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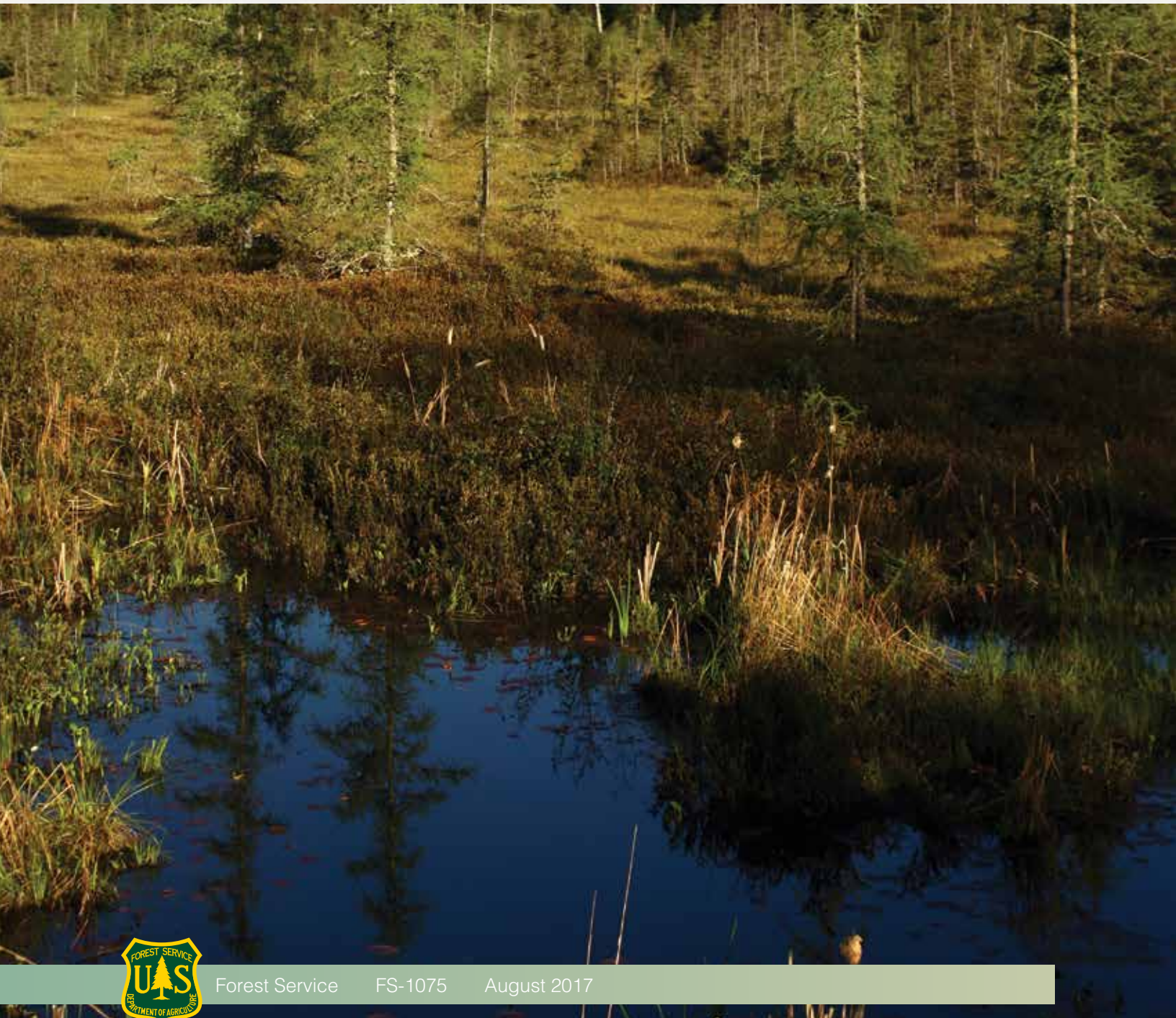
United States Department of Agriculture

Forest Inventory and Analysis

Fiscal Year 2016 Business Report



Forest Service FS-1075 August 2017

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Cover photo: *Spruce bog in Bayfield County, WI, courtesy of Sjana Schanning, Ecologist, Northern Research Station FIA.*

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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 regarding 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 19th, 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) 2016, FIA maintained annualized inventory activity in all 50 States including the Tanana Valley in interior Alaska. 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 2016 was $86.1 million, a net increase of $5.6 million from FY 2015 (appropriated funding increased $5 million). FY 2016 funding consisted of $75.0 million appropriated by Congress plus $0.9 million in net adjustments from the previous fiscal year, special funding of $0.3 million, and $10.2 million in partners' funds. State partners' funds are used to maintain an annual measurement and 5-year State report cycles. In FY 2016, total appropriated funding was 17 percent less than the amount needed for full program implementation of 2014 Farm Bill options A through C.

Partners' support. Partners contributed $10.2 million to the program in FY 2016. 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 $1,204,292 from FY 2015.

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 $18.2 million was spent in this way in FY 2016. Table 2 summarizes FIA funding activity to and from States from FY 2007 through FY 2016 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 532 spatial data requests and 175,110 online data requests.

Five-year reports. By FY 2016, 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 371 publications, 122 of which were peer reviewed in FY 2016.

Quality assurance. FIA field-checked 11 percent of all field plots measured in FY 2016 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 2016, FIA held one national and eight 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 565 people in FY 2016. Cooperators are integral to the efficient delivery of the FIA program, comprising 213 of the 565 employees, or 38 percent of the total workforce. Total employment was up 42 positions in 2016; 15 of these positions were Federal positions, and the remainder were cooperators funded by FIA. Of the total workforce, 179 were

employed in information management, techniques research, or resource analysis; they provided 1,289 consultations (7,547 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, 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.

FIA Strategic Plan. The provisions to be addressed in the FIA Strategic 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 Timber Product Output 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.

Looking to 2017. FIA had a productive year in FY 2016 and looks forward to further progress in FY 2017. Important goals for FY 2017 include—

- Continue annualized inventory of 50 States and continue to expand work in interior Alaska.
- Complete preliminary work on the 2017 *Forest Resources of the United States* report for the Resources Planning Act (RPA) and post tables to Federal Register.
- Expand urban inventory to cities in all FIA regions.
- Print the *Forest Atlas of the United States* (FIAtlas).
- Complete at least 10 State 5-year reports.
- Implement 2017 NWOS base, urban, and corporate surveys. Finalize and pre-test corporate NWOS.
- Publish Hawaii Nontimber Forest Products report. Publish 2012, 2013, 2014, and 2015 National Pulpwood reports.
- Continue to implement the Image-Based Change Estimation project to improve land cover and land use change classification and analysis.
- Explore estimation approaches for carbon estimation using LiDAR, Landsat, and other remotely sensed information in a 6-State pilot study.
- Continue work on DATIM and continue work to implement changes from field guide version 7.0 in FIADB and the online tools.

For additional detail, see Comparing FY 2015 Plans With FY 2016 Accomplishments and FY 2017 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) 2016 (October 1, 2015, through September 30, 2016), 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, how it is changing, 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) and includes Urban plots in the category of "Urban and Special Studies" in appendix table B-1.

Fiscal Year 2016 Program Overview

In FY 2016, 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 2016, the total appropriated funding of $75 million 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. 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 2016

Region	Land area	Forest area (FIADB)	Forest area (RPA)	Forest	All P1[a]	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.
[a]MODIS 250-meter pixels at 15.4 acres each.

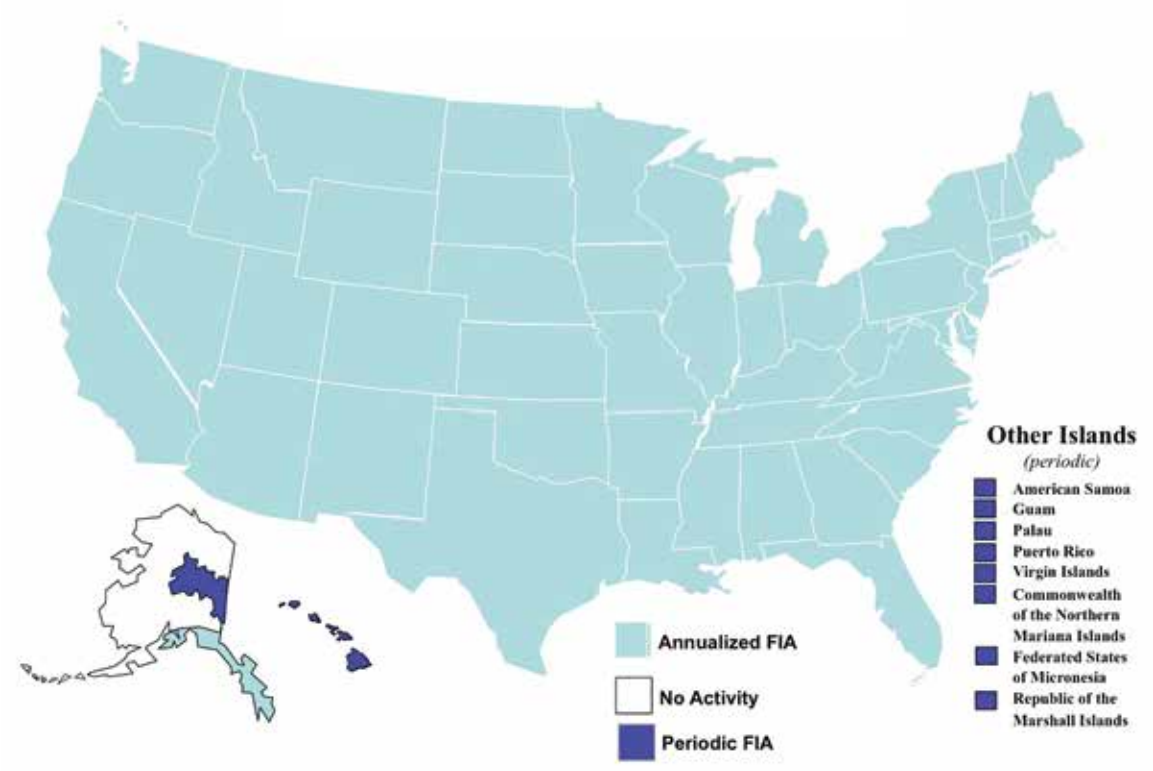
[1] U.S. Department of Agriculture, Forest Service. 2016. Forest Inventory and Analysis strategic plan. FS-1079. Washington, DC: U.S. Department of Agriculture, Forest Service. 46 p.

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 2016, we were active in all 50 States including coastal and Tanana Valley of Alaska (fig. 1), measuring 14,308 base grid forest sample locations, or 12 percent of the total. At the end of FY 2016, all States were covered by some level of annual FIA program activity, but only 49 States were fully implemented, with interior Alaska being implemented on a periodic survey unit basis. Appropriated funding saw an increase of $5 million in FY 2016, and partners' support increased $1,204,292. FIA's congressional mandate, under the Forest and Rangeland 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 the Federated States of Micronesia in 2016.

The FIA program produced 371 reports and publications in FY 2016, significantly more than in FY 2015 due to increasing adoption of automated report generation from online databases. Of these publications, 60 were core publications consisting of reports specific to a complete survey unit, 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 133 articles or abstracts in proceedings from scientific meetings and conferences. FIA staff participated in 1,289 significant consultations with FIA customers, requiring 7,547 hours of staff time—equivalent to more than 6 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 175,110 data retrievals in which FIA customers obtained user-defined tables, data downloads, and maps of interest. Overall numbers are up as the program improved interactive tools and added refinements to online user access.

Figure 1. FIA implementation status, FY 2016.



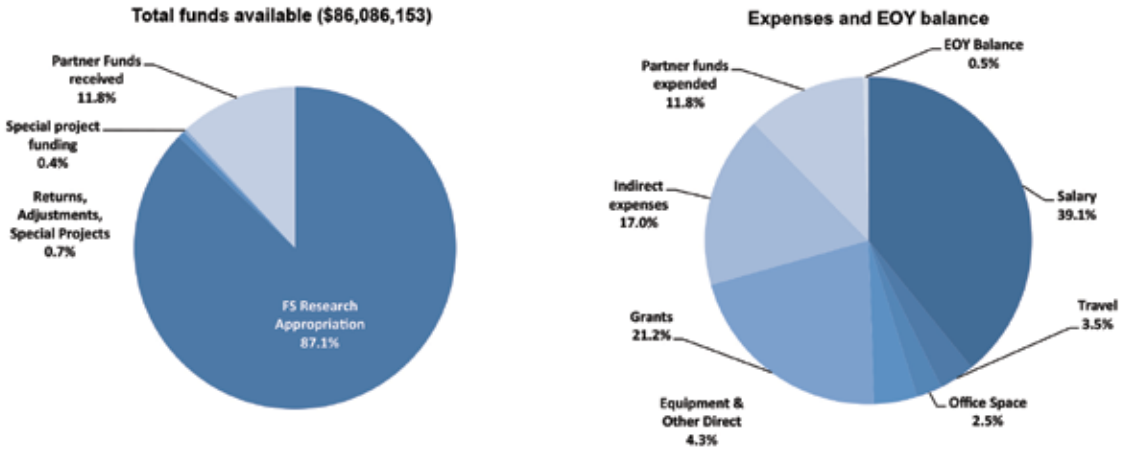
FIA = Forest Inventory and Analysis; FY = fiscal year.

Program Resources

Congress appropriated funds for the FIA program in one Forest Service deputy area: Research and Development (R&D), which had $75 million in appropriated funds in FY 2016, a net increase of $5 million from FY 2015 (appendix table B-12). In FY 2016, States and other partners provided an additional $10,175,328 for plot intensification and other program enhancements. Total available program funding, including $606,053 in pre-year adjustments and $303,772 in special funding, was $86,086,153 (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.

Figure 2. FIA program available funds and expenses by category, FY 2016.



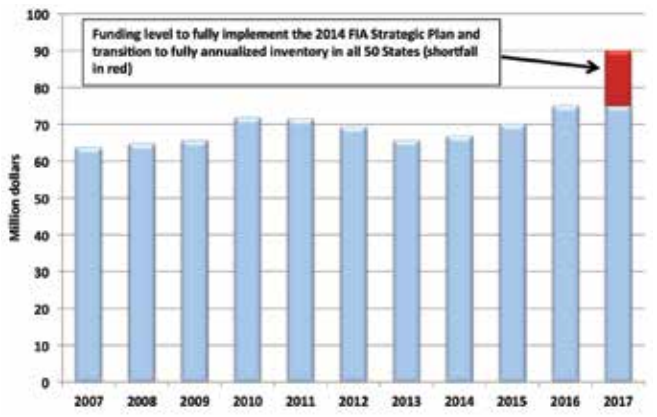
FIA = Forest Inventory and Analysis; FY = fiscal year.

Table 2. Annual FIA appropriations and allocation of FIA-appropriated and State-contributed funds for fieldwork only for FYs 2007–2016

Category	Fiscal Year									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	Thousand dollars									
Total FIA appropriation	63,605	64,641	65,536	71,817	71,452	69,186	65,567	66,805	70,000	75,000
FIA data collection grants to States	**6,146**	**5,590**	**6,971**	**7,278**	**8,002**	**7,475**	**5,338**	**7,098**	**5,173**	**8,428**
Number of States receiving grants	**18**	**18**	**19**	**20**	**17**	**18**	**16**	**17**	**16**	**18**
Average grants to participating States	**341**	**311**	**367**	**364**	**471**	**415**	**334**	**418**	**323**	**323**
Percent of appropriated funding granted to States for data collection	*10%*	*9%*	*11%*	*10%*	*11%*	*11%*	*8%*	*11%*	*7%*	*11%*
State contributions for leveraged data collection	**5,824**	**3,783**	**4,594**	**5,039**	**6,192**	**5,567**	**3,962**	**3,919**	**4,324**	**5,506**
Number of States contributing funds	**41**	**41**	**44**	**45**	**40**	**41**	**38**	**36**	**37**	**34**
Average contribution from States	**142**	**92**	**104**	**112**	**155**	**136**	**104**	**109**	**117**	**162**

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

Figure 3. FIA-appropriated funding level, FYs 2007–2016 and 2017 projected.



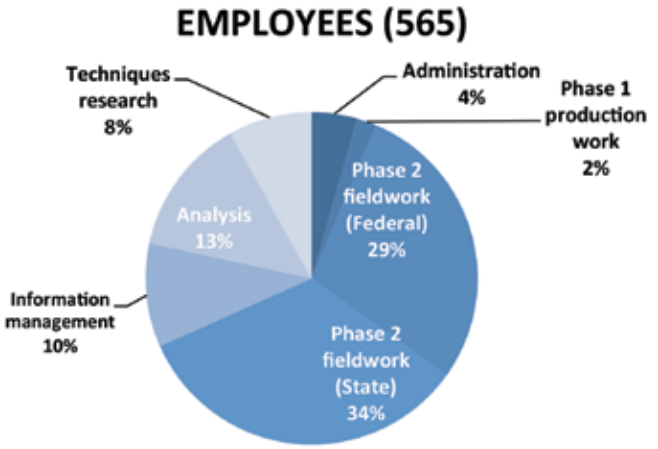
FIA = Forest Inventory and Analysis; FY = fiscal year.
Note: Estimated total funding to fully achieve the 2007 strategic plan was $77.7 million. The 2014 Farm Bill required a new strategic plan and added items requiring an additonal $90 million annually to fully achieve plan options A through C. This gap in funding is noted in the red segment on the 2017 bar.

Across FIA regions, cost and productivity figures differ because of the cyclical nature of the inventory system and because of differences among field units in operational methods and ease of access to property. Rates of effective indirect expenses in FIA field units in 2016 ranged from 8 to 16 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 71-percent rate of indirect cost because that budget item includes the USDA overhead, programwide charges to the Albuquerque Service Center ($6,550,000), and expenses related to the Information Resources Direction Board ($2,500,000) in FY 2016. Overall, the program's indirect expenses were 19.3 percent of the total expenses. Inclusion of the Albuquerque Service Center charges would take total program indirect to roughly 30.1 percent of appropriated funds. Figure 3 shows the total appropriated funding for FIA from FY 2007 through FY 2016, with FY 2017 indicating the amount required to fully implement the annualized inventory. Appendix table B-12 shows the trend data in FIA performance measures for FY 2009 through FY 2016.

In FY 2016, FIA Federal program staffing consisted of 353 Federal person-years of effort (appendix table B-3a), slightly lower than FY 2015. Cooperators, especially State forestry organizations, using grants and agreements, accomplish much of the work done by FIA, and they added 213 employees for a total workforce of 565. Cooperator employees included 160 State or cooperator field employees, 15 information management specialists, 17 analysts, 17 researchers, and 2 administrative specialists. Cooperator employees constituted 38 percent of the total FIA workforce in FY 2016—4 percent more than in 2015 as FIA continues to seek cost-effective partnerships.

Of all Federal and cooperator FIA employees, approximately 62 percent were involved in data collection and field support, 23 percent in analysis and information management, 8 percent in techniques research, 4 percent in program management and administration, and 2 percent in P1 production work (fig. 4).

Figure 4. FIA program employees by job group, FY 2016.



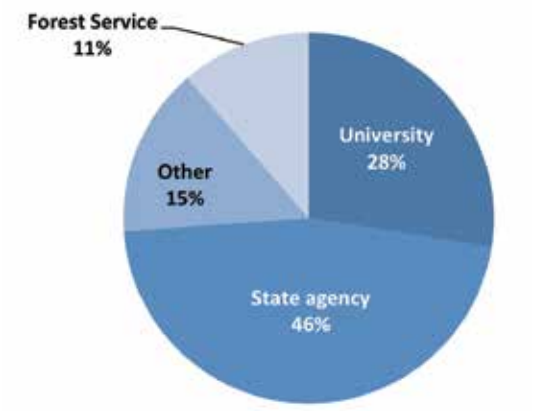
FIA = Forest Inventory and Analysis; FY = fiscal year.

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 128 grants and agreements for FY 2016, comprising $18,240,081. 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 (46 percent) and university partners (28 percent) (fig. 5).

Figure 5. Grants and agreements by recipient group, FY 2016.



FY = fiscal year.

Additional cooperators included other Federal and Forest Service offices (11 percent) and non-Federal partners (15 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 96 partners that have contributed resources to the FIA program in FY 2016, 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 $4.0 million toward the full 20 percent of target plots measured annually and another $6.2 million in contributions that add value to the FIA program, for a total of $10.2 million in partners' contributions. These contributions amount to $1,204,292 more than partners contributed in FY 2015. Experience has shown that as Federal funds increase, 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.

Over the last 10 years, FIA has provided grants of nearly $135 million to efficiently carry out annualized inventory, and partners have contributed more than $81 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.

Table 3. FIA grants and partners' contributions, FY 2007 through FY 2016 (10-year summary)

Group	Total FIA grants	Average annual grants	Percent of grants	Total partner contibutions	Average annual contributions	Percent of contributions
	Dollars			*Dollars*		
States/islands	67,548,399	6,754,840	50%	49,785,982	4,978,598	61%
Universities	37,911,739	3,791,174	28%	6,203,980	620,398	8%
Forest Service	11,278,184	1,127,818	8%	20,393,625	2,039,362	25%
Other Federal	1,356,268	135,627	1%	4,626,554	462,655	6%
Other partners	17,513,507	1,751,351	13%	623,384	62,338	0.8%
Total	**135,608,097**	**13,560,810**	**100%**	**80,633,523**	**8,163,352**	**100%**

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

FIA Data Availability

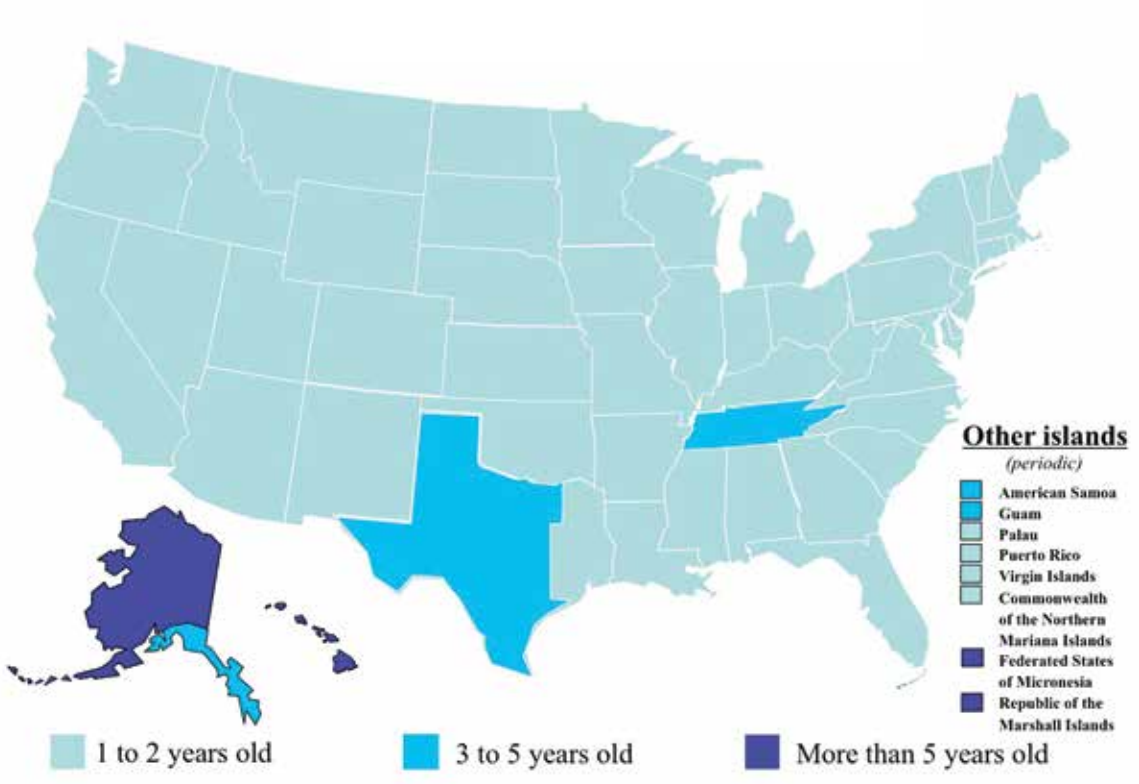
In 2016, FIA completed migrating its data and data-processing procedures to the new Forest Service corporate servers in Kansas City, MO. The overall goal of this migration was to move the Forest Service to a more reliable and modern infrastructure with improved platform tools, better response times, better documentation, and, of course, lower total life-cycle cost. Many significant challenges remain in the new corporate-server environment, but the major hurdles are behind us. FIA has returned 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 of primary interest to 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, 2016—the end of FY 2016. Virtually all States now have data that are less than 2 years old available in the database. Interior Alaska remains an outlier, owing only to partial funding and the recent initiation of inventory work beyond pilot testing. 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.

