Forest Inventory and Analysis (FIA) National *Quarterly* E-Newsletter

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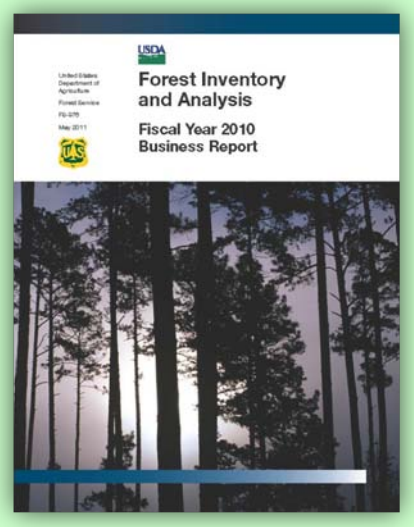

This report is available at:
http://www.fia.fs.fed.us/

A message to our clients…

My introduction may well sound like a repeat of the May 2011 message to partners and clients of FIA. Given that the new federal fiscal year (FY) has arrived with a great deal of continued uncertainty for the national FIA operating budget there is a need to restate the continuing drive for complete implementation of FIA nationwide. In fiscal year 2012 our intent is to continue implementation in all 50 states and affiliated islands and territories. Since 2010 FIA has made significant progress towards national implementation by adding Hawaii, Nevada and Wyoming to the annual inventory. Beginning in 2010, all 50 states have annualized inventory activity underway, with 30 percent of all program work accomplished through cooperative grants and partner funding. Interior Alaska remains our national challenge for full implementation. FIA stands as a unique partnership in measuring and monitoring our nations' forests. FIA relies on 600 federal, state, university and other professional staff to deliver "the Nation's Forest Census."

During the last half of FY2011, FIA and key partners worked together to complete full annual data collection on time while fulfilling the Department of Agriculture's direction to the agency to reduce the travel costs of agency employees by 20% in FY 2011. We have a dedicated and professional staff to thank for hitting the mark of field data collection on time. For FY2012 we have that same challenge of delivering the program with the request to reduce travel costs even further. A number of the field work travel adjustments we made in FY2011 are not sustainable. We'll be looking for input and suggestions from partners and clients of how to accomplish this request.

FIA is continuing its' momentum to improve methods to implement measuring all vegetation life forms and forest carbon pools including soil carbon. In FY2012 we will continue on this path of more field efficient and less-costly field procedures to collect slightly less detailed information on down woody material and understory vegetation on more plots. The current intensity of forest health (Phase 3 or P3) indicators is 1/16th of the FIA sample. In FY2012 and FY2013, FIA will assess the efficacy of increasing that intensity by sampling for what we have called P3 information at the Phase 2 plot locations for down woody materials and all vegetation life forms similar to the approach currently used by the western FIA Units.

What's going on in the world of research?

Northern Research Station

Harmon, M.E., Woodall, C.W., Fasth, B., Sexton, J., Yatkov, M. 2011. Differences between standing and downed dead tree wood density reduction factors: A comparison across decay classes and tree species. Res. Paper. NRS-15. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 40 p.

Miles, P.D., Heinzen, D., Mielke, M.E., Woodall, C.W., Butler, B.J., Piva, R.J., Meneguzzo, D.M., Perry, C.H., Gormanson, D.D., Barnett, C.J. 2011. Minnesota's Forests 2008. Res. Bull. NRS-50. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 67 p.

Piva, Ronald J. 2011. Pulpwood Production in the Northern Region, 2006. Res. Bull. NRS-39. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station 104 p.

Southern Research Station

Van Deusen, P.C.; Roesch, F.A. 2011. Sampling a tree for total volume, biomass and carbon. Journal of Forestry. 109(3): 131-135.

Smith, B.; Oswalt, S.N. 2011. Status and progress in large-scale assessments of the productive capacity of forest ecosystems in the United States. Journal of Forestry. 109(4): 226-232.

Much of this work will be focused in the Northern and Southern FIA programs and we will assess how best to move forward as a national program. We are looking forward to a better understanding of the tradeoffs between increasing sampling intensity and perhaps less detailed forest health information for increased cost-effectiveness in delivering the information that our partners and clients need.

The National FIA Users Group is scheduled for a yet to be determined week in mid-February to early-March in Washington, DC. With the many challenges and opportunities we have in delivering FIA information with state, National Forests System and other federal agency partners I encourage you to provide your input either through the National Users Group Meeting or at one of the Regional FIA meetings in your part of the country. FIA presents many partnership opportunities and we look forward to learning how best to deliver high quality forest information.

- Greg Reams, National Program Leader

Studies in progress…

Northern Research Station

Study Title: Winter Satellite Imagery Improves Forest Land Estimates

Participants: Ian W. Housman, Jeremy B. Webb, and Robert A. Chastain, Remote Sensing Applications Center; Sean P. Healey, Rocky Mountain Research Station; and Warren B. Cohen, Pacific Northwest Research Station, Chengquan Huang, University of Maryland, Department of Geography

Status: In Progress

Results: Forest Inventory and Analysis (FIA) plot data provide invaluable information about the distribution and health of our nation's forests, but by design, there are large gaps between plots. Satellite-based estimates from summer imagery are often used to fill these gaps, but these estimates are rarely consistent with FIA plot data. False positives for forest and forest disturbance greatly contribute to these inconsistencies, especially in forest landscapes intermixed with wetlands and agricultural lands. Forest Service scientists found that exploiting winter and summer satellite imagery with the vegetation change tracker (VCT) generated more reliable estimates of forest lands in the western Great Lakes (Figure 1). Indeed, VCT estimates of forest land were mostly consistent with those from FIA plots (Figure 2). VCT is an automated forest mapping algorithm that efficiently exploits the Landsat archive to produce comprehensive maps of forest changes. Using winter imagery exploited sharp seasonal contrasts of forest and nonforest areas that enabled the removal of most false positives, providing a reliable option for filling in gaps between FIA plots.

