3rd DRAFT Strategic Plan for Forest Inventory and Analysis, 2007-2011

INTRODUCTION

In 1998, Congress passed the Agriculture Research, Extension, and Education Reform Act. This legislation authorized significant changes in the Forest Inventory and Analysis (FIA) program of the USDA Forest Service, including conversion to an annual (continuous) forest inventory program; development of a core set of procedures to be implemented in a consistent fashion across all US forest lands; continuously updated databases available on an annual basis; and production of complete State-level analyses at five-year intervals. The legislation authorized the Forest Service to develop a strategic plan, in consultation with program partners and customers, detailing how these changes would be implemented over five years. That initial Strategic Plan for Forest Inventory and Monitoring 1999-2003 (hereinafter '1999 Strategic Plan') was delivered to Congress in April 1999.

As FIA reaches the end of the time period covered by that 1999 Strategic Plan, it is appropriate to take stock of where we have succeeded in achieving our goals, where we still have progress to make, and what else we intend to do over the next five years. The purposes of this current document are (1) to summarize the status of the FIA program with respect to the goals outlined in the original strategic plan, and (2) to set new goals and opportunities for the FIA program over the next five years. This document does not cover detailed operational business plans for each state or individual National Forest. Those interested in such details should contact FIA regional program managers or FIA's national office.

This Strategic Plan for Forest Inventory and Analysis **2007-2011** (**hereinafter '2007 Strategic Plan**), includes four major sections:

- Description of the **2005** FIA Program Status – a summary of where the program stands at the end of the first five-year period.
- Program Adjustments for **2006** and Beyond –revisions to initial staffing and budget assumptions based on what we have learned about implementation over the past five years.
- Base Federal Program Plans for **2007-2011** – proposed tasks to support and maintain the base federal FIA program over the next five years.
- Program Emphasis Shifts, Enhancements and Additions for **2007-2011** – other program enhancements for which we believe we hold a comparative advantage and for which we propose to seek support for adding to our base federal program.

2005 PROGRAM STATUS

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

> *"make and keep current a comprehensive inventory and analysis of the present and prospective conditions of and requirements for the renewable resources of the forest and rangelands of the US." (*McSweeney-McNary Forest Research Act of 1928).

Subsequent legislation has endorsed and expanded upon this mission in various ways, but the original mission is still a surprisingly good summary of what FIA is all about. For over 70 years, the FIA program has collected, analyzed, and reported information on the status and trends of America's forests: how much forest exists, where it exists, who owns it, and how it is changing, as well as how the trees and other forest vegetation are growing and how much has died or has been removed in recent years. This information is used in many ways, such as in evaluating wildlife habitat conditions, assessing the sustainability of ecosystem management practices, and supporting planning and decision-making activities undertaken by public and private enterprises.

FIA Vision – The FIA program delivers current, consistent, and credible information about the status, condition and trends of America's forests. While data are collected in all states each year, we summarize and report the most current information about forest health, productivity and ownership in each State every five years. We collect and analyze a consistent core set of ecological data on all forests so that comparable information and trends exist for all regions and ownership categories. In each region, we collect additional data beyond the core set which are used to customize analyses to address specific regional and local issues. Consequently, our status and trend information is recognized as the single best source of indicators on the conservation and sustainable management of America's forests.

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

Our partners are an integral part of our forest inventory and monitoring activities. Without the contributions from our State and other Forest Service partners of personnel, funding and their continued support, this vision cannot be attained.

FIA Program Customers – FIA data are used for a variety of purposes, including policy making at State and federal levels, to identify opportunities for renewable resource use, to assess sustainability of our forest resources, to monitor biodiversity and wildlife habitat, and to expand other research to the entire landscape. Key program customers include:

- State and federal (e.g. National Forest, BLM, NPS, USGS) land managers, policy and lawmakers
- State foresters
- Industry and consultants
- Environmental organizations
- International reporting agencies
- Forest Service officials
- Researchers
- Journalists
- Interested private citizens

Definition of the Base Federal Program – The legislation passed by Congress envisioned an FIA program that was a partnership between State organizations and the USDA Forest Service. In the course of implementing the changes, we held numerous consultations amongst the partners involved to determine what were the respective responsibilities and expectations of the different parties. Those expectations led to the definition of a Base Federal Program, which described the level of service to be provided by the Forest Service to all US States and territories, regardless of their ability or willingness to participate. The Base Federal Program defines the initial FIA program to be implemented across the country. The program consists of:

- A three-phase program including remote sensing for stratification (Phase 1), a sample of ground plots measured for basic forest data (Phase 2), and a subsample of the Phase 2 sample plots measured for an extended suite of ecosystem attributes (Phase 3);

- A national woodland owner survey to increase our understanding of private woodland owners;

- A survey of timber products output that canvasses all primary wood-using mills within each state using mail, phone and on-line questionnaires.

- Development of a consistent core set of field measurements collected the same way across all US forested lands;

- Annual data collection on 10% of all Phase 2 plots in the western US, 15% of all Phase 2 plots in the eastern US, and 20% of all Phase 3 plots nationwide;

- Compilation of all field data on an annual basis, made available online within 6 months of the end of the data collection for the panel;

- We will continue to produce comprehensive, analytical reports at five-year intervals for each US State, however, States may elect to delay the first report until the first full cycle of plots have been measured once;

- Special designs for interior Alaska, Nevada and for Caribbean and Pacific Islands.

Implementation Status

- **Transition to Annual Inventory**. By the end of 2005, we will have implemented the Base Federal program in 45 states representing 77 percent of the forests of the U.S., including the Puerto Rico, Virgin Islands and Pacific Trust territories (Figure 1). The current gaps include five States (Hawaii, Oklahoma, Mississippi, New Mexico, Wyoming), interior Alaska, Northern Mariana Islands, and Federated States of Micronesia. Nevada is not fully implemented, however FIA has implemented a pilot study designed to produce states estimates using new remote sensing techniques. Within the areas implemented, we cover all forest lands with a consistent core program.