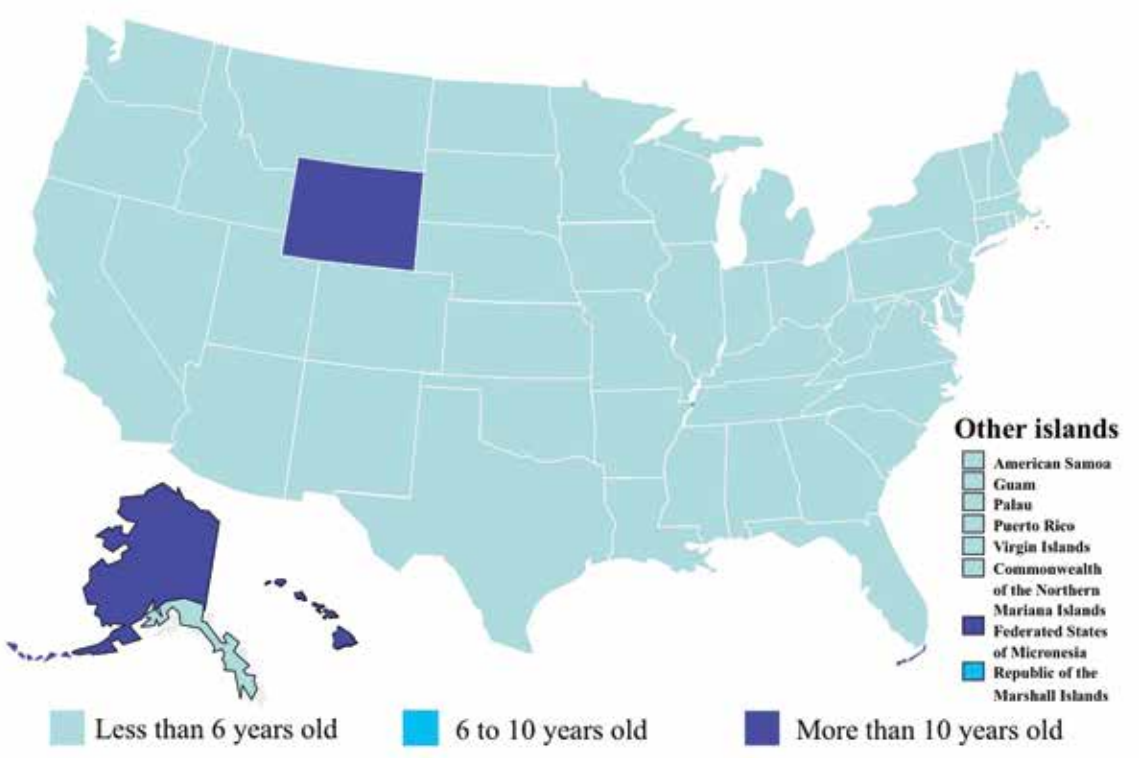
Figure 7 shows the age of the most recently published statewide FIA report for each State. States with publications based on data that are less than 6 years old—the program objective—are shaded light blue. States with publications 6 to 10 years old are shaded medium blue, and States where the most recent 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 be in 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 to not exceed 10 years in these areas.

Figure 6. Availability of online FIA data, FY 2016.



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

Figure 7. Publication status of State reports, FY 2016.



FY = fiscal year.
Note: 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) provides additional error checks, and consistently calculates a variety of derived variables using estimation equations that are described in general technical reports. The national QA 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 Forest Inventory and Analysis Database: Database Description and User Guide* provides detailed information to users about published FIA data.
- The analytical *QA Guide* outlines steps for checking compiled data for accuracy and completeness before releasing them to the public.
- 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 (in development).
- Defining rigorous national cold-check field and scoring procedures to allow for equivalent field crew assessments across regions and crew types (in development).

Regional Program Accomplishments for FY 2016

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: New information on America's family forest owners.

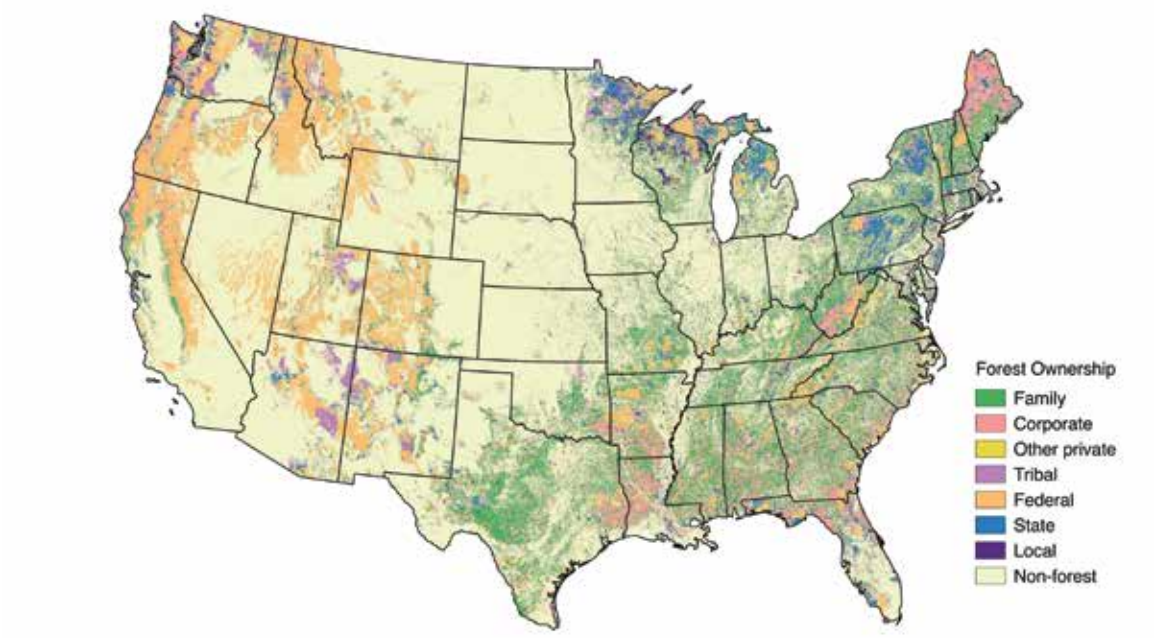
Accomplishment: Results from the 2011–2013 surveys have been published in the *Journal of Forestry* (http://dx.doi.org/10.5849/jof.15-099) and an accompanying Forest Service publication with State-level results (http://dx.doi.org/10.2737/NRS-RB-99).

Outcome: The Forest Service's FIA Program administers the National Woodland Owner Survey (NWOS) to understand who owns the Nation's 475 million acres of private forest (fig. 8), why they own it, what they have done with it in the past, and what they intend to do with it in the future. Understanding the future of forests in the United States demands that we understand the people who own a plurality of this land—family forest owners. The results from the NWOS are being released in the form of national, regional, and State tables and summaries, peer-reviewed journal articles, landowner magazines, and customizable output from the NWOS table maker program (http://apps.fs.fed.us/fia/nwos/tablemaker.jsp).

Selected results from the latest NWOS include:

- Family forest ownerships control 36 percent of America's forest land, more than any other ownership group. An estimated 290 million acres of forest land in the United States are owned by an estimated 11 million families, individuals, trusts, estates, and family forest partnerships, collectively referred to as family forest ownerships.
- The average family forest ownership has 27 acres of forest land. Of the ownerships, 62 percent have relatively small holdings of between 1 and 9 acres, but 56 percent of the family forest area is owned by ownerships with 100 acres or more.
- The most commonly cited reasons for owning family forests are related to the beauty and privacy the forests provide, along with wildlife and nature protection.
- Just 13 percent of family forest ownerships have a written forest management plan, and only 20 percent have received forest management advice in the previous 5 years.

Figure 8. Forest ownership across the United States.



- The average age of family forest owners is 63 years, with 48 percent of the family forest land owned by people who are at least 65 years of age.

Contact: Brett J. Butler, bbutler01@fs.fed.us

Finding: Soil carbon stocks in forests of the United States are significantly greater than previously estimated in national carbon budgets.

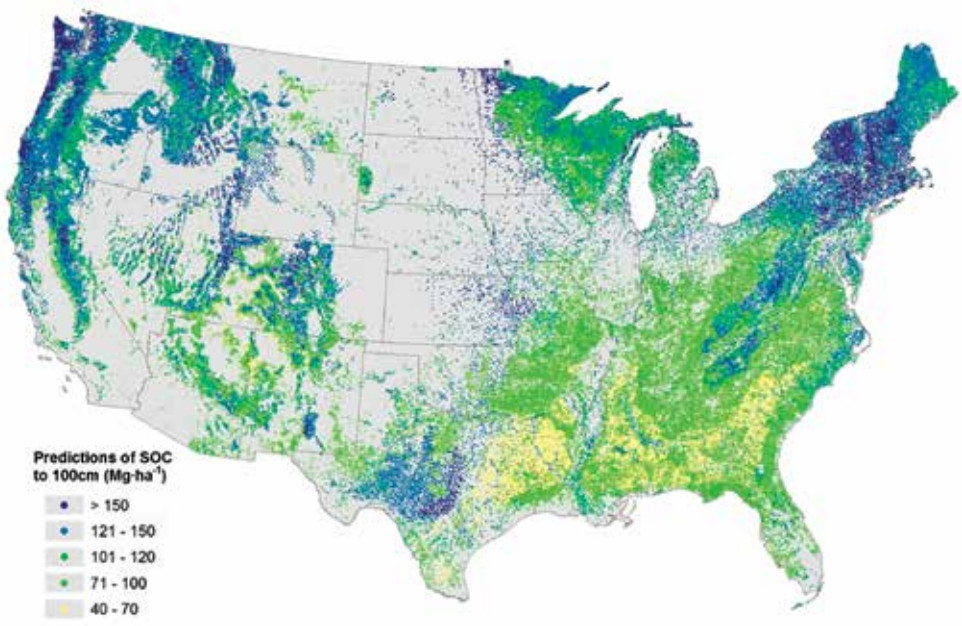
Accomplishment: Estimates of litter and soil carbon stocks and stock changes in the national greenhouse gas inventory are now based directly on field measurements from the FIA program.

Outcome: Forest ecosystems are the largest terrestrial carbon sink on Earth, with more than half of their net primary production moving to the soil via the decomposition of litter biomass. The FIA program within the Forest Service has been consistently measuring litter and soil attributes on permanent sample plots across all forest land and ownerships as part of the national forest inventory since 2001. Those data have recently been harmonized with auxiliary soils, climate, and geospatial data to develop models for predicting litter (Domke et al. 2016) and soil carbon stocks (Domke et al. In review; fig. 9) on forest land in the United States for United Nations Framework Convention on Climate Change (UNFCCC) reporting. This work resulted in an estimated 44 percent reduction in litter carbon stocks and an estimated 40-percent increase in soil carbon stocks relative to previous estimates in UNFCCC reporting. While these new methods represent improvements toward the estimation of litter and soil carbon stocks in forests of the United States, these pools are highly variable and much uncertainty remains.

Domke, G.M.; Walters, B.F.; Perry, C.H. [et al.] 2016. Estimating litter carbon stocks on forest land in the United States. Science of the Total Environment. 557–558: 469-478.

Domke, G.M.; Perry, C.H.; Walters, B.F. [et al.] 2017. Toward inventory-based estimates of soil organic carbon in forests of the United States. Ecological Applications. doi: 10.1002/eap.1516.

Figure 9. Random forests model predictions of soil organic carbon stocks (0-100 cm) for all national forest inventory plots with at least one forest land condition in the conterminous United States (source: Domke et al. 2017).



Woodall, C.W.; Domke, G.M.; Smith, J.E.; Coulston, J.W. 2016. Forest land category sections of the land use, land use change, and forestry chapter, and annex. In: U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2014. EPA 430-R-16-002.

Contact: Grant Domke, gmdomke@fs.fed.us

Finding: As of 2013, emerald ash borer (EAB, Agrilus planipennis) was documented in 18 percent of counties within the natural range of ash in the Eastern United States. Regional forest inventory data from the FIA program were used to quantify trends in ash mortality rate and volume, per hectare, relative to the year of initial EAB detection. Results indicate that the annual ash mortality rate increases by as much as 2.7 percent per year after initial detection of the pest in a county. Corresponding decreases in ash volume (as much as 1.8 m3 per hectare per year) continue for several more years until most live ash is killed. These results, while not necessarily representative of the effects on ash in urban ecosystems, document the severe impact this invading herbivore is having on forests as it expands its range in North America.

Accomplishment: Nonnative insects and diseases continue to accumulate in forest ecosystems worldwide. There is a need to assess the impacts of these species at a landscape level. Although an extensive body of literature exists related to the ecological impacts of invasive species in forest ecosystems, most studies have been limited to sampling from individual stands. This study used a regional approach to quantify the impacts of EAB across its range as of 2013. Volume and mortality estimates were presented in duration (years) categories for the groups of counties where EAB had been detected for comparison with the counties that are uninfested (fig. 10). The results document that invasion by EAB. An increase in ash mortality and corresponding decrease in ash volume generally begins 6–7 years after EAB is first detected in a county and continues for several more years until the live ash resource is reduced to very low levels in the region (fig. 11). As EAB continues to spread, it has the potential to functionally extirpate a large fraction of the ash component with potentially devastating economic and ecological impacts. Further monitoring and analysis will be needed to quantify the timing and magnitude of EAB impacts as this species expands its range across the Eastern United States and Canada.

Outcome: Regional impact studies for other forest pests are currently underway including Dutch elm disease and butternut canker.

Morin, R.S.; Liebhold, A.M.; Pugh, S.A.; Crocker, S.J. 2016. Regional assessment of emerald ash borer, *Agrilus planipennis,* impacts in forests of the Eastern United States. Biological Invasions. 9 p. http://dx.doi.org/10.1007/s10530-016-1296-x (http://www.treesearch.fs.fed.us/pubs/53082)

Contact: Randall Morin, rsmorin@fs.fed.us

Figure 10. Map of year of initial emerald ash borer (EAB) detection by county, 2013 (as of December 31, 2013) (source: Morin et al. 2016).

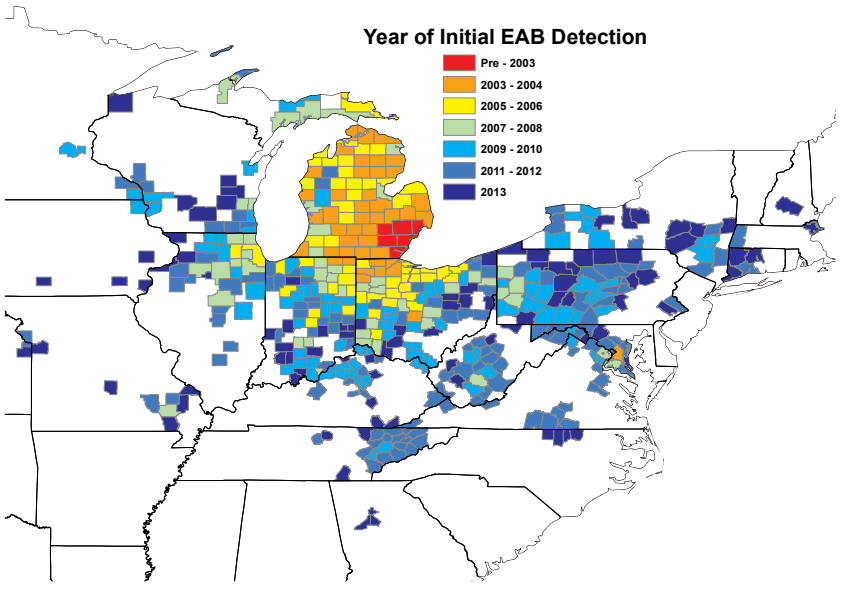
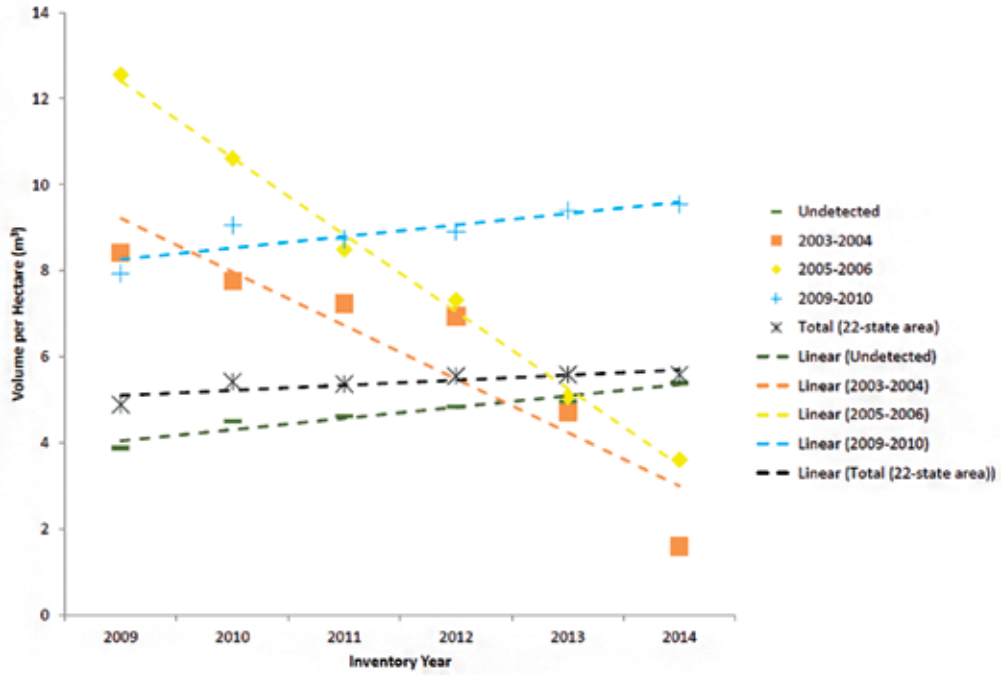


Figure 11. Ash volume, per hectare, by emerald ash borer (EAB) invasion status and inventory year with linear regression lines (source: Morin et al. 2016).



Pacific Northwest Research Station FIA Program

Finding: Pacific Northwest Research Station (PNW)-FIA presents the first broad-scale, ground survey-based fire severity remeasurements and estimates for a full range of severities and fire sizes. This study provides a broad-scale characterization of the extent of relatively low severity fires and small fires, including prescribed fires, not previously available.

Accomplishment: PNW-FIA used pre- and post-fire measurements across a variety of landscapes in Oregon and Washington (10,008 plots) to develop a tree-mortality-based fire severity classification. In many regions where fire is an important natural disturbance, determining how the frequency, severity, and extent of forest fires are changing in response to changes in management and climate is a key concern. In the United States, the only national-scale fire severity classification uses satellite image change-detection to produce maps for large (>400 ha) fires and is generated by the Monitoring Trends in Burn Severity program. It is not clear how much forested area burns in smaller fires or whether ground-based fire severity estimates from a statistical sample of all forest lands might provide additional useful information.

Outcome: Tree mortality based fire severity classifications (fig. 12), combined with remotely sensed and management information on timing and treatments, could be readily applied to nationally consistent FIA data to provide improved monitoring of fire effects anywhere in the United States sampled by remeasured FIA inventories.

> Whittier, T.R.; Gray, A.N. 2016. Tree mortality based fire severity classification for forest inventories: A Pacific Northwest national forests example. Forest Ecology and Management. 359: 199–209.

Partners: Oregon State University

Contact: Andrew Gray, agray01@fs.fed.us

Finding: PNW-FIA demonstrates with pre- and post-fire field measurements that previously developed conceptual, post-fire carbon trajectories for stand-replacing, high severity fires are not a good match for representing fire outcomes in forests that are more prone to low or moderate severity fires.

Accomplishment: We examined the dynamics of aboveground forest woody carbon pools—live trees,

standing dead trees, and down wood—during the first 6 years following wildfire across a wide range of conditions, which are characteristic of California forest fires. From repeated measurements of the same plots, we estimated change in woody carbon pools as a function of crown fire severity as indicated by a post-fire index, years since fire, pre-fire woody carbon, forest type group (hardwood versus softwood), elevation, and climate attributes. Our analysis relied on 130 U.S. national forest inventory plots measured before and 1 year after fire, with one additional remeasurement within 6 years after fire. There was no evidence of net change in total wood carbon, defined for this study as the wood in standing trees larger than 5 inches in diameter at breast height and down wood larger than 3 inches in diameter, over the post-fire period in any of the three severity classes.

