SOCIETY OF AMERICAN FORESTERS

Western Forester

March/April 2008 | Oregon • Washington State • Inland Empire • Alaska Societies | Volume 53 • Number 2

LIDAR: An Emerging Tool for Multiple Resource Measurement, Planning and Monitoring

BY STEVE REUTEBUCH AND BOB McGAUGHEY

Steve Reutebuch

Bob McGaughey

Over the last decade, a revolution in active remote sensing technology has occurred, providing new tools for measuring and monitoring forests over the landscape at unprecedented resolution and accuracy. The basis of this revolution is the ability to directly measure the three-dimensional structure (i.e., terrain, vegetation and infrastructure) of forests and to separate measurements of above-ground vegetation from measurements of the terrain surface. Of these new remote-sensing technologies, airborne laser scanning, a type of light detection and ranging (LIDAR), is the most commonly available (see sidebar: Airborne LIDAR in a Nutshell).

Nationally, at least 30 remote sensing companies have LIDAR sensors and are providing LIDAR for a wide range of applications. Several eastern states have embarked on, or completed statewide LIDAR acquisitions primarily for natural hazards mapping, particularly updating of flood zone maps.

In Oregon and Washington, two public LIDAR acquisition consortiums were formed, initially focused on the heavily forested areas west of the Cascades (see sidebar: How to Get LIDAR Data). As in other states, mapping of natural hazards (earthquake faults in the Puget Sound trough and landslides in western Oregon) has been the main justification for these efforts. However, participating consortium partners have recognized and are encouraging the use of these publicly available LIDAR datasets for other uses, particularly forest management.

Much research is underway to develop more precise measures from LIDAR; however, the following simple LIDAR-derived products are easily generated and quite useful to resource managers.

High-resolution ground surface models. Traditional digital terrain models (DTMs) were compiled from aerial photos that required map makers to make their best guess about where the ground surface was in heavily forested areas. LIDAR can provide much more accurate ground models for slope mapping, stream delineation, and road and harvest system planning and design. The Oregon and Puget Sound LIDAR Consortiums are producing DTMs with one- to two-meter grid resolution, a vast improvement over the standard USGS 10-meter DTMs.

Canopy height models. By subtracting the LIDAR-derived ground surface DTM from a LIDAR-derived canopy surface model, a canopy height model (CHM) is produced. CHMs provide spatially-explicit stand structure data over the landscape for estimation of growing stock, input for habitat and fire models, and any other resource planning activities where spatial arrangement and tree height are important considerations.

Percent canopy cover models. These models provide a direct measurement of cover by height above ground.

LIDAR intensity images. These high-resolution images can be matched with existing orthophotographs and other digital imagery for change detection and monitoring over time. Intensity data from leaf-off acquisitions can be used to separate hardwood from conifer canopy areas; intensity data from leaf-on data can be used to separate live trees from dead trees.

All Returns Datasets. This archive of the LIDAR point cloud (including all returns for each pulse) provides baseline data on current terrain and vegetation structure that is valuable for future change detection and monitoring (e.g., crown expansion or dieback). These files can also be used when checking the quality of other derived LIDAR products. For instance, the point cloud can be superimposed on the LIDAR ground surface model to assess how well the ground fits the raw LIDAR scan.

Most LIDAR vendors can easily provide these simple products along with the raw LIDAR point data. Also, public domain software is available from the U.S. Forest Service that can be used to process, visualize and perform basic measurements with LIDAR data (see

(CONTINUED ON PAGE 2)

JOB OPPORTUNITY
CLACKAMAS COUNTY FORESTER

The Clackamas County Parks & Forest Department wishes to hire a forester to manage 4,000 acres of county forestland. The position reports to the Department Manager and includes: timber sale design and on-the-ground preparation, road and plantation establishment, monitoring and maintenance; timber sale contract administration and accounting; determination of appropriate measures to protect resources; conducting surveys to determine the best silvicultural treatments for forest stands; managing public involvement with timber sale proposals; analyzing natural resource legislation and preparing reports for the Board of County Commissioners; communicating with the public regarding tree and forestry related questions, identification and resolution of hazard tree problems in county parks and other county properties.

A degree in forestry or related field is required. Monthly salary range: $4,200-$5,000 depending on qualifications. Benefits package includes health and dental insurance, retirement pension, vacation, sick leave and holidays. For more information, contact Chris Van Duzer at 503-353-4663.

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Western Forester is published bimonthly by the
Oregon and Washington State Societies' Northwest Office

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LIDAR: An Emerging Tool

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sidebar: Fusion LIDAR Software).

Over the last decade numerous projects have demonstrated that LIDAR data can provide high-resolution, spatially-explicit information for multi-resource management and planning. Simultaneously, LIDAR has emerged as the leading technology for high-resolution terrain mapping needed to better identify natural hazards such as flood- and landslide-prone areas. As LIDAR sensors and vendor capabilities continue to grow, LIDAR data will become as indispensable to tomorrow's foresters as the aerial photograph has been to today's foresters! ◆

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Golden Years

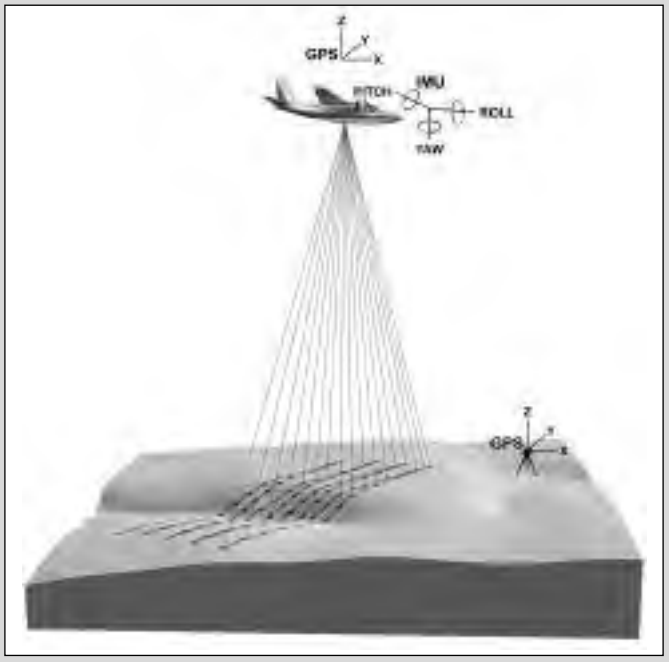
John Grey Wittmeyer was presented with his 2007 Golden Award on January 8 by Darren Mahr. The Coos Chapter member is a World War II veteran and long-time employee with the BLM, and still enjoys "carefully" cutting his own firewood.

PHOTO COURTESY OF DARREN MAHR

Next Issue: Tribal Forestry

Airborne LIDAR in a Nutshell

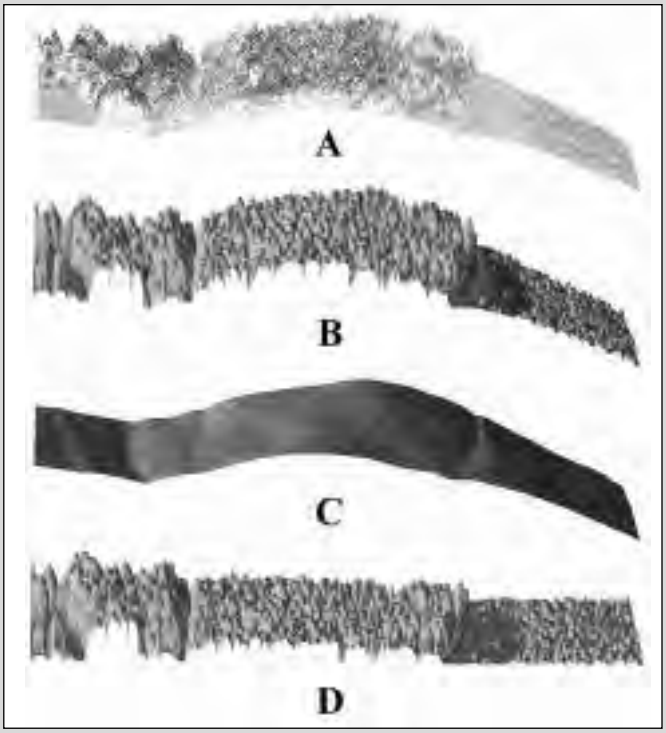
There are many different types of airborne LIDAR systems, but the most common for terrain mapping is discrete-return, small-footprint LIDAR. These laser-scanning systems have four major hardware components: 1) a laser emitter-receiver scanning unit; 2) GPS [aircraft and ground units]; 3) a highly sensitive inertial measurement unit (IMU) attached to the scanning unit; and 4) a computer to control the system and store data from the first three components. Large areas are surveyed with a series of swaths that often overlap one another by 50 percent or more.



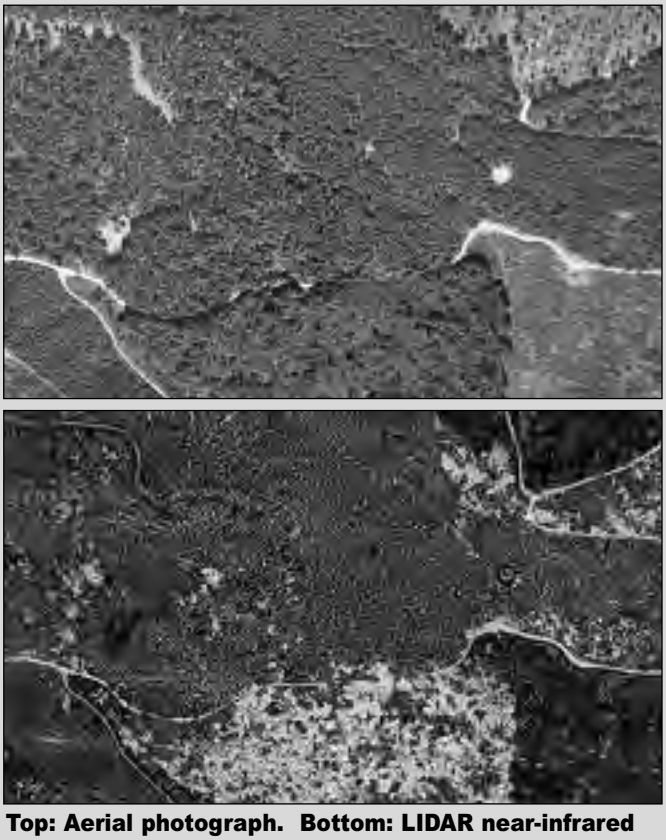
Schematic of a typical airborne LIDAR system.