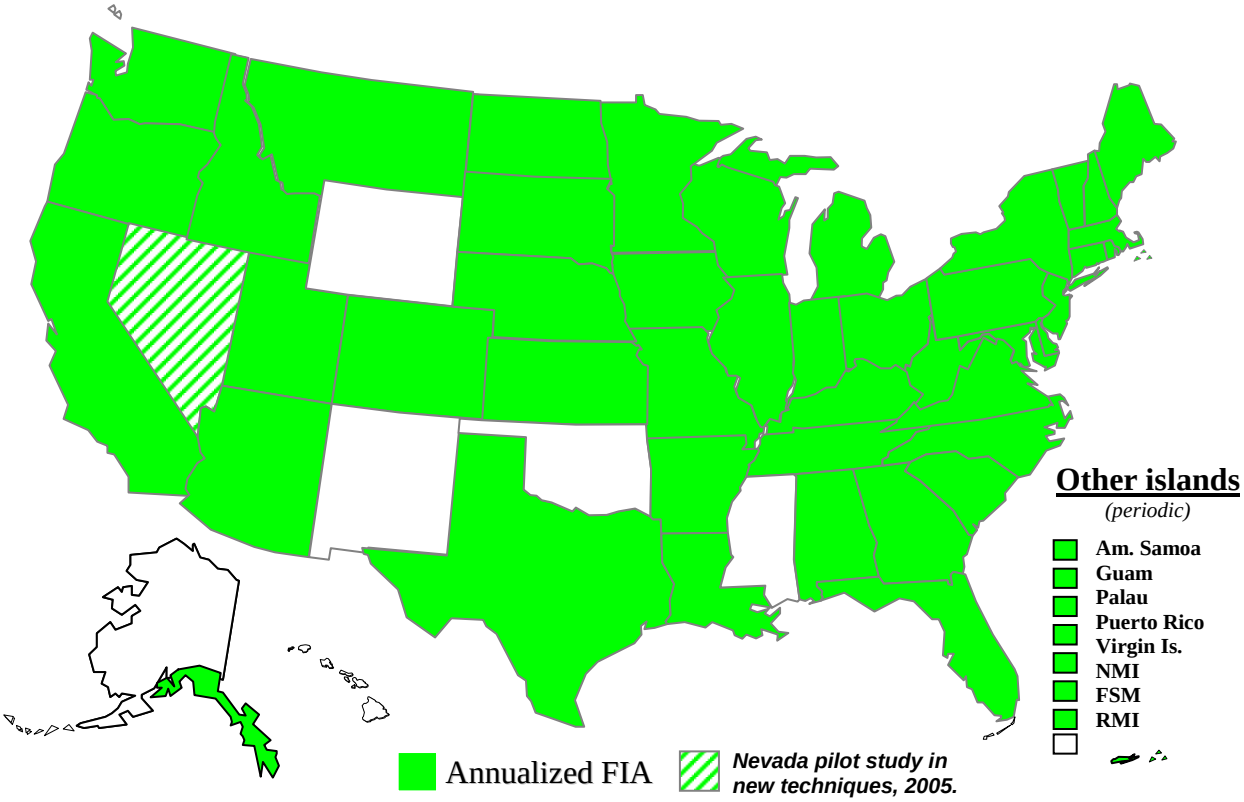

Figure 1.- Status of FIA Annualized Implementation, FY 2005

- **Consistency**. The FIA program agreed on the necessary levels of consistency in the Phase 1, 2, and 3 components of the program, and has in place written guidelines documenting data collection, estimation, and reporting methods to ensure that consistency. The national woodland owner survey is accomplished uniformly across the U.S. to determine who owns forests, why individuals and groups own forest land, and

what are possible futures of forest land. Timber products output questionnaires and surveys are implemented by state using standard procedures. We have also developed a National Information Management System (NIMS) for managing all field-sampled data. We have developed a web-based data compilation and analysis engine allowing users to access data and results in a consistent manner across the country. In each area, we have developed these systems in such a way that regional FIA programs can add to the national core program in order to meet the needs of their regional partners and customers.

- **National Core Variables**. Core variables were reviewed for consistency and application as part of the nationwide base FIA program. Several plot, condition, and tree level variables (such as recreation use, grazing intensity, or treatment opportunity) were dropped because they had never been implemented nationally. Most of the dropped variables were either found to be unrepeatable, could be generated from other sources like remote sensing, or were only used in one Region of the country. A few of the variables such as litter and humus depth were implemented as Phase 3 variables instead of Phase 2 variables. The national woodland owner survey also contains national core variables about ownership, management objectives, demographics of the private woodland owners, landowner perceptions of forest health, and flows of market and non-market goods.

  In addition to identifying variables that were not part of the national core list, we identified several variables to be added to the core or core optional categories to create a more complete program. In general these variables were ones that multiple FIA regions were already collecting although some work needs to be done so that they are fully consistent nationally. The Core variables include information on crew members, tree class, invasive or noxious plant species, and woodland stem diameters. Core optional variables would include variables such as land use class, terrain position, utilization class, and understory vegetation information on Phase 2. We are continuing the use of the macroplot as core optional and recommend looking at the potential for downed woody material as core optional on Phase 2 as well.

- **Scope**. FIA has maintained their historical excellence in collecting, analyzing, and reporting on data related to the extent, productivity, location, and value of US forest lands. We have also maintained the collection, analysis, and reporting of questionnaire-based data from landowner surveys and timber products outputs. In addition, we have broadened the scope of our program to include sets of measurements pertaining to tree crown conditions and damage; vascular plant species diversity and abundance; lichen community composition; soil conditions; down woody debris; and ozone exposure.

- **Partnerships**. The FIA program is based on partnerships. Within the Forest Service, the FIA program exists as a partnership among three branches of the Forest Service: Research and Development, which provides the overall leadership and management of the FIA program; National Forest Systems (NFS) which provides funding and guidance which enable FIA to cover National Forest lands and to provide information to National Forest managers; and State and Private Forestry, which provides funding and guidance for assessing forest health and supporting States in the implementation of Annualized Inventory.

  In addition to the internal partners, FIA relies heavily on a variety of external partners to increase the efficiency and quality of the program. State forestry agencies are key partners in many states, taking an active role in data collection, analysis, and facilitating contacts with landowners. Several universities provide technical assistance in data analysis and reporting, and in research aimed at improving FIA program operations. We signed a memorandum of Understanding between the National Association of State Foresters and the Chief of the Forest Service indicating the Forest Service's commitment to seeking the funding necessary for implementing the base federal FIA program. FIA and partnering states work together to address the most significant current forest resource issues and thereby maintain the usefulness and viability of the inventory program. The success of this partnership is evident through the $6-10 million annual contributions from participating states (**Figure 2**).

  The FIA Blue Ribbon Panels recognized that partnerships with other federal programs could improve FIA efficiency, products and delivery systems. We have teamed up with the US Geological Survey to improve accuracy of mapping forest cover under the 2001 National Land Cover Dataset project. Potential partnerships include the NRCS National Resources Inventory (NRI), the Multi-Resolution Land Characterization (MRLC-2000) Consortium and its National Land Cover Data (NLCD-2000) products, GAP, NASA, and NOAA. Most opportunities for partnerships involve sharing costs and logistical burdens to more efficiently and effectively use remotely sensed data from satellites and low-altitude aircraft, and broad-scale applications of GIS techniques to improve geospatial analyses. These same partnerships can

solve the logistical and financial barriers to implementing FIA's vision for remote sensing and adopting the radical changes in the FIA system that have been recommended by FIA users. FIA should also have a preeminent position in all federal efforts to inventory and monitor forest resource conditions at the regional and national levels. More innovative uses of remotely sensed data can improve the number of products, their quality and timeliness, and the cost-effectiveness of the FIA Program.

The National Forest System recognizes that all NFS regions share common priorities and needs for vegetation inventory. NFS needs an inventory that meets vegetation information needs at the regional, forest, and mid-scale. Mid-scale is defined as a minimum intensification of twice the density of the federal base grid (i.e. one plot per 3000 acres). These data are fundamental to: developing forest plans, monitoring forest plan standards and guidelines which are associated with vegetation, monitoring and management of fuels, monitoring and management of wildlife habitat including cumulative affects analysis, and also for monitoring broad-scale incidence and spread of invasive species.

Among our external partners, the National Association of State Foresters in 2004 passed resolution number 2004-4 that addressed the lack of a systematic inventory and assessment of the nation's urban forest resource. They recognized that there is no systematic method of continuously assessing the nation's urban forest resource, as there is for timberlands. This prevents the USDA Forest Service and the states from developing resource-based objectives and performance measures for the nation's urban forests and their urban forestry programs. Without a continuous urban forestry inventory, federal, state and local programs will continue to suffer from a lack of support. Currently, there are several urban forest assessment efforts that are uncoordinated, disparate and inadequately supported. The urban and community forestry and Forest Health Monitoring (FHM) program housed with USDA Forest Service's State & Private program have partnered with FIA to pilot test an FIA-like urban inventory in several states. FIA and State & Private Forestry have worked on logistics, field manuals, databases and reporting.