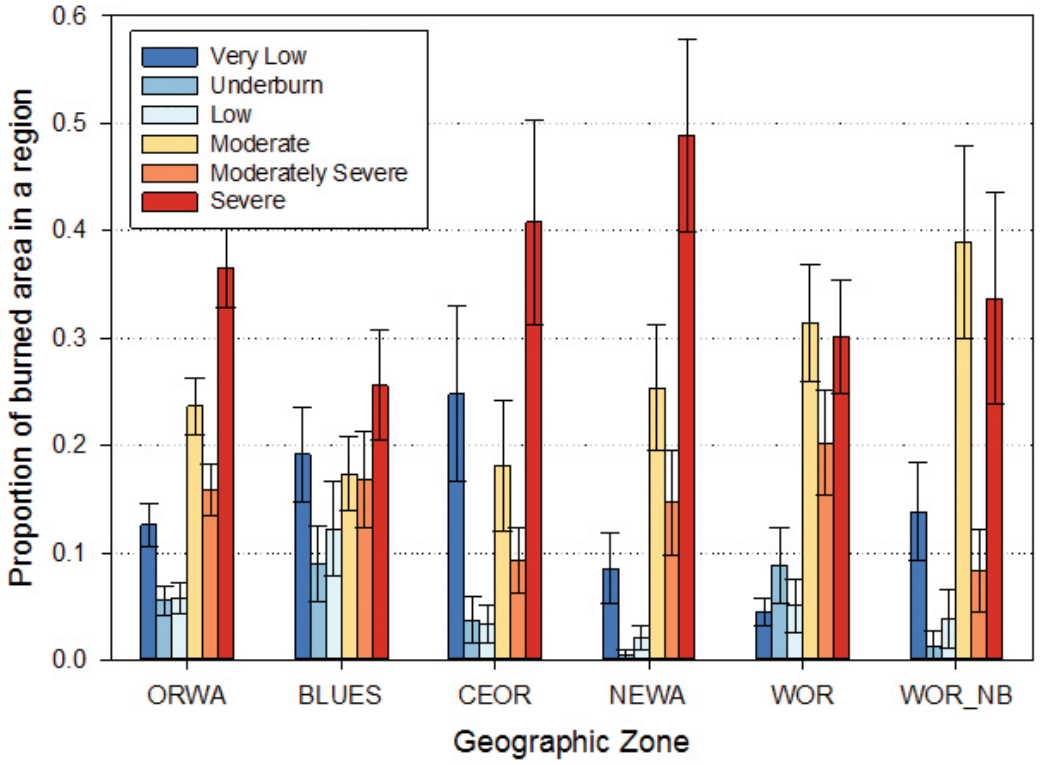
Outcome: Stands that burned at low severity exhibited considerable shifts from live to standing dead and down wood pools. In stands that burned at moderate severity, live wood decreased significantly whereas no net change was detected in standing dead or down wood. High severity fire resulted in movement from standing dead to down wood pools. Estimated mean post-fire dynamics resulting from fire severity are presented in fig. 13. The results suggest that the carbon trajectories for stand-replacing fires may not be appropriate for the majority of California's forest area that burned at low to moderate severities.

Eskelson, B.N.I.; Monleon, V.J.; Fried, J.S. 2016. A 6 year longitudinal study of post-fire woody carbon dynamics in California's forests. Canadian Journal of Forest research. 46: 610–620.

Partners: The University of British Columbia

Contact: Vicente Monleon, vjmonleon@fs.fed.us

Figure 12. Estimates and standard errors of proportion of burned area by tree-mortality severity class, and geographic zone in Oregon and Washington National Forests System (NFS) lands (1993–2007) (source: Whittier and Gray 2016).



ORWA = Oregon and Washington combined; BLUES = Northeastern Oregon, primarily Blue Mountains; CEOR = Central Oregon, east of Cascade Mountains crest; NEWA = Northeastern Washington, primarily northern Rockies ecoregion; WOR = Western Oregon, west of Cascade Mountains crest; WOR_NB = Western Oregon without Biscuit fire. Western Washington (WWA) not included due to very low area burned.

Finding: PNW-FIA presents a statistically rigorous assessment of estimation uncertainty for four large LiDAR (Light Detection and Ranging)-assisted, aboveground-biomass surveys to communicate the importance and availability of standard statistical tools.

Accomplishment: For many decades, remotely sensed data have been used as a source of auxiliary information when conducting regional or national surveys of forest resources. In the past decade, airborne scanning LiDAR has emerged as a promising tool for sample surveys aimed at improving estimation of aboveground forest biomass. This technology is now employed routinely in forest management inventories of some Nordic countries, and there is eager anticipation for its application to assess changes in standing biomass in vast tropical regions of the globe in concert with the United Nations Programme on Reducing Emissions from Deforestation and Forest Degradation program to limit C emissions. In the rapidly expanding literature on LiDAR-assisted biomass estimation, the assessment of the uncertainty of estimation varies widely, ranging from statistically rigorous to ad hoc. In many instances, too, there appears to be no recognition of different bases of statistical inference which bear importantly on uncertainty estimation.

Outcome: We have summarized four LiDAR-assisted studies (e.g., Upper Tanana Valley, Alaska, fig. 14) principally to emphasize the straightforward but nontrivial task of properly estimating the variance of estimators of aboveground biomass based on a complex sampling strategy. A complex strategy is one that may be based on two or more tiers of sampling, stratification and post-stratification, and that utilizes one or more models in the estimation of aboveground biomass. The purposes served by LiDAR-assisted surveys vary greatly, which prevents development of one standard sampling design. In contrast, standard statistical tools, which have not been universally recognized or employed, can be adopted to assess the variance of the proposed estimators.

Andersen, H.; Strunk, J.; Temesgen, H. 2011. Using airborne light detection and ranging as a sampling tool for estimating forest biomass resources in the upper Tanana Valley of interior Alaska. Western Journal of Applied Forestry. 26(4): 157–164.

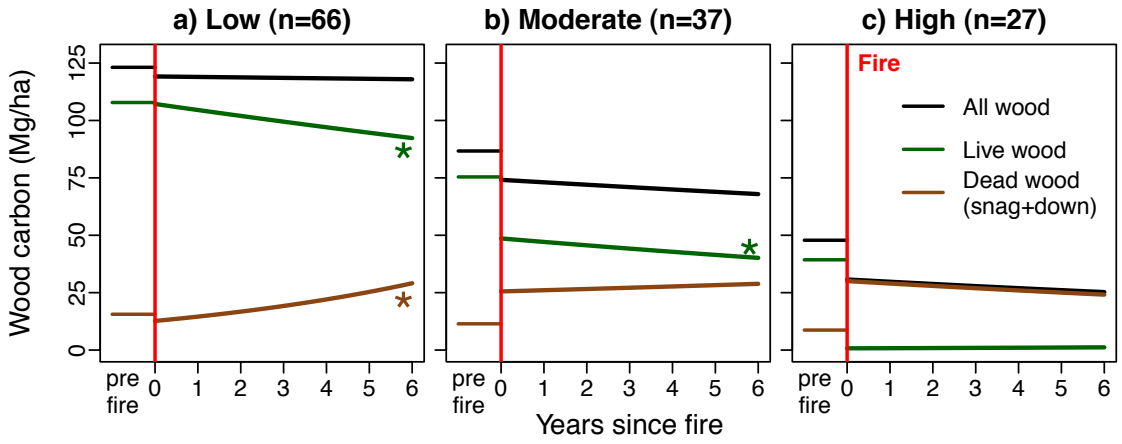
Gregoire, T.G.; Naesset, E.; McRoberts, R.E. [et al.] 2016. Statistical rigor in LiDAR-assisted estimation of aboveground forest biomass. Remote Sensing of Environment. 173: 98–108.

http://www.sciencedirect.com/science/article/pii/S0034425715302017

Partners: Yale University, Norwegian University of Life Sciences, Northern Research Station, Swedish University of Agricultural Sciences, National Aeronautics and Space Administration (NASA)-Goddard Space Flight Center, and Rocky Mountain Research Station, Interior West FIA Program

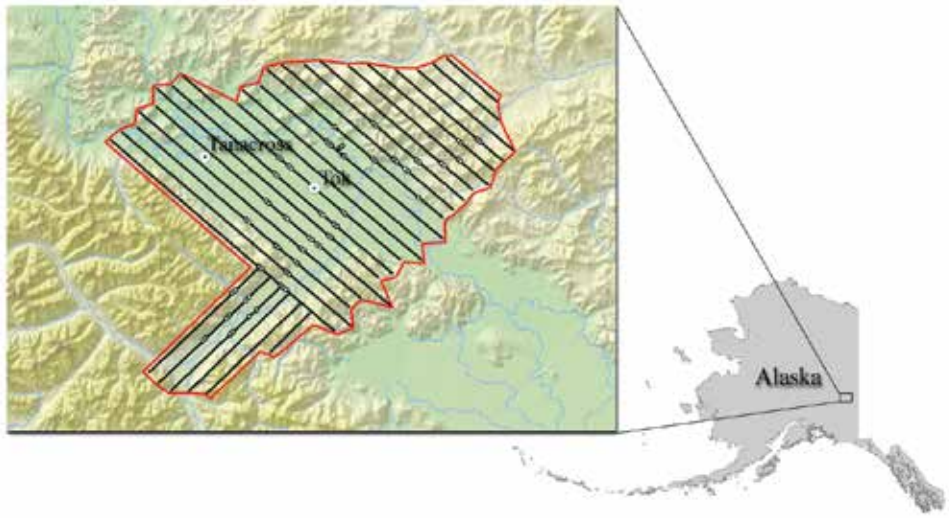
Contact: Hans Andersen, handersen@fs.fed.us

Figure 13. Estimated mean post-fire dynamics for California forests' carbon pools following (a) low, (b) moderate, and (c) high severity fires (source: Eskelson et al. 2016).



Significant trends are indicated by an asterisk.

Figure 14. Upper Tanana Valley study region in Alaska. The solid lines are the airborne laser scanning flight lines (spacing of 2.5 km) (source: Andersen et al. 2011).



Rocky Mountain Research Station, Interior West FIA Program

Finding: The forthcoming NASA Global Ecosystem Dynamics Investigation (GEDI) mission will install a full-waveform LiDAR instrument on the International Space Station for the purpose of measuring global forest structure. The resulting waveform data is expected to be strongly correlated with aboveground forest biomass, and one of the mission's primary science products will be a 1 kilometer (km) gridded biomass product. Grid cell-level estimates must be accompanied by formally estimated precision. Waveforms will be collected in spatially discontinuous "footprints" that will sample, instead of census, each 1-km cell (see fig. 15). Biomass will be modeled at each footprint using relationships derived from sets of co-located field and LiDAR measurements. GEDI's spatially discontinuous measurements, combined with the fact that biomass will be modeled instead of measured at each footprint, argues for methods based upon a hybrid of design- and model-based inference. Hybrid estimators have been employed in large-area estimation problems, but their performance at the scale of 1-km grid cells has not been thoroughly demonstrated. We investigated the performance of the estimators.

Accomplishment: An empirical study assessed proposed estimators using GEDI waveforms simulated from small-footprint airborne LiDAR data collected in six diverse sites in the United States. For each site, five grid cells were randomly chosen. This study addresses GEDI-specific concerns such as density of instrument overpasses and strength of the footprint-level biomass relationship. Relevance of this study extends to estimation of biomass across irregularly shaped areas (e.g., watersheds or countries), as well as to other sensors that collect high-quality but spatially discontinuous forest structure information.

Outcome:

- The proposed biomass estimator appears unbiased.
- The proposed variance estimator is underestimating variance with only 2 or 3 overpasses, but it appears asymptotically unbiased (see fig. 16).
- The methods being proposed for gridding biomass may be applied over any spatial domain, including irregular and discontinuous areas.
    - Methods transfer directly without having to add up pixels.
    - Estimates of biomass for large ecosystems or nations will be less sensitive to small-area limitation than 1-km cells.

There is a manuscript in preparation.

Partners: Sean Healey (Rocky Mountain Research Station), Göran Ståhl, Sören Holm (Swedish University of Agricultural Sciences), Steen Magnussen (Canadian Forest Service), Ralph Dubayah and Steve Hancock (University of Maryland), Hans-Erik Anderson (PNW), and Laura Duncanson (NASA, Goddard Space Flight Research Center)

Contact: Paul Patterson, plpatterson@fs.fed.us

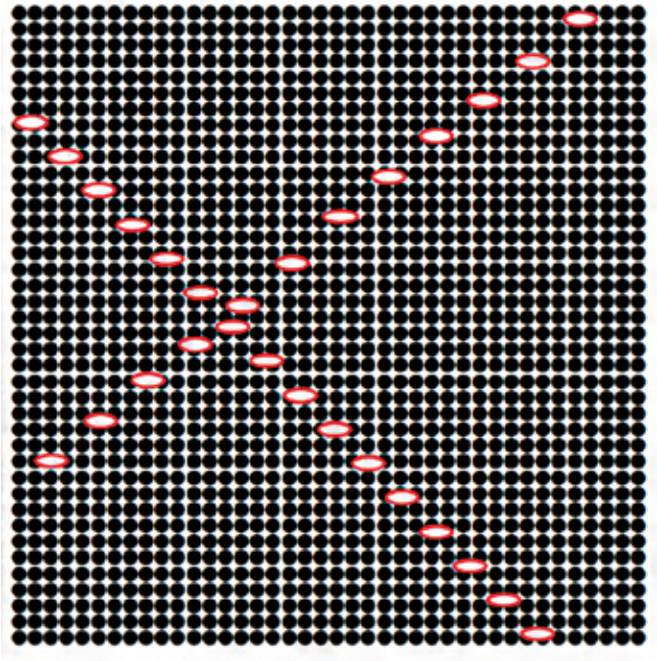
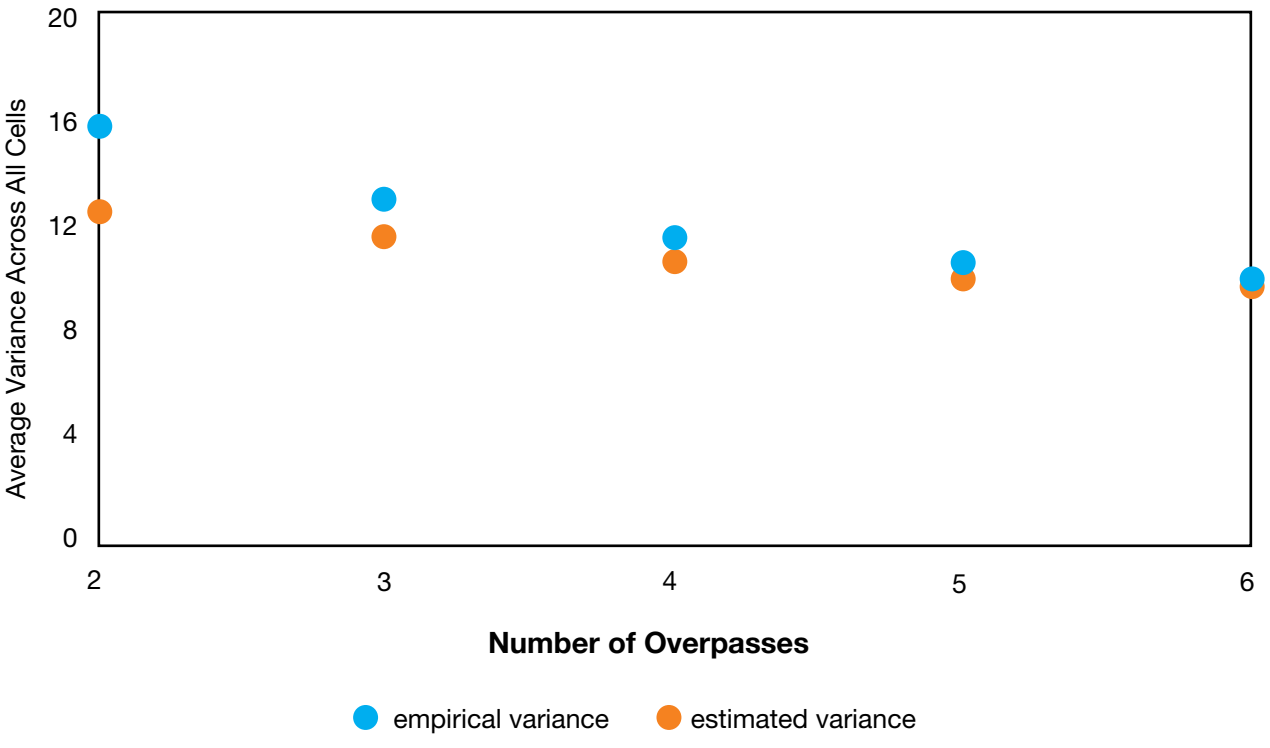


Figure 15. A grid cell with two Global Ecosystem Dynamics Investigation (GEDI) overpasses. The study was constructed to randomly simulate alternative GEDI overpass patterns, representing different numbers of overpasses from 2–6.

Finding: FIA is the Nation's forest census, yet its sample does not capture riparian forests adequately for certain analysis needs. Thus, monitoring of trees in riparian areas requires ancillary information about where riparian areas occur. Ecologically based definitions of "riparian" typically include a hydrologic component, e.g., flood magnitude or frequency, yet most riparian delineation methods use only topography, existing vegetation, and/or channel proximity, and may not perform well across broad scales or diverse watersheds.

Accomplishment: With support from FIA's Techniques Research Band, FIA scientists from the Rocky Mountain and Northern Research Stations collaborated with the Remote Sensing Applications Center to evaluate three dynamic methods for delineating potential riparian areas: an existing valley confinement algorithm; a cost-distance method based on fixed, user-defined heights above river channel; and a cost-distance method based on flood heights for user-defined flood recurrence intervals, e.g., 100-year floods, based on the U.S. Geological Survey (USGS) stage-discharge equations at gage sites. The three delineation methods all use digital elevation models and National Hydrography Dataset flowlines as inputs, additional inputs vary among the

Figure 16. The empirical and estimated variances as a function of the number of overpasses.



These values are the averages over all 30 grid cells that have been "built" so far. The estimated variance is less than the empirical variance, with the difference decreasing as the sample size increases.

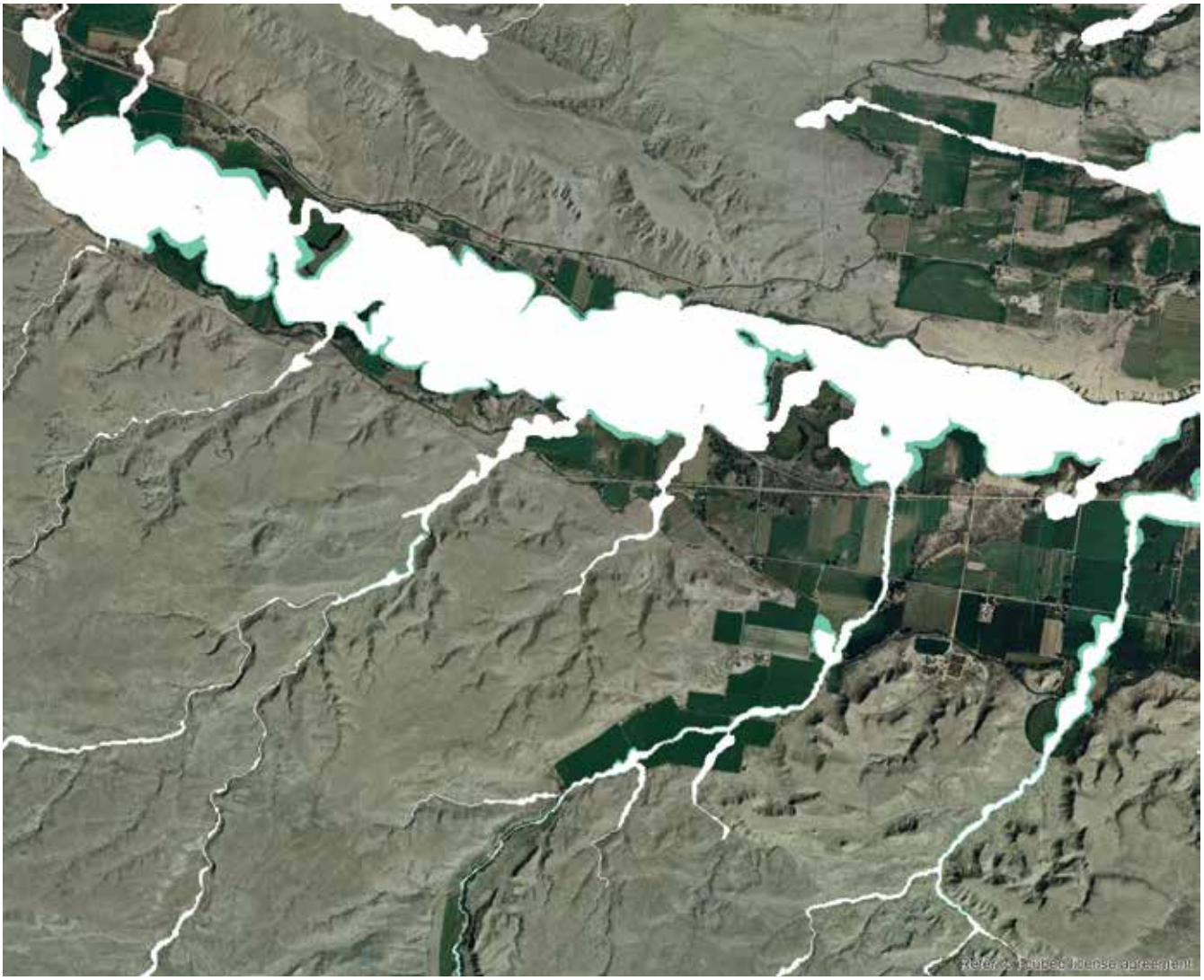
three methods. Methods were tested in two basins that differ with respect to gradient and degree of valley confinement: Utah's Duchesne River Basin (fig. 17), and the Nebraska portion of the Middle Republican River Basin. Evaluation criteria included each method's inputs, output, complexity, flexibility, sensitivity, and scalability.

Outcome: The third method—using USGS data to calibrate height differences between steams channels and riparian surfaces—was recommended as the most scalable and versatile. Because this method delineates potential rather than actual riparian vegetation, it can be applied at broad scales to create focused areas of interest, within which users may further distinguish existing riparian vegetation from potential riparian restoration sites. Understanding flood potential has ramifications for predicting where some species may regenerate (fig. 18). This work was presented at the Society for Conservation Geographic Information System (GIS) meeting in June 2016. This work will be presented in a Rocky Mountain Research Station publication in FY 2017.

Partners: Northern Research Station FIA, Remote Sensing Application Center

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

Figure 17. Delineation of riparian areas based on flood magnitude allows a flexible delineation for application across broad, diverse watersheds.



This image shows the area inundated by a 50-year flood (white areas) and a 100-year flood (white plus turquoise areas) along the Duchesne River, Utah.

Figure 18. Fremont cottonwoods require flood disturbance to regenerate.

USDA Forest Service photograph.

This stand of Fremont cottonwoods along the Green River, Utah, died and then burned. Because flood magnitudes have decreased due to a large upstream dam, it is unlikely to regenerate in the future. Hydrology-dependent methods of delineating riparian vegetation allow differentiating areas that previously supported riparian forests from those that currently can support them.

Southern Research Station FIA Program

Finding: The Forest Service Southern Research Station FIA unit is increasing the interactivity and reach of forest science by using FIA and other data to create story maps on topics that range from southern forest products to white-nose syndrome. This is a significant part of a larger cooperative effort with the GIS company Esri (Environmental Systems Research Institute).

Accomplishment: The Southern Research Station FIA program is exploring alternative methods of communicating the knowledge that is discovered through broad-scale data collection of the forest resources of the United States. The general public has evolved an appetite for rapidly delivered and focused applications to answer a wide range of questions. Few products are able to satiate the public appetite faster than data-rich, interactive maps (for an example, see fig. 19). Using the products created by the FIA program, users can explore 80 years and 800 million acres learning how FIA creates understanding of our natural and planted forests from over 355,000 sample plots with Web-based geographic systems and applications. From observations to analysis, the applications being developed provide understanding of clean water, clean air, wildlife and fish habitat, recreational opportunities, and resources for economic development.

Outcome: At the end of FY 2016, four State FIA resource updates and one timber product output update had been presented as story maps, with the intent of eventually offering all Southern Research Station FIA annual updates to users in this highly interactive format.