Contact: Kirk M. Stueve, (65) 491-3372, kstueve@biogeography.us, Patrick L. Zimmerman, Mark D. Nelson mdnelson@fs.fed.us (651) 649-5104, Charles H. (Hobie) Perry, cperry@fs.fed.us (651) 649-5191, and Dale D. Gormanson dgormanson@fs.fed.us (651) 649-5126

What's going on in the world of research?

Southern Research Station

Oswalt, Sonja N.; Oswalt, Christopher M. 2011. Invasive plants found in east Texas forests, 2009 forest inventory and analysis factsheet. e-Science Update SRS–039. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 5 p.

Interior West Research Station

DeRose, R.J., Shaw, J.D., and J.N. Long. 2011. Validating the Western Sierra and Utah variants of the Forest Vegetation Simulator using FIA annual inventory data. Final Report to the Forest Management Service Center, 85 p.

Main-Knorn, M.; Moisen, G.G.; Healey, S.P.; Keeton, W.S.; Freeman, E.A.; Hostert, P. Evaluating the Remote Sensing and Inventory-Based Estimation of Biomass in the Western Carpathians. Remote Sens. 2011, 3, 1427-1446.

Masek JG, Cohen WB, Leckie D, Wulder MA, Vargas R, de Jong B, Healey SP, Law B, Birdsey R, Houghton RA, Mildrexler D, Goward S, Smith WB (2011). Recent rates of forest harvest and conversion in North America. Journal of Geophysical Research, 116, G00K03, doi:10.1029/2010JG001471

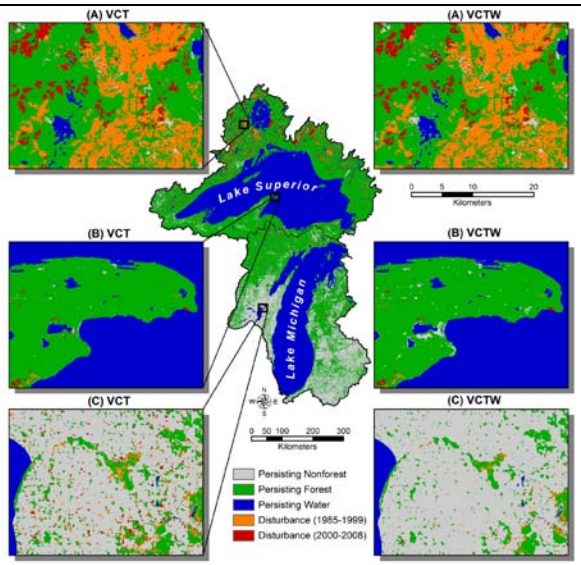

Figure 1. Comparison of vegetation change tracker output products without (left) and with (right) snow-covered winter satellite imagery.

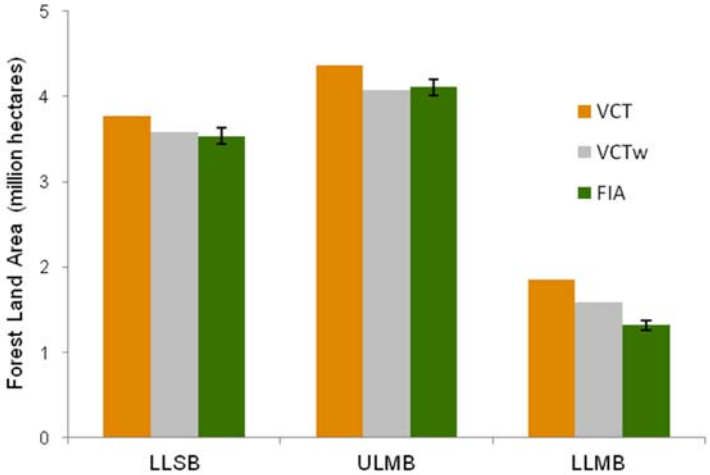

Figure 2. Comparison of forest land estimates in the western Great Lakes from FIA plots, vegetation change tracker without (VCT), and with snow-covered winter satellite imagery (VCTw). (LLSB = lower Lake Superior basin, ULMB = upper Lake Michigan basin, and LLMB = lower Lake Michigan basin)

Study Title: Carbon Content of Dead Wood by Species and Decay Class for Tree Species of the United States
Participants: Professor Mark Harmon at Oregon State University
Status: In progress
Results: Mark has conducted lab analysis of the carbon content of dead wood by species and stage of decay for hundreds of samples from across the US. Within the next year we expect to produce a journal article detailing the results. Most of the world assumes a 50% carbon content of dead wood (of oven-dry biomass); however, emerging work from this research indicates that carbon content could vary significantly based on stage of decay (due to lignin fractions). The results of this study should refine FIA's dead wood carbon stock estimates.
Contact: Chris Woodall, cwoodall@dfs.fed.us, (651) 649-5141

Study Title: Region wide mapping of Invasive Plant species in the

What's going on in the world of research?

Interior West Research Station

Witt, Chris; Patterson, Paul L. 2011. Big sagebrush in pinyon-juniper woodlands: Using forest inventory and analysis data as a management tool for quantifying and monitoring mule deer habitat. In: Wambolt, Carl L.; Kitchen, Stanley G.; Fisina, Michael R.; Sowell, Bok; Keigley, Richard B.; Palacios, Patsy; Robinson, Jill, comps. Proceedings of the 15th wildland shrub symposium; June 17-19, 2008; Bozeman, MT. Natural Resources and Environmental Issues. 16: Article 27.

Schroeder TA, Wulder MA, Healey SP, Moisen GG. (2011). Mapping wildfire and clearcut harvest disturbances in boreal forests with Landsat time series data. Remote Sensing of Environment, 115: 1421-1433.