State-of-the-art LIDAR scanners designed for terrain mapping emit near-infrared laser pulses at a high frequency (typically 50,000 to 200,000 per second). For each emitted pulse, most LIDAR sensors can record one to seven reflections from foliage, branches and sometimes the ground as the pulse passes from the top of the canopy down through canopy gaps. Using the distance from the sensor to each reflection or "return," the GPS aircraft position and the IMU aircraft altitude data, a 3D coordinate is computed for each object that reflected a pulse, resulting in a raw LIDAR data cloud. In a properly executed mission, the accuracy of points is typically 15 centimeters vertically and 25-50 centimeters horizontally. The density of points collected varies with mission specifications. In forested areas, one pulse per square meter has been commonly collected in the past; however, many newer surveys have collected five-plus pulses per square meter.

This data cloud (A) is then processed into different products such as canopy surface models (B), ground surface models (C), and canopy height models (D). In addition, a series of LIDAR point cloud metrics can be computed that have been shown to be strongly correlated with stand mean height, diameter, basal area, volume, biomass, cover and canopy fuel variables. Most LIDAR systems also record the level of near-infrared energy that was reflected. These return "intensity" values can be used to create near-infrared images of the forest and to separate leaf-off hardwoods from conifers or dead from live trees. Because the point cloud is in real-world coordinates, all LIDAR-derived products can be imported directly into GIS for use with existing orthophotos and resource data layers such as stand polygons and road coverages.



A: LIDAR Point Cloud (4 points/m²); B: Canopy Surface Model; C: Ground Surface Model; D: Canopy Height Model (created by subtracting C from B)



Top: Aerial photograph. Bottom: LIDAR near-infrared intensity image. Dark areas are conifers; light gray areas are leaf-off hardwoods and dead trees (and roads).

How to Get LIDAR Data

There are dozens of remote sensing vendors that fly airborne LIDAR systems and can provide a range of LIDAR products with costs ranging from less than $1 to several hundred dollars per acre, depending on mission requirements and desired products. Costs for large blocks over 10,000 acres are generally $1 to $3 per acre for typical LIDAR deliverables. So, before a landowner requests a bid, it is important that they understand what products and specifications will work for their project. Additionally, LIDAR missions require mobilization of personnel and aircraft, often from other states. Therefore, it is advantageous to spread this mobilization cost over a large area to hold down the cost per acre. To do this, landowners may want to see if their lands can be flown as part of a larger, coordinated acquisition.

In Oregon and Washington, consortiums have formed to coordinate large-area LIDAR mapping projects. Both the Oregon LIDAR Consortium (oregongeology.com/sub/projects/olc/) and the Puget Sound LIDAR Consortium (pugetsoundLiDAR.ess.washington.edu) have maps of completed and planned LIDAR project areas. They invite other federal, state, local and private owners to pool resources for more cost-effective LIDAR acquisitions.

The Oregon consortium's initial goal is to collect LIDAR over the nominally inhabited areas in western Oregon, with the ultimate goal of covering the entire state. In 2007, the Oregon consortium was funded by the state legislature to collect LIDAR over 2,000-3,000 square miles in 2008. In addition, the Bureau of Land Management and tribal partners are flying an additional 1,000-1,500 square miles in Oregon as consortium partners. The Puget Sound Consortium has collected over 12,000 square miles and hopes to eventually fly all of western Washington. The consortium has also flown smaller areas in eastern Washington with state and federal partners. Like Oregon, the ultimate goal is to fly the entire state of Washington.

Partial List of LIDAR Project Specifications in Forested Areas*

Pulse density per sq. meter	Minimum 1 for stand level canopy models and medium resolution ground models (2-m grid) 4+ for individual tree canopy measurements and high-resolution ground models (1 m grid)
Returns per pulse	Minimum 2 for canopy and ground surface measurements. 4+ for improved mid- and lower-canopy structure measurements
Laser beam divergence	Narrow beam settings have been shown to provide better tree heights and higher percentage of ground returns in limited studies. Narrow beam allows higher flight altitudes.
Scan angle	+/- 15 degrees or less increases ground returns in heavy forest cover, but narrower scan angles increase number of flightlines required and costs.
Swath overlap	Usually 50% or more sidelap on adjoining swaths, i.e., survey is designed for 100% double coverage at planned aircraft height above ground.
Season of survey	Leaf-off in areas of significant hardwood cover and no significant snow cover. Results in better ground measurements, but can be difficult to achieve in higher elevations. Leaf-off flight window can be very constrained by weather in the Northwest, resulting in lower probability of on-time mission success. Leaf-off also allows separation of hardwoods from conifers, but dead trees are difficult to separate from leaf-off hardwoods. Leaf-on for separation of live from dead trees. Conifer areas can be flown leaf-on, but poor separation of hardwoods from conifers. Leaf-on flight window is often larger, resulting in higher probability of on-time mission success.
Absolute LIDAR measurement accuracy	Horizontal: typically +/-0.5 to 1 m depending on survey objectives. Vertically: typically +/-0.15 to 0.5 m depending on survey objectives
Swath to swath LIDAR relative accuracy	Horizontal. +/-0.25 to 0.5 m depending on survey objectives. Vertically: +/-0.10 to 0.5 m depending on survey objectives.

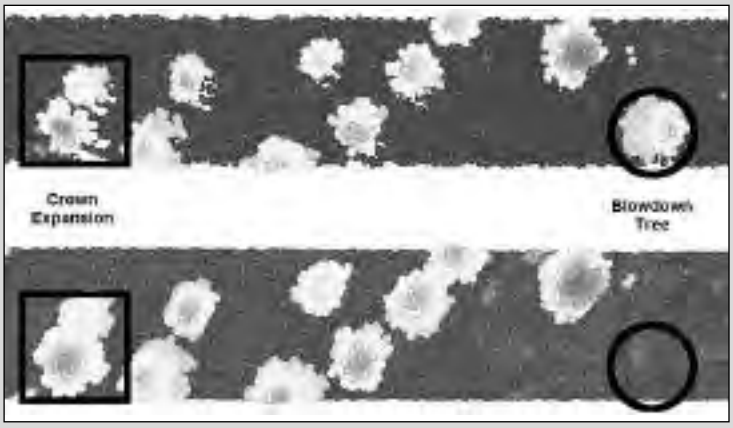
*Adopted from the Puget Sound LIDAR Consortium. Refer to article by Ralph Haugerud elsewhere in this publication for more information on model specifications.

If a landowner decides to contract for LIDAR data directly with a vendor, rather than partnering with one of the regional consortiums, review of the consortium specifications will help them better understand important choices that must be made regarding mission specifications, required accuracy standards and options for deliverables.

Above is a table of some of the major mission variables and typical specifications that should be considered when contracting for LIDAR projects.

As with any remote sensing contract, the purchaser should also address who owns the collected data, for what purposes, and for what timeframe after the project is completed. Some vendors retain ownership of the raw data and only license use of delivered products to purchasers.

This highlights another advantage of partnering with the consortiums—all data from their projects are put in the public domain and are carefully archived. This long-term warehousing of LIDAR missions will become particularly important as areas are re-flown over time (e.g., after large flood events, landslides or wind storms) and earlier LIDAR data are combined with data from later flights for change detection and monitoring purposes, such as tree growth, mortality and wind-throw.



Top: Overhead view of LIDAR points flown in 1999. Dark areas are ground.
Bottom: LIDAR for same area flown in 2003. Notice the crown expansion for most trees and the missing tree on the right side of the 2003 image. This tree was blown down between the 1999 and 2003 LIDAR flights.

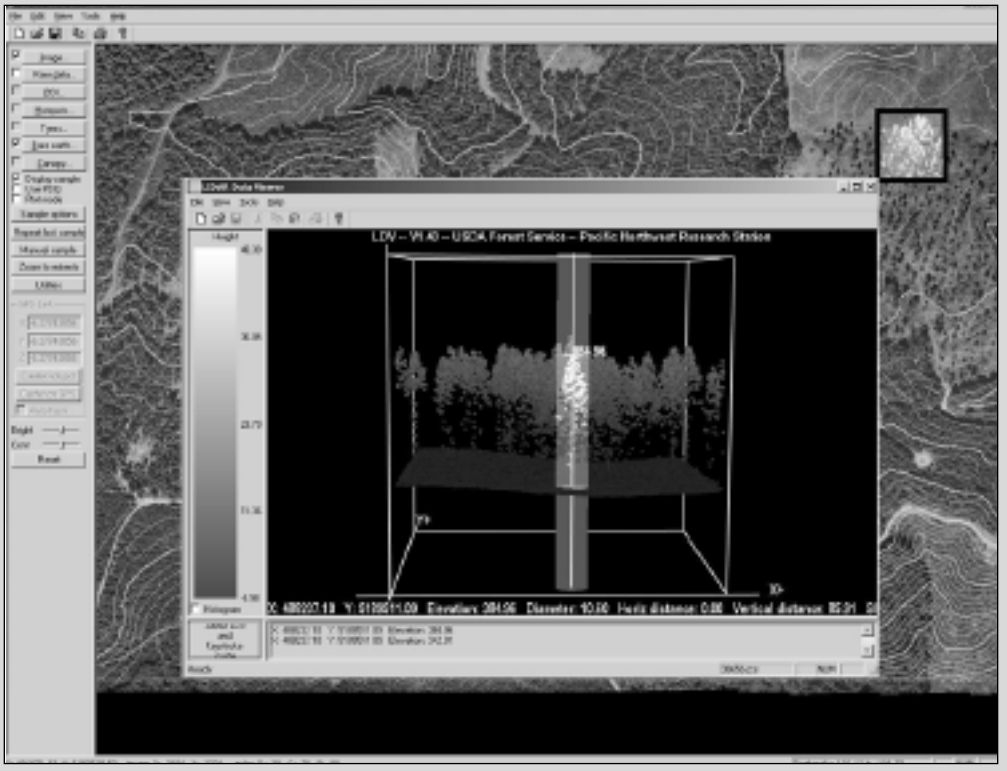
Fusion LIDAR Software

The PNW Research Station has developed a suite of software tools called "Fusion" that can be used to combine LIDAR point clouds with existing orthophotos, maps and GIS layers.

Fusion also includes utilities to process point clouds into canopy and ground surface models, canopy metrics (heights, cover, etc.) that can be imported into GIS for further analysis.

The Fusion package, along with an online tutorial, manual and sample dataset is available from the USFS Remote Sensing Applications Center's website at www.fs.fed.us/eng/rsac/fusion.

GRAPHICS
COURTESY OF
STEVE REUTEBUCH



Background: LIDAR contour lines super-imposed on an orthophoto. Foreground: Sample (from area shown in the black square) of LIDAR point cloud with individual tree measurement.

