] *Net of rescissions.*
[2] *Includes return of previous year carryover, return of fire transfers and additional Forest Service, Research and Development commitments.*
[3] *Includes Federal grants and agreements.*

FIA = Forest Inventory and Analysis. FIADB = Forest Inventory and Analysis Database.