Partners: Charles "Hobie" Perry (Northern Research Station), Sonja Oswalt (Southern Research Station), Carl Lucero (National Office—Landscape Restoration and Ecosystems Services Research), James Bentley (Southern Research Station), Jason Cooper (Southern Research Station), Theodore Ridley (Southern Research Station), Patrice Klein (National Office—Landscape Restoration and Ecosystems Services Research), Nicole Zimmerman (National Office—Landscape Restoration and Ecosystems Services Research)

Contact: Christopher M. Oswalt (coswalt@fs.fed.us)

Finding: A move toward an annualized sampling design for FIA's Timber Product Output functional area is desirable to gain a better understanding of roundwood production

at appropriate scales. Exploratory analyses indicated that stratified simple random sampling is a feasible solution for annual monitoring that would meet requirements for cost and flexibility.

Accomplishment: Wood product markets affect forest sector jobs, shape the composition and structure of future forests, and are strong drivers of investments in forest management. Monitoring timber products output is key to understanding the current utilization of raw material (fig. 20) to support these markets. Through key partnership and research, we developed new methodologies to monitor timber products in a timely and consistent fashion across the United States.

A good understanding of roundwood production in the United States, at fine spatial and temporal scales, is needed to support a range of analyses for decisionmaking. Currently estimates of county-level roundwood production are available at various time-intervals for different regions of the country and for different products. We tested various sampling designs with the goal of moving to an annual timber products monitoring program while avoiding increased cost. We found that both probability proportional to size and stratified simple random sampling designs were viable options but the stratified simple random sampling design provided more flexibility. This flexibility was deemed important to target emerging markets and to enable sampling with certainty of specific firms.

Outcome: The results lay the foundations for moving to an annual timber products output monitoring design in support of market, sustainability, and policy analyses as well as projections. A pilot test of the proposed sample design will be conducted in 2017 to determine actual costs and identify any logistical challenges when employing a sampled-based approach to timber products monitoring.

> Coulston, J.W.; Westfall, J.A.; Wear, D.N. [et al.]. In review. Annual monitoring of U.S. timber production: rationale and design.

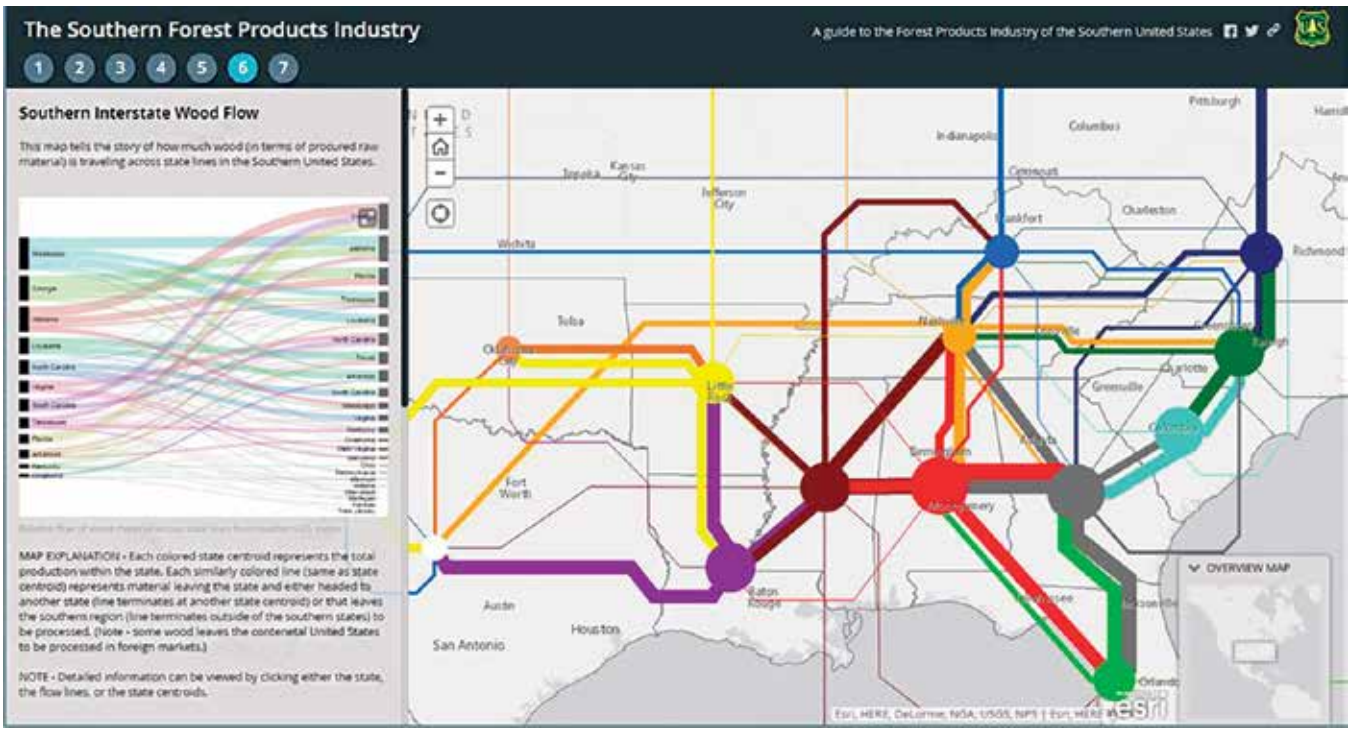
Partners: Jim Westfall (Northern Research Station), Dave Wear (Southern Research Station), Brad Smith (National Office), Chris Edgar (Texas A&M Forest Service), Steve Prisley (National Council for Air and Stream Improvement), Bob Abt (North Carolina State University), and Tom Treiman (Missouri Department of Conservation)

Contact: John Coulston (jcoulston@fs.fed.us)

Finding: A collaboration between FIA and the Latin American Seasonally Dry Tropical Forest Floristic Network (DRYFLOR) highlights implications for preservation of plant species diversity in threatened tropical dry forests across Latin America and the Caribbean.

Accomplishment: Tropical dry forests across Latin America and the Caribbean (fig. 21 and 22) are highly threatened,

Figure 19. Screenshot of the Southern Forest Products storymap depicting how wood moves around the Southern United States.



with less than 10 percent of their original extent remaining in many countries. Collaboration between the FIA Program and DRYFLOR is providing new insights about plant diversity among tropical dry forests and their conservation implications. We evaluated the sharing of woody plant species across areas of tropical dry forest and highlighted those containing the highest variety of unique tree species living only in a particular location (endemism) along with those with the highest tree species diversity. We also explored how tree species are replaced by new ones across areas of dry forests at a continental scale. Our results show that few species are widespread and shared across many areas of neotropical dry forest, providing perspective for national decisionmakers regarding the significance of their dry forests at regional and continental scales. Analyses are based upon an unprecedented new dataset made in dry forests from Latin America and the Caribbean, which has been compiled by DRYFLOR (http://www.dryflor). Only 14 percent of sites in the DRYFLOR database fall within protected areas, indicating the need to improve current levels of protection for neotropical dry forest.

Outcome: The results of this study have been published in the journal Science:

> Banda, K.; Delgado-Salinas, A.; Dexter, K.G. [et al.]. Plant diversity patterns in neotropical dry forests and their conservation implications. Science 353 (6306): 1383–1387. [doi: 10.1126/science.aaf5080]

Partners: Eileen Helmer (International Institute of Tropical Forestry), R. Toby Pennington and Julia Weintritt (Royal Botanic Garden Edinburgh), Karina Banda (Fundación Ecosistemas Secos de Colombia), Alfonso Delgado-Salinas, Kyle G. Dexter, Reynaldo Linares-Palomino, Ary Oliveira-Filho, Catalina Quintana, Darién Prado, Martin Pullan, Ricarda Riina, Gina M. Rodríguez, Pedro Acevedo, Juan Adarve, Esteban Álvarez, Anairamiz Aranguren, Julian Camilo Arteaga, Gerardo Aymard, Alejandro Castaño, Natalia Ceballos-Mago, Alvaro Cogollo, Hermes Cuadros, Freddy Delgado Wilson Devia, Hilda Dueñas, Laurie Fajardo, Ángel Fernández, Janet Franklin, Ethan H. Freid, Luciano A. Galetti, Reina Gonto, Roy González, Roger Graveson, Álvaro Idárraga, René López, Olga Martínez, Morag McDonald, Kurt McLaren, Omar Melo, Francisco Mijares, Virginia Mogni, Diego Molina, Natalia del Pilar Moreno, Jafet Nassar, Luis J. Oakley, Michael Oatham, Alma Rosa Olvera-Luna, Orlando Joel Reyes Dominguez, Maria Elvira Ríos, Orlando Rivera, Nelly Rodríguez, Alicia Rojas, Tiina Saarkinen, Roberto Sánchez, Carlos Vargas, and Boris Villanueva

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Figure 20. Hardwood saw logs in West Virginia.

USDA Forest Service photograph.

Figure 21. A landscape view of Cruz Bay from the subtropical dry forest on St. Croix, U.S. Virgin Islands, during the summer of 2014.

USDA Forest Service photograph.

Figure 22. A look inside the plant diversity within the neotropical dry forest of Mona Island Natural Reserve, Puerto Rico.

USDA Forest Service photograph.

National FIA Program

Finding: The FIA program is responsible for reporting information about the status, trends, and sustainability of our Nation's forests. This role was recently reinforced by the 2014 Farm Bill (Title VIII, Subtitle D, Section 8301). The Image-Based Change Estimation (ICE) project allows FIA to quickly create valuable information about land cover, land use, and causes of landscape changes. The ICE protocol uses photo-interpretation of high resolution aerial imagery to support a relatively quick, simple, sample- and image-based approach of providing reliable estimates of land cover and land use change on a statewide scale. Digital tools for supporting digital photo interpretation together with estimation and analysis tools have been developed to streamline data collection and reporting.

Accomplishment: The ICE project builds on a number of Forest Service enterprise geospatial solutions. Photo-interpretation data are collected, with a custom digital tool using Forest Service geospatial software Esri, using the existing FIA grid as a sampling frame. Two dates of aerial photography (fig. 23) support the characterization of land use, land cover and the observation of change agent through image interpretation—the aerial photography imagery is available through the multi-Agency consortium supporting the National Agricultural Imagery Program. The sampling protocol and estimation procedures were developed from a photo-based inventory pilot conducted in the State of Nevada from Interior-West, FIA, with automated output of estimates and variance of land cover, land use, and agent of change generated by an R-based statistical package, FIESTA.

Outcome: The ICE project supports timely reporting of land use, land cover and agent of change for each State in the contiguous United States. The ICE project will allow consistent, timely, simple, and reliable estimates on a time scale different than the traditional FIA field sample. The data are collected on a cycle consistent with National Agricultural Imagery Program imagery and can be used to support a number of other production and reporting business needs within the Forest Service and FIA.

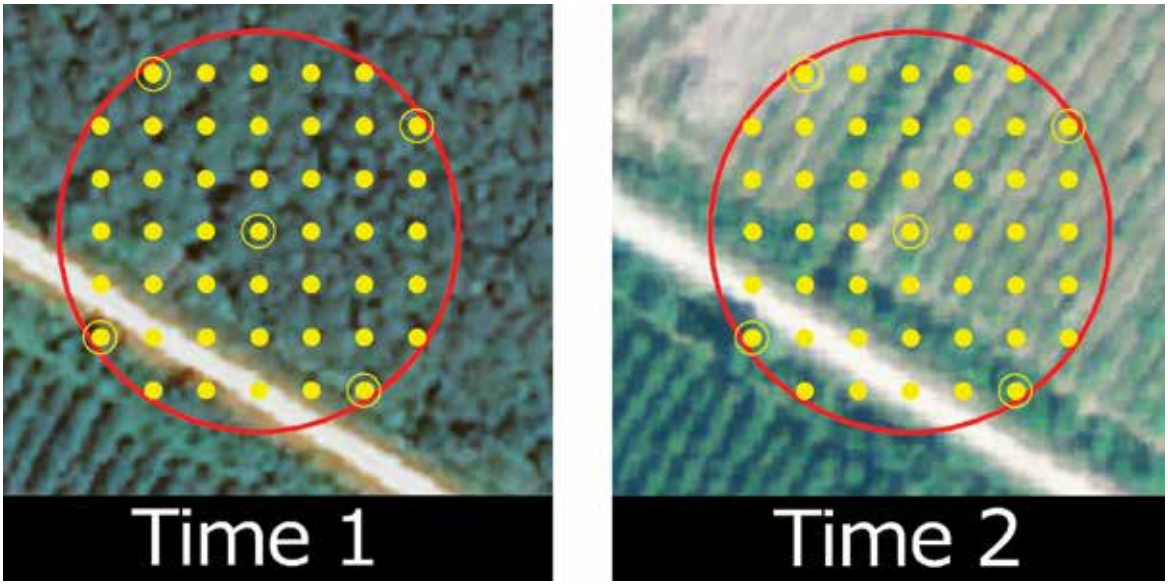
Partners: Forest Service, Remote Sensing Applications Center

Contacts: Tracey Frescino, tfrescino@fs.fed.us; Paul Patterson, plpatterson@fs.fed.us; and Kevin Megown, kamegown@fs.fed.us

Other National Office Accomplishments

In addition, the National FIA Program Office helps guide and coordinate the FIA field units in implementing the enhanced FIA program. Most National Office accomplishments

Figure 23. Aerial photography from the National Agricultural Imagery Program are used to interpret every FIA plot location classifying land use, land cover, and agent of change using the classification systems shown.



The photo interpretation is conducted in two steps: (1) Land use and land cover are attributed for 5 points over the Time 1 image. It is also noted whether any change is visible between Time 1 and Time 2. If no change has occurred, the land use and land cover attributes are copied to Time 2 points. (2) If change has occurred, a 45-point grid appears over both Time 1 and Time 2 imagery and all 90 dots are interpreted for land use, land cover, and agent of change for both time periods.

include making presentations, preparing policy white papers and budget justifications, and providing input to reports for national and international organizations. Some of these accomplishments include:

- 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 helped organize the ninth national users group meeting for FIA customers, which was held in Charleston, SC, in April 2016.
- Published the *Forest Inventory and Analysis Fiscal Year 2015 Business Report.*
- Officially published the FIA strategic plan required by Section 8301 of the 2014 Farm Bill (Public Law 113–79), and delivered it to Congress in March 2015. USDA Forest Service. 2016. Forest inventory and analysis strategic plan. FS-1079. Washington, DC: U.S. Department of Agriculture, Forest Service. 46 p.
- 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 Global Forest Observation Initiative of the intergovernmental Group on Earth Observations.

Contact: Greg Reams, greams@fs.fed.us

FIA Data Requests and Access

The FIA Spatial Data Services team provides spatial data services to clients and operates as a virtual Spatial Data Services Center with staff located throughout the country. Spatial Data Services Center staff consists of—

Liz Burrill—National Team Lead, Northern Research Station
Rich McCullough—Northern Research Station
Sam Lambert, Carol Perry—Southern Research Station
Chris Toney—Rocky Mountain Research Station, Interior West
John Chase, Tom Thompson, Joel Thompson—PNW

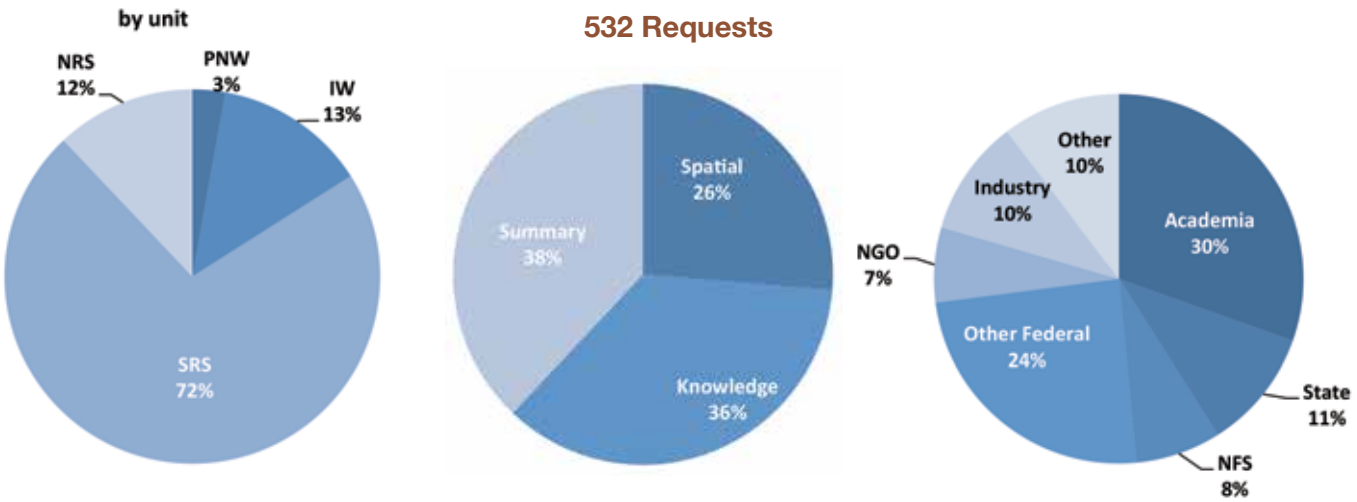
Partners

Memoranda of Understanding (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 Spatial Data Services personnel working with the client to provide the information needed. New agreements were put in place this year with the University of Vermont, the University of Minnesota, the University of Arkansas, Tennessee State, Colorado State, and the Cary Institute of Ecosystem Studies. Work continues with a variety of partners including NASA, Oregon State University, the University of Maryland, the University of New Hampshire, other universities, and groups within the Forest Service.

FY 2016 Spatial Data Requests

In FY 2016, 532 requests were active, as detailed in figure 23. Of the received requests, 99 percent were completed by

Figure 24. Requests made to the FIA Spatial Data Services Center in FY 2016.



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.

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 2016, public agencies were the largest group of spatial data requestors, with 42 percent of all new requests, followed by academia with 26 percent and industry with 14 percent.

FY 2016 Web Tools

The FIA program has been providing data to the public since 1996 through a variety of Web tools. FIA released the first database retrieval program, the FIA Database Retrieval System (DBRS), in 1996. The DBRS allowed the public to query regional FIA data sets in Eastwide/Westwide format. In 2002, FIA introduced the Forest Inventory Mapmaker program, allowing the public to generate estimates from national FIA data in the newly created Forest Inventory and Analysis Database (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 feature allows users to create multiple reports for an existing dataset quickly and easily. A new tool was added in 2015, the Design and Analysis Toolkit for Inventory and Monitoring (DATIM). The DATIM tool has been developed as a partnership between the National Forest System (NFS) and FIA. DATIM 5.0 was released in June 2016 and had 1,631 hits this fiscal year. The EVALIDator Application Programming Interface (API) was released in FY 2016. The API allows users to enter Hyper Text Markup Language (HTML) to query the database. There were 75,449 hits to this new tool.

In FY 2016, the total number of FIDO retrievals was 33,293. Analysis of the internet addresses showed that, although the source of 38 percent was undetermined, academia accounted for 22 percent of the users, corporate use 2 percent, Government use (State and Federal combined) 26 percent, nongovernmental organizations (NGOs) accounted for 1 percent, 10 percent were from outside the United States. For EVALIDator in FY 2016, the largest user group was government (State and Federal) with 48 percent; 24 percent of users could not be determined; academia accounted for 15 percent; and corporate for 13 percent. The total number of EVALIDator users was 34,082.

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 Timber Products Output (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 37,000 queries for TPO data in FY 2016, down from 66,000 in FY 2015.

The TPO program has been restructured as a national program. The data have been successfully incorporated 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. Data are currently being incorporated for all States that completed TPO surveys in 2013 and 2014.

In 2009, a Web application was developed that allowed querying of the NWOS database. In FY 2016, 1,710 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 2 but are thought to 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, 24,576 Zip files for a single file were downloaded. 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 in FY 2014

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	2016
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	175,110

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

to 19,768. In FY 2015, 18,544 data downloads occurred. FY 2016 saw the number of downloads increase to 69,025.

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 one 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, 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 continue.

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, FIA staff are increasingly in demand by customers seeking either to understand more about the FIA program and 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 2016, by unit and by type of customer. A significant consultation is defined as any dialog 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 1,289 significant consultations, which required 7,548 staff hours to complete (table 5)—equivalent to 4 full-time staff years. Of the consultations, 523 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 26 percent of the consultations and 20 percent of the time), industry (15 percent of the consultations and 9 percent of the time), and NGOs (10 percent of the consultations and 10 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 2016

Customer group	Number	Percent	Hours	Percent
Academic	329	26%	1,478	20%
Government	523	41%	4,216	56%
Industry	193	15%	708	9%
NGO	125	10%	750	10%
NIPF	20	2%	56	1%
Media	45	3%	126	2%
Other	54	4%	214	3%
Total	1,289	100%	7,548	100%

FIA = Forest Inventory and Analysis; FY = fiscal year; NGO = non-governmental 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 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 Forest Vegetation Simulator (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 5 in 2016 and are developing version 6. These versions are available to all FIA customers.

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 PNW-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 PNW-FIA to collaborate in crew training, contract administration, data collection, and data processing. The Northern Region and Intermountain Regions have collaborated with Rocky Mountain Research Station, Interior West FIA, and the Alaska Region has collaborated with PNW-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 Interior 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 2017.

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 NIMS 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 and monitoring of urban forests.

What are urban forests? Urban forests are the trees and other vegetation growing along streets and waterways, around buildings, in backyards and parks of our cities and towns. They are critical to the function and livability of these habitats. For the purposes of FIA sampling, urban forests are those treed areas nested within U.S. Census CBSA's (metropolitan areas), UAUC (urban areas and clusters), and city/places. The distribution of urban areas is seen on the map in figure 25.

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 have not previously been covered by a continuous wall-to-wall inventory and monitoring system like rural forests.

What is the urban FIA plan? The plan is to fill this information void by extending the FIA sampling frame to urban areas. Urban FIA (UFIA) started with two cities in 2014: Baltimore, MD, and Austin, TX. UFIA is adding additional metropolitan areas as funding allows with the goal of including all urban forests in the Nation. Once a city or urban area within a State is initiated, it will continue to be measured in the future just as traditional FIA plots are, thus creating a continuous inventory of the Nation's urban forests. The following summarizes the progress of UFIA:

- In 2014, Baltimore, MD, and Austin, TX, were selected as the first UFIA cities because of the Forest Service's

Table 6. Urban plots by State and metro/urban area

State	Metro Area / Urban Area*	Plot count	With trees	With trees and saplings	With saplings
IL	Chicago, St. Louis	66	23	11	2
IN	Chicago	8	2	-	-
IA	Des Moines	32	14	1	1
KS	Kansas City	5	2	1	-
MD	Baltimore	34	14	7	-
MA	Providence	2	-	2	-
MO	Kansas City, Springfield, St Louis	329	86	33	7
NY	Rochester	27	13	2	
OH	Cleveland	33	9	7	1
PA	Pittsburgh	42	13	8	-
RI	Providence	35	11	3	-
TX	Austin, Houston	111	28	19	-
VT	Burlingtion, VT, urban areas	41	15	6	1
WI	Chicago, Madison, Milwaukee, WI, urban areas	173	67	23	6
Total		938	297	123	18

* Some Metro Areas / Urban Areas overlap State boundaries and are included more than once.

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 collaborate and ensure the effort's success made them a logical starting point.

- In 2015, data collection in both Austin and Baltimore continued and UFIA expanded data collection to include Milwaukee and Madison, WI; Houston, TX; Des Moines, IA; Providence, RI; and St. Louis, MO.
- In 2016, data collection expanded into Burlington, VT; Rochester, NY; Pittsburgh, PA; Cleveland, OH; Chicago, IL; as well as, Kansas City and Springfield, MO. Sample areas and plot totals for 2016 are summarized in table 5.
- In 2017, all four FIA units will have active UFIA projects in operation as the program expands into San Diego, CA; Denver and Colorado Springs, CO; Lincoln, NE; Philadelphia, PA; Detroit, MI; Wichita, KS; Fargo, ND; Portland, ME; and Minneapolis, MN.

