



United States
Department of
Agriculture



Forest
Service

Forest
Management
Service
Center

Forest Management Service Center - Biometrics Group

Annual Staff Report

Fiscal Year 2017



About Us

The Forest Management Service Center (FMSC), located in Fort Collins, Colorado, is a detached unit of the USDA Forest Service National Forest System Forest Management Staff, Washington Office. The Service Center provides mensuration, statistical, modeling, biometric, sampling, and analysis skills to the Forest Service and also cooperates and works in partnership with other government agencies (federal, tribal and state), research, colleges and universities, forest industry, consultants, and individuals in the United States and other countries. The FMSC is staffed with biometric and mensuration specialists possessing skills not available at most regional and forest level offices and is considered an extension of each region's technical staff.

Our Program Emphasis

We provide products and technical support for forest vegetation modeling and forest products measurement to the National Forests and our partners.



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Message from the FMSC Center Manager

The Biometrics Group of the Forest Management Service Center includes the Forest Products Measurement Group and the Forest Vegetation Simulator Group (FVS).



The Forest Products Measurement group maintains a suite of programs related to cruising, scaling, volume and biomass estimation, and area determination.

In FY17, our re-engineered national cruising software, Version 2.0, continued to be used widely for general field use. Several training sessions on the new software were completed, both virtually and with site visits. The software continues to be updated as new features are proposed by Forests making the switch to the new software. In FY18, we will begin to look at providing versions of our data collection software to run on the Android operating system.

The TwoTrails traversing program continues to be improved upon and has seen an increase of use by the field in FY17. An alpha version of TwoTrails for the Android operating system was developed and is currently being tested.

The Service Center has partnered with the Fremont-Winema NF and the Nature Conservancy on a pilot project to explore the use of virtual boundaries using GNSS on harvesting equipment. The project will continue into FY18. A similar project is being planned for the Black Hills NF in Region 2 in FY18.

The Interagency Check Cruiser Workshop was held in Flagstaff, AZ from May 3rd – 5th. The topic was Incorporating New Technology and Procedures. The Workshop explored the Digital Restoration



Guide, Virtual Boundaries, the use of Unmanned Aerial Systems, and 3D-imagery. A field trip explored the use of the Digital Restoration Guide on the 4FRI project.

As part of the Forest Products Modernization effort, the FMSC was able to purchase 126 TruPulse lasers and 34 Allegro 2 data recorders, which were distributed to the Regions.



The Forest Vegetation Simulator (FVS) is the US Forest Service's nationally supported framework ensuring consistency among forests in vegetation growth and yield modeling.

At the national level, one of our most important goals is to develop, maintain, and improve the logic used throughout the FVS model. This includes the base model as well as the extensions, such as the Fire and Fuels Extension (FFE). Another national goal is to provide quality instructional materials for new and experienced users. Development continues of an online version of FVS that operates through a web browser.

In FY17, our projects included the initial phase of a multiple-year modernization effort focused on improving existing outputs and providing additional outputs, redesigning the graphical user interface, enhancing the ability to integrate FVS into other software systems, and other things less obvious to users, such as improving the ability to easily maintain the source code.

We conducted the fifth FVS Conference this year. It extended over three days and included forty presentations. This was a groundbreaking event in that it was the first multiple-day e-conference in the Forest Service (that we are aware of) conducted entirely virtually. This allowed for greater overall participation at far less cost. The post-conference reviews indicate this type of conference was effective and well-received. The proceedings of the FVS e-Conference was compiled and published as a General Technical Report (GTR) through the Southern Research Station.

In FY18, the FMSC will be a strong partner in the Forest Products Modernization effort. We want to be the best at forest products delivery in the country. Continuing to be the best means constantly improving and making a commitment to excellence.

Dave Cawrse

Biometrics Group Leader,
Forest Management Service
Center



Forest Products Measurement

The Forest Products Measurement staff supports the forest product sales program. Our primary responsibilities are developing and applying practical and efficient methods of timber cruising, scaling, volume estimation, and area determination that are accurate, consistent and defensible. We maintain a suite of programs related to cruising, scaling, volume estimation, and area determination and provide measurements support and training to the field. We also coordinate the National Measurements Steering Committee which meets annually and provides direction for the measurements group.