Pacific Northwest Research Station

Barrett, Tara M., Christensen, Glenn A., 2011. Forests of southeast and south-central Alaska, 2004–2008: five-year forest inventory and analysis report. Gen. Tech. Rep. PNW-GTR-835. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.156 pp.

Andersen, Hans-Erik.; Strunk, Jacob; Hailemariam, Temesgen. 2011. Using airborne LIDAR as a sampling tool for estimating forest biomass resources in the upper Tanana Valley of interior Alaska. *Western Journal of Applied Forestry,* 26(4) 2011:157-164.

24 state area
Participants: Cassandra Kurtz
Status: In Progress
Results: Cassie Kurtz is doing a region-wide analysis of the invasive plant species found on Phase 2 Invasive plots in the 24-state area. In addition to regional mapping, background information such as plant hardiness and growth characteristics are summarized. Figures of the NRS region show the presence of each of the 48 species that were monitored from 2005 through 2010. Tables are included to indicate the number of plots invaded per state and the number of observances of each invasive species for all states in the NRS region.
Contact: Cassandra Kurtz, cmkurtz@fs.fed.us (651) 649-5149

Southern Research Station

Study Title: Issues with Analyzing Net Growth by Diameter Class
Participants: Sheffield, R. (retired), Conner, R., and Burkman, W.
Status: Analysis completed; currently being developed for NIMS
Results: Under FIA's current method, any distribution of net growth by diameter-based classes results in smaller diameters receiving disproportionately high net growth volumes. While this "anomaly" has been known for some time, it only recently became an issue due to the growing interest in biomass for energy. Increased demand for small-diameter trees as biomass feedstock is eliciting concerns about sustainable harvesting, resulting in the need for closer scrutiny of growth to removals relationships among diameter classes.
FIA's estimate of net annual growth is calculated as the increased volume of trees greater than or equal to 5.0 inches in diameter, minus deductions for tree mortality. This routine and widely accepted calculation results in reasonably accurate estimates of total net growth. Net annual growth distributed among typical FIA forest resource categories (e.g., ownership, forest type, species, etc.) and compared with estimates of annual removals; provide valuable information in the analysis of net change in resource status and conditions. However, current FIA growth variables are not adequate to explain inventory changes for sub-categories of net growth based on tree size.
FIA's estimates of inventory change derived by subtracting removals from growth do not closely match actual change by diameter class. The fault lies in the FIA '*growth accounting system*'. The current system does not provide estimates of transfers into and out of a given tree-size subcategory. There are reasonable solutions that give users a great deal of flexibility in the assessment of growth for a wide range of tree size classes. Most of the basic growth computations and variables that are required already exist in FIA's current processing system, but these data and variables are not stored in FIADB or made available in on-line tools such as FIDO or EVALIDator.
<u>Proposed solution</u>
The proposed solution to the problem, as developed by retired SRS FIA forester Ray Sheffield, would be to create two additional variables that would provide estimates of transfers into and out of a given tree-size subcategory. To accomplish this, two net growth variables are needed for each tree, one allocated to the initial diameter class (IDC) and one to the final diameter class (FDC). An Outgrowth component would be calculated and assigned to the IDC. This component is treated as a negative value in the computation of

What's going on in the world of research?

Pacific Northwest Research Station

Barrett, Tara M., and Andrew N. Gray. 2011. Regional monitoring of habitat change through sampling of forest vegetation. Biological Conservation 144: 1285-1294.

Temesgen, H., Monleon, V.J., Weiskittel, A.R., and Wilson, D.S. 2011. Sampling strategies for efficient estimation of tree foliage biomass. Forest Science 57: 153-163

Lintz, Heather E., Bruce McCune, Andrew Gray, and Katherine A. McCulloh. 2011. Threshold strength and diagonality: indices of shape for ecological response patterns. Ecological Modeling 222: 427-436.

overall net growth for the tree. An Ingrowth component would also be calculated and assigned to the FDC, which would be known at the time each tree is remeasured. The Ingrowth component is treated as a positive value in the computation of overall net growth for the tree. When summed, these two values would equal the current net growth value for each tree. For the proposed adjustment to work, the volume calculations would necessarily assume that the trajectory of change is linear.

The above calculations would be accomplished and stored for each tree by 1-inch diameter class. The two net growth variables and each tree's initial and final diameters would allow accurate assignment of growth to tree size classes, particularly for cases where the tree grew into a larger size class. Similarly, in cases where a tree stays in the same 1-inch class, or when trees grow from sub-merchantable to merchantable size (less than 5 inches in diameter to 5 inches or greater in diameter), the growth components would be assigned to the FDC.

The following graph illustrates how the proposed change would adjust the distribution of net growth by diameter class. The Current net growth values reflect how FIA's system calculates and assigns net growth by diameter with the existing calculations. Note that the current estimates of growth are skewed toward the smaller diameter classes. When compared to annual plot-level removals, the results show a large surplus in the small diameters and overcutting in several of the larger diameter classes. With the proposed adjustment, the distorted distribution is corrected and a more accurate assessment of growth to removals relationships at the diameter level is possible. More importantly, the adjusted diameter distribution is more consistent with actual inventory change.

Current users of FIA data through external tools such as EVALIDator and FIDO that query the data for net growth and removals by diameter class will get an output with the distorted distribution of net growth by diameter class. To implement that change as proposed here will take some time. In the interim, users should not conduct these types of analyses. A warning will be posted to users of the possibility of inaccurate results. Until the correction is implemented, users with a need to analyze net growth and removals by diameter class should contact the employees listed below.