A Model Specification for LIDAR Surveys in the Pacific Northwest

BY RALPH HAUGERUD

An increasing number of vendors offer LIDAR surveying services to a client community that includes local, state, federal and tribal governments, private landowners large and small, engineering and land management firms, and a handful of researchers. With time, LIDAR survey data should become a well-understood commodity. But we are not there yet! Many purchasers of LIDAR survey data still find that, on occasion, they do not receive a product that meets their expectations. To avoid this, it is helpful to have a specification that communicates to the vendor what the client desires, and that if met, guarantees that a data set will be fit for use and provides a framework for resolving disputes over data quality.

Recently, Susan Nelson (Bureau of Land Management), Diana Martinez (Puget Sound Regional Council) and I, with advice from several colleagues, wrote a model specification for LIDAR data to be purchased by public agencies in the Pacific Northwest. The complete specification is available online at http://pugetsoundLIDAR.ess. washington.edu/proposed_PNW_LIDAR_specification-1.0.pdf. The specification is based on prior experience with several vendors and multiple acquisition contracts. While it is informed by the experience some of us have with the Puget Sound LIDAR Consortium, it is not based solely on this experience. Use of this specification should ease data interoperability, reduce contracting costs, and facilitate development of a shared set of tools for manipulating LIDAR data.

The model specification is designed for the Pacific Northwest. It reflects the prevalence of young, angular landscapes, the regional importance of forests and fish habitat, and the need to intelligently guide ongoing urbanization. It may, perhaps with adjustments, be useful elsewhere. The specification reflects our perception of LIDAR technology and market conditions as of 2007. It should evolve with increasing experience and changing technology. We know that in at least one aspect (classification of LIDAR returns) the specification needs to be improved.

Writing a LIDAR survey specification presents a challenge. A good specification is such that: (1) conformance to the specification can be readily evaluated; and (2) if data conform to the specification, the data are assured of being suitable for the task at hand. Absolute vertical accuracy, typically the foundation of topographic surveys, fails this challenge on both counts. LIDAR data should be accurate, complete and usable. We wrote a specification that describes these qualities and for which conformance can, with a few exceptions, be easily measured. In general, the specification focuses on LIDAR data, not the procedures employed to collect the data. An exception is GPS practice, as we have found that it is very expensive to adequately judge the quality of absolute spatial positioning; for this reason, we specify some aspects of GPS procedures.

In addition, the specification prescribes some aspects of GPS procedures, prescribes a data-tiling scheme and file names, discusses the negotiation of point-classification procedures, and provides instructions for formal metadata. Perhaps the most important feature of the specification is not the particular set of choices for point density, absolute accuracy, maximum scan angle, swath overlap and the like, but the recognition that these things should be specified.

Constraints in survey design

There are tradeoffs between survey design, cost, accuracy and resolution of a LIDAR survey. To a first approximation, cost is the sum of mobilization expenses (including establishing GPS ground control), aircraft and crew time, and processing time. Accuracy is controlled by GPS base-line length, inertial measurement unit (IMU) quality, care and experience in calibration, and flying height. Resolution is mostly a function of on-ground spot spacing, which is governed by instrument pulse rate, flying height and airspeed. In forested areas, ground resolution is significantly decreased as most laser pulses do not produce returns from the ground surface.

At a given pulse density, single-swath (no overlap) data generally provide better relative accuracy, and thus better feature recognition, but may require a higher pulse-rate instrument to achieve the desired pulse density. However, multiple, overlapping swaths make it easier to achieve high pulse densities and generally have multiple look angles, both desirable characteristics for increasing the probability of ground returns in dense forest canopy, but at a cost of poorer feature recognition

Summary of the specification

Acquisition procedures	Instrument shall be capable of detecting and recording at least 3 returns per pulse. 10-40 cm on-ground spot diameter, maximum permissible scan angle ≤ ±20 degrees, at least 4 pulses/m^2 nominal 50% sidelap survey in leaf-off conditions
Accuracy	≤15 cm root mean square error (RMSE) vertical absolute accuracy as measured by contractor, ≤10 cm RMSE vertical and ≤50 cm RMSE horizontal intra-survey reproducibility for project as a whole, ≤5 cm RMSE reproducibility of range measurements.
Completeness	No voids between swaths, no voids because of cloud cover or instrument failure, ≤20% no overlap area per project, ≥85% design pulse density for project as a whole.
Usability	Consistent file names, consistent file formats. Minimum deliverables are Report of Survey, aircraft trajectory files, all-return point cloud, bare-earth surface model (DEM), and formal metadata. Optional deliverables include first-return surface, ground point list, intensity image and contours.
Intellectual property considerations	Unrestricted rights to all delivered reports and data.

because of swath-to-swath errors. Leaf-off acquisition gives much better ground penetration, but at the cost of a shorter acquisition season that generally has poor weather. Leaf-on acquisition is likely to be cheaper because of better instrument availability and generally better weather.

Since 2000, there has been a six-fold increase in instrument pulse rate. Faster computers, better codes and more experience have allowed handling of greater data volumes at the same cost. Rather than moving toward lower-cost surveys at the same resolution, the Puget Sound LIDAR Consortium has chosen to acquire surveys with a higher pulse density. There are several reasons for this.

First, and best documented, is that higher-density surveys allow much better characterization of the forest canopy. Second, we observe that with a six-fold increase in pulse density, we have not seen a corresponding increase in the number of identified ground points, but we see fewer vegetation returns misidentified as ground and fewer landscape corners misidentified as vegetation. We suspect that with a smaller fraction of returns identified as ground, the confidence that these are indeed ground points increases and the fraction of errors decreases. The resulting bare-earth surface models are more detailed and more informative (see Figure 1). Third, closer pulse spacing probably results in better survey calibration, as (a) the data set has better XY resolution (a limiting factor in some pointing calibration procedures); and (b) interpolation errors associated with tying quasi-regularly spaced LIDAR returns to arbitrary ground control points are smaller. Fourth, reducing cost by increasing the instrument pulse rate and flying higher and faster significantly reduces survey accuracy, as the dominant error in most LIDAR surveys is mis-positioning because of pointing error and this effect is linear with instrument height.

Why not save money by purchasing lower quality data?

LIDAR data are expensive and we believe that community support for continued data acquisition is more likely if we meet the needs of most potential users. Angular landforms, dense forest cover, and significant land and habitat values dictate that in the wet Pacific Northwest we need dense, accurate surveys.

A faster instrument allows one to fly higher and faster and cover the same area at the same pulse density in less time—but in most cases such cheaper data will be significantly less accurate. For earthquake and landslide hazards mapping where public safety is an issue, we are concerned to deflect liability issues by using the best-available data. In the long run, change detection and analysis is likely to be a major use of LIDAR data and the ability to detect and describe change is closely related to data resolution and accuracy. ◆

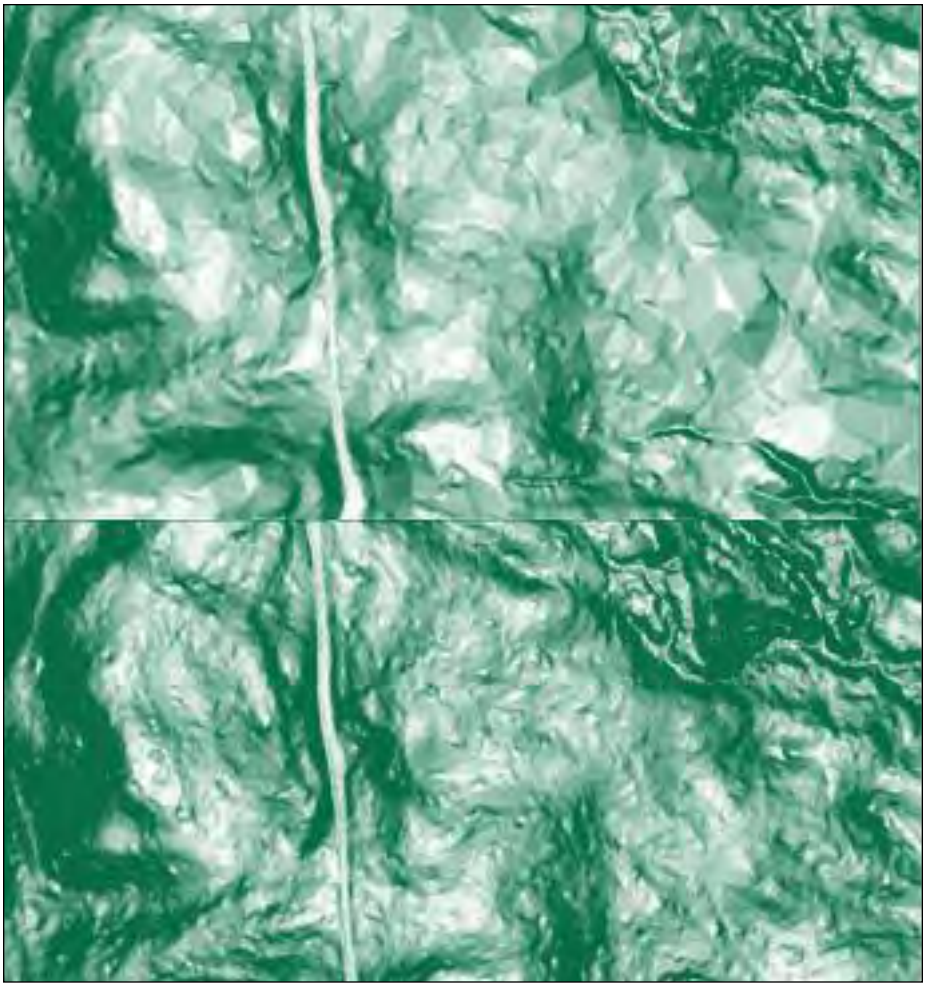


IMAGE COURTESY OF IAN MADIN, OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

Figure 1. Bare-earth images showing effects of pulse density in forested areas. Top, 2005 survey at ~2 pulses/m². "Crystal forest" is indicative of too-few ground returns. Bottom, 2007 survey of same area at ~8 pulses/m². Note North-South forest road for scale.

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Developing a Stand-Level Inventory Using LIDAR

BY GEORGE McFADDEN

Remote-sensed data collected using Light Detection and Radar (LIDAR), when combined with additional data in a two-stage sampling procedure can provide stand-level inventory information with sampling errors that are equivalent to ground sampling techniques. The use of remote-sensed data has the potential to reduce field costs and quickly complete large inventory programs. These savings are possible because of the economies of scale that are achieved when computing capacity is substituted for labor costs.