In 2018, data collection will include New York City, NY; Portland, OR; and Dover, DE. Conversations with additional cities across the Nation continue.

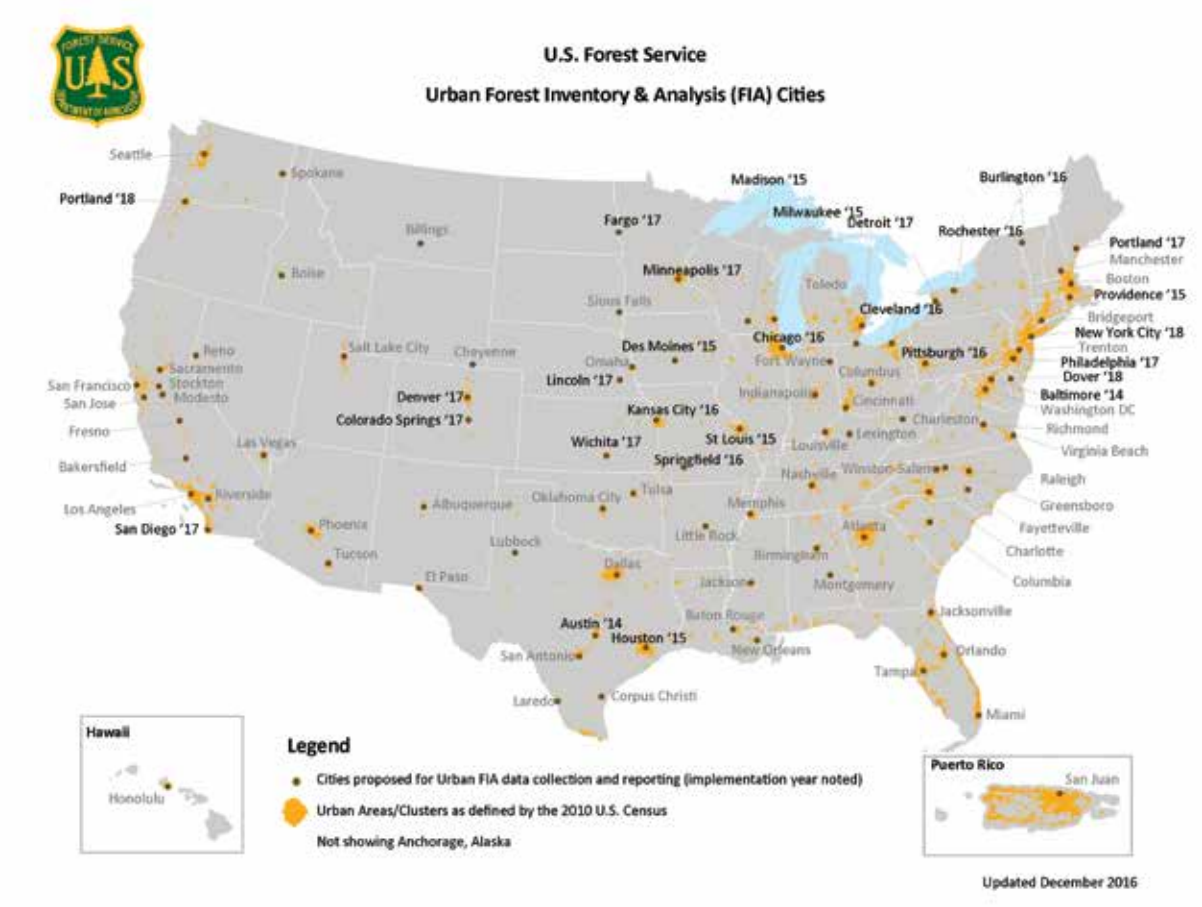
Forest Products, Utilization, and National Woodland Owner Survey Studies

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

Figure 25. Urban forest inventory implementation status in FY 2015 and FY 2016.



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 Dooley et al. (2015), Zarnoch et al. (2004), Oswalt et al. (2014), 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 (NWOS). It is ultimately the owners of the forest land, working within social, economic, and political constraints, who decide the fate of the forest. Therefore, the FIA program implements the NWOS as a social complement to our biophysical forest inventory. The goals of the NWOS are to provide information on 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 information is used by forestry agencies, NGOs, companies, educators, and researchers to design, implement, and analyze programs, services, and policies aimed at landowners.

For the past year, the NWOS efforts have concentrated on communicating the results from the previous iteration of the survey and planning for the next iteration. Recent communications activities have included:

- Publishing an article on the findings in the Journal of Forestry.
- Publishing a Forest Service Resource Bulletin with detailed State, regional, and national tables.
- Publishing two-page summaries for States (where sample sizes allowed), regions, and the Nation.
- Working with landowner organizations, tailored articles on the NWOS results included in their magazines and newsletters.

The next iteration of the NWOS will be distributed beginning in early 2017. This iteration will:

- Provide updated information on America's forest owners.
- Expand to include urban forest owners.
- Introduce a new instrument aimed specifically at large, corporate owners.
- Increase the robustness of State-level results.
- Allow for examination of trends over time.
- Provide an opportunity for States to intensify and customize the survey.
- Introduce the concept of science modules where specific topics can be examined in greater depth.

More detailed information on NWOS may be found in Butler et al. (2015a), Butler et al. (2016), Butler et al. (2005), and U.S. Department of Agriculture, Forest Service (2015). For updates and more information about NWOS, visit http://www.fia.fs.fed.us/nwos.

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Enhanced Forest Indicator Surveys

FIA began implementing a nationwide, field-based forest ecosystem health indicator monitoring effort in the 1990s. The program has evolved, with some indicators no longer being collected and others being collected on a greater proportion of plots (see appendix table B-9). These variables are now referred to as enhanced forest indicators, and they are collected 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., tree dwelling) 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 (DWM). 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 WillWolf 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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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:

- Partnered with Bureau of Indian Affairs to evaluate impacts from the Conseen Drive Fire in Cherokee, NC.
- Partnered with the Eastern Band of the Cherokee to study management of edible forest products. Southern Research Station FIA scientist Jim Chamberlain and post-doctoral research associate, Michelle Baumflek, established

long-term studies to examine and compare the impacts of traditional and local harvest methods of ramps (wild onions). Baumflek, recently hired under the Pathway program, is charged with developing similar research and relationships with other tribes. Maintained ongoing partnership with Tanana Chiefs Conference (TCC) using FIA protocol and assistance to train foresters and implement forest inventory on Alaska Native allotments in interior Alaska.

- Created exchange opportunities for Native Pacific Islanders to work in Alaska on forest inventory projects during the field season so they have more training and skills in forest monitoring.
- Worked with the University of Hawaii to report on both traditional and nontraditional harvests made by Hawaiian communities of nontimber forest products.
- Participated in the annual tribal/Forest Service MOU meeting in Watersmeet, MI. The 1-day meeting affirms the MOU between the Forest Service and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) member tribes in the Great Lakes Region.
- Received a tribal request for additional distribution of the "Forest Resources within the Lake States Ceded Territories, 1980–2013" to member tribes.
- Provided GLIFWC with maps highlighting Emerald Ash Borer movement in the ceded territories in northern Wisconsin.

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 partner employees from daily exposure to hazards that threaten safety and health. Table 6 summarizes the program's safety record for FY 2016. Figures 26 and 27 show program safety trends by incident type for FY 2010 through FY 2016, followed by regional safety highlights for FIA units in FY 2016.

Table 7. FIA program Federal employee estimates for hours worked, miles driven, aircraft hours flown, and safety incidents reported for FY 2016

	FIA Unit					
Category	**PNW**	**IW**	**SRS**	**NRS**	**NO**	**Total**
Base data						
Federal FTE equivalents[a]	80	95	81	95	3	353
Total estimated hours worked[b]	167,024	196,560	169,312	196,768	5,200	734,864
Total vehicle miles driven	316,144	618,223	697,000	743,292	-	2,374,659
Total flight hours logged	149	25	-	-	-	174
Recordable incidents by class						
Time lost illness/injury incidents	4	4	-	2	-	10
Motor vehicle accidents	2	-	2	-	-	4
Aircraft accidents	-	-	-	-	-	-
Safety incident frequency rate						
Time lost illness/injury rate per 100 FTEs	5.0	4.2	-	2.1	-	2.8
Motor vehicle accidents per million miles driven	6.3	-	2.9	-	-	1.7
Aircraft accidents per 100,000 flight hours	-	-	-	-	-	-

PNW = Pacific Northwest Research Station; IW = Rocky Mountain Research Station, Interior West; SRS = Southern Research Station; NRS = Northern Research Station; NO = National Office.

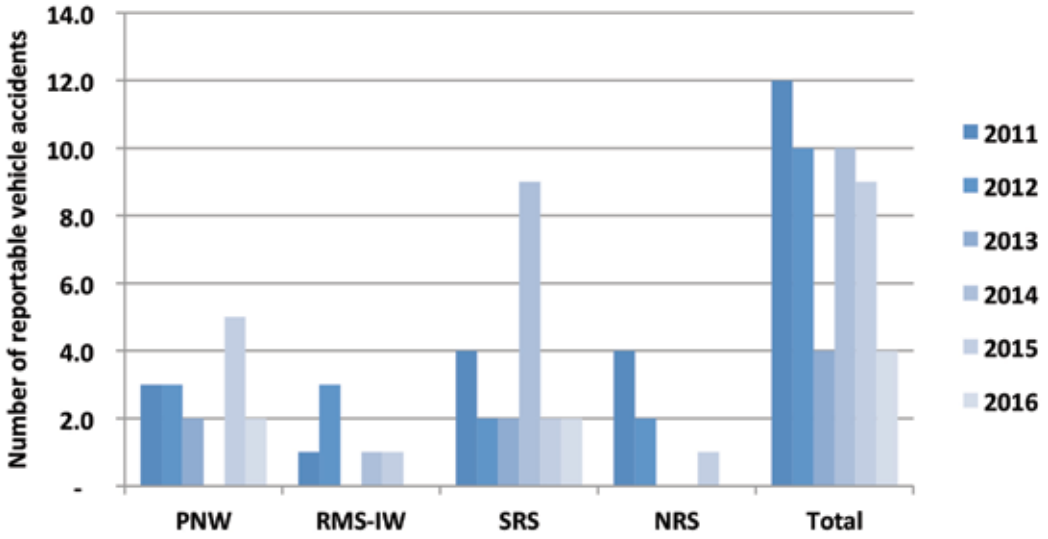
[a] Based on appendix table B-3 number of Federal employee estimated Full Time Equivalents (FTE).

[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.

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.

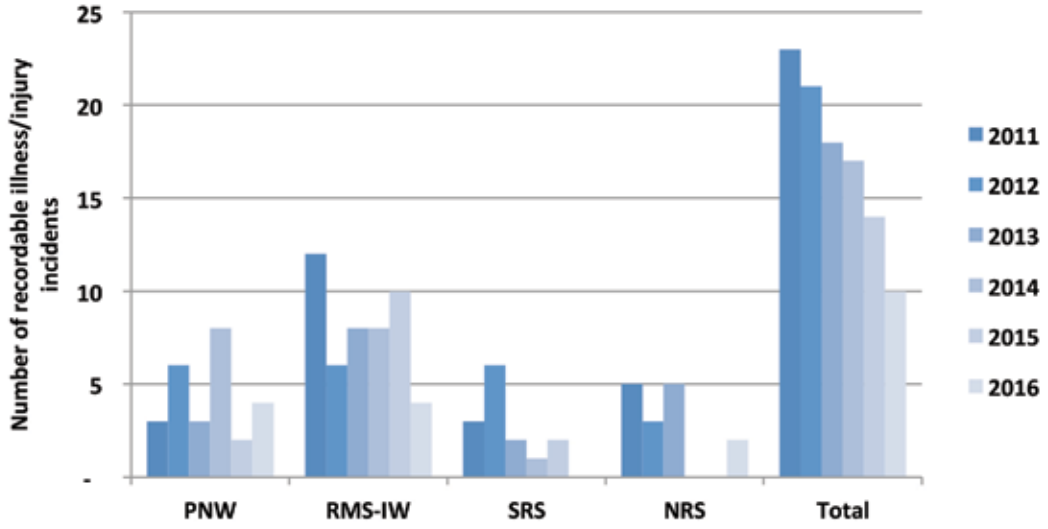
As a demonstration of our commitment to safety, FIA units have now completed four consecutive annual safety engagements as part of the ongoing Chief's Safety Journey, giving all employees a voice toward improving policies and procedures around safety.

Figure 26. Number of motor vehicle accident incidents by unit, 2011–2016.



FIA = Forest Inventory and Analysis; FY = fiscal year; NRS = Northern Research Station; PNW = Pacific Northwest Research Station; RMS-IW = Rocky Mountain Research Station, Interior West; 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.

Figure 27. Number of OSHA (Occupational Safety and Health Administration) recordable cases by unit, 2011–2016.



FIA = Forest Inventory and Analysis; FY = fiscal year; NRS = Northern Research Station; PNW = Pacific Northwest Research Station; RMS-IW = Rocky Mountain Research Station, Interior West; 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.

Regional Safety Highlights for FY 2016

Northern Research Station FIA Safety Highlights

The Northern Research Station is unwavering in its commitment to developing and maintaining a safe work environment. At the station, safety is one of our core values, and we are on a continuous mission to improve our habits and procedures to minimize risk individually and as an organization. By sharing our experiences, we build a trusting environment where people provide timely and relevant information that strengthens our safety program. We are empowered to identify areas of safety enhancement, and we freely communicate our ideas and suggestions to minimize our exposure to possible hazards.

During FY 2016, our safety committee met as often as necessary, usually once a month, to share information and enhance safety practices throughout the unit. Along with its other duties, the committee reviewed the Forest Service Manual on Safety and Occupational Health Program Administration to assure the Unit's compliance with its policies.

Throughout this year, we strove to provide necessary training as efficiently as possible. For example, we trained field staff on the proper use of aerosol defense spray for defense against wild and domesticated animals. Field supervisors, who had been previously trained, ensured all employees were confident in their ability to use the aerosol defense spray. Employees took part in the training, whether or not they currently choose to carry the spray. After completing the training, all field staff signed the Aerosol Defensive Spray Job Hazard Analysis (JHA). Our unit received authorization to continue carrying aerosol defensive spray in FY 2017.

Our location was selected to pilot the national 2016 Safety Journey training. Unit leaders led a discussion to review both the five practices and some of the hard truths identified at previous engagement sessions. Our data collection staff attended the training and provided feedback on what areas of the training were successful and also areas where improvements could be made.

We also reviewed office security, approved and distributed a security awareness reminder to employees to emphasize proper safety practices in the office environment, and distributed an active shooter training video to staff at local monthly safety meetings.

We updated the urban JHA to reflect recent changes. The availability of cones was added to the urban JHA as possible Personal Protective Equipment (PPE), although employees were cautioned against the use of cones in high-traffic urban areas. Both urban and field crews were able to purchase cones for their vehicles as desired. Cones are available in three sizes, and crews working in certain areas found that tall cones were useful to safely block off parking areas.

After successfully completing the annual review of all program areas, we submitted the JHAs and received approval and were complimented for including detailed PPE needs. In 2016, we continued our exemplary safety record. Only one injury was reported this year, an ankle sprain. In addition, there were a few accident reports filed for tick bites. Two minor off-road vehicle accidents were reported, which resulted in some dents/dings to vehicle bodies. There were no injuries. To ensure that best practices were being observed, both accidents were discussed by the Data Collection Team and at regional safety meetings.

Use of the in-reach Satellite Emergency Notification Device (SEND) device was implemented on October 3, 2016. The new device is an improvement over the SPOT (Satellite Personal Tracker) device, and crews are more confident that messages are being sent and received by the dispatcher. This improved communication should reduce the number of unnecessary search-and-rescue event.

Usage of the device was expanded. We also made the check out/check in dispatch monitoring and an in-reach SEND device available to an employee working alone in an urban environment. All employees using the new in-reach SEND devices were invited to an implementation call to ensure they were comfortable using the updated devices. The devices were put to use when a crew in Pennsylvania got stuck on a backwoods road where they had no cell coverage. The crew was able to communicate with our dispatchers using satellite text messages to describe their predicament. The dispatcher contacted the Missing Person Recovery Coordinator, and he was able to send help.

By sharing success stories such as this, we learn ways to keep ourselves safer. In the coming year, we plan to further our safety efforts by engaging an expert on tick-borne diseases and prevention and conducting a Life First session.

Pacific Northwest Research Station FIA Safety Highlights

The Pacific Northwest Research Station (PNW) Resource Monitoring and Assessment Program's FIA unit continues to support processes and programs that strengthen our culture of safety and wellness. We do this through our commitment to annual safety surveys, regularly improving the JHAs, recording and analyzing Near Misses (more than 270 shared in FY 2016), promoting the safety boot reimbursement program, sharing safety information through *"Careful Cliff Notes"* newsletters, providing safety training for both field and office positions, and investing in an active safety committee.

Safety Knowledge Sharing

- We are finding different platforms to share our safety program successes and learn from others (within and among teams, clients, and partners), including an engagement with the national team to define specs for a national check-out and -in tool that could be adapted by research and FIA.
- We completed our annual Safety Survey of program employees (45 responses) and compiled a report comparing results from the past 4 years with the current year.
  - o An interesting trend to note is related to answers to the question "Have you encountered peer pressure from crew members or supervisors to work beyond your limitations, allowing safety to become secondary to production?" Responses fell from 10 "always" in 2012 to 0 in 2016.
  - o Many responses mentioned long hours, short staffing, staffing turnover, and fatigue, which we will use to inform our safety strategy for next year. There were also several comments on the communications devices, which as you'll see under Safety Communication Technology section, we are currently working to address.
- Safety committee members created an access database of the near-miss reports that connects the Oracle tables where we store near-miss information so that any interested party can view current near-misses and summarize reports by month, State, duty station, permanent versus seasonal employees, or office versus field employees.
- The Alaska Data Collection Team integrated near-miss reporting into daily morning briefings, which facilitated inclusive team safety discussions and rectified prior lack of near-miss reporting in Alaska due to lack of access.
- The data collection teams in California, Oregon, and Washington rolled out a "Safety Challenge of the Month" program, where field staff nominate a challenge to other crews. Challenges accepted so far include building an emergency overnight kit in each field-going vehicle, taking time to fit and pack backpacks properly, creating a cheat sheet of emergency medical resources in the work area, and verifying that everyone had orange Hi-Viz clothing to wear during hunting season.

Safety Communication Technology

- We introduced a new online check-out tool after recognizing deficiencies in our previous phone answering service and field check out and in system. We now include fire safety protocol to ensure all field-going staff are situationally aware of possible fire hazards, and we continue to refine our system by integrating it with real-time spatial data, allowing crews to interact with current maps of weather and fire hazards to further inform which areas are safe to work in and those that should be avoided due to current hazardous conditions, as part of a one-step check-out system.
- We have been strategically testing and investing in upgraded communication tools for field crews to increase our coverage in remote areas. This includes piloting the next generation of satellite phones and satellite emergency notification devices with two-way communication capability. It looks as though some of these tools will add to our overall safety, so to start, we will begin procuring and disseminating these new devices to areas that need them most.

Peer-to-Peer Safety Recognition

- The Safety Committee completed an analysis of participation in our peer-to-peer Safe-T-Buck safety recognition program by team. Field crews had the highest participation rates. Although some office-based teams had similarly high rates, they had room for improvement in office-based employee participation. To allow for a broader interpretation of safety, and to encourage increased participation in the program, wellness activities are now also included as a basis for recognition. It's now **SAFE-T & Wellness! –BUCKS** (or **Swellness Bucks**) that are exchanged amongst colleagues, with a slogan of: Stay safe. Keep well. **Be swell!**
  - o To kick off the new wellness component of the program, the Safety Committee circulated a short video on stretching, originally intended for tree planters, which many continue to find useful for a pre-field warmup.
  - o The Anchorage Lab team initiated Wellness Wednesday Lunch Yoga that is attended by several staff weekly.
  - o Approximately 700 Swellness Bucks were redeemed for safety awards by 50 employees in 2016!

Safety Engagement and Empowerment

- Field going teams discussed risk as part of the Life First! Engagement session.
  - o Discussions on expectations to act within the sphere of your influence and to consider the following four keys in evaluating potential risk—STOP, THINK, TALK, then ACT—to reject unnecessary exposure and increase the odds that everyone goes home was the primary focus of the engagement.
  - o The discussion was followed up by a Hard Truths exercise, where all staff were encouraged to identify and anonymously submit an example of a situation where we are accepting unnecessary exposure. The responses were compiled and released to the team that day, and everyone reconvened to discuss some of those Hard Truths that were submitted.
  - o As a result of the unnecessary exposure exercise, Data Collection South's Team Leader has created a decision document (awaiting Program approval) to extend the field season window in southern latitudes so crews can avoid working during the height of fire season.
- Alaska Coastal Unit employees enacted a safety stand-down on June 19, 20, and 21 to address unscheduled recurring maintenance issues with the aircraft. This put the Forest Service's safety engagement message of employee empowerment into action, where safety took precedent over production.

Office Safety Improvements

- Our program provided standing desks and other ergonomic office furniture for employees in our labs and those remotely hosted to support employee wellness.
- The Anchorage Forestry Sciences Lab updated its Safety Walk-Through Checklist for visitors and new employees.
- The Safety Committee created an approved EpiPen program, which included training, for the Anchorage Forestry Sciences Lab so interested staff can carry one in case of anaphylactic shock.

Safety Training

- Both Data Collection teams provide regular CPR (cardiopulmonary resuscitation) and NOLS (National Outdoor Leaders) Wilderness First Aid training to staff. This year, 21 Alaska staff participated in the training, and a portion of that staff took the opportunity to become further trained and recertified as Wilderness First Responders.
- Alaska Data Collection updated and improved safety protocols and training to meet national and local standards, including shotgun training, bear training, and aviation training. They also updated aviation flight vests and initiated an aviation helmet inspection program to meet new Federal Aviation Administration standards.
- Anchorage Forestry Sciences Lab, Data Collection staff attended 3 aviation- related trainings sessions:
  - o Helicopter Crew Member: 7 employees completed training
  - o Helicopter Manager: 3 employees completed training and 1 finished her task book and became a certified Heli Manager
  - o Water Ditching and Survival Training: 20 employees completed training, and 1 acted as an assistant instructor for the first time.
- Alaska Data Collection reinitiated the Hearing Conservation Program as part of its annual spring training.
- Data Collection staff based in California, Oregon, and Washington completed a training session in anticipation of a need to defuse hostile situations with the public and used this training to help de-escalate heated interactions.

Encouraging a strong safety culture at PNW has allowed for growth beyond the safety routines we've put into practice over the years. We continue to rely on and improve upon existing systems, as well as develop new ones as needed. Our recordable injuries continue to remain low, which is a testament to our commitment to safety.

Rocky Mountain Research Station, Interior West FIA Safety Highlights

At the Rocky Mountain Research Station, Interior West FIA program, we are 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 our people.