Contact: Roger Conner, rconner@fs.fed.us, (865) 862-2031
Sam Lambert; slambert@fs.fed.us, (865) 862-2097

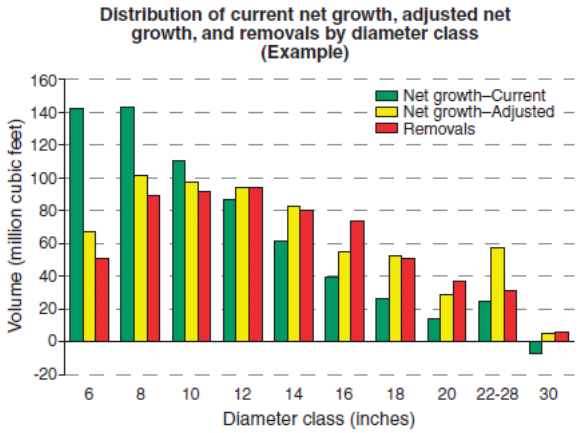

Figure 3. Distribution of Current net growth, adjusted net growth, and removals by diameter class.

Category of Links	
National Program http://fia.fs.fed.us **Pacific Northwest** http://www.fs.fed.us/pnw/fia/ **Interior West** http://www.fs.fed.us/rm/ogden/ **Northern** http://www.nrs.fs.fed.us/fia/ **Southern** http://srsfia1.fia.srs.fs.fed.us/	**Study Title:** Tree species identification and validation in large strategic inventory and monitoring surveys **Participants:** James F. Rosson, Jr.; Sam Lambert; Joe McCollum; Lewis Zimmerman **Status:** In progress. **Results:** The correct identification of tree species is of primary importance for the USDA Forest Service, Forest Inventory and Analysis (FIA) program. A diverse range of important applications of the data (beyond that of a traditional forest inventory) by both internal and external users is ongoing as the program strives to provide information that addresses a wide spectrum of forest resource issues. The science of taxonomy and systematics is one of the most challenging field-collected components embedded within the FIA sample because of: 1) the inherent difficulty of systematics as a subject-matter discipline and 2) the very diverse number of tree species that grow in the south across a wide range of habitats. This research will use Arkansas as a case study to determine: 1) the extent of the species identification problem, 2) the ramifications of incorrect species identification in research studies using FIA data, 3) procedures that can be used to decrease identification problems and improve the taxonomic skill levels of people involved in the collection of FIA data, and 4) how the FIA program can contribute to the systematic literature through the submission of voucher specimens to herbaria located at universities, colleges, botanic gardens, museums, or other research institutions. Phase I of the study involves development of a tool that easily and efficiently flags and lists tally trees that are far outside their known botanical range. The distance beyond the range is set arbitrarily. This tool will be a tremendous aid for QA/QC personnel in follow-up identification and verification of these questionable species. A prototype, in the form of a Visual Basic script, has been developed for application in the ArcMap environment. The tool-user can select a state of interest and the script will query every tree selected in that evaluation group. Identical species will be grouped by plot. The program will derive the distance from a respective plot to the nearest boundary of the known native range of the plot species in question. If the plot is inside the native range, the script will return a value of zero; if not, a one is returned, indicating a species has been tallied outside its known range. As an example, Figure 1 shows 16 FIA plots with *Celtis occidentalis* L. occurrence not in agreement with a published range map. The species identification by FIA could be wrong or the range map could be wrong and this illustrates where further investigation is warranted. Currently, Little's maps are being used as the botanical range standard but the program can be adapted to other more recent data, such as herbaria records maintained by universities and syntheses from other institutions such as the USDA PLANTS database, the Biota of North America Program (BONAP), and the Flora of North America (FNA). With the increasing amount of botanical information available electronically, it has become apparent that the ranges of many respective species are not in agreement between data sources. How to handle these range disagreements will also be a part of Phase I. Phase II of the study will involve collaboration with herbarium personnel. The collaboration will consist of continual periodic training of field people, access to select herbaria, and collection of material to be used as official voucher specimens. The latter is especially important and will serve as a contribution to the botanical literature

that officially documents the occurrence of a species where it was not known to occur.
The overall goal of the study is to improve the taxonomic and systematic skills of people involved in all aspects of data collection and to enhance the credibility of FIA data. In addition, implementation will improve the identification of the invasive species and lower vegetation components of the FIA sample.
Contact: James F. Rosson, Jr.; jrosson@fs.fed.us; (865)862-2067

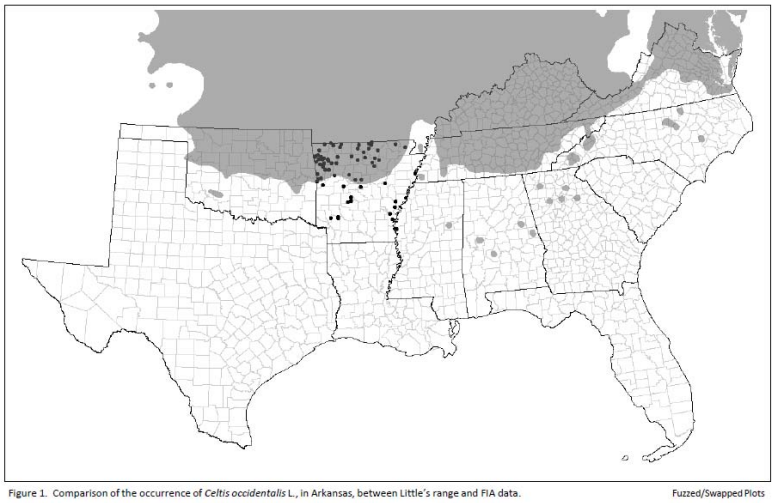

Figure 4. Comparison of the occurrence of Celtis occidentalis L., in Arkansas, between Little's range and FIA data. Fuzzed/Swapped plots