Cruising



Timber cruising is the process of measuring forest stands to determine stand characteristics, such as average tree sizes, volume, and quality. The primary purpose of cruising is to obtain a volume

estimate to appraise and prepare timber sales and stewardship contracts.

In FY17, the user base for our re-engineered national cruising software, Version 2.0, continued to expand. Several training sessions on the new software were completed, both virtually and with site visits. The software continues to be updated as new features are proposed by Forests making the switch to the new software.

Cruise Processing had several releases this year. A new report was added, Volume Summary by Cutting Unit, and some extensive modifications were made to the Region 10 reports. Work has begun on an Android version of the FS Cruiser

This program [FS Cruiser] is one of the most user friendly programs we have ever used, the setup is quick and easy especially with our Allegro2. I would estimate that our production capacity has increased around 20% over the last couple of years...it is definitely making our job easier and more productive.

Wesley Todd, Timber Sale Administrator,
Talladega National Forest, Shoal Creek
Ranger District

data entry program, which should make its debut in FY18.

A series of Quick Start Guides were developed for Cruise Processing, Cruise Manager, and FS Cruiser. The new guides include short video tutorials to help new users learn and use the re-engineered software. An additional Quick Start Guide was developed on the topic of Basic File Management to help users organize and backup data files to prevent accidental deletion and over-writing of data files.

As part of the Forest Products Modernization effort, the FMSC was able to purchase 126 TruPulse lasers and 34 Allegro 2 data recorders, which were distributed to the Regions.

Timber Tips, a publication for the field describing helpful tips and information, continues to be a semi-annual publication.

Volume and Biomass Estimation



The National Volume Estimator Library (NVEL) is a collection of standing tree volume estimators used by the

Forest Service and contains the research publications, descriptions of the implementation process, and the computer source code. The National Biomass Estimator Library (NBEL) provides componentized estimates of biomass material for the bole, branches, crown, stump, and bark in both dry and green tons. Both libraries are fully integrated within the re-engineered National Cruise Software and are also available as Excel Plug-ins.

The NVEL and NBEL have been merged into a single DLL so a single call can access both libraries. An interface function has been developed for the R statistical software making the volume library available to R users.

The FMSC continues to work with the Regions, research, FIA, and outside cooperatives to develop and validate biomass equations and weight factors to be incorporated within the NBEL.

The Region 8 Clark's profile models were reworked to add more flexibility with tree height inputs, basically making the Region 8 and Region 9 models work the same way. The model change is currently being validated and should be implemented in early FY18.

Scaling



Scaling is the determination of the gross and net volume of logs. The primary purpose of scaling is to determine the volume by product or species to be charged at a predetermined rate.

The measurements group maintains the FSscaler field data collection software and the Scale Expansion Program which furnishes data for the Timber Sale Accounting system. The Scale Expansion Program is incorporating the use of bar codes on log load receipt tickets and the use of bar code readers should be adapted in early FY18.

Area Determination



Area determination is quantitatively measuring land area using GPS or traditional traverse methods, or both. We continue to work with the

Missoula Technology and Development Center (MTDC) supporting procedures using GPS and other surveying techniques in Forest Service operations including expanding the Accuracy Matrix for the various GPS units.

Support for the area determination chapter of the Timber Cruising Handbook (FSH 2409.12, Chap. 50) continues as National Forests implement the new direction. The field personnel are finding ingenious ways to work using the new allowances of the handbook; ways to create safety for the crew members, combine polylines, decrease office work, avoid surveying common boundaries twice, and more.

The TwoTrails traversing program continues to be improved upon and has seen an increase of use by the field in FY17. A beta version of TwoTrails for the Android operating system was

released for testing and is currently being modified to better support Android tablets.

The Service Center has partnered with the Fremont-Winema NF and the Nature Conservancy on a pilot project to explore the use of virtual boundaries using GNSS on harvesting equipment. The project will continue into FY18. A similar project is being planned for the Black Hills NF in Region 2 in FY18.

Many training sessions on improved practices have been completed successfully using Video Teleconferencing technology and Skype Communicator. These training sessions included: introduction to Area Determination, field and office practices with any mobile software; introduction and intermediate use of TwoTrails; using current advantages of the handbook for safety and efficiency; and individualized sessions addressing specific concerns. The Service Center will continue to utilize virtual training technology in FY18.