- **Finances and Staffing**. The FIA program appropriated federal funds in 2005 consisted of a total of $60,882,000 from two sources:

Research and Development	$55,924,000
State and Private Forestry	$ 4.958,000

This represents 82 percent of the funds necessary to deliver the Base Federal Program as outlined in the original Strategic Plan. Funding has increased significantly over the past five years, commensurate with the increased expectations placed upon the FIA program. The President's Budget shows the program will achieve full funding in FY 2006 of $73,371,000, and will increase thereafter at a rate appropriate to maintain our capabilities. Since a large portion of FIA funds are expended on salaries, the annual federal salary increase rate is used to estimate the financial growth needed to stay even with inflation. A funding history/projection for 1999-2011 is shown in **Figure 3** (the annual funding gap is represented by the white section of the graph bars).

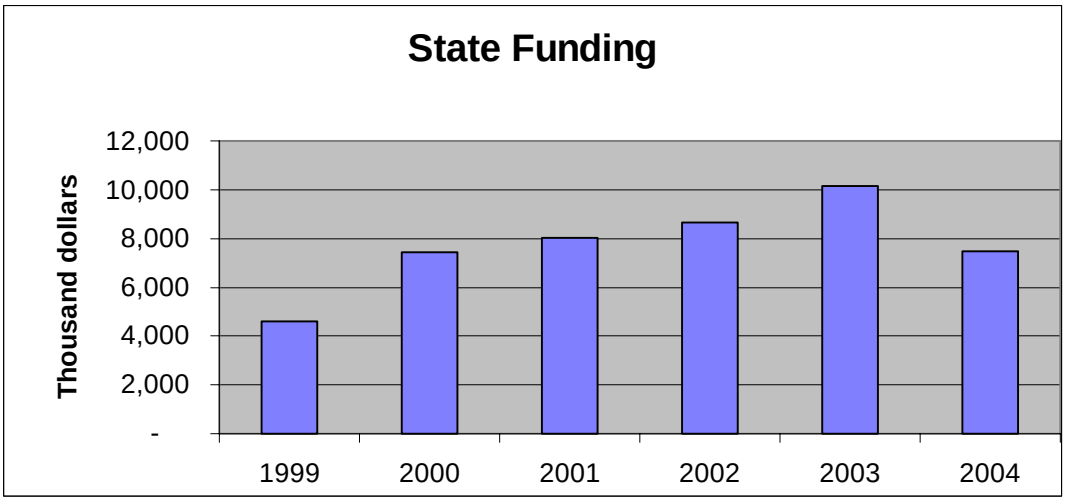

Figure 2. – In-kind contributions from states for the Annualized FIA program.

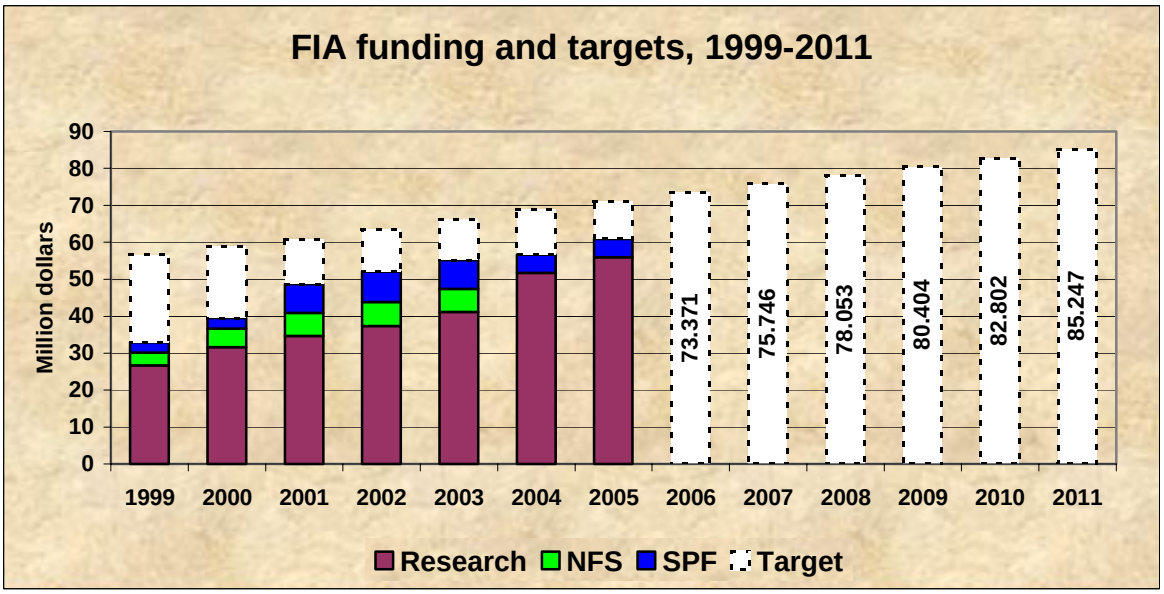

Figure 3. – Appropriated federal funds and target funding for the Annualized FIA program.

In 2004, federal funds paid for over 400 federal employees engaged full time in implementing the FIA program. The funds also cover approximately $10 million in external grants and agreements to program partners who are also engaged in helping to deliver the FIA program.

These appropriated funds are typically augmented by approximately $6-10 million in cash or in-kind contributions from a variety of partners, primarily State forestry agencies (**Figure 2**). These funds are

typically contributed to add value to the base federal FIA program in some way, for example by increasing the base sample intensity, collecting additional data attributes or reducing remeasurement cycles.

Expansion of FIA inventory and monitoring work with the National Forest System mid-scale inventory (2X intensification of base grid) is not covered in the funding targets for full funding of annualized FIA (**Figure 3**). Funding targets given above will provide NFS with the federal base grid and standard P2 and P3 sampling protocols.

- **Information Availability**. The FIA database (FIADB) contains a full suite of the most recent data for all States both annualized and periodic. At the end of 2004, annual forest inventory data was available through our web site for 35 states comprising 63 percent of the nation's forests. FIA information has also been loaded into the Natural Resource Information System (NRIS) of the USDA Forest Service, National Forest Systems branch, in order to make data readily available to National Forest managers. **Figure 4** represents annualized data availability and **Figure 5** represents current publication status.

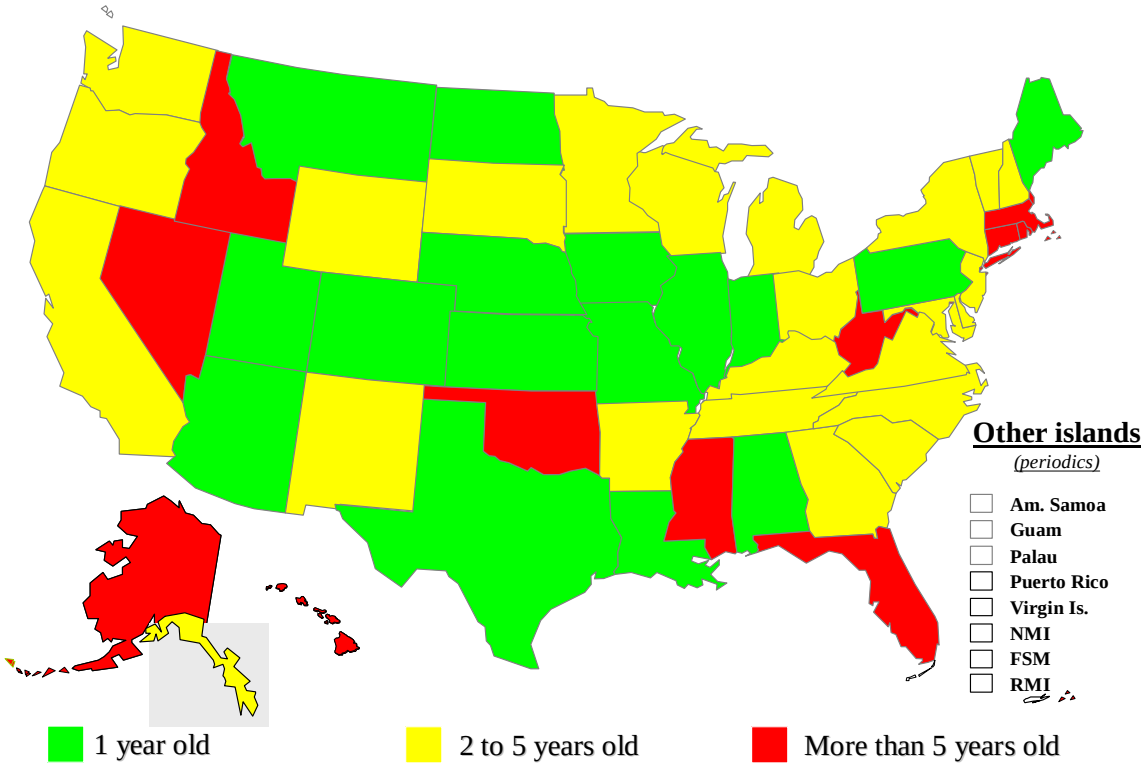

Figure 4. Availability of State FIA data, FY 2004. Age of the most recent data available to the public in online FIA database.