Study Title: Estimation equations for Annual Radial Increment (ARI) for the tree species in the Southern Region.
Participants: Gartner, D.G.
Status: In progress
Results: The current Southern Research Station method for calculating diameters at the middle of the remeasurement period for harvested and removed trees uses average growth rates of similar trees from the same remeasurement period. Prediction equations are being created using a mixed effect model, assuming a condition level random effect. Equations are being created to predict diameters forward in time and backwards in time, for both the continental Southern Region and for Puerto Rico and the Virgin Islands. The new set of equations will not only work better with the changes to the compilation system, they will also be more easily understood and used by our customers.
Contact: David Gartner, dgartner@fs.fed.us, (865) 862-2066

Interior West Research Station

Study Title: Phase 3 of the North American Forest Dynamics Project (NAFD3)
Participants: Sam Goward, Warren Cohen, Jeff Masek, Gretchen Moisen, Rama Nemani, Cheng Huang, Todd Schroeder, Karen Schleeweis
Status: This 3-yr project held its kickoff meeting this July 2011
Results: Funded under the North American Carbon Program, the North American Forest Dynamics project (NAFD) is a multi-faceted project that has involved collaborators from FIA, University of Maryland, NASA, the Pacific Northwest Research Station, Canadian

	Forest Service CONAFOR in Mexico, and others since 2005. The project continually works on methods for integrating historic Landsat data with inventory and other ancillary data sets to characterize the effects (particularly for carbon) of forest disturbance across North America. NAFD Phase 1 involved processing a sample of ~25 samples of biennial Landsat imagery stacks and analyzing these for disturbance rates, carbon consequences, and other applications. Phase 2 involved the processing of an additional 25 sample stacks along with expanded applications for forest inventory and monitoring. Now in its third phase, NAFD partners will be processing the historic Landsat data record since 1972 in 1-year intervals for the conterminous U.S. RMRS's contribution to this project will be to develop and apply models assigning cause of disturbance nationwide to areas identified by partners as disturbed forest. These causal disturbance models will enable initial analyses of changes in disturbance type through time and potential consequences on carbon sequestration in the U.S. **Contact:** Gretchen Moisen, gmoisen@fs.fed.us, (801) 625-5384 **Study Title:** Investigations into Whitebark Pine **Participants:** Sara Goeking, John D. Shaw, Mike T. Thompson (IW-FIA); James N. Long (Utah State University) **Status:** On-going **Results:** Whitebark pine is a high-elevation, five-needle pine of the western states that is of high importance to wildlife species such as the grizzly bear and Clark's nutcracker. Whitebark pine is currently in a period of decline due to changing fire regimes, elevated mountain pine beetle populations, and the spread of blister rust. In response to petitions to list whitebark pine as an endangered species, the US Fish and Wildlife Service currently lists the tree "warranted but precluded", meaning that it is a candidate for threatened or endangered status. IW-FIA investigations into whitebark pine include special sections in the upcoming state reports for Idaho and Montana (in press) and comparisons of periodic and annual data in special studies. These analyses suggest that whitebark pine live basal area has declined at a rate of approximately 2.5 percent per year over the past 10 to 15 years. These results are consistent with mortality studies from other periods, such as the early 1900s and the 1970s. Also, managers lack some basic tools for assessment and classification of whitebark pine stands. In response, FIA data are being used to develop site index curves and a density management diagram for whitebark pine. These tools will allow local managers to assess the site quality and structure of their stands in the context of the species across its entire range in the U.S. Preliminary results from these studies were presented at the annual meeting of the Whitebark Pine Ecosystem Foundation, held in Cody, Wyoming on Sept. 16-17, 2011. **Contact:** John D. Shaw, jdshaw@fs.fed.us, (801) 598-5902 **Study Title:** Extending Survey/Sample Methods to Remotely Sensed Measurements **Participants**: Sean Healey and Paul Patterson (IW-FIA), Sassan Saatchi (NASA Jet Propulsion Laboratory), Michael Lefsky (Colorado State University), Andrew Lister (NRS-IM) Status: In development **Results:** Obtaining consistent measurement of biomass across global forests is difficult. Field-based inventories do not exist

everywhere, and important differences in definitions and methods exist among countries which do have inventories. Satellites can offer globally consistent measurement, and work at Colorado State and elsewhere has shown that LIDAR (light detection and ranging) data from NASA's ICESat satellite has the potential to support accurate remote measurement of biomass. However, ICESat measurements are not wall-to-wall; the data are acquired at discrete points. FIA researchers are extending sample design and estimation techniques so that a subset of ICESat data may be used as a sample for the purpose of estimating biomass for particular areas. Critical in this process has been the development of statistical estimators which integrate tracking of both sample error and measurement error. The developed approach is currently being tested in the US, and may soon be applied elsewhere. This work is being done to support the NASA-led Carbon Monitoring System (CMS).
Contact: Sean Healey, seanhealey@fs.fed.use, (801) 625-5770

Pacific Northwest Research Station

Study Title: Alternatives to poststratified estimation
Participants: PNW-RMA Vegetation Monitoring Science Applications team, Oregon State University.
Status: On-going
Results: In the PNW, FIA used poststratification to improve the precision of the estimates of forest attributes and account for nonsampled plots (access denied by owner or hazardous). The strata are based on geographic region, ownership and a classification of forest types based on satellite data. However, because many strata do not have a large enough sample of plots, similar strata are combined following a rather elaborate procedure. The stratification changes depending on how many panels and, therefore, plots are included in a particular problem. In this study, we examine alternative approaches to incorporate available information, including continuous variables, which may result in more efficient and easily implemented estimators. We developed linear, generalized linear and mixture working models to describe tree volume. Currently, we are studying regression estimators and a model calibration approach to incorporate auxiliary information in the estimation process.
Contact: Vicente Monleon, vjmonleon@fs.fed.us, (541) 750 7299