Measurements Steering Team

The National Measurements Steering Committee met last spring to provide direction for the measurements group. The Service Center has been coordinating with the Regions on re-engineering the cruising software to work with Windows 7, Windows 10, and new generations of field data recorders, including the Android operating system.

Check Cruiser Workshop



The Interagency Check Cruiser Workshop was held in Flagstaff, AZ from May 3rd – 5th. The topic was Incorporating New Technology and Procedures. The Workshop explored the Digital Restoration Guide, Virtual Boundaries, the use of Unmanned Aerial Systems, and 3D-imagery. A field trip explored the use of the Digital Restoration Guide on the 4FRI project.

Important Partnerships

Developing and maintaining partnerships with natural resource agencies outside of the Service Center is important to provide consistent measurements support across the nation.

Besides the National Forests, we are working with state, tribal, other federal agencies, educational institutions, Forest Service Research Stations, private individuals and companies on diverse measurements issues including biomass estimation and area determination.

Nearly all land management agencies involved with area and timber measurement currently use our software (BLM, BIA, National Park Service, Army Corps of Engineers and the Department of Defense), as well as five state forestry agencies.

Gary Boyack continues to serve on the national Mobile Geospatial Technology Advisory Group

(MGTAG), which looks at developing a consistent policy to manage geospatial equipment as a national asset. Ken Cormier serves as the US Forest Service Representative on the Scaling Primary Forest Products Subcommittee of the Canadian Standards Association. Yingfang Wang continues to be a member of the FIA Biomass Working Group working with Forest Service and University personnel to develop and validate biomass equations. Matt Oberle serves on the Unmanned Aircraft Systems Advisory Group (UASAG), the National Windows Mobile Advisory Group, and the National Mobile Hardware Review Team.

In addition, Matt Oberle took a 120 day detail as the acting Regional Measurement Specialist for Regions 8 & 9 while YingFang Wang took a 120 day detail with the FIA as a Program Manager.

Customer Support

In FY16, the measurements staff participated or assisted in training Advanced Cruisers from several Regions. Additional training on TwoTrails and new area determination procedures was provided to the Regions in a combination of virtual training and field visits.

The measurements staff continues to average about 30 hotline contacts, emails and phone calls per week related to volume, biomass, cruising, scaling, and area determination questions from all regions of the Forest Service and other government agencies, as well as state agencies, universities, and private consultants.

Future Initiatives and Projects



We will continue to support all software components within the National Cruise System, updating the software as needed. In

FY18, we will begin to look at providing versions of our data collection software to run on the Android operating system. A new application is being developed for Sale

Admin for the collection of additional volume and will target the new Android tablets. The use of the Android versions of Two Trails with Sale Admin will continue to be explored in FY18. Cruiser certification maintenance training will continue to be developed for AgLearn to assist in cost effective training. We will continue to explore and use virtual training technology to provide timely and cost effective training to the field. We will examine new procedures and new technology to promote efficiency and safety to our users in the field. Future projects include expanding the use of UAS to collect aerial photography and remote sensing imagery to develop methodologies for utilizing virtual boundaries on timber sales and stewardship projects.



Contact	% of contacts
Forest Service	80
Other Gov. Agencies	10
State/University	5
Private	5

Forest Vegetation Simulation (FVS)

The Forest Vegetation Simulator (FVS) is a forest dynamics model simulating growth and mortality for most tree species, forest types, and stand conditions found in the United States. FVS can simulate a wide range of silvicultural treatments, fire, insects, diseases, and other disturbances. It can calculate volumes, densities, stocking levels, harvest yields, biomass amounts, carbon allocations, fuel loads, fire effects, and many other metrics.

National Support



At the national level, some of our most important goals are to develop, maintain, and improve the logic used throughout the FVS model, and to work with researchers and users of the model. In the spirit of these goals, we conducted the fifth FVS Conference this year. It extended over three days and included forty presentations. This was a groundbreaking event in that it was the first multiple-day e-conference, conducted entirely virtually. This allowed for greater overall participation at far less cost. The post-conference reviews indicate this type of conference was effective and well-received.