The program continues to engage employees through many different approaches. During our all-hands meeting in the spring, program leadership led all employees in formal engagement sessions in which the value of vulnerability was discussed. The program continued to publish a safety newsletter, the *"Careful Chronicle,"* featuring a monthly message from the program manager, Sharing Our Stories (which are employees' first-hand accounts of near misses and accidents), monthly trivia and contests, and other safety and health news. The Program Safety and Health Committee, comprised of both field and office staff, union representatives, and management, conducted nine meetings throughout the year, including during the busy field season.

Following meetings, the notes are made available to all program employees on the program's safety and health Web page. Several work improvement teams from the 2012 Engagement Sessions are still functioning and continuing to improve safety for employees. One such team evaluates new field-related technologies and equipment as they become available. Program leadership also spent several weeks in the field with data-collection employees. A key element to these field visits is to engage employees in one-on-one safety dialogue and hear from the "boots on the ground." The program manager, deputy program manager, and data-collection team leader all made individual visits throughout the Interior West with different employees. The visits were very fruitful; we received feedback for improvement, heard what is working well, and developed action items for continuing to improve the program and reduce employee risk.

The program continues to search for and test new safety-related technologies and equipment in order to decrease risk involved in field data collection. As a result of the ongoing equipment team, we equipped every field-going employee with his or her own inReach SE device, a new SEND with greater technology capabilities than the previously used SPOT devices. The inReach provides users with the ability to check in from remote areas using customized or automated SMS (Short Message Service) text messages, provides message recipients with up-to-date location information, and allows for continuous tracking. We held hands-on inReach training during the 2-week field training in the spring. Throughout the field season, there were multiple learning opportunities to hone our use of the devices and share our lessons learned with program employees and other units. We continue to refine the use of the devices and explore other potential uses. Another subgroup comprised of Safety Committee members, motorbike users, the program safety and health specialist, and the fleet and equipment specialist reevaluated our standard issue motorbike equipment, personal protective equipment, and training. The team recommended changes that were implemented in time for our spring training.

Interior West FIA devoted considerable time and resources on all employee safety training in FY 2016. The program held an all-hands meeting in the spring followed by a week of field-specific training. Leadership opened the session with a presentation and discussion on program safety; this was followed by specialized training (discussed below) and required training such as fire extinguisher, bloodborne pathogens, bear safety, all-terrain vehicles, and aviation among others. The program coordinated with the stations' Human Performance Research Development and Applications staff to present a full-day session on wellness and resiliency to continue to address wellness—and whole-body well-being more broadly—in an effort to reduce repetitive motion injuries, which are historically our largest source of injuries, missed work, and expense. Personal safety was discussed in a session led by Forest Service Law Enforcement officers to help identify illegal marijuana operations and handle hostile public concerns; we continue to research ways to reduce risk in this area. This year, in addition to classroom training, we added a hands-on training session at the nearby Forest Service airport hangar for employees to work around aircraft and ask questions to increase aircraft familiarization, thus increasing ownership and promoting moving from passenger mentality to crew (ownership and responsibility). A 3-day Wilderness First Aid was also provided for employees.

We are pleased to report fewer recordable injuries and chargeable motor vehicle accidents throughout the year, though we remain vigilant as past performance is no guarantee of future performance. 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

At Southern Research Station FIA, we continue to enhance our safety culture through training, communication, and reinforcement of our safety values. Aligning our safety culture with the Life First Safety Engagements requires that we learn from both our successes and our mistakes, sharing those experiences with co-workers. We have also committed to meeting face-to-face more frequently—to improve communication, conduct inventories and inspections, and provide training opportunities in safety.

We had four major training goals going into FY 2016, three of which we were able to effectively address in spring and fall meetings designed primarily for field-going employees. First, at our spring meeting at Land Between the Lakes, KY, our field personnel received boating training from the Coast Guard Auxiliary. This detailed review of boating safety received great reviews from participants. Secondly, we wanted to provide employees with a Wilderness Recovery and First Aid class. Landmark Learning conducted a 16-hour class with two instructors during our fall meeting at Lake Guntersville, AL. The class received good reviews from those employees who attended. Some employees opted out of the class, citing concerns with the provider's required waiver; unfortunately, even though the Federal Government addresses injuries incurred in the

line of duty through Workmen's Compensation, this was beyond our control. Southern Research Station leadership is now working with Landmark Learning to extend this training opportunity to other station employees. Finally, at the same meeting, employees who expressed a desire to carry defensive sprays to be deployed in the event of a bear attack received the required training. The fourth major training activity took place at our main office in Knoxville, TN, where Forest Service Law Enforcement provided an excellent session on how to respond to active shooter situations in the workplace. While we believe the potential for such an emergency is low, the potential consequences are high, and our office staff learned about options such as "Run, Hide, Fight."

Some FIA employees responded to a request from Southern Research Station leadership, sharing their expertise on off-road driving and working in remote areas in videos that were incorporated into a larger video for the Life First Safety Engagement (http://fsweb.srs.fs.fed.us/comm/life-first/). Topics included checking for obstacles before attempting to drive through water, safe winch operation, maintaining communication, and proper hydration. We appreciate the willingness of our employees to share their knowledge and ideas beyond FIA!

Our Safety and Environmental Health Specialist enlisted the assistance of our Safety Committee to research and compose a JHA for the ever-increasing threat of Zika virus. By the time the first cases appeared in Florida, the JHA was ready and in place. The Southern Research Station subsequently picked it up as its model for all station employees. The committee also assisted in reviewing and updating the FIA Health and Safety Plan and researched satellite phone options, as well as additional training for working in very remote areas. After much discussion, our Safety Committee was also able to finalize a charter that will guide operations and help determine how issues are resolved when they come to the committee. Both the Health and Safety Plan and Safety Committee Charter have been loaded onto our intranet website for easy access by employees.

Our field personnel have shown tremendous interest in defensive sprays for protection in the event of bear attacks. While attacks by black bears are relatively uncommon, we do operate in some very remote areas with significant black bear populations. Continuing work that was started during the FY 2015 Safety Engagement, our Safety and Occupational Health specialist researched defensive spray use, enlisting the help of some of our field personnel, and put a program together including a JHA that was approved by the station director. He then obtained the required training to become a trainer in defensive sprays. During the fall meeting at Lake Guntersville, AL, all personnel were given training on the use of defensive sprays and almost half of our employees are now carrying defensive spray. Southern Research Station is extending the defensive spray program to other field-going employees, with the assistance of our Safety and Occupational Health specialist.

In FY 2017, we are going to experience quite a transition in our Safety Committee as six of our current members leave the committee and six more employees transition into the committee. Fresh ideas, open communication, and the risks associated with extensive driving and field work will make for fruitful, and sometimes challenging, conversations. Some items our Safety Committee may explore include development of an urban FIA plot JHA and options for a new SEND unit with expanded capabilities. Additionally, we intend to improve our Hazardous Weather Mass Notification system to better communicate our office closures or delays in opening due to local hazardous conditions. Specific training for FY 2017 includes CPR/First Aid and fire extinguisher training classes for the Knoxville, TN, office.

Comparing FY 2015 Plans With FY 2016 Accomplishments and FY 2017 Plans

In the FY 2015 business report for FIA, we included a section stating our plans for FY 2016. In the following table, we show how our actions in FY 2016 matched our plans from FY 2015 and present our plans for FY 2017.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, 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 Alaska.	Continue base inventories in 49 States along with inventory in Tanana Valley Alaska.
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.	Published 5-year State reports for American Samoa (2012), Arizona, Georgia (2014), Louisiana, Michigan, New Jersey, New Mexico, Pennsylvania, South Carolina (2011), and Wisconsin. Staffing shortfalls and insufficient GRM information contributed to missed deadlines in the West, while the Florida report requires additional analysis due to data reprocessing.	Publish 5-year State reports for Alabama, Arkansas, coastal Alaska, Delaware, Florida, Guam, Idaho, Illinois, Kansas, Kentucky, Maryland, Montana, Nebraska, North Dakota, Oklahoma, Oregon, Puerto Rico, South Dakota, Tennessee, Texas, Virgin Islands, Washington, and Wyoming.
Continue the interior Alaska inventory in cooperation with the State of Alaska; University of Alaska, Fairbanks; and NASA.	Completed first panel of interior Alaska plots in the Tanana Unit in cooperation with the State of Alaska; University of Alaska, Fairbanks; and NASA.	Continue with second panel of the interior Alaska inventory in cooperation with the State of Alaska; University of Alaska, Fairbanks; and NASA.
Remeasure FIA plots in the Federated States of Micronesia and implement the Micronesia Challenge.	Remeasured and implemented the Micronesia Challenge FIA plots in the Federated States of Micronesia.	Complete Micronesia Challenge FIA plots in the Federated States of Micronesia and Guam. Make preparations for remeasurement of Republic of Marshall Islands. Complete change proposals and continue with national implementation.
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.	Evaluated modifications to the indicators and identified core intensity and assessment levels. Combined final recommendations and started the change proposal process with national FIA teams.	Complete change proposals and continue with national implementation.
Recommend protocol adaptations based upon the power analysis.	Continued analyses to evaluate proposed protocol adaptations to the Ecosystem Indicators, made final recommendations to the management team, and submitted official pre-proposals to national FIA teams (bands) to start the change proposal process. Continued implementing modified down wood and vegetation protocols in all regions, soils in NRS and RMRS-IW, and crowns in the East and Pacific Northwest.	Continue the formal change proposal process through the national FIA teams (Bands) and assess implementation plans for soils and crowns in all regions.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, we will—
Continue work by Analysis Band to examine ways to streamline and standardize report content and data delivery.	Submitted a nationally aligned template for State reporting, including core elements and options to highlight regionally or temporally important issues. An online, interactive Esri story map template was created for annual reporting.	Continue FIA-wide report standardization, to include delivery online and interactive products. Publish online, interactive Esri story maps as annual reports for 10 States across the Nation: Alabama, California, Georgia, Illinois, Kentucky, Mississippi, New Jersey, North Dakota, Oregon, and West Virginia.
Begin implementation of strategic plan.	As allowed with budget increase, started implementation of the new strategic plan. Funding was still $15 million per year short of full funding for Option C.	
National Woodland Owner Surveys and Timber Products Surveys		
Continue to implement national TPO data management and processing system and deploy the data query system.	Continued testing of the processing system and automated table reporting applications.	Continue processing and testing South and North data, continue entering legacy data, and develop data entry and processing protocols for the West. Continue developing and testing a national sample design for annual TPO.
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.	Published TPO reports for California (2012) and Oregon (2013). Completed draft Hawaii NTFP report. Published journal article "Predicting Logging Residue Volumes in the Pacific Northwest" in Forest Science (Idaho, Montana, Oregon, and Washington logging utilization). Published logging utilization study in Oregon and Washington.	Publish Alaska report. Enhance website to include annual TPO harvest and logging residue data for several Western States. Publish Hawaii NTFP report. Carried over from FY 2016 due to delays in TPO processing system: Publish 2012, 2013, 2014, and 2015 National Pulpwood Reports. Southern Pulpwood Report for 2013, 2014, and 2015. Southern States TPO updates for 2013 and 2015.
Finalize implementation of corporate ownership survey and publish documentation.	Work has continued on the corporate survey, but it will not be implemented until FY 2017.	Implement 2017 NWOS base, urban, and corporate surveys. Finalize and pre-test corporate NWOS.
Prepare and publish additional summary materials and journal articles. Work with landowner organizations and others to prepare outreach materials.	Published summary journal article and Forest Service publications with summary tables and documentation. Multiple articles published in landowner magazines/newsletters.	Prepare for 2018 NWOS, including sample list augmentation. Implement NWOS State intensifications.
Update and release the next iteration of the NWOS TableMaker tool.	Created the next iteration of the NWOS TableMaker program. It is in the queue for deployment.	
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.	Obtained OMB approval. Made progress on integrating NWOS into NIMS. Continuing to work with partners.	Submit OMB package for 2019–2021 NWOS. Continue to integrate NWOS data into NIMS.
Pre-test the questionnaires, including the base survey, urban survey, and corporate survey, contingent upon receiving OMB approval.	Completed base and urban pre-testing.	Pre-test the corporate survey.
Begin logistical preparations for getting the NWOS back in the field in FY 2017.	Completed planning and commenced preparations.	Finish preparations and begin base and urban NWOS.ust (TIMO/REIT) variable into NIMS.
Identify States interested in collaborating (i.e., intensifying and customizing).	Received indicated interest from a handful of States in intensifying/ customizing the NWOS.	Secure funding for intensifications and begin the work.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, we will—
Obtain and update national parcel ownership data and create a standardized list of large private forest ownerships.	Obtained parcel data. Concentrated efforts on methods for making the data more accessible.	Work to maintain access to the national parcel data and increase accessibility.
Add a new condition-level TIMO/REIT variable into NIMS.	Created an initial estimation of this variable, but working with experts to verify it before populating NIMS.	Continue to develop the TIMO/REIT variable. Collaborate with partners to analyze NWOS data.
Urban Inventory		
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.	Continued urban monitoring activities in Austin and Houston, TX; Baltimore, MD; Milwaukee and Madison, WI; Des Moines, IA; and St. Louis, MO; Providence, RI; and added urban monitoring activities in Springfield and Kansas City, MO; Chicago, IL; Cleveland, OH; Pittsburgh, PA; Rochester, NY; and Burlington, VT. Initiated statewide urban inventories in both Wisconsin and Vermont.	Continue urban monitoring in Austin and Houston, TX; Baltimore, MD; Milwaukee and Madison, WI; Des Moines, IA; and St. Louis, MO; Providence, RI; Springfield and Kansas City, MO; Chicago, IL; Cleveland, OH; Pittsburgh, PA; Rochester, NY; and Burlington, VT. Initiate urban monitoring activities in San Diego, CA; Denver and Colorado Springs, CO; Lincoln, NE; Philadelphia, PA; Detroit, MI; Wichita, KS; Fargo, ND; Portland, ME; and Minneapolis, MN. Continue discussions and preparations for future urban monitoring in San Antonio, TX; Portland, OR; Dover, DE; and New York City, NY.
Publish Austin, TX, report and prepare Houston, TX, report for publication.	Published Austin, TX, report and prepared Houston, TX, report for publication. My City's Tree application was released and Urban FIA DataMart was released.	Publish Houston report. Post 2014 and 2015 data for Austin and Houston, TX, to the FIA DataMart. All four FIA units will be Urban FIA operational in 2017.
		Train PNW employees in urban protocols and implement accelerated urban inventory in San Diego, CA.
Remote Sensing Projects		
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.	Through the Landscape Ecology, Modeling, Mapping and Analysis group, a collaboration between the Forest Service and Oregon State University scientists, developed a method for approximating our bootstrap sampling approach to uncertainty from FY 2015 and tested it across Oregon, Washington, and California forests. Implemented production workflow.	Present results at an international conference (ForestSat 2016, Santiago, Chile). Submit a manuscript describing the method, especially as it deals with live and dead forest carbon mapping. Incorporated production workflow in future GNN map production runs
Finalize NLCD methods and implement nationwide production.	Released NLCD tree canopy cover (2011) datasets for U.S.-affiliated islands and territories to the public. Conducted research with Virginia Tech University to develop methods for 2016 NLCD tree canopy cover update. Focused research on improving models of percent tree canopy cover. The nationwide mapping effort began in late FY 2016.	Finalize methods, begin full-time production, and produce a draft dataset for the contiguous United States (c. 2016 tree canopy cover).
Publish article in Photogrammetric Engineering and Remote Sensing journal.	Article(s) delayed.	At least one peer-reviewed manuscript describing new canopy modeling methods will be submitted to a suitable outlet.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, we will—
Complete implementation of Image-Based Change Estimation (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.	Completed ICE data collection in Hawaii, Utah, Vermont, New Hampshire, and New Jersey. Began or continued ICE data collection in California, Nevada, Texas, Nebraska, Wisconsin, Ohio, New York, and Maryland. Updated response design, manual and training material. Began automated reporting format for completed States.	Complete ICE data collection in California, Nevada, Texas, Nebraska, Wisconsin, Ohio, New York, and Maryland. Provided standardized reports for completed States. Begin development of tools to support reporting and estimators for three or more time periods.
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.	Published the project's foundational algorithm in Global Change Biology and made software publically available on the Comprehensive R Archival Network. Submitted pilot manuscript to Remote Sensing of Environment. Produced nationwide attribution maps on NASA's Earth Exchange. Established new partners for use of this data set in water, wildlife, and RPA applications.	Publish nationwide attribution product. Disseminate to partners. Conduct RPA, water, wildlife, and other applications. Implement uncertainty mapping to the GNN workflow for map production, resulting in maps of estimated precision across Pacific Northwest forests for subset of forest attributes.
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.	Ported 7 algorithms to Google Earth Engine. Began to collect reference data to integrate individual algorithms and validate the synthesis product. Began collaborating with NASA and SilvaCarbon on mapping land cover change in East Africa.	Complete reference data collection in concert with the U.S. Geological Survey Land Change Monitoring, Assessment, and Projection project. Submit two draft manuscripts related to (1) algorithm comparison and (2) integration of algorithms through ensemble model. Continue working with NASA and SilvaCarbon.
Forest Carbon		
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.	Wrote a general technical report with findings from the 2014 Tanana pilot project, including chapters on (1) tree biomass, (2) soils, (3) ground cover (lichens, mosses), (4) down woody material, (5) understory plant diversity, and (6) remote sensing. In 2015, established approx. 300 specialized plots at 6 different sites (South Carolina, New Jersey/Pennsylvania, Maine, Minnesota, Colorado, and Oregon) that are currently being used to establish LiDAR-based regression models.	Produce several publications based on analysis of the remote sensing and field data collected in the Tanana pilot project. These results will be used to inform the planning for Goddard's LiDAR, Hyperspectral, and Thermal Imager (G-LiHT) sampling of the Susitna-Copper inventory unit (2018).
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.	Using data from the Oregon site, established proof-of-concept for a REDD+ system where a combination of sparse field plots, LiDAR sampling, and Landsat data are used to estimate biomass for the current year, and Landsat time series data are used to estimate biomass back to a 1990 baseline. These approaches are currently being applied to data from five other sites.	Continue analyzing results from additional sites to further integrate field-collected and remotely sensed data. Continue to explore estimation approaches for carbon pool estimation using LiDAR, Landsat, and other remotely sensed information for greenhouse gas reporting. Pilot will include six States in FY 2017.
Roll out Forest Carbon Management Framework (ForCaMF) results for all regions, working with Office of Sustainability and each region.	Completed reports and distributed internally to all regions.	As part of pilot work, explore possibility of more targeted ForCaMF assessments related to specific forest plan alternatives.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, we will—
Prepare publication summarizing, nationally, the relative impact of different types of disturbance and management on national forest carbon storage.	Published two papers exploring approaches for better characterizing uncertainty in carbon estimation and accounting and a national publication is in preparation.	Publish national paper. Early results from the pilot effort specific to attribution will be ready in December 2017 with an early 2018 submission target.
Increase transparency, documentation, and characterization of uncertainty in the new carbon accounting system.	Published two papers exploring approaches for better characterizing uncertainty in carbon estimation and accounting and started a third.	Continue work on estimating total uncertainty in the forest land category and prepare an additional manuscript.
Conduct research into downscaling estimates from the new carbon accounting system.	Began pilot testing in the Rio Grande National Forest. A pilot effort is underway in six States, using multiple processing formats, to provide spatial and temporally resolved estimates (and associated uncertainties) of forest carbon stocks and stock changes.	Continue work on the pilot with research on attribution to disturbance, carbon dynamics associated with land use change, and integration of auxiliary data to support estimation and accounting.
Begin research into the length of time that land remains in a conversion category and develop a mechanism to implement a new accounting framework.	Tested the IPCC default 20-year conversion period in the current compilation system and adapted system to ensure consistency with IPCC good practice.	Test approaches for the estimation of forest area and carbon dynamics associated with land use conversion following IPCC Good Practice Guidance in New York, Maine, Vermont, and New Hampshire.
Refine estimates of down dead wood and understory carbon based on litter and soil organic carbon methodology.	Started internal review of draft understory manuscript and the downed dead wood analysis.	Test litter and soil estimation methods on data from interior Alaska pilot and develop new methods for downed dead wood carbon estimation following the methods used for litter and soil carbon estimation.
Continue collaboration by PNW with the RMRS IW tree-ring lab to process and analyze cores.	Continued to collaborate on processing and analyzing increment cores collected in 2014 and 2015.	Continue collaboration and analysis.
Continue to have PNW cores on plots in 2016 field season.	Continued to collect increment cores in 2016.	Continue to collect increment cores during the 2017 field season.
Experimental Forests and Ranges		
Continue projects on an ad hoc basis.	Continued projects on an ad hoc basis.	Continue projects on an ad hoc basis.
Information Management and Distribution—FIDO		
Continue Information Management and Distribution—FIDO.	Initiated retirement of FIDO and replacement by DATIM, a partnership of FIA and National Forest System for a flexible online tool.	Continue work on DATIM; Continue work to implement changes from field guide version 7.0 in FIADB and the online tools; Continue work to implement net growth, removals, and mortality estimates of volume, biomass, and carbon for all States.
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.	With the University of Montana's continued participation in the national biomass effort, finalized data acquisition methods and continued sampling.	Following expiration of the national biomass agreement, created a new agreement with IW and University of Montana and added Northern Arizona University as a partner in the southern RMRS IW States. Partners will develop draft biomass models during FY 2017.
Continue to have PNW analysts and information management staff test and update the GRM module to improve Western States' accuracy in large diameter trees and forests.	Developed new GRM modules and tested in the national databases.	Complete review and testing of new GRM module for PNW States, making GRM available through public tools.

In the FY 2015 business report, we said that in FY 2016 we would—	In FY 2016, we—	In FY 2017, we will—
Host a RMRS-IW user group meeting, and possibly a joint "Western User Group" meeting in cooperation with the PNW FIA unit.	Held two RMRS-IW user group meetings in conjunction with preparations for the 5-year State Reports (Colorado/Wyoming). The combined RMRS/PNW Joint Western Group meeting was postponed.	Continue to host and report on regional user group meetings.
Complete work on FIADB User Guide based on version 7.0 of the National Field Guide.	Completed work, but not the transition to 7.0, delaying processing of six State inventories.	Finish the conversion to 7.0, eliminate processing backlog.
As data become available, implement necessary changes to FIADB and data distribution tools for field guide version 7.0. Also, as data becomes available, implement changes necessary to include estimates of net growth, removals, and mortality of biomass and carbon.	FIA has begun working on changes for FIADB and online tools to implement changes for field guide version 7.0 and to implement net growth, removals, and mortality estimates for all trees to 1.0 inches in weight (biomass) and carbon.	Continue to update FIADB to reflect changes to the field guide and NIMS.
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.	Began evaluation of hardware platforms and worked with CIO to address security issues.	Continue to evaluate hardware platforms and work with CIO to address security concerns.
Information Management and Distribution—NIMAC		
Through NIMAC, continue to provide, training, and software tools in five regions (Africa, Asia, North America, Central America, and South America) as part of the SilvaCarbon effort.	Conducted technology transfer activities, advised partner country staff, hosted visiting resource professionals, and developed data analysis tools and methods with cooperators in each of the regions.	Provide support to international and other nontraditional FIA clients in order to deliver the broader FIA and Forest Service missions of engagement through technology sharing and research partnerships.
Process and make available completed panels of continuous forest inventory data via EVALIDator for Missouri and Wisconsin. Update field guide and PDR program for Wisconsin and Indiana.	Processed and made available completed panels of CFI data via EVALIDator for Missouri and Wisconsin. Updated field guide and PDR program for Wisconsin.	Process and make available completed panels of continuous forest inventory data via EVALIDator for Missouri and Wisconsin.
Deliver final product, documentation and training to Massachusetts.	Delivered final database/analysis product, documentation, and training to Massachusetts Department of Conservation and Recreation.	
Release version 4 of DATIM for FIA customers. Begin development of version 5 for late 2016 release to the public.	Released version 4 of DATIM in January 2016 for FIA customers. Released version 5 in July 2016 to the public.	Release version 6 of DATIM in January 2017. Release version 7 of DATIM in July 2017.
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.	Completed sampling and plot designs and implemented on three U.S. Fish and Wildlife Service refuges using established PDR software. Database and analysis software development delayed due to unforeseen circumstances.	Finalize the PDR software and complete the database and analysis tool development. Will implement sampling and plot design on additional refuges.
Continue to provide technical assistance and software tools to other countries through the SilvaCarbon program.	Worked with SilvaCarbon cooperators to deliver training materials in workshops and participate in research and development activities that meet SilvaCarbon goals.	Fully develop research and training partnerships with SilvaCarbon countries to address changing resource monitoring challenges related to sound forest management and biodiversity.