Study Title: Housing development impacts on nearby public lands
Participants: PNW-RMA analysts, Oregon Department of Forestry
Status: On-going
Results: Increasing ex-urban population growth in Oregon and Washington has applied pressure to forested lands. Lands that are managed by public agencies, mainly the USDA Forest Service (NFS), the Bureau of Land management (BLM), the Oregon Department of Forestry (ODF) and the Washington Department of Natural Resources (DNR), may not be under development pressure, but they may have boundaries that are becoming increasingly populated. Management at

the boundaries of public and private lands becomes increasingly complex as development occurs. We used a grid of photo-interpreted points across western Washington and Oregon to evaluate changes in the numbers of developments between the 1970s the early 2000s. We also mapped landuse polygons that the individual point fell within. For each point we counted the number of developments that occurred in an 80 acre circle at each time period. Early results show that the increase in the number of structures stays roughly the same around public lands in western Washington but drop around public lands in Oregon between the 1970-90s and the 1990s to 2000s. The amount of edge that is either urban or low density residential has some marked increases around the BLM in western Oregon and the around the DNR lands in western Washington.

Contact: Dave Azuma dazuma@fs.fed.us (503) 808-2047

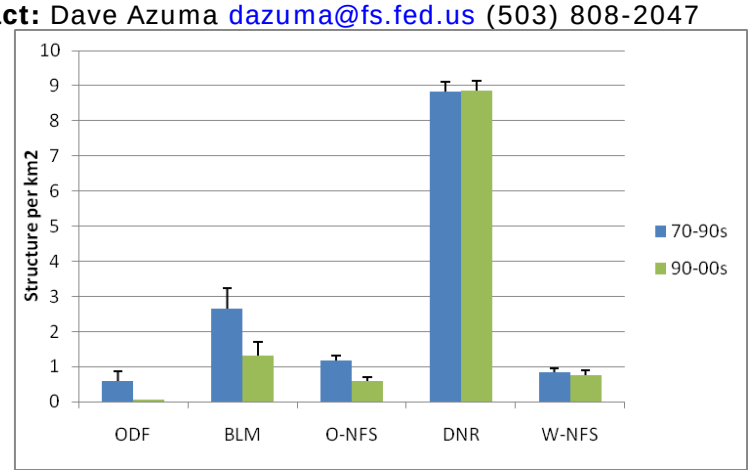

Figure 5. Average increase in structure counts by ownership for two time periods.

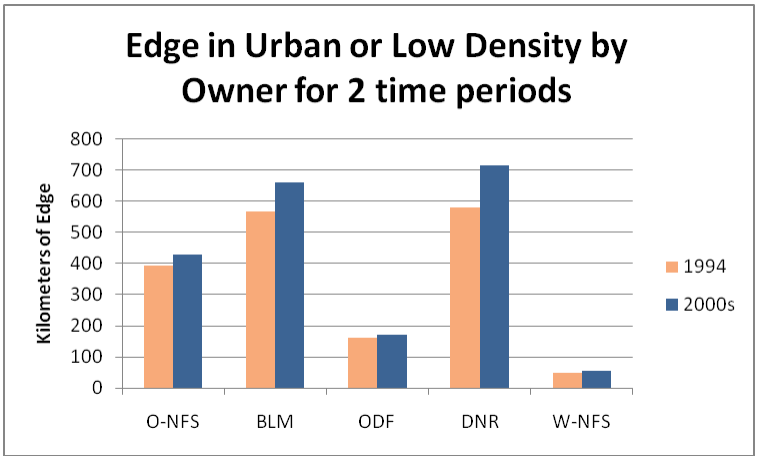

Figure 6. Amount of edge with urbanized land use by ownership for two time periods.

Study Title: A synthesis of the economics of fuel treatments in the dry mixed conifer forests of the western U.S.

Participants: Jeremy Fried (PNW-RMA), Terrie Jain (RMRS), Mike Battaglia (RMRS), Han-sup Han (Humboldt State University), Jonathan Sandquist (RMRS).

Status: Analysis for this Joint Fire Science Program funded study is in progress; results will be published in a RMRS General Technical Report in late 2011, with related articles to follow

Results: We are using PNW's FIA BioSum model applied to over

Contact Us

Greg Reams
National Program Leader
Forest Inventory & Analysis

USDA Forest Service
National Office
1601 North Kent Street, Suite 400
Arlington, VA 22209

Phone: (703) 605-4189
Fax: (703) 605-5131
Email: greams@fs.fed.us

Brad Smith
Associate National Program Leader
Forest Inventory & Analysis

USDA Forest Service
National Office
1601 North Kent Street, Suite 400
Arlington, VA 22209

Phone: (703) 605-4190
Fax: (703) 605-5131
Email: bsmith12@fs.fed.us

5000 FIA plots to analyze landscape-scale fuel treatment scenarios in dry mixed conifer forests in the northern western U.S. (WA, OR, ID, MT, UT, NV and extreme northern CA) with respect to area of forest that we classify as high hazard by three definitions, by broad forest type group and sub-region; the likely effectiveness of 13 alternative mechanical fuels treatment prescriptions in reducing hazard; costs of implementing fuels treatment, including harvest, prescribed fire and product transportation components; and the quantities of merchantable wood products and bioenergy that would likely be produced, the sale of which could contribute to the financial viability of fuels management. Treatment effectiveness is evaluated in terms of modeled crown fire hazard indicators to reflect the perspective of forest and fire managers seeking to reduce stand-replacing fire, surface flame length to reflect difficulty that would be encountered in fire suppression, and mortality volume to reflect both value loss and potential carbon implications of changed fire regimes. Results will be published in a synthesis of fuel treatment in dry mixed conifer types to provide guidance to fuels managers on the scope of fuel hazard reduction opportunities in their forests, characterization of the post-treatment outcomes they can achieve under a variety of treatment strategies, depictions of the trade-offs among treatment costs, hazard reduction accomplishment, and treatment co-benefits, and the evaluations of the relative importance of bioenergy facility proximity with respect to treatment feasibility. Preliminary results suggest, for example, that 1) treatments that significantly reduce canopy cover rarely improve fire hazard as much as those that address ladder fuels; 2) nearly 3.6 million acres of this landscape could be effectively treated while generating positive net revenue (receipts for sales of merchantable and energy wood, net of treatment and transportation costs) with an average net return of $1400/acre (range 0-12 thousand) while an 5.7 million acres could be effectively treated if funds are available to subsidize the effort, at an average net cost of $1500/acre (range 0 to 48 thousand); 3) acres of forested land that could benefit from one or more of the 13 treatments modeled that occur on steep (>40%) slopes account for about one-third of the treatable area but are far more expensive to treat, averaging a net cost of $1800/ac versus a net revenue of $366/ac where slopes are more gentle. Federal lands account for by far the greatest share of dry mixed conifer forest land with high current hazard and high potential for effective and economically feasible treatment.
Contact: Jeremy Fried, jsfried@fs.fed.us, (503) 808-2058