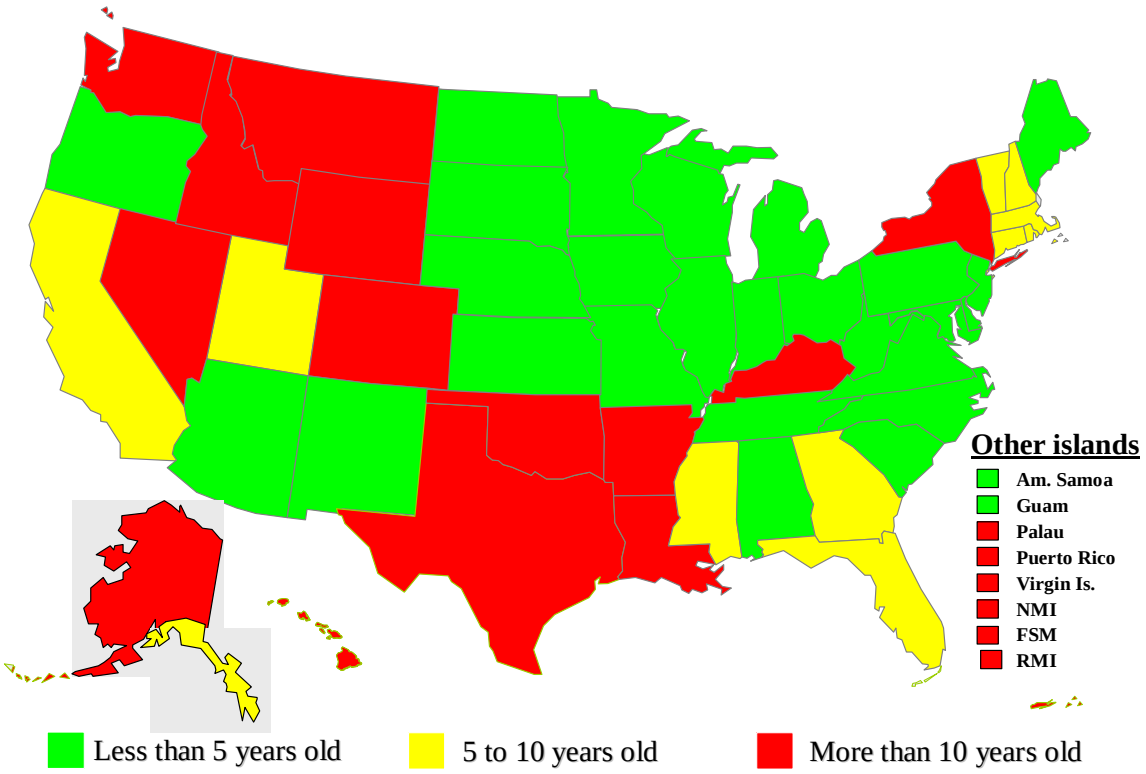

Figure 5. Publication status of state reports, FY2004. Age of data used in the latest published FIA report.

- **Organizational Structure**. The FIA program has developed a 'virtual' organization structure designed to provide opportunities for collaborative decision-making among program partners, while respecting the decentralized nature of formal Forest Service organizational structures. The national structure consists of three levels: 1) An Executive level composed of 5 Forest Service research station directors, 3 State foresters, 2 NFS regional foresters, and a national director from Forest Service R&D, NFS, and S&PF. The R&D SPPII deputy director serves as chair and this team meets annually to provide policy guidance. 2) A Management level composed of 5 FIA regional program managers, the Forest Service national program leaders for FIA, FHM, NFS, and 3 state representatives. This team is chaired by the FIA national program leader and the team meets monthly to make decisions about operational program elements with national implications. 3) A technical level composed of 5 technical groups (statistics, analysis, remote sensing, information management, and data acquisition) which meets as needed to develop technical solutions and to share expertise across all program units.

  Operational implementation of the FIA program occurs through 5 FIA research work units regionally assigned to the Southern, Northeastern, North Central, Rocky Mountain and Pacific Northwest Research Stations. At the regional level, Regional Management Teams exist to provide opportunities for communication and coordination within each FIA region. This structure is complimented by a system of regional and national user groups that meet every year to provide feedback on program success.

- **Accountability**. Each year, the FIA program publishes a Business Report that describes basic information about the business side of FIA: current year's accomplishments, performance measures, budget and staffing data, program changes, and future direction. This report is distributed to all interested customers and partners, and made available on our web site.

FEDERAL BASE PROGRAM ADJUSTMENTS FOR 2006 AND BEYOND

The 1999 Strategic Plan made many assumptions about the workloads and resources implied by the proposed program. After six years of experience with the annual system, it is timely to reassess these assumptions and to adjust them as needed. The following describes some of the major changes we are making in the original assumptions required to deliver the base federal program and to describe the implications this has had on our strategy. These changes will in turn need to be reflected in adjusted program budgets and staffing.

Updated estimates of forest area. One of the key drivers of the cost and workload of the FIA program is the amount and distribution of forested land in each State. Our goal is to send a field crew to each forested sample location. When the area of forestland in a state changes – either through true land use change, or through more reliable estimates of forest cover – then the expected number of sample plots requiring field measurements will also change. In the 1999 Strategic Plan, we used numbers from the 1992 Resource Planning Act (RPA) report to estimate forested areas.

For the 2007-2011 Strategic Plan, we are updating the estimates. In some cases, particularly in the interior west, these changes are significant. This is partly due to revised information from National Forest lands which had not previously been surveyed by FIA procedures, and partly due to a technical change in our sampling approach which now uses a mapped plot which has the effect of increasing the percent of plots which require field measurements. **Table 1** shows the forested area per state that we will use for planning for the next five years. The net effect of this change is to add more than $1,000,000 annually to the cost of the inventory program due to the increased workload associated with the increased forest area.

Changes in Staffing Plans. In 1998, we made many assumptions about the quantity and types of skills needed to implement the base federal program. In the absence of specific commitments from partners, we assumed that such staff would be federal employees. Since that time, each FIA unit has reassessed their needs and developed updated staffing plans based on the best current understanding of needs, plus an assessment of opportunities for utilizing contracting and partnerships throughout the program. **Table 2** shows the 2004 staffing summary, the new staffing needs, and total staffing required by FIA unit to fully implement the base federal program. All totaled, there is a net increase in the total staffing for the FIA program as compared to 1999 Strategic Plan.