The first stage in the two-stage process is to acquire the raw LIDAR data. Organizations such as the Puget Sound LIDAR consortium and the Oregon LIDAR consortium can assist in this process by coordinating the efforts of multiple landowners to acquire LIDAR data. The savings can be substantial between large and small projects.

LIDAR acquisition in the 5,700-acre Panther Creek watershed approached $5.00 per acre, whereas the cost of data acquisition in the 1,500,000-acre Coos Bay project coordinated by the Oregon LIDAR consortium is expected to be less than $0.70 per acre. In addition to coordinating large acquisition projects, the consortiums can establish technical specifications for resource-grade LIDAR acquisitions that will ensure the compatibility of current and future LIDAR collection projects.

Raw LIDAR data can be used to model the surface of the earth and individual tree canopies (ITC). The information from the bare-earth models can be used to produce several products, such as digital elevation models, without the need to acquire additional data. The ITC models can be used to locate individual tree canopies and estimate canopy height, area, shape and return intensity, but in order to produce a stand-level inventory, additional information is required.

The second stage of the data acquisition process involves acquiring information that can be used to identify tree species and to estimate individual tree diameters and the number of ITC polygons that contain more than one tree. The key to creating a stand-level inventory from LIDAR data is establishing an unbiased link between remotely sensed ITC data and ground measurements of identifiable trees. This link enables the integration of additional remote-sensed data and the establishment of a statistical correlation between the ITC data and ground measurements.

Digital color infrared (CIR) photography is used to identify the species of individual trees through a process that requires the digital CIR photography to be intersected with the ITC polygon layer. This produces a layer where the spectral characteristics of individual tree canopies can be identified and species identified based upon the spectral characteristics, provided there is a good match between the location of the ITC polygons and the CIR photography.

The correlation process to identify individual tree metrics requires the boundaries of individual stands in the inventory area be identified as well as stratifying the stands based upon their LIDAR derived metrics. A statistical analysis is conducted to determine the number of plots and stands where correlation plots are to be established. It is important that the ground measurements are accurate and unbiased at the stand level. This requires that the trees

on the correlation plots be located with survey-level accuracy in order to achieve as near to a one-to-one relationship between the ITC location and the ground-based tree location. Tests of this process by ImageTree Corporation in the southeast United States have yielded root mean square errors for basal area and volume estimates at the stand level of 9.7 and 12.8 percent.

Once the correlation is established in the sample stands, this information along with the CIR photography and the ITC map is used to develop stand tables for all of the stands in the inventory project. If there is a good correlation between the modeled stand boundaries and the actual stand boundaries, then the stand table information derived from the remote sensed data is expected to be similar in accuracy to ground-based inventories.

The knowledge base necessary to complete stand level inventories using remote-sensed data is expanding. Several organizations are developing and validating the computer algorithms necessary to adapt this sampling process to the forests of the Pacific Northwest.

Developing a stand-level inventory using remote-sensed data is a computer-intense process. The raw LIDAR data for the Coos Bay project alone is expected to approach 2.5 terabytes. A limited number of organizations have the knowledge and computer capacity necessary to work with multi-terabyte files. The use of a computer-intensive inventory process to replace a labor-intensive process provides economies of scale that reduces the cost per acre for large inventory projects.

In the 5,700-acre Panther Creek, the cost for a stand-level inventory based upon remote sensing would approach $20.00 or more per acre. The Washington State DNR is currently completing a 200,000-acre inventory project using remote-sensed data and the cost is approximately $4.00 per acre, including the $1.50 per acre for acquisition of the raw LIDAR data.

The $4.00 per acre cost of remote-sensed inventories compares favorably with the $7.00 to $10.00 per acre that a typical ground-based inventory costs to complete. In the future, the cost of an inventory based upon remote-sensed data should decrease as computer processing and storage become cheaper and the algorithms necessary to produce the inventory become more refined. The cost of a ground-based inventory will likely increase in the future in relation to labor cost. The result is that stand-level inventories using remote-sensed data will become more cost competitive in the future.

The use of LIDAR as part of an inventory program will not completely replace the need for ground-based inventories. Stand cruises will still be necessary in small-scale projects, in high-value projects that require low standard errors, and in any stand type were LIDAR cannot produce equivalent estimate errors. ◆

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The Impact of LIDAR Technology on Transportation System Design: Moving from Coarse Topographic Maps to Detailed Digital Elevation Models

BY PETER SCHIESS

Recent advances in remote sensing and data collections are creating an environment where forest operation designs result in a high level of agreement between paper designs and their corresponding field locations. In fact, we see a change in paradigm in that discrepancies between map-based locations and field-located conditions are not the result of poor map material, but rather a reflection of no longer appropriate (or needed) measuring and referencing procedures during the field verification process. This article discusses the impact of the increased quality of data collection on road and skyline profiles.

Peter Schiess

Maps have been one of the critical data requirements for forest engineering application, ranging from topographic to forest stand maps. In the past, ground-based and photogrammetric mapping has been the most cost effective way to build topographic and other maps of forested areas. At the turn of the last century, during the railroad logging days, the necessary detailed maps were created using staff compass and steel tapes. Those maps did have the necessary level of detail, usually with 0.5 meter contour interval, unencumbered by tree coverage. In later years, the advent of aerial photography led to the creation of photogrammetric maps. These maps provide good preliminary guidance for laying out roads and harvest units; unfortunately, the trees that draw us to these areas also obscure the underlying topography. In difficult topography, planned skyline profiles and road

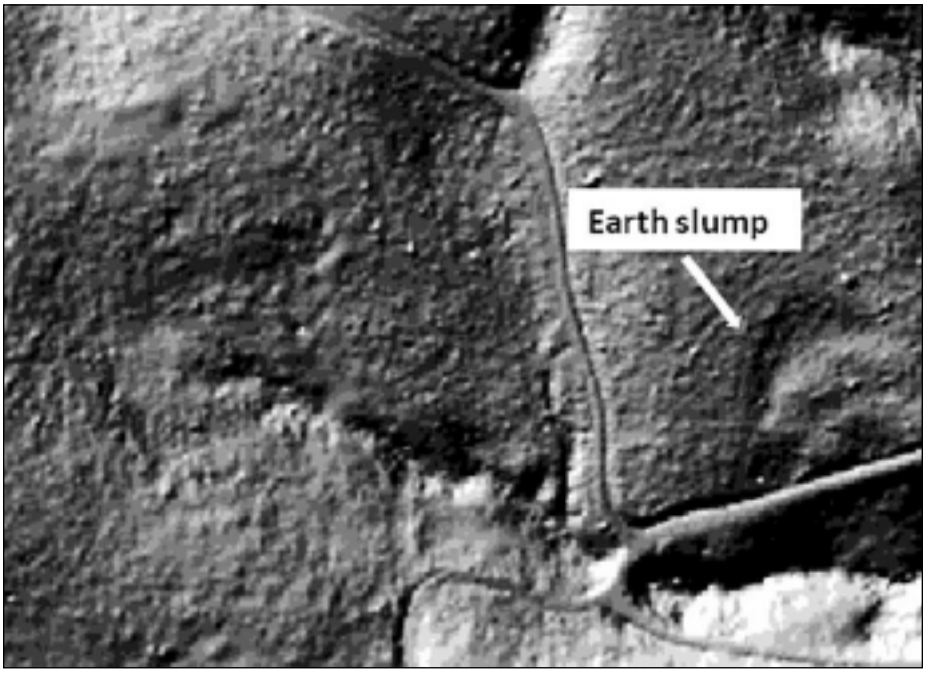


Figure 1. LIDAR topography provides detail from road beds, individual slash piles, ditches and earth slumps. Note the earth slump encroaching on an existing road with the headwall clearly noticeable. Walking the ground, field engineers were not even aware of the headwall.

alignments are frequently rendered unworkable by topographic "details" that are not represented in the photogrammetric topography that is used to plan them.

For that reason, forest engineers always emphasized the importance of field verification. Initial planning in the office was certainly recognized as important, but its primary function was to focus field reconnaissance. Field reconnaissance always has been time consuming and therefore expensive. Due to the often long "walk-in" times to get to the necessary planning locations, substantial time had to be allowed for, or limited field verification was done to stay "on budget."

Recent technological advances led to a rapid spread in airborne laser altimetry (LIDAR) mapping of the earth's surface. Just as in photogrammetry, forest canopies can intercept most of the laser pulses, but any stand in which sky can be seen from the ground will allow LIDAR penetration to the ground. Wherever the LIDAR pulse density can overcome canopy density, the resulting ground points can be interpolated into a topographic map.

The detail of the new LIDAR-generated maps can be seen in the computer-generated hill-shaded image (Figure 1). In addition to roads and streams, roadside ditches are clearly evident, as is a subtle earth slumping along the eastern edge. The minor mounds scattered across the area in the upper half of Figure 1 appear to correspond with stumps and slash piles. This new mapping shows considerable promise in a range of designs from skyline corridor profiles to road location and design activities.

Recent experiences with the use of LIDAR-generated maps as part of the University of Washington Forest Engineering (FE) Senior projects, in collaboration with Washington State Department of Natural Resources (DNR) has led to a significant shift in how to approach paper planning and subsequent field reconnaissance. As part of the planning for the Tahoma State Forest, the FE seniors developed LIDAR-based paper plans that were subsequently field verified. For a particular timber sale DNR had field-measured skyline profiles to assure