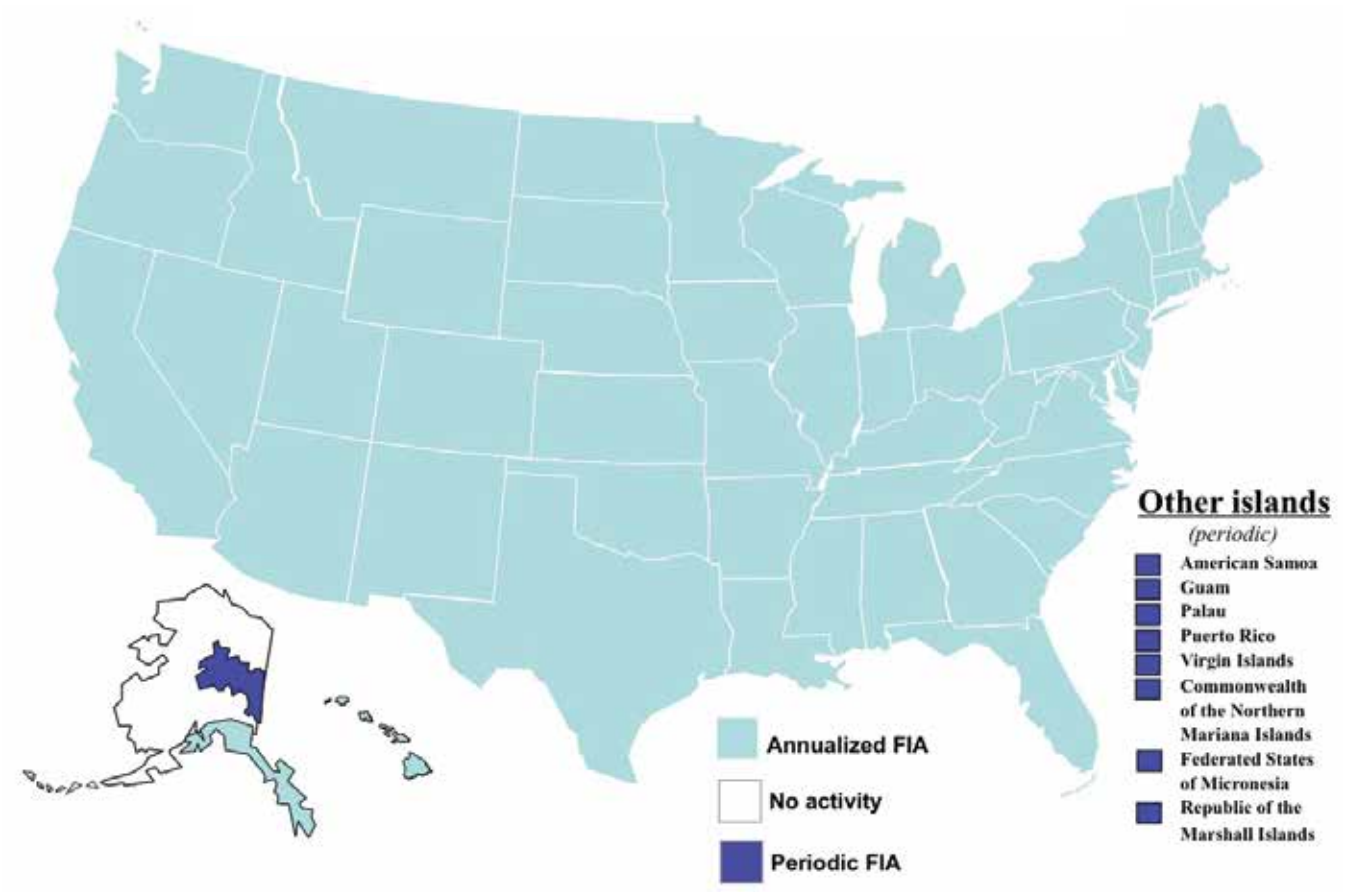
Information Management and Distribution—NIMS-CS		
In the FY 2015 business report, we said that in FY 2016 we would—	**In FY 2016, we—**	**In FY 2017, we will—**
Implement NIMS-CS and FIADB version 7.0.	Worked to implement changes necessary for version 7.0 of NIMS-CS and FIADB. This version will not go into production until early 2017.	Redesign and develop NIMS into a more robust and flexible system needed to accommodate the expanding FIA program.
Implement changes to GRM packages to implement GRM estimates for RMRS and PNW plot remeasurements.	Decided that RMRS would start using national GRM data processing protocols once a State reached 60%+ A2A measurement (which started with Utah 2015 data).	Continue testing GRM packages for the Western States. Implement GRM packages and volume, weight (biomass) and mortality estimates for annual inventory remeasurement in all States.
FIA Atlas Project		
Complete policy and technical reviews for print and Web editions.	Submitted document to the national Office of Communications for review and clearance.	Integrate review comments into a final print and Web document.
Complete layout of remaining print features and publish the Forest Atlas of the United States.	Completed the preliminary layout of features and started editorial review and clearance process.	Begin layout of the 2nd edition features upon publication of the 1st edition.
Continue collaboration with Esri via design, implementation, reporting, and training support, including all Web features.	Held training programs within each unit to build skills at publishing Web features. This led to the publication of 29 different Web apps, including 10 annual reports.	Prototype a Massive Raster Processing environment to facilitate future geospatial modeling and publishing efforts.
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.
Begin planning for FY 2017 Symposium.	Planned FY 2017 Symposium, published FY 2015 FIA Symposium Proceedings.	Complete planning Symposium – to be held at beginning of FY 2018 (October 24–26, Park City, UT),

CFI = Continous Forest Inventory; CIO = Chief Information Office; DATIM = Design and Analysis Tool for Inventory and Monitoring; Esri = Environmental Systems Research Institute; FIDO = Forest Inventory Data Online; FIA = Forest Inventory and Analysis; FIADB = Forest Inventory and Analysis Database; FIDP = Forest Inventory Data Online; GNN = gradient nearest neighbor; GRM = growth, removal, and mortality measures; IPCC = Intergovernmental Panel on Climate Change; NASA = National Aeronautics and Space Administration; NIMAC = National Inventory and Monitoring Applications Center; NIMS = National Information Management System; NLCD = National Land Cover Dataset; NRS = Northern Research Station; PNW = Pacific Northwest Research Station; NTFP = nontimber forest products; NWOS = National Woodland Owners Survey; OMB = Office of Management and Budget; PDR = portable data recorder; RMRS-IW = Rocky Mountain Research Station, Interior West; RPA = Resources Planning Act; TIMO/REIT = Timber Investment Management Organization/Real Estate Investment Trust;
TPO = timber product output.

Fiscal Year 2017 FIA Program Direction

The FY 2017 budget, as in many recent years, has considerable uncertainties. If a Continuing Resolution is adopted, the FY 2017 budget would be set at the FY 2016 level of $75.0 million, all from R&D appropriations. This will slow progress to fully implementing Option C. 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 2017 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 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 28. Planned FIA implementation status, FY 2017.



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

Long-Term Strategic Direction

The FIA program initially intended to implement the *Strategic Plan for Forest Inventory and Analysis* by achieving a base Federal program of 10 percent of plots measured annually in the West and 15 percent of plots measured annually in the East by FY 2003. Aggressive financial support from partners has enabled FIA to achieve full implementation and 5-year cycles throughout many 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 was 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 8301 of 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 that were 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 Natural Resources Conservation Service, NASA, National Oceanic and Atmospheric Administration, and USGS 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 approximately $1 billion. During that time, multibillions of dollars have been invested by forest industries and tens of thousands of jobs created from logging; primary wood processing; and manufacturing, construction, and retail sales of wood-based

Goal	Performance measure	2011 level (%)	2012 level (%)	2013 level (%)	2014 level (%)	2015 level (%)	2016 level (%)	Target level (%)
Inputs								
Maintain sufficient funding to support the base Federal FIA program[a]	Percentage of total Federal funding necessary for annualized inventory received	92	89	85	85	89	82	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	92	92	88	90	94	96	100
Keep online data current	Percentage of States with FIA online data less than 2 years old	92	92	92	96	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	11	11	13	10	10	12	20

FIA = Forest Inventory and Analysis; NRIS = Natural Resource Information System.
[a] Revised percentages based on new congressional target of $90 million for new FIA Strategic Plan options A, B, and C and FY 2015 funding is 82 percent of the new target.

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, adds interior Alaska, 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 analysis 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 following table shows our key goals, performance measures, and benchmarks for the FIA program for 2011 through 2016 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. These 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 their 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 2016 FIA program

	Pacific Northwest	Interior West[a]	Southern	Northern	National Office	Total
Total available Federal funds, FY 2016	$15,989,473	$14,553,717	$17,530,967	$17,477,668	$10,358,000	$75,909,825
Total appropriated Federal funds, FY 2016	$15,962,000	$14,034,000	$17,470,000	$17,176,000	$10,358,000	$75,000,000
Appropriated as percent of 2014 Farm Bill target						83%
Contributions from partners:						
Supporting the 20% FIA program	$439,095	$527,557	$2,131,164	$873,523	$0	$3,971,339
Value-added contributions	$569,560	$1,460,876	$986,636	$3,187,917	$0	$6,204,989
Total contributions	$1,008,655	$1,988,433	$3,117,800	$4,061,440	$0	$10,176,328
Total all available funds, FY 2016	$16,998,128	$16,542,150	$20,648,767	$21,539,108	$10,358,000	$86,086,153
Forest plots sampled:						
Base Federal grid	**1,923**	**2,564**	**5,309**	**4,512**	**-**	**14,308**
Spatial intensification	-	-	1,144	355	-	1,499
Temporal intensification	836	-	311	1,445	-	2,592
Urban and special studies	7	67	15	84	-	173
Total forest plots sampled	2,766	2,631	6,779	6,396	-	18,572
Forest plots with one or more health indicators	1,698	2,315	5,088	4,287	-	13,388
Number of base forest quality assurance plots	143	95	859	432	-	1,529
Percent base forest quality assurance plots	7%	4%	16%	10%	-	11%
Total base grid plots and percent sampled:[b]						
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	13%	12%	13%	15%	-	12%
Percentage of States with annual FIA activity[c]	**100%**	**100%**	**100%**	**100%**	**-**	**100%**
Number of publications:						
National forest reports	-	-	-	-	-	-
State/island resource reports	-	-	9	29	-	38
State timber product output reports	1	1	-	2	-	4
Regional reports	-	-	-	2	-	2
National reports	-	-	1	-	1	2
5-Year State reports	1	3	4	6	-	14
Subtotal – core reports	2	4	14	39	1	60
Peer-reviewed journal articles	18	14	24	66	-	122
Proceedings articles and published abstracts	30	13	16	74	-	133
Other station publications	2	1	-	47	-	50
Other publications	-	-	1	4	1	6
Total, all reports	52	32	55	230	2	371
Number of publications per Federal FTE	0.65	0.34	0.68	2.48	0.57	1.05
Consulting activities:						
Number of significant consultations	212	98	383	560	36	1,289
Total hours of significant consultations	814	2,370	1,499	2,630	234	7,547
Meetings:						
User-group meetings held	3	3	0	2	1	9
Management meetings held	1	0	0	1	1	3

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 2016 FIA program Federal funds

	Pacific Northwest	Interior West	Southern	Northern	National Office	Total
Available funds:			*Dollars*			
Previous year end-of-year balance	27,473	227,846	56,195	-	-	311,514
Post-year adjustments[a]	0	291,871		2,668	-	294,539
Subtotal pre-year adjustments	27,473	519,717	56,195	2,668	0	606,053
FY appropriated funds						
Research (base)	15,800,000	13,554,000	17,280,000	16,221,000	10,358,000	73,213,000
Initial R&D funds added to base[b]	162,000	260,000	173,000	650,000		1,245,000
Secondary R&D funds added to base[b]		220,000	17,000	305,000	-	542,000
Subtotal appropriated funds	**15,962,000**	**14,034,000**	**17,470,000**	**17,176,000**	**10,358,000**	**75,000,000**
Special project funding[c]	0		4,772	299,000	0	303,772
TOTAL AVAILABLE FEDERAL FUNDS	**15,989,473**	**14,553,717**	**17,530,967**	**17,477,668**	**10,358,000**	**75,909,825**
Direct expenses:						
Salary—	**7,684,916**	**7,490,426**	**8,215,251**	**9,880,202**	**416,000**	**33,686,795**
Administration	614,954	709,868	604,392	413,447	416,000	2,758,661
Phase 1 production	20,173	161,215	218,783	361,287	0	761,458
Field support	1,139,109	1,025,742	1,023,713	840,489	0	4,029,053
Data collection	2,955,935	2,045,614	725,015	2,500,333	0	8,226,897
Quality assurance	404,364	596,373	1,832,519	327,870	0	3,161,125
Information management	1,004,745	1,228,622	883,557	1,745,179	0	4,862,102
Analysis	1,067,160	950,816	1,891,547	2,890,535	0	6,800,058
Techniques research	478,476	772,176	1,035,727	801,063	0	3,087,442
Travel—	**862,813**	**767,619**	**901,050**	**464,962**	**25,000**	**3,021,444**
Office travel	99,398	153,417	106,214	121,165	25,000	505,194
Field/quality assurance crew travel	763,415	614,202	794,836	343,797	0	2,516,250
Equipment—	**876,847**	**598,729**	**443,033**	**465,157**	**0**	**2,383,766**
Imagery	0	1,688	0	4,000	0	5,688
Vehicles	280,759	356,780	339,959	209,822	0	1,187,320
Field equipment	439,347	36,029	62,930	113,944	0	652,250
Information technology/communications	156,741	142,467	36,144	129,265	0	464,617
Other	0	61,765	4,000	8,126	0	73,891
Publications	**5,124**	**19,905**	**40,000**	**145,237**	**5,000**	**215,266**
Grants and agreements[d]	**3,094,809**	**3,423,921**	**5,307,276**	**3,876,075**	**2,538,000**	**18,240,081**
Field work/data	*2,162,653*	*2,385,638*	*4,718,465*	*1,852,169*	*25,000*	*11,143,925*
Information management		*145,312*	*80,000*	*666,501*	*2,208,000*	*3,099,813*
Research	*932,156*	*369,340*	*508,811*	*1,357,404*	*305,000*	*3,996,342*
Office space and utilities	**821,440**	**480,953**	**530,252**	**356,523**	**0**	**2,189,168**
Other direct expenses	**110,298**	**455,394**	**209,044**	**113,703**	**0**	**888,439**
Total direct expenses	**13,456,247**	**13,236,947**	**15,645,906**	**15,301,859**	**2,984,000**	**60,624,960**
Fire transfer	**0**	**181,146**	**0**	**0**	**0**	**181,146**
Effective indirect expenses						
Total effective indirect[e]	**2,482,861**	**1,135,624**	**1,711,259**	**1,948,000**	**7,374,000**	**14,651,744**
Total effective indirect rate	15.5%	7.8%	9.8%	11.1%	71.2%	19.3%
End-of-year balance	**50,365**	**181,146**	**173,802**	**227,809**	**0**	**451,976**
TOTAL FEDERAL EXPENSE	**15,989,473**	**14,553,717**	**17,530,967**	**17,477,668**	**10,358,000**	**75,909,825**

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

[a] Some bookkeeping is not completed until after the new FY 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 Washington 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] Program-wide charges for Albuquerque Service Center included in National Office indirect expense.

Table B-3a. Federal staffing (FTEs) for the FY 2016 FIA program

	Pacific Northwest	Interior West	Southern	Northern	National Office[a]	Total
Administration	5.5	6.0	5.8	3.7	2.5	23.5
Phase 1 production work	0.2	2.3	3.0	4.0	0.0	9.5
Field support	12.7	12.8	10.1	7.3	0.0	42.9
Data collection	35.6	35.1	8.5	30.2	0.0	109.4
Quality assurance	4.6	7.3	21.5	3.6	0.0	37.0
Information management	7.4	11.9	7.7	15.0	0.0	42.0
Analysis	10.5	10.1	15.6	23.3	0.0	59.5
Techniques research	3.7	9.0	9.2	5.7	1.0	28.6
Total	**80.3**	**94.5**	**81.4**	**92.8**	**3.5**	**352.5**

FIA = Forest Inventory and Analysis; FTE = full-time equivalents; FY = fiscal year.
[a] 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 2016 FIA program

	Pacific Northwest	Interior West	Southern	Northern	National Office[a]	Total
Administration	0.9	1.0	0.0	0.0	0.0	1.9
Phase 1 production work	1.0	0.0	0.0	0.6	0.0	1.6
Field support	0.1	0.0	0.0	2.5	0.0	2.6
Data collection	16.4	25.4	91.7	24.3	0.0	157.8
Quality assurance	0.0	0.0	0.0	0.3	0.0	0.3
Information management	0.5	0.8	1.0	6.7	6.0	15.0
Analysis	6.4	3.8	0.0	3.4	3.0	16.6
Techniques research	4.0	1.9	0.0	10.2	1.0	17.1
Total	**29.3**	**32.9**	**92.7**	**48.0**	**10.0**	**212.9**

FIA = Forest Inventory and Analysis; FTE = full-time equivalents; FY = fiscal year.
[a] Techniques person is in unit funded by National Office at Research Triangle Park, NC.

Table B-3c. Estimate of total federally funded staffing (FTEs) for the FY 2016 FIA program

	Pacific Northwest	Interior West	Southern	Northern	National Office[a]	Total
Administration	6.4	7.0	5.8	3.7	2.5	25.4
Phase 1 production work	1.2	2.3	3.0	4.6	0.0	11.1
Field support	12.8	12.8	10.1	9.8	0.0	45.5
Data collection	52.0	60.5	100.2	54.5	0.0	267.2
Quality assurance crew	4.6	7.3	21.5	3.9	0.0	37.3
Information management	7.9	12.7	8.7	21.7	6.0	57.0
Analysis	16.9	13.9	15.6	26.7	3.0	76.1
Techniques research	7.7	10.9	9.2	15.9	2.0	45.7
Total	**109.5**	**127.4**	**174.1**	**140.8**	**13.5**	**565.3**

FIA = Forest Inventory and Analysis; FTE = full-time equivalents; FY = fiscal year.
[a] Techniques person is in unit funded by National Office at Research Triangle Park, NC.

Table B-4. Partners' contributions toward implementing FIA in FY 2016

Unit	Partner	Contributions toward the base program	Contributions that add value
		Dollars	
Interior West	Colorado State Forest Service	231,308	-
	NASA, Brian Williams, Goddard Space Flight Center	-	135,262
	NASA, Eastern Africa	-	177,706
	NASA, Global Ecosystem Dynamics Investigation LiDAR	-	108,000
	RSAC, Information Resources Decision Board	-	147,000
	University of Montana, Bureau of Business and Economics Research	96,249	-
	USDA Forest Service, PNW FIA	200,000	-
	USDA Forest Service, PNW Research Station	-	72,817
	USDA Forest Service, Region 1	-	300,023
	USDA Forest Service, Region 4	-	191,168
	USDA Forest Service, WO	-	258,900
	USDA Forest Service, WO (LANDFIRE)	-	70,000
IW total		**527,557**	**1,460,876**
National Office		-	-
NO total		**-**	**-**
Northern	Auburn University, NWOS	-	1,250
	Connecticut Department of Conservation	2,000	-
	Conservation Biology Institute, Protected Areas Database layers	-	15,000
	Davey Tree Expert Company, Urban	-	217,617
	Delaware Department of Agriculture	4,392	-
	Environmental Protection Agency, Urban, Great Lakes Restoration Initiative	-	120,000
	Illinois Division of Forest Resources	19,039	-
	Indiana Department of Natural Resources	48,230	-
	Iowa Department of Natural Resources	15,203	-
	Kansas State Forest Service, Urban (in part)	16,938	10,000
	Kansas State University, Trees Outside Forestland	-	6,072
	Maine Forest Service	205,331	233,905
	Maryland Department of Natural Resources Forest Service	20,730	-
	Massachusetts Department of Conservation and Recreation	7,700	-
	Michigan Division of Forest Management	40,200	-
	Michigan State University, National Biomass	-	21,875
	Michigan Tech University, analysis	-	6,250
	Minnesota Department of Natural Resources, Intensification, Buydown	139,957	339,829
	Missouri Department of Conservation	55,092	229,828
	NASA	-	51,763
	Nebraska Department of Forestry, Fish, and Wildlife	5,880	-
	New Hampshire Department of Resources and Economic Development	19,600	-
	New Jersey Forest Service	15,000	110,130
	New York Department of Environmental Conservation	18,195	-
	North Dakota Forest Service	4,590	-
	Northern Arizona University, National Biomass	-	18,750
	Oakville City, Urban	10,000	-
	Ohio Department of Natural Resources	13,687	-
	Oregon State University, National Biomass	-	6,250
	Pennsylvania Department of Conservation and Natural Resources, Regeneration	43,000	8,686
	RSAC, ICE	-	80,000
	Rhode Island Department of Environmental Management	6,471	-
	South Dakota Department of Forestry and Nat. Res. Mgmt.	19,742	-
	State University of New York, Urban	-	8,125
	University of Arkansas, Imputation Mapping	-	14,975
	University of Georgia, National Biomass	-	6,250
	University of Maine, National Biomass	-	21,875
	University of Massachusetts, NWOS	-	45,327
	University of Minnesota, Carbon	-	46,875
	University of Nebraska, Lincoln, Trees Outside Forestland	-	13,605

Table B-4. Partners' contributions toward implementing FIA in FY 2016 (continued)