Distribution of National Roles to the Regional Units. The 1999 Strategic Plan assumed that there would be a nominal level of National staff to provide support for national functions. In practice, we have found it more practical to locate these resources wherever possible within field FIA units. Each FIA field unit has offered to accept one or more national functions. Currently, there are 6 major national activities; 1) National Database, 2)National Information Management System (NIMS), 3) National Woodland Owners Survey, 4) National Resource Information System (NRIS) with NFS, 5) National Assessment and RPA, and 6) National Indicator Advisors. Combined, these efforts utilize roughly $2 million and 30 FTEs annually. These commitments are currently done by interunit transfers of funds which provide flexibility and ability to adjust commitments annually. Basic agreements are assumed to be continuous until a mutual agreement of the Washington Office and participating field unit alters the agreement. If in the future a field unit chooses to no longer provide a national role or personnel expertise shifts, the resources can be allocated accordingly to another unit.

BASE FEDERAL PROGRAM PLANS FOR THE NEXT FIVE YEARS

Thanks to the strong collaboration of our partners and strong support from our customers and Congress, the FIA program has made tremendous strides over the past five years. We have evolved to a continuous inventory program that provides a wealth of information products tailored to meet the needs of a variety of customers. Our overall priority for the next five years will be to fully implement and maintain the base federal FIA program. To achieve the original goals of an annual inventory, a core set of nationally consistent procedures, continuously updated databases available on the web, and five-year analytical reports, many managerial and technical tasks need to be completed. Over the next five years, we will:

- Make National Information Management System (NIMS) fully operational;
- Continue to develop and enhance web-based tools for accessing and analyzing FIA data;
- Complete the first round of State-level analytical reports for all lands where the annual inventory was implemented by 2006;

- Develop and implement algorithms for estimating change over time under the annual inventory approach;

In the following sections, we discuss some of the more specific goals and priorities for key FIA program areas.

General Program Management. We will:

- Complete the implementation of the base federal FIA program in all US states and territories.
- Continue to conduct Phase 2 and 3 annual fieldwork in all areas at the target levels, delivering annual updates of data within six months of the end of each field season.
- Continue to involve partners in program management and decision-making.
- Continue to hold annual user group meetings at regional and national levels, and to demonstrate accountability through our annual business report.
- Adapt to changing customer needs by addressing emerging forest resource issues.

Statistics and Design. We will:

- Continue to enhance estimation methods and to update Phases 1 and 2 documentation.
- Work with the Indicator Advisors to document their sampling methods (and adjust as necessary), and then work with them on identifying and documenting appropriate estimation (and modeling) methods.
- Document and publish Phase 3 estimation procedures
- Conduct a study of Phase 2 and 3 fieldwork as part of a cost/benefit analysis of all attributes to identify methods to improve efficiency and effectiveness.
- Develop small area estimation methods to both improve estimates for small populations and to spatially distribute the plot-based sample estimates.
- Continue to provide support to the other technical teams.

Indicators. We will:

- Finalize Phase 3 indicators by developing stable indicators in terms of fieldwork timing and protocols, information management, analysis, and reporting.
- Integrate Phase 3 indicators with Phase 1 and 2 analyses by working with analysis team and regional analysts to develop standard national and regional tables and reports for Phase 3 indicators.
- Document Phase 3 indicator sampling methods and appropriate estimation and modeling methods.

Analysis. We will:

- Complete the development of the five-year report templates, including template or outline for the nationally consistent text, core tables (including Phase 3 tables and maps), and glossary with national terminology.
- Complete the first 5-year cycle of the national woodland owner survey.
- Comparison of the core table requirements with the core manual variables for consistency.
- Develop options for integration of Phase 1 into core products.
- Develop additional geo-spatial products that add value to the existing table products.
- Integrate Phase 3 indicators into the national and regional analysis and reporting of FIA data.
- Serve as the FIA focal point for the addition of new attributes and the development of new indicators, such as for sustainability.

Remote Sensing. We will:

- Use satellite imagery to stratify the sample (Phase 1) to produce Phase 2 estimates.
- Identify attributes that can be measured with similar accuracy from remote sensing/GIS methods and develop methods to efficiently automate those measurements.
- Develop an FIA Strategic Plan for Operational Remote Sensing, Geospatial Modeling, GPS, and Land Navigation.
- Develop a method for obtaining meaningful Phase 2 (and Phase 3) estimates for small geographic areas using Phase 1, along with additional forest and/or geospatial attributes.

- Link satellite imagery and/or derived products to all the spatial data in the FIA database, enabling a wide variety of spatial analyses and products.

Information Management and Compilation. We will accomplish the work using task teams:

Portable Data Recorder Team:

- Develop basic version of the PDR software to meet core national needs.
- Develop a full featured version to meet the diverse needs of the regional FIA units.

Development Team:

- Plan for the continued evolution of NIMS to accommodate Phase 1 information, the operational use of remote sensing, a geo-spatial context, and FIA's other data (Timber Products Output, Landowner, regional variables, and ancillary data), including sampling errors for each table cell estimate.
- Modify the existing data distribution format to accommodate all variables in version 2 of the FIA National Field Procedures Manual, including any derived or core-optional variables needed to generate core products (tables, figures, maps, etc).

Data Distribution Team:

- Develop the next generation of FIA data distribution tools incorporating the full suite of FIA data (Phases 1, 2 and 3, Timber Products Output, and Landowner), measures of data quality, spatial analyses and outputs, privacy protections, and dynamic area expanders, including sampling errors for each table cell estimate.
- Ensure that the National Information Management System can store all information collected and derived from version 2 of the FIA National Field Procedures Manual, process this information using the documented core estimation procedures, and deliver this information in the enhanced format.

Data Acquisition. We will:

- Maintain documentation for a nationally consistent set of core field procedures.
- Complete preparation of the FIA National Field Procedures Manual version 3.0. Include approved changes and interpretation clarifications/examples where needed.
- Develop comprehensive training program and Quality Control field methodology to ensure consistent application of core field protocols as well as consistent valuation/scoring of core field data across units.
- Evaluate current field protocol to ensure that methods and attribute codes handle remeasurement situations for the National core plot.
- Review current field techniques and actual measurement errors to develop cost effective alternatives for improving data gathering efficiencies, including both field and potential non-field methods.

POTENTIAL PROGRAM EMPHASIS SHIFTS, ENHANCEMENTS AND ADDITIONS

The primary focus of the FIA program will remain on delivering the base federal FIA program, and cooperating with partners who wish to enhance or add value to that base federal program. However, FIA is frequently asked to add to our scope – to apply our expertise in forest inventory and analysis to other areas, such as urban forest monitoring and range monitoring.

Based on comments of the first and second drafts of this plan from the National Forest System (NFS), Northeastern Area State Foresters (NASF), the Forest Service's Forest Health Monitoring program and the Urban and Community Forestry program, that there is considerable interest in having FIA move towards a broader definition of land with trees (i.e., tree or forest cover) and away from a forest definition strictly based on use or commodity production. For example the NASF has requested that the USDA Forest Service and NASF convene a task force representing the USDA Forest Service, NASF, state urban forestry coordinators, and forest health specialists to:

- evaluate current urban forest inventory efforts,
- investigate a national continuous urban forest inventory and assessment protocol,
- propose an implementation strategy, and

- recommend a funding mechanism.

Similarly, NFS has requested that the agency consider FIA as the most viable program to implement a general vegetation inventory on all NFS lands not just those that meet the definition of *forested*. For NFS inventory and monitoring needs, FIA must be implemented annually in all states, and the sample design must be directly tiered to the FIA P2 grid. A full suite of vegetation (grasses, forbs, shrubs and trees) sampling is needed and standard sampling protocols are needed across all NFS lands, not just forested lands. Other known needs include the ability to intensify the base federal grid beyond a 2X intensification if needed, and develop an "a la carte protocol" for a suite of additional attributes that would meet NFS information and business needs. NFS has also demonstrated that an inventory compilation package developed for NFS business needs and mid-level vegetation maps products are needed. NFS is currently evaluating an enhanced partnership role with FIA to address corporate NFS inventory and monitoring needs.