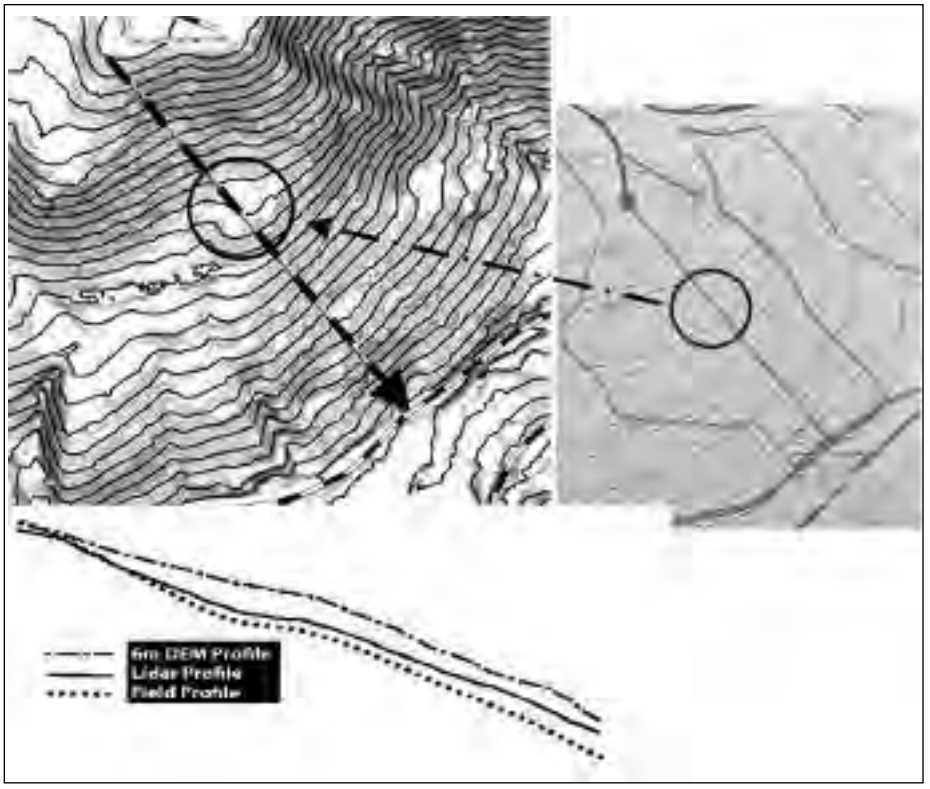


Figure 2. Shown are a LIDAR-generated contour map with a two-meter pixel size (left) and a photogrammetically-derived contour map (right, with a six-meter pixel size) showing a field-verified profile as well as profiles based on the DNR and LIDAR maps. The LIDAR map clearly identifies a bench (arrow) not shown by the DNR contour map. Also note the topographic detail of the LIDAR map elsewhere, which the DNR map does not display.

their technical feasibility. Field work took about a one-person-day given the difficulty of terrain, brush conditions, etc. The LIDAR maps provided a much more realistic assessment than the photogrammetically-derived map could (Figure 2). The LIDAR maps showed a much higher level of detail than the standard maps did. Not only that, but the LIDAR profile could be

generated in less than five minutes, compared to the one-person-day to generate the field profile. The time savings are obvious.

It is speculated that the LIDAR profile provides the best approximation of true ground conditions given the precision of the field instruments used (clinometers, hand compass and string box). Other researchers established high correlations between LIDAR-derived topography and true topography based on terrestrial mapping.

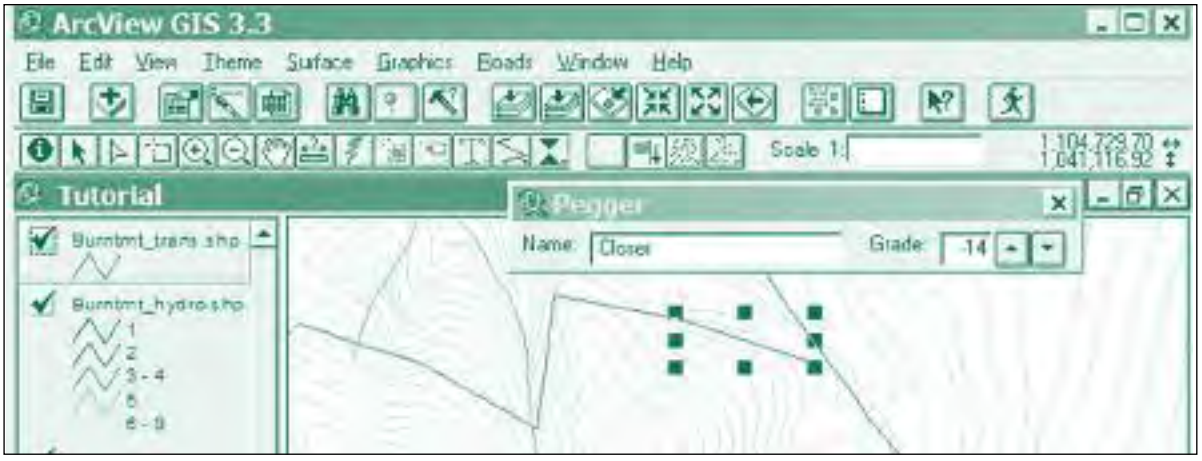


Figure 3. Locating a road with PEGGER. The tool allows for rapid road location on a digital map. LIDAR-derived maps now have such precision that map-located roads agree very well with subsequent field verification to the point that those map locations can almost be accepted as "field-verified." However, issues such as seepage and rock outcrops do not yet show up on these LIDAR maps, so some field verifications are still needed.

The nature of the map location (pegging) and grade-line location process is now beginning to change as well. Great emphasis can now be put on pegging roads on LIDAR-derived maps. A pegging tool that automates this process is available from the Rural Technology Initiative website (Figure 3, www.ruraltech.org/tools/pegger/). The pegged roads on digital LIDAR maps are the script, laid out in the office, and GPS units can be used to keep the road locators on track in the field ("following the script").

The purpose now is to "find the location on the ground" as predicted by the paper road location, rather than being guided by the simple field instruments such as cloth tape, hand compass and clinometers. Differences usually are due to the metrics used in the field for establishing grade lines. Those field instruments are far less sophisticated and less precise than the process of establishing a paper-map road from a LIDAR DEM (digital elevation model). The road location process is now moving from a field verification process to a "field tracking of map-derived (LIDAR DEMs) road locations," a basic change in road-location paradigm. Office-located roads can now be exported into RoadEng (a commercial forest road design package) for further evaluation of critical areas such as switchbacks or stream crossings (Figure 4).

LIDAR-derived maps with their high resolution also offer new ways to look at terrain features. Traditional maps utilize contour lines of varying equidistance, typically 20 feet for maps of

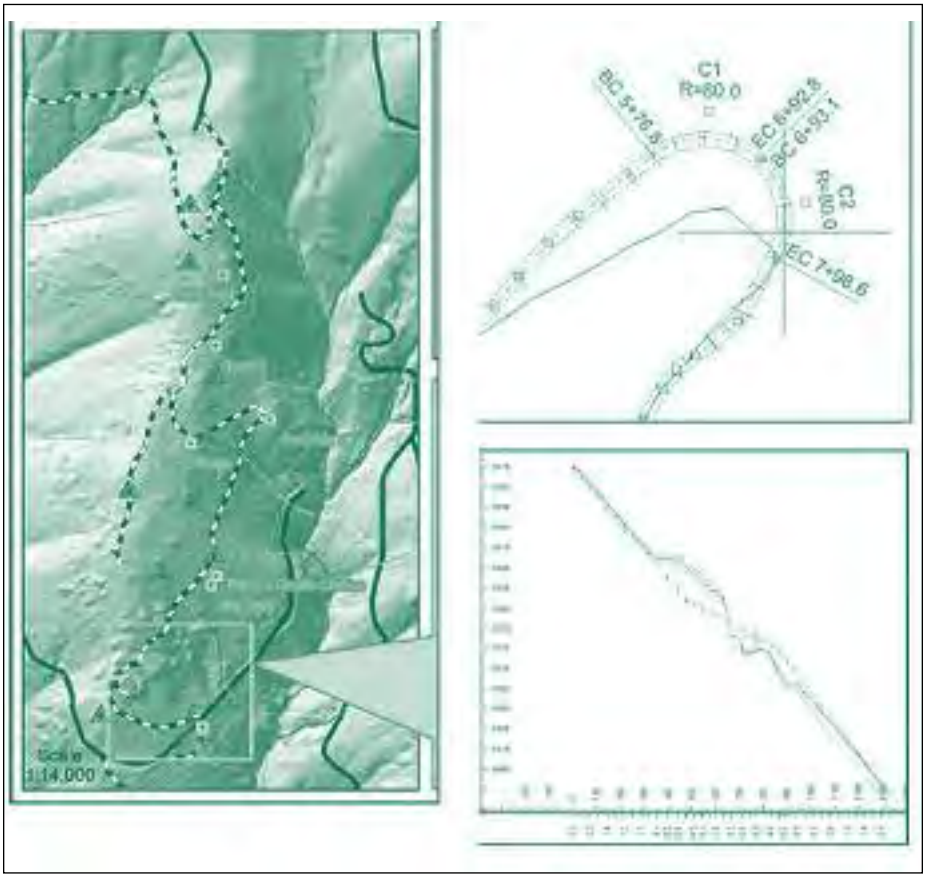


Figure 4. Road systems developed with PEGGER based on two-meter DEMs. On the left, the dashed line represents the pegged road. The circle with dot represent GPS location points collected in the field during the field reconnaissance phase. The triangles are proposed landings. The underlying DEM has a grid spacing of two meters. The enlarged area shows a plan and profile view of a critical switchback road location, initially pegged with PEGGER and further evaluated by exporting the data into RoadEng for additional evaluation, work all done in the office.

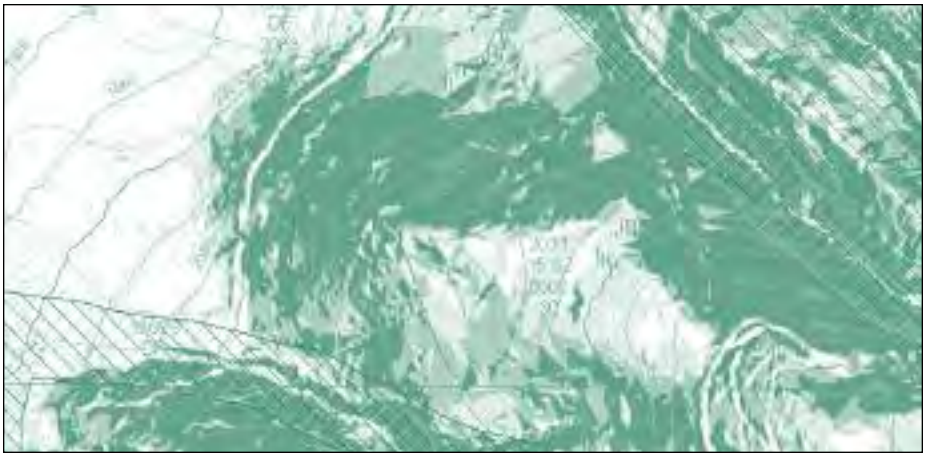


Figure 5. Slope class map derived from LIDAR DEM with two-meter grid spacing. Slope classes are in varying shades of green, the darker the steeper. Slope class depiction provides much more detail about critical terrain features than contour lines would. For example, small areas of gentle terrain (colored white or light green) within larger areas of steeper slope classes (dark green) are clearly shown. Note old skid trail locations in the lower right and roads in the left upper half.

1:4800 scale ratios. Students commented that the slope class maps provided a much better assessment of locating oneself in the field as well as finding critical topographic features such as benches, appropriate areas for switchback locations and more with LIDAR-derived maps than traditional contour maps could provide (Figure 5).