Outcomes from recently held meetings…

Northern Research Station

On September 28, 2011, a delegation of natural resource professionals, as well as Information Technology specialists and managers from Peru and Columbia were hosted by the Northern Research Station Forest Inventory and Analysis (NRS-FIA) program. After a welcome from Assistant Director Tom Schmidt, a series of eight speakers provided an overview of the FIA program. The presentations were coordinated in order to convey the process flow of data through the NRS-FIA system, with particular attention to the information technology infrastructure. Topics covered included sample design, database design, field data collection hardware and

software, utility of remote sensing and GIS, data verification, and web-based data distribution tools. The group also shared examples of how FIA data and information is turned into knowledge through such endeavors as wildlife habitat assessments and carbon accounting and reporting. The group was accompanied to St. Paul by Wes Wong from the Forest Service's International Programs office as part of a three-city tour, which also included Washington, DC and Salt Lake City, UT.

Employee Profile

Thomas Willard
Supervisory Forester
Northern Research Station

I was raised in a tiny town called York Springs just north of Gettysburg, PA. My dad got his doctorate from NC State in animal nutrition and mom studied botany at UNC. Both were a great influence on my love of science and the environment. As a boy I camped, canoed, swam, and built many tree forts. After High School, I went to University of Maryland Baltimore County to study genetics where I realized my interests and strengths were more in the environmental field. I transferred to Penn State and graduated with a BA in Forest Science in 1998. My first "real job" was with a small lumber company, Mann & Parker, where I began as a green lumber buyer learning skills in lumber grading and kiln operations as well as the business of buying and selling lumber. It was a small operation but overall a positive learning experience.

While on one of my business routes with Mann and Parker, I ran into an old college roommate that worked for the Forest Service. He said they needed inventory foresters to work for the former Northeast Research Station. I jumped at the opportunity to get paid to work in the forest and quickly discovered that this type of outdoor work suited me well and thus I started my career with NE FIA in April of 2000 in Altoona, Pennsylvania. For the next 6 years, I worked primarily in Pennsylvania but traveled to do FIA plots throughout the NE FIA Region working with several different FIA data collectors. My experiences were diverse, I saw sites not seen for nearly 100 years, and had a lot of fun.

In 2006, I was hired as the field supervisor for NRS FIA responsible for PA, NJ, DE and MD. This job has challenged me to develop better supervision and interpersonal skills as well as opportunities to give presentations at local colleges and universities, meeting with foresters and environmentalists from countries developing national inventory programs, as well as a detail with the FIA program in the WO. I've certainly met a lot of very interesting people along the way.

On a personal note, I was married in 2000 and have two boys. One of them even said he wants to be a forester when he grows up. Who knows, maybe I can pass the love of the woods on?

Safety at work…

Southern Research Station

Hard Hat Maintenance and Replacement
Sam Lambert, Forester

The hard hat (or hard cap) is one of the most important pieces of PPE (Personal Protection Equipment) worn by FIA field staff. Many USDA Forest Service personnel have been saved from serious injury or even death because they were wearing a hard hat. Thermoplastics (polyethylene, polycarbonate and others) and thermoset materials (fiberglass and phenolic-impregnated textiles) comprise the shells of industrial hard hats. These materials have proven to be durable, reliable and lightweight while providing effective protection, given the proper care and normal workplace conditions.

Users of Type I head protection devices (Type I-Top Protection, Type II- Lateral Protection, and Class E, G, and C-Electrical) must realize that hard hats do not have an indefinite useful life. “OSHA's standard does not call for a particular service life of a hard hat, but does advise that hard hats be inspected before and after each use.” A regular evaluation and head protection replacement program should be implemented by FIA units as a proactive solution to the task of addressing service life and maintenance (storage, etc.) of hard hats. Because the details of such a program must be based on work conditions FIA employees face every day, it is impossible to provide a specific time frame for hard hat replacement. As a general guideline, many large companies and other government agencies replace all employees' head protection every five years, regardless of the hard hat’s outward appearance or condition.

Manufactured date is typically located on the underside of the front or rear brim of the hard hat. In most cases the dates are covered by a piece of protective black plastic. Where user environments are known to include higher exposure to temperature extremes, sunlight or chemicals, hard hats should be replaced automatically after two years of use. In certain rare instances, a hard hat should be replaced in under two years. Other considerations are:

- If the hard hat has been struck by a forcible blow of any magnitude, both the shell and suspension should be replaced immediately, even if no damage is visible.
- Conventional hard hats provide limited protection by reducing the force of falling objects striking the top of the shell. They are not designed to provide front, side or rear impact penetration protection, if greater protection is required.
- The hard hat’s shell or suspension should never be altered or modified. Drilling holes in the shell for ventilation purposes must be prohibited at all times.
- Avoid contact of the hard hat with electrical wires.