Many partners have commented that the current program is based both on aerial photography and satellite imagery in combination with field visits for data collection. Future activities may include a larger proportion of FIA data being collected via various remote sensing activities. This will not eliminate field visits but will potentially reduce the amount of field visits for data collection. FIA and partners are particularly interested in relying more on this approach in the interior west and interior Alaska where access costs are high and there is less demand for frequent updates of change. Also, FIA data will be integrated with other data sources for a more complete, comprehensive estimate of forest condition and inventory.

FIA is changing, and with many potential new partners it is critical that FIA does not lose its mission and place with current partners. FIA does not plan to implement new or expanded surveys on all lands without proper resource and partner support. FIA recognizes that timely, quality data and analyses are paramount in addressing forest industry, state, and federal lands issues and needs. The changes outlined and requested from the first and second blue ribbon panels (American Forest & Paper Association 1992, 1998) on FIA are being realized. The recent success of implementing annual surveys through state and federal partnerships is leading to enhanced and new potential partnerships. Many partners recognize the need for a comprehensive forest monitoring program. FIA is ideally positioned to work with partners on realizing these needs.

The following section outlines a series of possible emphasis shifts, enhancements and additions prioritized through partner review and comments of the base federal FIA program. Each emphasis shift, enhancement or addition is described along with the reasons why such an emphasis shift, enhancement or addition may be valuable; who would be the potential beneficiaries; and who might be the potential cooperators.

LOW COST EMPHASIS SHIFTS

1. **Techniques Research.** FIA units could increase their capacity to conduct scientific research into techniques to improve how FIA collects, analyzes, and disseminates forest ecosystem data. Potential research areas include indicator development and testing; improved sampling and estimation procedures; better linkages to small area or tactical assessments; and improved geospatial analytical tool development. This could be done in-house, or though an enhanced use of cooperative grants and agreements with academic partners.

   Why: FIA units have long supported a modest investment in in-house and external research of techniques pertaining to the FIA program. Research topics have included new and better ways to capture data about forested ecosystems; new tools and techniques for analyzing data; and new mechanisms for making data and results available to the public. History has shown that the most relevant research has resulted when the researchers were incorporated into an operational FIA unit. The move to a national program that uses compatible methods across regions requires that FIA reevaluate the need for either a national research work unit or for a current FIA unit to take national leadership in this role. Regional FIA units tend to focus on data collection, data management, and data analysis, however redistributing operational emphasis within the entire program could provide an opportunity to increase national techniques research and national analyses at a regional location. An emphasis on national techniques could increase our involvement in internally directed extramural research that would increase the knowledge and uses of FIA data.

   Who Benefits: Current FIA customers would gain access to a wider array of data, more reliable data, and more tools to analyze and interpret data. University cooperators could gain research opportunities and improved knowledge of and access to FIA data. This would eliminate duplication of techniques research across the five regional FIA units.

Potential Cooperators: Forest Service scientists; University cooperators; other government research organizations; Forest Health Monitoring program.

2. **Increased FIA Analytical Capability**. Although FIA currently invests approximately 20% of our budget in compiling and analyzing information, clearly more could be done to increase the quantity of high quality analysis. Such an investment could yield specialized reports such as:

   Periodic regional studies, e.g., South's Fourth Forest
   National Analysis, e.g., Carbon Sequestration, Resources Planning Act reports
   Forest health analyses
   Wildlife Habitat analyses
   Customer-specific analyses, e.g., certain ownerships
   More spatial analyses and map products

   This work could be accomplished through a combination of in-house analysts and cooperative agreements or contracts with universities, states, and other qualified analysts.

   Why: Current analyses of FIA data focus on the key information needs shared by the majority of customers. Many more analyses could be done for other purposes if additional resources were made available. A large portion of the cost of the FIA program is in the collection and management of information. Once collected, a relatively small marginal investment in more analysis would have a very high rate of return.

   Who benefits: Current FIA customers as well as potential customers whose information needs could be, but currently are not, addressed.

   Potential cooperators: Universities, consultants, state agencies, other federal organizations.

3. **Rapid Assessment Teams**. FIA could create and maintain staff trained in rapid assessment techniques to provide emergency resource assessments in the aftermath of an environmental disturbance, e.g., a fire, storm, hurricane, or sudden insect or disease outbreak. The team could not only have expertise in data collection but also information management, compilation, analysis, and reporting. It could be maintained on-call for use as needed for rapid deployment in days or weeks following a disturbance.

   Why: Post disturbance forest management activities are often hampered by a lack of good data. Since FIA will exist across all forest lands, any large forest disturbance will include approximately 1 FIA plot per 6,000 acres. Rapid remeasurement of such affected plots, with comparison to the status before the disturbance, could provide quantitative data on the changes associated with the disaster, as well as a database for planning and measuring post- disturbance management responses. It would also reduce pressure on operational FIA units who are often called to assist with disturbance events, at the expense of impacting ongoing field operations.

   Who Benefits: Land managers and decision makers dealing with the aftermath of a disturbance; citizens and businesses affected by the disturbance; researchers interested in the effects and recovery of disturbance.

   Potential Cooperators: Federal and state land managers, Forest Health Protection staff, and Forest Health Monitoring program.

EFFICIENCY SHIFTS

4. **Synchronize Phase 2 and Phase 3 Plot Schedules.** FIA units could increase their overall program efficiency by synchronizing Phase 2 and Phase 3 plot measurement schedules. Currently all Phase 3 plots are on a five year measurement schedule. For states that are currently measuring 20% of the Phase 2 plots per year program efficiencies for plot visits, data processing, and estimation have been achieved. However, for states on a ten year (10%/year) or seven year (15%/year) cycle there are a number of inefficiencies. These include visiting $1/16^{th}$ of the plots at time intervals different than the other $15/16^{th}$ of the plot network, thus increasing costs and complexity throughout the program.

Why: The power of integrating Phase 2 and Phase 3 is diminished when $1/16^{th}$ of the plot network is measured on a cycle different than the other $15/16^{th}$. This includes adding complexity to tracking which plots are measured on different schedules, increasing field costs by measuring $1/16^{th}$ of the plots more frequently than others, and adding complexity to the statistical estimation. By synchronizing the measurement schedules it is now possible to use the Phase 3 and Phase 2 plots in a double sampling context to increase the precision of the Phase 3 estimates. .

Who Benefits: FIA and numerous customers. FIA can decrease program costs while simultaneously increasing the precision of the Phase 3 estimators by controlling the temporal measurement of Phase 2 and Phase 3 plots.

Potential Cooperators: Forest Service scientists; University cooperators; other government research organizations; Forest Health Monitoring program.

5. **Increased Use of Remote Sensing and Spatial Techniques.** – The FIA program recognizes that significant efficiencies could be realized by using high resolution imagery, including LIDAR in the interior west, interior Alaska and other regions with forests dominated by open canopies and lower levels of stocking. Resource issues in these regions are often different than for highly productive forests and FIA is currently developing procedures that will be less reliant on one ground plot per 6000 acres. We anticipate significant gains in efficiencies for these regions.

   Who benefits: The FIA program, Forest Service Research and Development, and current FIA partners and customers including: state foresters, federal and state policy makers, National Forest Systems, other federal agencies, researchers, private industry and consultants, environmental organizations, and media.

   Potential Cooperators: Universities; other Units in the all three Deputy Areas of the Forest Service; State agencies; and federal agencies and programs.

EXPANSIONS ON THE LANDSCAPE EMPHASIS SHIFTS

6. **Land Use/Land Cover Change Analysis**. FIA data (both remotely sensed and ground data) could be used to perform analyses and produce reports about status, trends, and location by land use class. This could include assessments of land use and land cover change, fragmentation, as well as the development and support of user tools that enable others to do such analyses.