A question that still has to be answered conclusively is: Are road design data derived from LIDAR maps as reliable as road data customarily traversed in the field? Many have suggested that a LIDAR map cell size of between 1.0 and 3.0 meters is sufficient for operational route location. Extracting road design data from LIDAR maps appears feasible when considering that for forest roads, construction tolerances quite often are in the same range.

Cross section data collected from a traverse were compared with cross sections derived from LIDAR DEMs collected with typical forestry survey equipment (Figure 6). The traverse field data collected with staff compass and Laser Impulse instrument for distances and slopes were superimposed over the LIDAR DEM and the corresponding cross section extracted and compared with the cross section data collected in the field (Figure 6).

From experience, the author will accept the cross section data from LIDAR DEMs as comparable to field measurements where side shots are customarily collected with hand-held clinometers and cloth tape. In fact, it appears that LIDAR-derived cross section data are of equal if not better quality, and may provide more detail than typically recorded in the field.

It appears that we can indeed carry out a full road design based on LIDAR topography without going to the field. The issue now becomes one of being able to find and stake the coordinate value of the centerline on the ground. Currently, investigations are on-going to answer this question. Typical Global Positioning Systems (GPS) units have been unreliable, with an absolute error in the one- to five-meter range under dense canopy. So our gains of better topographic data are currently negated by our inability to accurately locate a map-derived point (coordinate) on the ground. We currently are testing some new technologies that hopefully will overcome this hurdle. ◆

Peter Schiess is a professor of Forest Engineering at the College of Forest Resources, University of Washington in Seattle. He can be reached at 206-543-1583 or schiess@u.washington.edu.

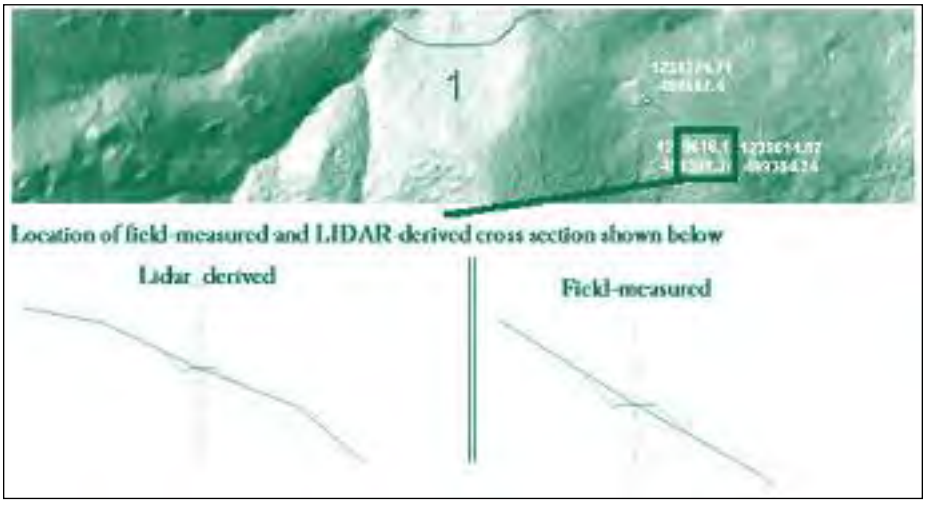


Figure 6. Road traverse superimposed on LIDAR DEM with cross section location shown. The small dots are GPS coordinates to geo-reference the field traverse. Both sets identify the slope break below the center-line stake. However, the field crew only took one "side shot" or measurement upslope from the traverse point. The LIDAR-derived cross section reveals a break above the traverse point.

Fledgling Student Council Takes Flight

BY JENNY WREN

In January of 2005 the first "Our Voice" column titled "Students Challenge SAF" was included in the *Western Forester*. Green River Community College (GRCC) student Jessyka Lemieux wrote the article and pointed out, "It is imperative to the future success of our organization that SAF demonstrate the value of continued membership and instill the belief in students that their continued support is a value to both their careers and the SAF." As a newly inducted member I thought it was very courageous of Jessyka to speak so bluntly. When asked to write an informational article concerning the inception of Student Executive Council (SEC), I found myself reflecting over the last three years and realizing how far we have come.

When Jessyka posed the challenge to SAF I had just started the GRCC Natural Resources program. I joined the student chapter and was immediately involved in an impassioned dialogue about the benefits of SAF membership and the role of students in the organization. This mentorship led to three years of active involvement in a variety of SAF activities ranging from our local student chapter to attending leadership conferences and national conventions.

By the 2006 National Convention in Pittsburgh I had gained numerous professional connections and friends, but the conversation about students that had been so engaging started losing steam. The National Student Assembly (NSA) was sparsely attended because of scheduling conflicts and, unfortunately, lack of interest. I talked to as many students as possible about the suggestions raised in the 2004 Volunteer Organizational Structure (VOS) Task Force report and possible creation of the SEC, and found a broad range of interest and awareness. Student chapters with an active relationship with other local chapters clearly understood these proposed actions.

PHOTOS COURTESY OF JENNY WREN

Jenny Wren scans the 2006 Potato Fire on the Sawtooth National Forest near Stanley, Idaho. At the time, she was working for a Type 2 Initial Attack Crew from Diamond Lake on the Umpqua National Forest.

I also sensed a mounting impatience among students from all over the United States who were challenging the SAF to acknowledge our relevance to the society. Ultimately, I left the convention convinced that enough students across the country wanted to be involved to make an impact. However, it was felt that the NSA was no longer a productive medium to speak through, due to either the lack of consistent, structured dialogue beyond the convention or via official liaison at the national level throughout the year. We needed an organized, collaborative national communications pathway that was mentored and supported well beyond our local chapters.

Shortly after the 2006 national convention, preliminary SEC operational guidelines as well as an application for the District 1 representative position (Washington State, Inland Empire and Alaska Societies) were circulated. I was very excited that the SAF was taking this groundbreaking step, so I applied for the position with the support of local folks such as Chuck Lorenz, Pam Phillips, Rob Sjogren and Dick Hopkins.

GRCC was also involved with the planning committee for the 2007 National Convention student activities with other Washington and Oregon schools. As GRCC Chapter chair I attended regular convention planning meetings over the course of the year. While serving on this committee, I learned of my appointment as SAF District 1 Representative to the SAF Student Executive Committee by the District 1 SAF Council Representative Kirk David. Other districts may have chosen their initial SEC members differently, but the intent was first to form the SEC, and then let the SEC decide

how it would select replacement members. Like most other SAF procedures, the goal is self governance subject to the approval of Council. The SEC is currently in the process of determining how future members will be chosen and will look to the students they represent for suggestions and approval.

The SEC held its first meeting at the National Convention in Portland with all 11 Districts attending. The student representatives were provided with an introductory charter that stated the general objective and tasks of the SEC council. Joe Roberson and Kirk David, from the Council Committee on Students, offered logistical guidance during the meeting, but strongly encouraged us to direct ourselves. It was a productive and engaging meeting considering we had all just met and had approximately two hours to produce results. We established a calendar term for the SEC representatives that coincides with SAF Council's term. Stephen Purvis from University of Georgia was elected chair of the SEC and Student Representative to SAF Council (SRC). Some of the duties of the SRC include addressing the NSA at conventions and informing SAF Council on issues and actions that have bearing on student members and interests. Jamie Jacobs from Colorado State University was elected chair-elect. It was obvious to me that each and every representative had something to contribute and was chosen with deliberation and high expectations.

The potential of the SEC can only be realized if students are diligent yet patient, as the SEC is a work-in-progress and presents many challenges. Our objective is "to enhance the engagement and active participation of student members in SAF issues and actions, by creating a structure for communication that recognizes the importance of student perspectives of SAF and forestry issues."

The SEC functions as Executive Committee of the NSA, responsible for planning and executing national convention student activities in coordination with the host school and National Convention Committee. The SEC also selects the SRC, solicits student issues for communication to Council via SRC, and serves to disseminate information from Council to student chapters within each District. SRC Stephen Purvis was introduced at the Council meeting in December. He will also attend the March, June and Convention meetings this year. The SEC will meet via phone conferences.

SAF members at various chapter, state, district and national levels should be recognized for bringing this new student council together. Organizing a national voice is a daunting task given the complex nature of the constantly revolving membership base of student chapters. Maintaining our momentum is crucial if the student base wants this fledgling council to earn a voting position.

The SEC brings a value to students beyond networking. Through direct involvement with SAF's influence on politics, policies, science and public outreach, the student will develop a strong relationship that remains intact during the transition from student to the forestry profession.

If I may also speak bluntly, it is my opinion that if the students and young professionals of today do not carry the legacy and stewardship of the SAF into the future, our industry and our forested landscapes will be drastically and irrevocably altered. SAF professionals have met Jessyka's challenge to act with vigor and it is now up to the students to respond accordingly. ◆

Jenny Wren, a student at Green River Community College in Auburn, Wash., is District 1 representative on the Student Executive Council. She welcomes questions and suggestions and can be reached at wrenbright@hotmail.com.

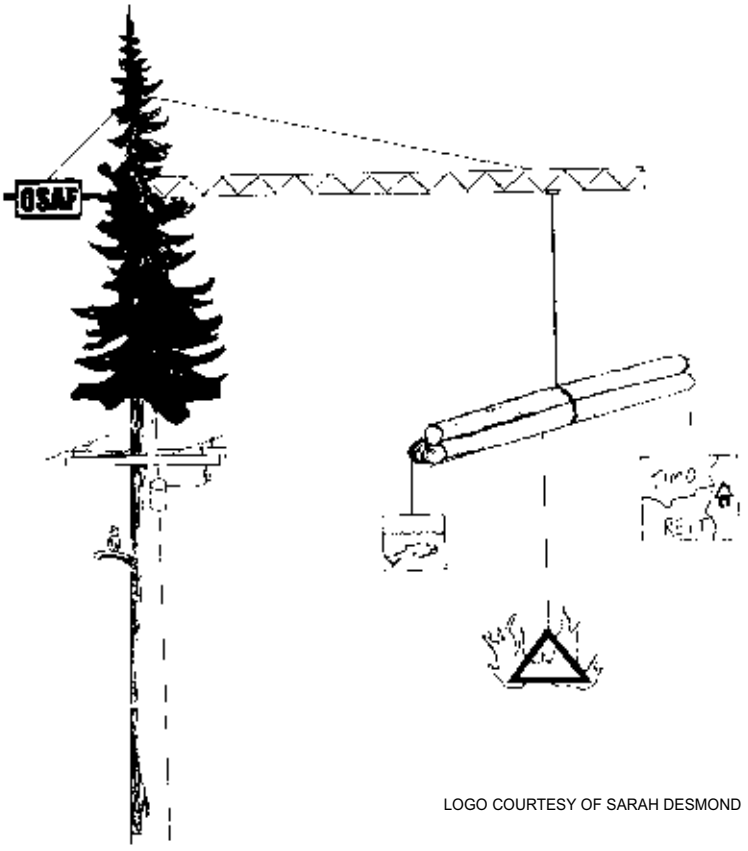
OSAF 2008 Annual Meeting: Building the Future with Oregon's Forests

BY SUE BOWERS

It's coming, and we hope you are too! The 2008 OSAF Annual Meeting is set to begin on Wednesday, May 7 at the Valley River Inn in Eugene. Hosted by the Emerald Chapter, this year's meeting will focus on emerging issues affecting Oregon's forests and the tools being used by foresters to address them.