Forest Service Safety Website

Please click on the following link for the Forest Service safety website. It contains lots of safety information, as well as the links to other good safety websites.
http://www.fs.fed.us/safety/

- Hard hats should not be carried on the rear window shelf of an automobile or stored in direct sunlight. Exposure to extreme sunlight over time may cause degradation which can affect the degree of protection originally provided.
- Because hard hats can be damaged, they should not be abused. They should be kept free of abrasions, scrapes and nicks and should not be dropped, thrown or used as supports. Do not sit on a hard hat.
- Wearers should never carry or wear anything inside their hard hat. A clearance must be maintained between the shell and head for the protection system to work properly.
- Do not paint hard hat/caps prior to consultation with the manufacturer. Some paints and solvents may attack and damage the shell and reduce the degree of protection originally provided.
- As a general guideline, all new employees should be provided with new, unused and unexposed hard hats. The practice of reissuing cleaned hard hats must be avoided. The cost of a hard hat is negligible when the potential for injury, lost time, health care cost and liability are considered

Remember that hard hat/caps consist of two components – the shell and the suspension– which work together as a system. Both components require periodic inspection and maintenance. Individuals should check hard hats before and after use for wear and damage, and it is recommended that FIA units conduct a regular head protection inspection, maintenance and replacement program. Always remember to take care of your PPE; in return, it just might spare you from serious injury or worse!

Figure 6. Typical location of date of manufacture on hard hat shell.

Interior West Research Station

To Err or Not to Err?
Devon Donahue, Safety & Health Specialist

Based on Sidney Dekker's "*The Field Guide to Understanding Error*" After hearing about an accident, we are so very quick to think: *I never would have done it that way, he didn't pay enough attention, she should have done it this way, or he should have put in a little more effort….* After the fact, everything seems so clear and avoidable. It's so easy to see where the individual went "wrong" so that person must be a "bad apple" and should be disciplined. But underneath every accident, there is always a more complex story. It's only when we look back and can see all the pieces of the event, pieces that the individual didn't know at the time, that everything

seems so clear. Hindsight, as they say, is 20/20.

The fact is that very rarely is there a "bad apple" in the mix. Sidney Dekker said it best; "people do not operate in a vacuum, where they can decide and act all-powerfully. To err or not to err is not a choice. Instead, people's work is subject to and constrained by multiple factors". The choices we make have to make sense to us or we wouldn't have done it. It's safe to say that if someone knew they were going to be hurt, they would have changed the way they had done things or called in sick that day. People don't choose to make errors. Moreover, if the decision made sense to one person, it may well have made sense to others which means that the problem may show up again and again.

Given this, we must search for the second story. We have a duty to find out why our colleague's assessments, decisions, and actions made sense at the time given the circumstances surrounding them. The story telling after an incident allows employees and supervisors to focus on how risks are seen differently and helps daylight the hazards we anticipated and the hazards actually encountered, resulting in a safer and more efficient workplace. We recognize humans are fallible, but learning from error helps us create a system in which an error doesn't lead to an injury or loss.

IW FIA is committed to digging deeper, learning, and sharing all that we can from accidents, and as a result we have begun to implement "Facilitated Learning Analyses" (FLAs). For more information on Facilitated Learning Analyses and Accident Prevention Analyses, please see http://wildfirelessons.net/documents/APA_FLA_Guides_2011.pdf.

Pacific Northwest Research Station

Increasing Safety Through Partnerships
Jon Williams, Supervisory Biological Scientist

The Data Collection Team within PNW has always pursued cooperative partnerships with entities both inside and outside the organization. These partnerships help facilitate our data collection and dissemination activities and allow us to operate more efficiently as part of a larger group. Another benefit of partnerships is often an increase in safety margins for our field staff; these benefits can come in direct or indirect forms and have proven to be very valuable to our team. Several recent examples of cooperation with outside groups have served to highlight this phenomenon.

In northern Washington, the Pasayten Wilderness provides quite a challenge for our staff to access research plots. One successful strategy has been to use stock animals to transport crew and equipment to remote sites. This year, the field crew partnered with the local ranger district to provide stock support for our operations. Working closely with the district, the crew was able to participate in a pre-trip stock safety training, get briefed on proper equipment and PPE, and also go on a single-day stock trip to gain experience with pack strings before their larger trip. This cooperation between our team and the district paid off not only in lower costs and closer relationships, but also in increased safety through the participation in pre-trip training.

On the Olympic Peninsula, we have recently worked to develop closer ties to the National Park Service Research Coordinator. By realizing that this position in the park is available to help us plan access and get information before heading into remote areas, we are able to better plan ahead and avoid unforeseen obstacles. Having a local contact that is closely in touch with park operations also helps us gain access to transportation resources that might not be otherwise available; at times this can save our crews' significant hiking or help facilitate a more accommodating travel schedule to reduce fatigue.

Outside the Federal Government, a crew in southern Washington arranged a co-visit to several research sites on the Yakama Indian Reservation with members of their local inventory crew. While the goals of this co-visit were not primarily safety related, several safety benefits were realized. The local inventory staff was able to provide guidance on the ground to our crew which helped them avoid potentially hazardous access routes as well as arrange for camping sites situated much closer to the research area reducing the fatigue associated with hiking. We were able to give back in terms of safety by demonstrating our use of communications equipment and our check-in/out service and having discussions about safe practices observed by the Forest Service.

Our team has also helped provide some safety related training to other groups within the Forest Service this year. For example, when we partnered with the National Outdoor Leadership School to provide Wilderness First Aid training for our field crews, we opened additional slots to local district staff that wanted to participate. This was a great partnership to facilitate and helped provide safety training for staff members across the region.

Working with outside groups allows us not only to derive some of the direct safety benefits outlined above, but also to see how other groups approach safety and learn from their systems and experience. By continuing to recognize the diverse range of benefits that come with partnership building, Data Collection is looking forward to a future of increased efficiency and safety culture.

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