Here are just a few highlights of our national efforts:

- Compiled and published the proceedings of the FVS e-Conference as a General Technical Report (GTR) through the Southern Research Station;
- Added the ability for a user to specify the relative distribution of trees (on a scale of extremely clumpy to extremely uniform) for the calculation of canopy cover;
- Began distributing an FVS Newsletter with each software release in place of the bulletin we previously distributed. The newsletter is in a more user-friendly format and contains additional information.
- Continued development of an online version of FVS that operates on a remote server through a web browser, along with an

“onlocal” version that operates similarly, but on a local PC.

Collaboration with the Forest Inventory and Analysis (FIA) staff on the development of a new tool to translate FIA data into FVS-ready input files is well underway.

Collaboration continues on the development of an online greenhouse gas estimation tool that will use FVS to estimate greenhouse gas fluxes in a wide range of forest types under varying management.

Development has begun on a feature to allow Stand Visualization System (SVS) images to reflect the spatial tree arrangement specified by the new canopy cover adjustment keyword.

Preparation has begun for an advanced training that will be conducted in Ogden, UT in the spring of 2018.

The FVS Steering Team continues to provide strategic guidance in the development and enhancement of FVS. The ninth annual meeting was held in April in Fort Collins. The Steering Team helps direct the program of work for the FVS staff and acts as a valuable networking group and a means to ensure incorporation of the best available science into FVS.

Recommendations from past meetings have resulted in initiation of work on several projects, such as the clumpiness index and the online version of FVS.

Regional and Forest Support

We provide FVS support to all Regions and National Forests for planning efforts, project work, and more. Here are just a few highlights of our regional support efforts over the past year:



- Improved height growth and site index dubbing in the Eastern Montana variant;
- Reviewed simulation results and yield projections for the Forest Plan Revisions on the Custer Gallatin National Forest;

- Assisted with an economic analysis of the value of all timber on the Monongahela National Forest;
- Fixed several issues in the ORGANON-FVS variants for Oregon and northern California;
- Improved sprouting algorithms for eastern variants.

Important Partnerships

Our partners include Forest Service Research Stations as well as universities and other land management agencies, including the BLM, BIA, and NRCS. Here are examples of some important projects from the past year that directly involved our partners:

- Forest Inventory and Analysis (FIA): worked with us collaboratively on development of a tool to translate FIA data into FVS-ready files;
- NRM-FSVEG staff: maintained the FSVEG DB Link utility, which is the FVS data link with the FSVEG database;
- Bureau of Land Management (BLM): supported and tested the new ORGANON variants of FVS;

- Bureau of Indian Affairs (BIA): continued support of an interagency agreement, part of which is designed to assist in FVS modernization;
- Natural Resources Conservation Service (NRCS): continued to support the development of FVSOnline, the online version of FVS;
- Northern Research Station and USDA Climate Change Program Office: continued support of an agreement for the development of an online greenhouse gas estimation tool;
- Rocky Mountain Research Station: continued development of the Rangeland Vegetation Simulator (RVS), which is intended to be integrated with FVS;
- Forest Inventory and Analysis (FIA), Pacific Northwest Research Station, Rocky Mountain Research Station, Northern Research Station, Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Natural Resources Conservation Service (NRCS), and Forest Health Technology Enterprise Team (FHTET): provided members of the FVS Steering Team.

Customers

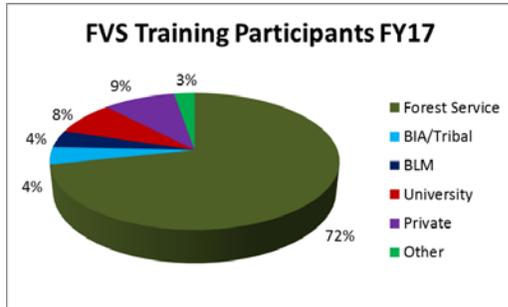
In addition to the Forest Service, other users of FVS software include the Bureau of Land Management, Bureau of Indian Affairs, Natural Resources Conservation Service, National Park Service, Department of Defense, and other federal agencies, as well as state and tribal agencies, educational institutions, private companies, and individuals. FVS software is also used internationally for modeling forest dynamics, carbon accounting, and many other things.



Customer Support

During the past year there were four quarterly releases of updated FVS software, and a newsletter was sent out describing the new and updated software features in each release. FVS user guides and training materials were updated to reflect changes in software and methodologies. The FMSC website was redesigned, and the content was updated as necessary.