Jim Brown, retired state forester and last year's recipient of the OSAF Lifetime Achievement Award, will be the keynote speaker, highlighting the Forestry Plan for Oregon in his opening address. The rest of Wednesday will feature speakers from industry, agencies and the conservation community discussing emerging land management issues. These include changing ownerships, land use laws, salmon recovery, collaboration efforts, and state and federal policies affecting Oregon's forests.

Following Alumni Breakfasts on Thursday, the morning program will cover fuel reduction, wildfire protection and prospects for developing a biomass energy plant. After the OSAF membership meeting (and lunch), OSU's Arne Skaugset will share preliminary results from the first entry affecting the paired watershed of the Hinkle Creek study. Other afternoon speakers will provide updates on and discuss tools in use to affect long-term soil productivity, practical use of LIDAR, and forest genetics and climate change. Thursday evening will bring the annual Awards Banquet, honoring the recipients of this year's OSAF awards. There will also be a special program by western story teller and author Rick Steber.



LOGO COURTESY OF SARAH DESMOND

Friday will begin with a pep-up breakfast, and then everyone will have their choice of three field tours (first-come, first-served, so don't be late with your registration). One will visit the McKenzie River watershed, the principal source of drinking water for the city of Eugene and also a key waterway for native fish populations and power generation. The tour will focus on protection of the water at its source and how water managers use it as it reaches them.

A second tour will take participants to the Lost Creek holdings of the Giustina family. From railroad remnants to state-of-the-art silviculture, this trip will provide the chance to see and touch the history of the timber industry in Oregon and learn how a family ownership has prospered through their love of the land.

The third tour will visit just some of the 42,875 acres burned by the Oxbow Fire of 1966 in the Smith River and Siuslaw watersheds southwest of Eugene. Foresters will review the past rehabilitation with a focus on current conditions and upcoming stand treatments for the fire area, which includes federal, state and private ownership.

Special tours are also planned for spouses/guests who accompany SAF members to Eugene. On Wednesday, they can visit three different museums in the area along with shopping at the 5th Street Public Market. After that tough day, they will be ready for Thursday's Grape Escape Wine Tour, with stops at three local wineries and an afternoon chocolate surprise.

As with all OSAF Annual Meetings, everyone will be asked to participate in efforts to benefit the Foresters' Fund. The fund's financial grants promote education to enhance public understanding of the role of professional foresters in forest resource management, conduct forest policy activities, and strengthen local societies to help fulfill the mission of SAF. OSAF chapters and representatives were recipients of three Foresters' Fund grants in 2006 for a variety of initiatives including an art project for a retrospective of forestry work, oral history work for preserving Oregon's forestry history, and field trips to educate the public on wildfire restoration efforts in the Cascade Mountains. Ted Reiss (treiss@senecasawmill.com) is the primary contact for gathering donations and coordinating the raffle and silent auction. You may also contact Tim Keith, the OSAF state Foresters' Fund coordinator, at tim.keith@state.or.us. Please help make this year's Foresters' Fund fundraising work successful.

If you haven't done so already, NOW is the time to send in your registration, as the early registration deadline is April 11. If you've already given your registration form to a non-SAF-member colleague, you can download another from the OSAF website at www.forestry.org/or/annual.php. If you have any questions about registration, call Tash Shaheed at 541-744-4677.

The 2008 OSAF Annual Meeting will be a great chance to share new and exciting information, catch up with old friends and meet OSAF members from all over the state. Please join us for a great program coming to Eugene in May! ◆

Sue Bowers is a member of the Emerald Chapter and the 2008 annual meeting committee. She can be reached at sbowers@centurytel.net.

Forests in Transition: Washington State SAF Annual Meeting

BY PETER HEIDE

Get these dates on your calendar. The Southwest Washington chapter is hosting the Washington State SAF annual meeting May 28, 29 and 30 at the Little Creek Casino and Resort south of Shelton. Just minutes from Olympia, you will be impressed with this new 120-room hotel and convention center. A hosted icebreaker will kick off the meeting on Wednesday evening. Exhibits and posters will be on display. Stay late to catch up with friends and enjoy the hors d'oeuvres or head for the casino to test your skills…and…uh…oh yes, luck.

You'll be able to sleep in a little on Thursday morning with the conference kicking into gear about 9:00 a.m. We are assembling a timely and forward-looking program based around the "Future of Washington's Forests" report. This 18-month effort was researched by the University of Washington and summarized for public distribution by the Department of Natural Resources. Our program will focus on both the opportunities and challenges that lie ahead for our profession. Friday is a day in the field. But, first we will start with a breakfast business meeting featuring updates on state and national society affairs.

The field tour is organized with small groups rotating among four or five stops near the conference center. There won't be any long bus rides and you will be able to get close up and personal with our hosts at each stop. We guarantee that you will see lots of trees on the tour, but don't be surprised if there are some new and different experiences along the way.

Saturday is the weekend and the Olympic Peninsula awaits with miles of beautiful shoreline, alpine meadows crowned with glaciers, rainforest valleys and historic communities for sightseeing, hiking and camping.

Watch your mailbox and www.forestry.org for registration information. Hotel reservations can be made by calling 1-800-667-7711. ◆

Peter Heide is general chair of the WSSAF annual meeting. He can be reached at 360-705-9287 or pheide@wfpa.org.

WSSAF Annual Meeting Contacts

Need more information about the WSSAF annual meeting? Contact the appropriate member of the annual meeting team:

General Chair: Peter Heide, pheide@wfpa.org, 360-705-9287

Program Committee: Adrian Miller, amiller@wfpa.org, and John Walkowiak, johnwa@dor.wa.gov

Exhibits: Wes Wasson, wsw@olynet.com, 360-249-3710

Poster Session: Connie Harrington, charrington@fs.fed.us, and Tom Terry, tateery45@comcast.net

Sponsorships: Mike Mosman, mmosman@portblakely.com, 360-596-9418

The Little Creek Casino and Resort south of Shelton will provide a great venue for this year's WSSAF annual meeting to be held May 28-30.

Our Voice

Our Voice is a column for students that will appear occasionally in the Western Forester. *The intent is to provide students with a venue to present their thoughts and views on a variety of topics related to forestry and SAF, and to provide a communications link where professional members can learn what is on the minds of students and our future leaders.*

Any Country that is Worth Defending is Worth Preserving

BY MICHAEL FARNUM

There's a new program in town, and it's bringing with it some incredible people—people with the core values of loyalty, honor, integrity and respect. Professionals will want to look closely at this program for two really good reasons. First, because they volunteer for work! And second, because many of these people are soon to be available for hire.

It's called the Veterans Conservation Corps and is the result of a conversation between two men, Washington State Senator Ken Jacobsen and Tom Schumacher of the Washington Department of Veterans Affairs. From that fortunate meeting, legislation was passed and the Veterans Conservation Corps (VCC) was created. The purpose of the VCC is to assist veterans by providing volunteer opportunities on projects that help restore Washington's rivers, streams, lakes, marine waters and open lands.

How does that help veterans? It helps in three ways: for starters there are the rehabilitation benefits to be gained from doing conservation work. Then there is networking with prospective employers like private consulting companies and city, county and federal agencies. And finally, it provides educational opportunities leading toward a degree in natural resources, water quality or GIS.

The rehabilitation benefits of restoration work, or "eco-therapy" as it's sometimes called, are very real. A prime example is the story of John Beal. John was a Vietnam vet who was given six months to live. He decided to spend his remaining days cleaning up Washington's Duwamish River, a last gift to the planet and something positive to leave for posterity. Twenty-six years later John finally passed away. The side effect of eco-therapy adding years to veteran's lives is the topic of leading edge research at state and federal levels. This research may lead to expansion of the VCC program to other colleges, cities and states.

As for the networking opportunities, the VCC conducts volunteer work on restoration projects throughout the Puget Sound area and are able to work directly with program managers at all levels. As a result, some of these managers are noticing the value veterans can bring with them. Values like a strong work ethic acquired from working long hours on long deployments. Another value is experience, everything from construction to communications and heavy equipment management to aircraft maintenance and more.

Finally and most important are the educational opportunities. This is where the Veterans Conservation Academy comes in. The purpose of this program within the VCC is to provide eligible veterans a monthly grant to participate in specialized training approved by the Washington Department of Veterans Affairs through Green River Community College. These are primarily natural resources programs and include fire, water quality, park management and GIS. Hands on or lecture, classroom or alpine forest, the vets are doing it all. And best of all, the flexibility built into the program allows vets to seek AAS or BS degrees or take their dream job at any point in between. ◆

About the Author

Michael Farnum, originally from Honolulu, Hawaii, and recently retired from the US Army, is working toward a BS in Natural Resources/GIS at Green River Community College. Michael's career goals are to work in research and analysis with GIS in forestry or wildlife management. He is a team leader with the Veterans Conservation Corps, treasurer of the Green River CC Society of American Foresters Student Chapter and the GIS Alliance treasurer. His military career fostered a passion for the outdoors. The VCC and GRCC are providing the tools needed to start a second career that will allow him work in the best office ever made—our forests. Michael can be reached at msfarnum7@hotmail.com.

About Green River Community College

The Natural Resources program at Green River Community College in Auburn, Wash., offers an Associate Pre-professional degree in Natural Resources and Associate of Applied Science degrees in Natural Resources (recognized by the Society of American Foresters), Natural Resources—Park Management, Natural Resources—Water Quality, Natural Resources—GIS, and Natural Resources—Wildland Fire. The program has a typical enrollment of around 50, offering small class sizes and personal instructor help to students.

For additional information, contact Dick Hopkins at 253-833-9111 x4509 or DHopkins@greenriver.edu.

Calendar of Events

International Wood Composite Symposium, March 31-April 2, Spokane, WA. Contact: Vikram Yadama, symposium.info@wsu.edu, 509-335-2262.