   Why: FIA data represent a huge investment in spatial data collection, yet program analyses have not fully exploited the potential set of land use/land cover change analyses that may be conducted. Our field data in particular represent a potentially huge asset for ground-truthing remotely sensed imagery. Many analysts are currently producing assessments of land use and land cover change, without access to sufficient ground data – hence the increased demand for access to FIA coordinates. Creating some increased capacity in-house for spatial analyses of FIA data could lead to more and better products for society, while protecting FIA and our landowners from pressure to release coordinates.

   Who Benefits? Federal and state policy makers interested in changes in land use and land cover; analysts and researchers producing land use/land cover change analyses that might benefit from increased collaboration with FIA researchers.

   Potential Cooperators: Other federal, state, and academic research and analysis organizations

7. **Urban Forest Inventory** – Implement a systematic approach to collecting and reporting data on status and trends of trees and forests in urban settings. The FIA system currently does not include urban forests – lands classified as 'urban' are excluded from the FIA population of interest, regardless of whether or not the land has trees. The FIA sample frame could be expanded to urban settings, maintaining the strategic scale while providing a platform for others to intensify to the individual city level.

Why: Urban trees and forests play a huge role in quality of life of urban populations, which includes some 80% of the US population. Urban populations have a need for and an interest in information about the state of trees and forests in their surroundings. Urban trees have significant implications on urban energy budgets and air quality, and would also be of high interest to island environments. This issue is of high interest to State Foresters from urban states.

Who Benefits: Urban foresters and planners; researchers; national, state, and local policy makers; journalists; urban populations.

Potential Cooperators: State Forestry organizations; city governments; State and federal environmental protection agencies; State and Private Forestry; Forest Health Monitoring (currently piloting an urban monitoring program which incorporates the FIA Phase 2 sample grid).

8. **Rangeland Inventory**. Extend the FIA program to data collection for rangelands currently not included in the FIA. Monitoring would be for purposes of tracking health, productivity, and sustainability at the strategic level. Developing such a system would require clear definitions of what exactly 'rangeland' is in order to define the sample frame. Careful consideration should be given as to whether the effort should be restricted to public rangeland, or should also expand to include private rangeland (NRI currently survey range on private but not public lands).

   Why: There is currently no consistent strategic-scale inventory and monitoring system in place, yet the needs exist for similar sorts of information as reported by FIA for forested lands. The 2002 House Interior Appropriations Committee report includes language directing the Secretaries of USDA and USDOI to collaborate in implementing a rangeland monitoring system. FIA has a demonstrated track record in doing this for forest; much of the experience could be translated easily to rangelands.

   Who Benefits: Managers and users of range or other vegetation lands (federal, state, local); researchers; ranchers; organizations interested in natural resource health and sustainability.

   Potential Cooperators: National Forest Systems/Range staff; State and Private Forestry/Forest Health Protection; Natural Resources Conservation Service; USDI Bureau of Land Management; State governments.

9. **Other Treed and Riparian Land Inventory**. Extend the FIA program to data collection for other lands with trees that do not fall neatly into the range or urban definition. Examples include narrow riparian features, windrows, agroforestry stands, and other trees that exist in situations which do not currently meet the definition of forest and which therefore are not currently sampled. This strategic level monitoring would be for a number of purposes including tracking health, biodiversity, carbon sequestration, wildlife corridors and habitat, and their trends.

   Why: In combination with a rangeland and urban extension, such an approach would ensure that all trees in the US would be sampled by FIA in proportion to their occurrence. There would no longer be any 'gaps' in the nationwide monitoring of trees and their various associated ecosystems. In particular, an extension to Other Treed and Riparian Land would include a small but ecologically very important set of trees. This would be of especially high interest in arid land ecosystems where trees that are not part of a larger contiguous forest are very important.

   Who Benefits: Federal, state, and local policy makers and planners from jurisdictions with a high occurrence of Other Treed Lands; agroforestry interests; organizations interested in forest ecosystem health and sustainability.

   Potential Cooperators: Natural Resources Conservation Service, USDI Bureau of Land Management, State governments.

OTHER ENHANCEMENTS

10. **Sustainability Assessment.** FIA at present has clearly defined a role for supplying information to satisfy reporting needs for indicators and criteria of sustainability. For example, we have identified a specific list of

approximately 21 indicators under the Montreal Process that we feel we can address. We have deliberately chosen to not become the data collection vehicle for all 67 indicators under the Montreal Process. An option for expanding FIA would be to make FIA become the provider of information some or all of the rest of the 67 indicators. This would require some additional investments in collection of biological data, and substantial investments in the collection of social and economic data, without overburdening current data collection capabilities.

Why: The nation is required to report on criteria and indictors of sustainability at the national level, and many forest stewardship organizations (e.g., the National Association of State Foresters) have endorsed use of the Montreal Criteria and Indicators at the regional, state, and local level. There is no other program currently positioned as well as FIA to collect, analyze, and disseminate information on all aspects of forest sustainability.

Who Benefits: Individuals and organizations seeking to produce reports of sustainability at national, regional, and state scales would be the direct beneficiaries. Local interests would be indirect beneficiaries through establishment of the framework (although the data intensity would probably not suffice for local assessments).

Potential Cooperators: State forestry agencies; State Department; International Programs.

11. **Increase Intensity of the Base FIA Program to 15% or 20% Nationwide** – The current target level of base federal FIA field sampling calls for remeasuring 15% of Phase 2 sample locations in the eastern US each year, and 10% of Phase 2 sample location in the west each year. The decision about different sampling intensities was a compromise between the different costs of inventory in the east and west. One alternative for expanding FIA is to seek more federal funding to achieve 15% or 20% sampling each year as a federal program.

    Why: The Farm Bill called for sampling 20% of all sample locations every year through a state-federal partnership. Many states see strategic forest resource inventory as a federal role, much like conducting the US Census every 10 years. Western states in particular share this feeling since so much of the western forest land is federally owned. Western states would like to be federally funded for the same level of inventory as eastern states; and all states would like to be federally funded at the full 20% level.

    Who benefits: Current FIA partners and customers including state foresters, federal and state policy makers, National Forest systems, other federal agencies, researchers, private industry and consultants, environmental organizations, and media.

    Potential Cooperators: Primarily States who are currently cooperating in fieldwork implementation.

12. **Legacy Data Recovery Project.** FIA has been collecting data for over 70 years. Much of the historical data is available in internal records (paper tally sheets, computer tapes, and old formats and codes), but is not available electronically. FIA could invest in recovering these historical records, making the data and the metadata available electronically for public use.

    Why: Periodic measurement of forest parameters provides multiple snapshots over time of the status and change in America's forests. These data are not only valuable to FIA, but could be used by a wide array of analysts interested in quantitative data on America's forests over the past 70 years. Making the data available electronically would serve FIA customers by providing a longer time series over which to assess trends in the nation's forested resources. Note however that, in many cases, the individual tree record has been severed as a result of changes in sampling designs.

    Who Benefits: Current FIA customers interested in longer time series for trends; scientific peers who can utilize quantitative data on the state of American forests over time.

    Potential Cooperators: University cooperators, other Forest Service researchers, forest historians.

13. **Wildlife Habitat Monitoring**. **Inventory and Monitoring of Habitats.** – FIA has long used forest inventory measurements to infer information about habitats for animal and plant species. This application is increasing, as managers must monitor changes in habitat components to mitigate concerns about management actions on

species viability. Now, sustainability of timber management programs, and applications of Standards and Guidelines such as "Survey and Manage," depends upon FIA data. However, standard FIA indicators, plot size, and measurements protocols can miss important habitat components. For example, the geographic scale of a habitat component might not match the scale of a 1/24th-acre FIA sub-plot, or a 1-acre FIA field plot. Enhancements or embellishments might be needed to the traditional FIA design and processing procedures.