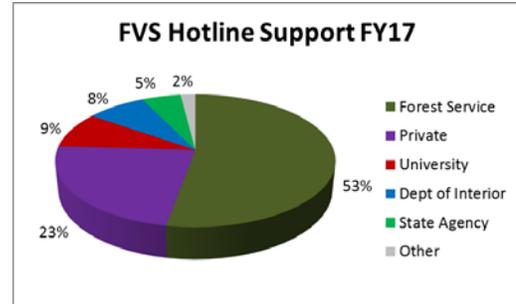
The FVS staff provides a variety of different types of training, both in-person and virtual. We conducted three week-long, formal FVS classes. These trainings were attended by a total of 74 students, 23 of which were in the National Advanced Silvicultural Program (NASP). A little over one quarter of the students were non-Forest Service employees. Several shorter training sessions, educational presentations,



and webinars were also conducted, including two short sessions designed specifically for NASP students. These sessions bring the total number of people trained this year to well over 200.

In addition to traditional trainings, nearly 300 people attended the FVS e-Conference. The virtual format allowed people to attend only those presentations of interest to them. This, and the fact that there was no travel required, helped to increase the number of people able to attend.

The FVS staff provides hotline support during normal working hours on all federal workdays. Requests come in the form of phone calls, emails, instant messages, and personal visits. We answered more than 800 support requests, requiring over 600 hours of staff time. Approximately half of the support was provided to the Forest Service, including employees from nearly every National Forest System Region, Research Station, and the Washington Office. The remainder of the support was provided to a variety of agencies, universities, and private entities.



Future Initiatives and Projects



For Fiscal Year 2018, in addition to the on-going activities of model maintenance, enhancements, and training, our future initiatives and projects include the second phase of a multiple-year modernization effort. FVS modernization is focused on improving output functionality, redesigning the graphical user interface, integrating a rangeland model, enhancing the ability to integrate FVS into other software systems, and other outcomes less obvious to users, such as improving the ability to easily maintain the source code. We will also begin a multiple-year project to update the Alaska variant by expanding its geographic range, increasing the number of species it simulates, and improving growth and mortality estimates.

Forest Management Service Center, Biometrics Staff

Dave Cawrse, Biometrics Group Leader

Mike Van Dyck, FVS Group Leader

Mark Castle, Pathways Intern

Aaron Gagnon, FVS Model Support, Training

Bob Havis, FVS Programming, Support (Retired)

Chad Keyser, FVS Model Support, Training

Erin Smith-Mateja, FVS Model Support, Training

Mike Shettles, FVS Model Support, Training

Lance David, FVS Programming, Support

Ken Cormier, Measurements Group Leader

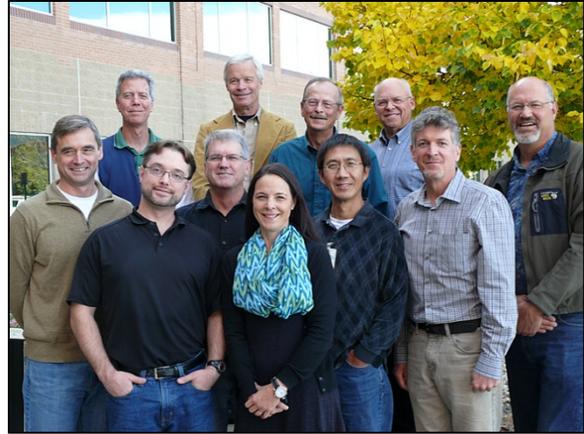
Gary Boyack, Forest Product Measurement Support

Rob Hilton, Cruise Manager, FScruiser
Programming Support

Barbara Menzel, Cruise Processing Programming
Support, Training Support

Matt Oberle, Field Data Collection Programming Support

Yingfang Wang, Volume and Biomass Estimation Support



Front L to R: Aaron Gagnon, Mike Shettles, Ken Cormier, Erin Smith-Mateja, Yingfang Wang, Matt Oberle, Dave Cawrse
Back L to R: Mike VanDyck, Bob Havis, Lance David, Gary Boyack

Not pictured: Chad Keyser, Rob Hilton, Mark Castle
Behind the camera: Barbara Menzel