	USDA Forest Service, National Forest System, Intensification, DATIM	500	629,675
	USDA Forest Service, State & Private Forestry, Urban, NWOS	66,500	348,146
	Vermont Department of Forests, Parks and Recreation, Urban (in part)	8,675	4,000
	West Virginia Division of Forestry	22,271	-
	Wisconsin Department of Natural Resources, Intensification	54,600	561,859
NRS total		**873,523**	**3,187,917**
Pacific Northwest	Alaska Department of Natural Resources	291,801	
	Federated States of Micronesia state government forestry programs (Pohnpei Division of Forestry, Kosrae Island Resource Management Authority, Chuuk Dept. of Agricultural and Forestry, Yap State Division of Agriculture and Forestry, Federated States of Micronesia Dept. Resources and Development, Micronesia Conservation Trust, Chuuk Conservation Society, Conservation Society of Pohnpei, Yap Community Action Program)		44,670
	University of Alaska Anchorage, inventory sample processing	21,836	
	University of Alaska Fairbanks, inventory sample processing	20,200	
	University of Guam	105,258	
	University of Hawaii, Manoa, forest products reporting		7,010
	USDA Forest Service, PNW Research Directors Office, 2016 Science Finding awards		14,369
	USDA Forest Service, PNW, Research Directors Office, Research Underserved Communities Fund awards		21,640
	USDA Forest Service, Region 10, Coastal Alaska non-forest veg plots		138,000
	USDA Forest Service, Region 5, FIA inspection plot remeasurment		20,385
	USDA Forest Service, Region 5, State and Private Forestry grants for Federated States of Micronesia Forest Inventory Program		22,545
	USDA Forest Service, Region 6, natural resource forester vegetation survey		8,941
	USDA Forest Service, RMRS, lichen analysis		25,000
	USDA Forest Service, State and Private Forestry, landscape restoration grant to Micronesia Challenge Regional Effort for Terrestrial Monitoring		150,000
	USDA Forest Service, WO, California mortality research		67,000
	USDA Forest Service, WO, Urban FIA		50,000
Pacific Northwest total		**439,095**	**569,560**
Southern	Alabama Forestry Commission	147,086	
	Arkansas Forestry Commission	126,255	
	Florida Department of Agriculture and Consumer Services	140,322	49,100
	Florida Department of Agriculture, Mangrove Inventory	5,000	
	Georgia Forestry Commission	182,764	90,049
	International Institute of Tropical Forestry	100,000	
	Kentucky Division of Forestry	99,337	189,723
	NFIM (National Forest Inventory and Monitoring budget code) funding		15,376
	Texas A&M Forest Service, implement annual FIA	837,883	311,713
	National Visitation Monitoring, Southern Research Station		8,000
	Oklahoma Department of Agriculture, Food & Forestry	113,397	
	South Carolina Forestry Commission	112,985	46,500
	Special Technology Development Program		29,500
	Tennessee State University, Improving Trees per Acre estimates	42,000	
	Tennessee Department of Agriculture, Intensification		49,600
	University of Tennessee — information management		80,000
	University of Georgia — improved biomass	48,592	
	University of Kentucky — estimating Kentucky inventory	15,828	
	Virginia Department of Forestry	129,481	75,343
	Virginia Tech, assess NTFP inventory using forest inventory data	5,000	
	Virginia Tech, Improved Biomass and Carbon Database	25,234	
	Virginia Tech, Legacy Data, Knowledge Synthesis		15,250
	Virginia Tech, RPA Land Use Modeling		26,482
SRS total		**2,131,164**	**986,636**
Grand total, all FIA units		**3,971,339**	**6,204,989**

BLM = Bureau of Land Management; CNMI = Commonwealth of the Northern Mariana Islands; DATIM = Design and Analysis Toolkit for Inventory and Monitoring; FIA = Forest Inventory and Analysis; FY = fiscal year; GEDI = Global Ecosystem Dynamics Investigation; ICE = Image-Change Estimation; IW = Interior West; LiDAR = Light Detection and Ranging; NASA = National Aeronautics and Space Administration; NFS = National Forest System; NLCD = National Land Cover Dataset; NO = National Office; NRS = Northern Research Station; NTFP = Nontimber Forest Products; NWOS = National Woodland Owners' Survey; PAD = Protected Areas Database; PNW = Pacific Northwest Research Station; RMRS = Rocky Mountain Research Station; RPA = Resources Planning Act; RSAC = Remote Sensing Applications Center; SRS = Southern Research Station; 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 2016

Unit	Amount	Recipient	Purpose
	Dollars		
Interior West	85,000	Digital Visions/Natural Resource Manager	National IT development
	60,312	RSAC	FIA2FVS project
	150,000	RMRS, Forest and Woodland Ecosystems	Western soils analyses
	20,000	RMRS	Conservation Biology Institute
	54,316	American West Forestry	Implementation of annual FIA
	69,065	Chestnut Ridge Forestry	Arizona plots
	414,565	Chestnut Ridge Forestry	New Mexico plots
	69,200	ISI Inc.	Implementation of annual FIA
	133,100	Michael Kazio	Implementation of annual FIA
	1,495,392	Colorado State Forest Service	Implementation of annual FIA
	59,928	Swarthmore College	Estimation strategies for FIA
	16,056	Swedish University	NASA Global Ecosystem Dynamics Investigation project (global biomass)
	10,000	University of Arizona	Tree ring analyses
	578,395	University of Montana	Timber Products Output, Biomass
	199,353	Utah State University	ICE, Forest Carbon Management Framework
	9,239	Weber State University	Water resource applications
Interior West total	**3,423,921**		
National Office	200,000	Eastern Forest Environmental Threat Center	SRS 4854 Eastern Forest Environmental Threat Center
	20,000	Government Publishing Office	Natural Inquirer printing
	100,000	RSAC	FIA Atlas project
	125,000	RSAC	Techniques Research Band work projects
	220,000	RSAC	National Agriculture Imagery Program land cover-land use project
	30,000	Conservation Biology Institute	Protected Area Database
	75,000	Ecological Society of America	Test/development tablets (“paperless push”)
	93,000	Society of American Foresters	Support projects
	150,000	University of Massachusetts	National Woodland Owners Agreement
	1,500,000	University of Nevada Las Vegas	University of Nevada, Las Vegas database agreement
	25,000	Virginia Tech University	FIA legacy data work
National Office total	**2,538,000**		
Northern	5,000	National AgroForestry Center	Trees Outside Forest
	10,000	NRS, Baltimore	Urban FIA support
	70,000	NRS, Chicago	National Woodland Ownership Survey support
	10,000	NRS, Chicago	Urban FIA support
	40,000	NRS, Durham	Down Woody Material support
	233,000	NRS, Grand Rapids	Soil analyses
	39,000	NRS, Newtown Square	Carbon accounting support
	25,000	RMRS	FIA IT architecture support
	26,349	Access Ability, Inc.	Prefield document imaging services
	93,818	Chandler B. Johnson	Implementation of annual FIA
	60,000	Conservation Biology Institute	Protected database
	100,549	Daniel Huberty	Kansas plots
	217,617	Davey Tree Expert Company	Enhancing i-TREE spatial simulation
	25,760	DJM Ecological Services, Inc.	Missouri urban plots
	341,000	Environmental Systems Research Institute (Esri)	Annual services and additional learning credits
	38,900	Glen Summers	West Virginia plots
	11,200	Joel Fyock	Illinois plots
	6,150	Joel Fyock	Missouri plots
	70,357	Joel Fyock	New York plots
	64,758	Joel Fyock	West Virginia plots
	77,580	Mark Webb	Ohio plots
	45,263	Quercus Consultations, Inc.	Nebraska plots
	40,000	Student Conservation Association	Summer student hires for New York
	21,064	Student Conservation Association	Summer student hires for West Virginia

Table B-5. Grants and agreements entered into by FIA units, FY 2016 (continued)

	17,661	Tom Bergstrom	North Dakota plots
	9,600	Wolf Ridge Associates	ICE student hires
	79,968	Department of Energy, Oakridge	Oak Ridge Institute for Science and Education research participation program
	22,884	Government Publishing Office	NWOS analytical support
	86,130	Indiana Department of Natural Resources	Implementation of annual FIA
	685,023	Maine Forest Service	Implementation of annual FIA
	24,920	Maryland Forest Service	FIA analytical support
	339,829	Minnesota Department of Natural Resources	Implementation of annual FIA
	57,078	South Dakota Dept of Forestry & Nat. Res. Mgmt.	South Dakota plots
	10,700	Vermont Department of Conservation	Urban FIA support
	5,000	Auburn University	Forest ownership dynamics
	24,288	Kansas State University	High-res land cover Nebraska/Kansas windbreak assessment
	87,500	Michigan State University	FIA Biomass Study
	25,000	Michigan Tech University	NWOS analytical and outreach support
	75,000	Northern Arizona University	National Biomass Study support
	25,000	Oregon State University	National Biomass Study support
	5,000	State University of New York	Forest ownership dynamics across the United States
	13,500	State University of New York	i-Tree integrating hydrological ecos services and feedbacks
	14,000	State University of New York	New York summer student
	59,902	University of Arkansas	Bayesian Temporal and Spatial Analysis
	25,000	University of Georgia	FIA Biomass Study
	87,500	University of Maine	FIA Biomass Study
	181,306	University of Massachusetts	NWOS/Family Forest Research Center
	27,500	University of Minnesota	FIA biomass estimation data access
	160,000	University of Minnesota	Biometrical refinements of U.S. forest carbon accounting
	54,421	University of Nebraska	High-res land cover & windbreak assessment
Northern total	**3,876,075**		
Pacific Northwest	200,000	RMRS	Implementation of FIA
	270,000	SRS	Implementation of FIA, State plot surveys
	8,062	USDA Forest Service, Region 6	Okanogan-Wenatchee National Forest, Methow Valley Ranger District stock support
	21,640	Chugachmiut Tribal Organization	Alder Biomass Study at Port Graham, AK
	37,912	Ecotrust	Modeling ecological, economic, and climate impacts of forest restoration management
	12,582	The Student Conservation Association, Inc.	Implementation of ICE data collection in California
	220,562	The Student Conservation Association, Inc.	Implementation of base FIA
	90,000	NASA	Remote sensing data from NASA Goddard's LiDAR
	1,147,505	Alaska Department of Natural Resources	Implementation of FIA interior Alaska
	7,000	Oregon Department of Forestry	Assessment of annual forest inventories
	10,407	Alaska Pacific University	Cooperative Ecosystems Studies Unit Tall Shrub Biomass Project
	21,569	Oregon State University	Lichen and bryophyte indicators and roles in forests
	165,240	Portland State University	Modeling forest resilience, biomass, and carbon management potential
	76,136	University of Alaska	Using tree rings to understand the impacts of climate change in interior Alaska
	20,770	University of Alaska	Incorporating interior Alaska FIA plot data into an assessment of proposed U.S. National Vegetation Classification Groups — Boreal National Vegetation Classification Key
	40,000	University of Alaska, Fairbanks	Pilot Project Tanana Valley FIA, Alaska
	263,942	University of Guam	Enhancing the FIA network throughout the Pacific Islands
	12,235	University of Hawaii	Developing statewide report on nontimber forest product use
	161,000	University of Montana	Implementation of FIA, Pacific States Forest Industry, and Timber Harvest Analysis
	64,000	University of Montana	Implementation of FIA, Alaska TPO studies
	146,119	University of Washington	Analyzing environmental changes in interior Alaska (1982-2014) using field measurement, stereo aerial photos, and G-LiHT data
	66,213	University of California Berkeley	Rates, patterns, and potential causes of tree mortality in California's forests
	31,915	Washington State University	Evaluation of visual structure from motion technology for forest inventory field operations
PNW total	**3,094,809**		

Table B-5. Grants and agreements entered into by FIA units, FY 2016 (continued)

Southern	71,500	International Institute of Tropical Forestry	Experimental forest study
	50,000	SRS Research Triangle Park	RPA land use modeling
	60,000	Urban Forestry (RWU 4952)	Urban forestry
	441,289	Alabama Forestry Commission	Implementation of annual FIA
	378,767	Arkansas Forestry Commission	Implementation of annual FIA
	20,000	Florida Department of Agriculture and Consumer Services	Evaluate alternative methods for Mangrove Ecosystem Inventory
	371,866	Florida Department of Agriculture and Consumer Services	Implementation of annual FIA
	487,385	Georgia Forestry Commission	Implementation of annual FIA
	374,000	Georgia Forestry Commission	Implementation of annual FIA
	298,011	Kentucky Division of Forestry	Implementation of annual FIA
	411,957	North Carolina Dept of Agric. and Consumer Services	Implementation of annual FIA
	340,190	Oklahoma Dept of Agriculture Food and Forestry	Implementation of annual FIA
	292,457	South Carolina Forestry Commission	Implementation of annual FIA
	271,185	Tennessee Division of Forestry	Implementation of annual FIA
	583,550	Texas A&M Forest Service	Implementation of annual FIA
	336,308	Virginia Department of Forestry	Implementation of annual FIA
	40,000	Alabama A&M University	Forestry recruitment
	30,000	Auburn University	Tree planting data, (Auburn, Purdue, Idaho)
	30,000	Auburn University	Tree planting data, (Auburn, Purdue, Idaho)
	80,828	Louisiana State University	TPO survey
	65,000	University of Georgia	Improved volume biomass and carbon database
	25,000	University of Kentucky	Estimating Kentucky's forest inventory
	80,000	University of Tennessee	Information management – cooperative research
	19,983	University of Tennessee	Woodland Owner Survey
	20,000	Virginia Tech University	Assessing NTFP inventory using FIA data
	38,000	Virginia Tech University	RPA land use modeling
	65,000	Virginia Tech University	Improved volume biomass and carbon database
	25,000	Virginia Tech University	Legacy data – knowledge synthesis volume, biomass, carbon
SRS total	**5,307,276**		
Grand total	**18,240,081**		

FIA = Forest Inventory and Analysis; FVS = Forest Vegetation Simulator; FY = fiscal year; GPO = Government Publishing Office; G-LiHT = Goddard's LiDAR, Hyperspectral, and Imager; ICE = Image-Change Estimation; IT = Information Technology; LiDAR = Light Detection and Ranging; NASA = National Aeronautics and Space Administration; NTFP = Nontimber Forest Products; NWOS = National Woodland Owners' Survey; RMRS = Rocky Mountain Research Station; RPA = Resources Planning Act; RSAC = Remote Sensing Applications Center; SRS = Southern Research Station; TPO = Timber Products Output; USDI = U.S. Department of the Interior.

Table B-6. Number and hours of significant consultations by FIA staff by customer group, FY 2016

Customer group	Pacific Northwest		Interior West		Southern		Northern		National Office		Total	
	No.	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*	*No.*	*Hours*
Academic	49	196	37	428	105	394	135	420	3	40	329	1,478
Government	82	404	52	1,611	154	639	223	1,492	12	70	523	4,216
Industry	28	46	1	1	43	248	118	388	3	25	193	708
NGO	22	72	4	247	28	85	63	281	8	65	125	750
NIPF	2	4	1	8	12	28	3	6	2	10	20	56
Media	22	70	-	-	2	3	15	39	6	14	45	126
Other	7	22	3	75	39	102	3	5	2	10	54	214
	212	814	98	2,370	383	1,499	560	2,630	36	234	1,289	7,547

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 Services Center requests, FYs 2008–2016

Indicator	Number of annual accesses									Total 2008-2016
	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Online tools										
MapMaker	20,834	25,000	-	-	-	-	-	-	-	45,834
FVS	683	-	-	-	-	-	-	-	-	683
Fuel Treatment Evaluator	50	-	-	-	-	-	-	-	-	50
FIDO	38,092	55,494	70,943	72,946	52,099	57,567	57,974	47,263	33,293	485,671
NWOS		6,560	1,700	2,070	5,515	4,502	2,994	2,068	1,710	27,119
EVALIDator		3,920	29,000	55,468	34,901	33,759	35,839	36,532	34,082	263,501
National TPO tool							69,600	18,544	37,000	125,144
DATA downloads		2,014	3,033	1,929	1,512	7,383	19,768	66,000	69,025	170,664
Total	**59,659**	**92,988**	**104,676**	**132,413**	**94,027**	**103,211**	**186,175**	**170,407**	**175,110**	**1,118,666**
Spatial data requests										
Academia	140	109	114	121	168	143	155	160	162	950
State	48	49	47	36	45	29	55	91	56	309
NFS	29	16	32	17	46	31	32	29	40	203
Other Federal	135	105	116	92	169	175	131	136	130	923
NGO	34	41	31	23	41	35	31	38	35	236
Industry	29	28	35	34	61	41	94	84	54	322
Other	68	57	48	91	75	67	88	66	55	494
Total	483	405	423	414	605	521	586	604	532	3,437

FIA = Forest Inventory and Analysis; FIDO = Forest Inventory Data Online; FVS = Forest Vegetation Simulator; FY = fiscal year; NGO = nongovernmental organization; NFS = National Forest System; NWOS = National Woodland Owners Survey; TPO = National Timber Products Output.

Table B-8. Mill, fuelwood, and ownership surveys processed and utilization sites visited, FYs 2000–2016

Survey or site	Year initiated	Number of annual survey questionnaires or sites										Total 2000-2016
		2000-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Timber products	1947	14,775	1,131	2,657	1,727	3,521	1,375	2,675	1,142	2,750	1,341	33,094
Fuelwood	1947	2,919	-	-	-	-	-	2,360	-	-	-	5,279
Ownership surveys	1978	17,281	-	-	-	7,960	4,028	5,262	-	-	-	34,531
Utilization sites	1947	772	486	17	66	58	162	189	105	216	162	2,233

FY = fiscal year.

Table B-9. Forest health indicator, year of initiation, and number of samples collected, FYs 2000–2016

Indicator	Year initiated	Number of annual samples										Total 2000-2016
		2000-2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Crowns	1991	7,305	962	1,177	761	-	1,510	5,031	3,813	4,437	5,399	30,395
Lichens	1998	2,678	127	150	167	-	33	-	-	8	193	3,356
Soils	1999	5,665	349	201	266	2	595	565	439	487	456	9,025
Veg	2001	13,246	2,100	2,125	2,097	1624	7,145	6,703	7,098	6,666	6,757	55,561
Ozone	1994	8,104	948	1,003	1,018	107	-	-	-	-	-	11,180
DWM	2001	18,889	1,448	2,152	1,392	1414	6,263	8,271	8,635	8,186	8,459	65,109
Mortality[a]	2001	46,191	12,594	13,892	15,293	15,858	20,275	13,859	17,308	16,825	14,606	174,626

FY = fiscal year; DWM = Down Woody Material.

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

Table B-10. Status of FIA special project areas excluded from annualized inventory

Region and area	Land area	Forest area	Percent forest	Number of major islands	Year of published report	Number of base field plots	Number of intensification plots	Available online data
Pacific (PNW):	- - - - - *Acres* - - - - -							
American Samoa	48,434	39,156	81%	4	2012	20		Yes
Guam	132,230	69,851	53%	1	2013	48	58	Yes
Palau	108,227	102,130	94%	10	2014	56		Yes
Commonwealth of the Northern Mariana Islands	74,907	60,207	80%	3	2015	37		Yes
Federated States of Micronesia	161,917	143,466	89%	4	2005	85	90	Yes
Marshall Islands	33,120	23,252	70%	10	2006	58		Yes
Hawaii	4,109,962	1,471,180	36%	8	2015	246	90	Yes
Atlantic (SRS):								
Commonwealth of Puerto Rico	2,191,815	1,219,177	56%	4	2013	287		Yes
U.S. Virgin Islands	82,164	46,967	57%	3	2013	48		Yes
Total	**6,942,776**	**3,175,386**	**46%**	**47**		**885**	**238**	

FIA = Forest Inventory and Analysis; PNW = Pacific Northwest Research Station; SRS = Southern Research Station.

Table B-11. Land and forest area and FIA annualized implementation status by State and region, FY 2016[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 2016
		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

Table B-11. Land and forest area and FIA annualized implementation status by State and region, FY 2016[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 2016
		Thousand acres		*Year*	
Nevada	70,260	11,169	8,121	2010	Yes
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%**

AK = Alaska; FIA = Forest Inventory and Analysis; FIADB = Forest Inventory and Analysis Database; FY = fiscal year; RPA = Resource Planning Act.
[a] Based on area defined as forest in FIADB plus area defined as forest by 2012 RPA Assessment.

Table B-12. FIA summary statistics and performance measures, FYs 2009–2016

	2009	2010	2011	2012	2013	2014	2015	2016
AVAILABLE PROGRAM FUNDS								
Appropriated funds[a]	65,536	71,817	71,452	69,186	65,567	66,805	70,000	75,000
Other Federal funds[b]	3,320	930	856	528	2,668	3,077	743	304
Total Federal funds	68,856	72,747	72,308	69,714	68,235	69,882	69,882	75,304
Total partner funds	6,494	7,516	9,109	10,129	7,772	7,833	8,972	10,176
Total available funds	75,350	80,263	81,417	79,843	76,007	77,715	77,715	85,480
Percent full Federal appropriated funding	84%	92%	92%	89%	84%	86%	78%	83%
PROGRAM EXPENSES AND BALANCES								
Administration	2,999	3,262	3,233	2,735	2,854	3,036	2,703	2,759
Image processing	1,102	916	724	519	589	597	635	761
Field support	3,003	3,594	3,917	3,946	4,151	4,082	3,782	4,029
Data collection[c]	25,243	26,162	27,057	24,387	22,559	23,590	22,807	26,888
Information management[c]	7,623	7,476	6,794	6,740	5,933	6,737	7,680	7,962
Analysis	5,354	5,357	6,105	6,570	6,695	7,058	6,907	6,800
Research[c]	5,881	6,903	5,444	6,075	6,690	7,072	6,111	7,084
Miscellaneous/other	3,909	4,473	4,417	3,882	3,652	3,864	5,025	4,342
Total direct expense	55,115	58,143	57,692	54,854	53,124	56,037	55,651	60,625
Total Indirect expenses	12,653	14,189	13,958	14,180	14,704	13,461	14,708	14,652
Indirect rate	19.3%	19.8%	19.5%	20.5%	22.4%	20.2%	21.0%	19.5%
Total Federal expense	67,768	72,332	71,650	69,034	67,828	69,498	70,359	75,277
Fire transfer							449	181
Total end-of-year balance	1,089	415	658	680	407	384	312	452
Total Federal funds	68,856	72,747	72,308	69,714	68,235	69,882	71,119	75,910
Other measures								
Percent States with annual activity	94	100	100	100	100	100	100	100
Percent States with FIADB 1-2 yrs old	90	88	94	94	94	96	96	96
Federal employees	381	392	397	372	366	366	338	352
Other employees	201	205	201	203	184	204	185	213
Total employees	582	596	598	575	550	570	523	565
P2 base forest plots	21,545	19,272	21,233	19,673	21,263	19,789	18,346	14,308
P2 base quality assurance plots	3,597	4,020	4,550	4,417	5,465	2,312	3,083	1,529
Percent quality assurance Federal plots	8%	9%	9%	9%	11%	5%	7%	11%
All publications	206	203	204	272	238	234	236	371
Journal publications	38	74	62	90	90	87	122	122
Percent journal publications	18%	36%	30%	33%	38%	37%	52%	33%
Consultations, number	1,399	991	1,753	848	824	945	1,350	1,289
Consultations, hours	8,603	10,381	8,584	8,807	8,124	7,987	13,806	7,547
User/management meetings	11	10	14	15	12	14	13	12
Spatial data requests filled	405	423	414	605	605	586	604	532
Online accesses	92,988	104,676	132,413	94,027	94,027	186,175	170,407	175,110

FIA = Forest Inventory and Analysis; FIADB = Forest Inventory and Analysis Database; FY = fiscal year.

[a] *Net of rescissions.*

[b] *Includes return of previous year carryover, return of fire transfers and additional Forest Service Research commitments.*

[c] *Includes Federal grants and agreements.*