Why: Management decisions in the National Forest System are becoming more affected by issues related to habitats for Threatened and Endangered species and other featured species. Now that FIA has the primary lead, and associated funding, for strategic inventory and monitoring of National Forest lands, FIA can take further lead in research and development into new ways to address significant management challenges.

Who benefits: The FIA program, Forest Service Research and Development, and current FIA partners and customers including: state foresters, federal and state policy makers, National Forest systems, other federal agencies, researchers, private industry and consultants, environmental organizations, and media.

Potential Cooperators: Universities, other Units in the all three Deputy Areas of the Forest Service, State agencies, and federal agencies and programs.

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14. **Inventory and Monitoring of special forest products**. Forests are frequently managed and harvested for a variety of specialty products such as medicinal plants, traditional foods, and decorative plants (e.g., holly, mistletoe, and fir branches). Current FIA protocols generally do not measure such products, but sampling protocols could be added to quantify the status and trends in volume and value of these products.

    Why: One result of reductions in the harvest of timber products on federal lands is increased opportunities for and interest in commercial possibilities for specialty products. New industries, many of them community-based and small in scale, would benefit from knowledge about the approximate distribution, quantity, value, and sustainability of such products.

    Who benefits: Commercial interests based on specialty products, and the forest managers who must monitor harvest rates and sustainability and regulate access, organizations interested in forest ecosystem biodiversity and sustainability.

    Potential cooperators: Federal and state land managers, tribal interests, specialty product enterprises.

15. **Enhanced Tropical Forest Inventory**. Enhanced FIA tropical island territories to deliver information of interest to island land managers above and beyond that level of information delivered by the base federal FIA program. FIA is currently developing a base federal FIA option for US tropical forest regions in the Caribbean (Puerto Rico and the US Virgin Islands) and the Pacific (Hawaii and the tropical island trust territories). Although this will be included as part of the base federal program, it is expected that the base federal program will not fully satisfy the needs and interests of tropical island partners.

    Why? Unlike small geographic areas or states in the US, islands generally cannot be rolled up into 'regions' for purposes of increasing sample sizes and making inferences; generally each island or group of islands must stand alone due to significant differences in their ecology. Consequently, there is interest in increasing investment in both the intensity and breadth of information gathering for islands. For example, Hawaii has expressed a need for more intensive vegetative sampling focused on exotic species and remaining native forests.

    Who Benefits: Island land managers, policy makers, researchers.

    Potential Partners: Island governments; other federal agencies and organizations.

APPENDIX

Table 1: Updated estimates of forest area by state
Table 2: Updated staffing plan

Table 1. Land area and forest area for 1992 and 2002 by state and region.

	State	Land Area	Forest 1992*	Forest 2002	Forest change
		Thousand acres			
Northeast	Connecticut	3,101	1,819	**1,859**	
	Delaware	1,251	389	**383**	
	Maine	19,753	17,533	**17,699**	
	Marylandb	6,295	2,700	**2,566**	
	Massachusetts	5,016	3,203	**3,126**	
	New Hampshire	5,740	4,981	**4,818**	
	New Jersey	4,748	2,007	**2,132**	
	New York	30,223	18,713	**18,432**	
	Ohio	26,210	7,863	**7,855**	
	Pennsylvania	28,685	16,969	**16,905**	
	Rhode Island	668	401	**385**	
	Vermont	5,920	4,538	**4,618**	
	West Virginia	15,415	12,128	**12,108**	
	TOTAL	**153,025**	**93,244**	**92,886**	**(358)**
North Central	Illinois	35,580	4,266	**4,331**	
	Indiana	22,957	4,439	**4,501**	
	Iowa	35,760	2,050	**2,050**	
	Kansas	52,367	1,359	**1,545**	
	Michigan	36,359	18,253	**19,281**	
	Minnesota	50,955	16,718	**16,680**	
	Missouri	44,095	14,007	**13,992**	
	Nebraska	49,201	722	**947**	
	North Dakota	44,156	462	**672**	
	South Dakota	48,574	1,690	**1,619**	
	Wisconsin	34,761	15,513	**15,963**	
	TOTAL	**454,765**	**79,479**	**81,581**	**2,102**
South	Alabama	32,481	21,974	**22,987**	
	Arkansas	33,328	17,864	**18,771**	
	Florida	34,520	16,549	**16,285**	
	Georgia	37,068	24,137	**24,405**	
	Kentucky	25,428	12,714	**12,684**	
	Louisiana	27,883	13,864	**13,812**	
	Mississippi	30,025	17,000	18,580	
	North Carolina	31,180	19,278	**19,302**	
	Oklahoma	43,955	7,539	7,665	
	South Carolina	19,272	12,257	**12,495**	
	Tennessee	26,381	13,612	**14,396**	
	Texas	167,626	19,193	**17,149**	
	Virginia	25,343	15,858	**16,074**	
	Puerto Rico	2,199		**710**	
	Virgin Islands	86		**35**	
	TOTAL	**536,775**	**211,839**	**215,350**	**3,511**
Interior West	Arizona	72,732	19,595	**19,427**	
	Colorado	66,387	21,338	**21,637**	
	Idaho	52,960	21,621	**21,646**	
	Montana	93,157	22,512	**23,293**	
	Nevada	70,276	8,938	10,204	
	New Mexico	77,674	15,296	16,682	
	Utah	52,587	16,234	**15,676**	
	Wyoming	62,147	9,966	10,995	
	TOTAL	**547,920**	**135,500**	**139,560**	**4,060**
	California	99,824	37,263	**40,233**	
	Hawaii	4,111	1,748	1,748	
	Oregon	61,442	27,997	**29,651**	
	Washington	42,612	20,483	**21,790**	
	Alaska Coast	54,518	13,718	**13,718**	
	Alaska Interior	310,523	115,413	113,151	
	Guam	136		**52**	
	Am. Samoa	49		**29**	
	Palau	115		**77**	
	N. Marianas	113		40	
	FSM	150		77	
	TOTAL	**573,593**	**216,622**	**220,565**	**3,943**
	Grand Total	**2,266,078**	**736,684**	**749,942**	**13,258**

** Area used in origianl strategic plan.*

Annualized implementation 2004	
States	43 of 50
Islands	5 of 7
Coverage	76%

Est. forest increase effect	
Increased area	13,257,700
Increased plots	2,541
Inc. annual cost	1,079,085

Table 2.-- 2004 Staffing resources (Full time equivalents- FTEs) and new staffing required

	Pacific Northwest	Interior West	Southern	North Central	North East	National Office	Total
Administration	11	8	8	3	4	2	36
Phase 1	0	2	7	4	1	0	15
Phase 2 & 3							
Field coordination	12	13	14	4	11	0	54
Field crew	40	60	117	41	39	0	298
Quality assurance	4	11	13	3	8	0	40
Information management	13	15	19	9	7	5	69
Analysis	11	5	21	8	6	5	56
Techniques research	9	3	3	3	6	1	25
Total	**100**	**117**	**204**	**76**	**82**	**13**	**591**
2004 staffing summary							
FIA	92	104	94	65	70	2	426
Other	8	14	110	11	12	11	166
TOTAL	**100**	**117**	**204**	**76**	**82**	**13**	**591**
New Staffing need							
FIA	20	28	16	24	11	0	93
Other	2	4	19	4	2	0	36
TOTAL	**22**	**32**	**35**	**28**	**13**	**0**	**130**
Total Staffing required							
FIA	112	132	110	89	81	2	519
Other	10	17	129	15	14	11	202
TOTAL	**122**	**149**	**239**	**104**	**95**	**13**	**721**