International Mountain Logging and 13th Pacific Skyline Symposium, April 1-6, Corvallis, OR. Contact: Heather Rangner, heather.rangner@oregonstate.edu, 541-737-6439.

Starker Lecture Series—Environmental Services from Plantations, April 3, Corvallis, OR. Contact: Nathalie Gitt, nathalie.gitt@oregonstate.edu.

Intermountain Logging Conference, April 10-12, Spokane, WA. Contact: Julie Schwanz, julie@intermoutainlogging.org, 208-245-3425.

Mechanized Harvesting, April 15-16, Richmond, BC. Contact: Forest Engineering Inc.

Professional Timber Cruising Seminar, April 16-17, Beaverton, OR. Contact: Atterbury Consultants.

Helicopter Logging, April 17, Richmond, BC. Contact: Forest Engineering Inc.

Starker Lecture Series—The Role of Plantations in Conserving Biodiversity, April 17, Corvallis, OR. Contact: Nathalie Gitt, nathalie.gitt@oregonstate.edu.

OSU Tree School West, April 25, Florence, OR. Contact: Steve Bowers, steve.bowers@oregonstate.edu.

Practical Application of New Technology for Foresters Seminar, April 29-30, Beaverton, OR. Contact: Atterbury Consultants.

Olympic Logging Conference, May 1-2, Victoria, BC. Contact: kay@hermannbros.com.

Oregon SAF Annual Meeting, May 7-9, Eugene, OR. Contact: Stephen Cafferata, cafferat@msn.com.

SuperACE06/FLIPS06 Seminar, May 13, Beaverton, OR. Contact: Atterbury Consultants.

Using ArcPad in Forestry, May 15, Beaverton, OR. Contact: Atterbury Consultants.

Washington State SAF Annual Meeting, May 28-30, Shelton, WA. Contact: Pete Heide, PHeide@wfpa.org, 360-705-9287.

Intertribal Timber Council Meeting, June 2-5, Pinetop, AZ. Contact: Joann Reynolds, itc1@teleport.com, 503-282-4296.

Forestry and Leadership Youth Summer Camp, June 22-28, Wilsonville, OR. Contact: Rick Zenn, rzenn@worldforestry.org, 503-488-2103.

OSU Tree School South, June 29, Roseburg, OR. Contact: Raini Rippy, raini.rippy@oregonstate.edu.

Association of Consulting Foresters National Meeting, June 29-July 2, Anchorage, AK. Contact: ACF, www.acf-foresters.org, 888-540-8733.

Advanced Insect and Disease Field Session, July 14-17, Klamath Falls, OR. Contact: WFCA.

Who Will Own the Forest?4, Sept. 8-10, Portland, OR. Contact: Sara Wu, swu@worldforestry.org, 503-488-2130.

Professional Timber Cruising Seminar, Oct. 15-16, Beaverton, OR. Contact: Atterbury Consultants.

National Tree Farmer Convention, Oct. 17-19, Portland, OR. Contact: American Tree Farm System, info@treefarmsystem.org, 202-463-2462.

Practical Application of New Technology Seminar, Oct. 22-23, Beaverton, OR. Contact: Atterbury Consultants.

SAF National Conference, Nov. 5-9, Reno, NV. Contact: Carlton Gleed, 866-897-8720 ext. 111, gleedc@safnet.org.

Contact Information

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WFCA: Western Forestry and Conservation Association, 4033 SW Canyon Rd., Portland, OR 97221, 503-226-4562, richard@westernforestry.org, www.westernforestry.org.

Send calendar items to the editor, *Western Forester*, 4033 SW Canyon Rd., Portland, OR 97221; fax 503-226-2515; rasor@safnwo.org. The deadline for the May/June 2008 issue is April 14.

High School Students Learn Skills at GRCC

The Green River Community College (GRCC) Student Chapter of the Society of American Foresters and Forestry Club sponsored a learning opportunity for natural resources students from Puyallup High School and Emerald Ridge High School at GRCC in December. Fifty high school students from four natural resources classes were taught map reading, pacing, compass work, measuring tree heights and diameters, forestry tool identification, and disease and insect identification by GRCC students and instructors.

PHOTOS COURTESY OF DICK HOPKINS

High school students get a taste of forestry.

The students worked in the outdoor classroom in the rain, as well as inside. Forestry Club and the GRCC Student Chapter of the Society of American Foresters also sponsored a Western Washington high school forestry contest on February 8 that drew teams from the Pacific Northwest. ◆

Multiple Resource Management is Focus of New Technical Report

Forests can serve society in numerous ways—by providing timber, habitat for fish and wildlife, and recreational opportunities, for example. Management of these multiple resources is a primary mission of the USDA Forest Service. In May 2007, the agency co-sponsored a biennial workshop in Ketchikan, Alaska, for silviculturists, forest practitioners and researchers designed to present and discuss new ideas in silviculture and forest management that produce multiple resource benefits.

The four-day National Silviculture Workshop is now captured in proceedings published by the Pacific Northwest Research Station. Titled, "Integrated Restoration of Forested Ecosystems to Achieve Multiresource Benefits," the publication contains a compilation of many of the silvicultural research and forest management papers and posters presented at the workshop.

"The proceedings papers in this report are examples of state-of-the-art research and application in different regions of the country," said Bob Deal, research silviculturist and technical editor of the publication. "These papers demonstrate the increasing importance of collaborative efforts and successful partnerships that promote active management to achieve multiple resource forestry management objectives."

An electronic copy of the publication is available online at www.fs.fed.us/pnw/publications/gtr733/. Printed copies can be requested by visiting www.fs.fed.us/pnw/publications.

The PNW Research Station is headquartered in Portland, Oregon. It has 11 laboratories and centers located in Alaska, Oregon, and Washington and about 500 employees. ◆

Letters

Dear Editor,

I very much enjoyed the September/October 2007 issue of the *Western Forester* on the subject of Environmental Education. Well done to you and the SAF foresters in the Northwest.

When I saw the item that was titled "Other Education Resources for Foresters" on page 5, I noted an omission. It wasn't your fault, but I saw an opportunity to tell your members about a new (three years old) series of national 4-H Forestry curriculum that is available. I was the national design team coordinator for this material (and I'm a professional forester) and think it is outstanding for use by foresters.

The curriculum is called "Forests of Fun" and it's available from the National 4-H Cooperative Curriculum System (4-HCCS). The narrative below describes the materials—developed by foresters FOR foresters to teach youngsters of all ages. These are relevant, meaty forestry activities and I recommend them to everyone in the Northwest.

I encourage you to go to the website (www.n4hcc.org) and explore these materials. Anyone can take one or two of the activities and teach valuable lessons about the world's forests. Look under "Products A to Z" then pick Forestry. To see the supporting website pick "Projects Online" then pick Forestry. The "Supporting Pages" for the activities in the curriculum books should be very interesting to foresters. The cost is low too!

I hope you will make this resource known to all your readers.

–Bob Daniels
SAF Council Rep Dist. 11

Forests of Fun Released

Each year nearly 480,000 youngsters in the U.S. enroll in 4-H projects that involve the study of trees and forests. Recently, a new set of national 4-H Forestry curriculum publications titled "Forests of Fun" has become available to them.

The Forests of Fun curriculum is the result of a two-year project developed by a national design team chaired by Bob Daniels, Extension professor in the Mississippi State University Department of Forestry. The new national curriculum is the first for 4-H Forestry since 1979. Foresters, educators, curriculum specialists, county Extension agents and volunteer leaders from around the country collaborated to create the new curriculum.

The new Forests of Fun curriculum enables youth to gain a life-long appreciation of forests as sources of multiple benefits for society. These publications and the supporting website provide research-based information and activities to guide volunteer leaders and stimulate youngster's natural interest in forests.

The Forests of Fun activity guides incorporate the experiential learning model and focus on developing youth life skills while imparting knowledge of forests. The curriculum was subjected to national pilot testing and passed by a national jury before release.

The three youth activity guides, titled Follow the Path–Level 1, Reach For the Canopy–Level 2, and Explore The Deep Woods–Level 3, the Helper's Guide and the supporting website feature educational activities that focus on individual trees, forests, urban forests, forests around the world, forestry careers and management of forest resources. The educational materials help youth encounter trees and forests in a way that makes forest attributes personal to them. Youth can select the activities they wish to do and track their own progress toward completion of the certificate contained in the guides. A website (www.n4hccs.org) provides additional forestry information to support the activities and more contacts for youth that wish to investigate the wider world of forestry. It is an excellent way for young people to contact the organizations and people that comprise the forestry sector in the United States.

The curriculum is available from the 4-H Cooperative Curriculum System through its website at www.n4hccs.org or from your state 4-H office at your land-grant university.

The 4-H Cooperative Curriculum System, United States Forest Service and the Hardwood Forest Foundation funded the curriculum project. ◆

Letters to the Editor

Western Forester welcomes letters to the editor. Priority will be given to letters no longer than 250 words and referring to ideas presented in prior issues of *Western Forester.* All letters are subject to editing. Letters may be faxed to 503-226-2515 or sent via email to rasor@safnwo.org. Please include full name, address and phone number.

Policy Scoreboard

Editor's Note: To keep SAF members informed of state society policy activities, Policy Scoreboard is a regular feature in the Western Forester. *The intent is to provide a brief explanation of the policy activity—you are encouraged to follow up with the listed contact person for detailed information.*

Idaho Roadless Rule. The U.S. Forest Service in December 2007 proposed adopting the Idaho Roadless Rule developed under the leadership of Gov. James Risch. As part of the rulemaking process the agency is soliciting public comments through early April. The proposal would partition the 9.3 million acres of national forest roadless areas within the state into five different categories, including 609,500 acres to general use. The proposal is more restrictive than designations made in current NFMA plans, but less so than the otherwise controlling 2001 roadless rule promulgated at President Clinton's direction. Several public hearings have been held, with most people speaking against the proposal. At this writing the SAF chapters in Idaho are deliberating the adoption of a draft position statement supporting the proposal. For more information see http://roadless.fs.fed.us/idaho.shtml. Contact: Jay O'Laughlin, IESAF policy chair, 208-885-5776, jayo@uidaho.edu.

Idaho Ranch, Farm and Forest Protection Act. A proposal to offer $3 million per year in state income tax credits for qualifying conservation easements was introduced on February 6 in the Idaho legislature, with basically the same features as a bill introduced last year that did not receive a hearing. In December 2007 the Inland Empire and Intermountain Societies adopted a joint position statement addressing the potential for conservation easements to help keep working forests working, but did not offer specific support for or against this bill. The position statement can be accessed from the Policy section at www.iesaf.org. Contact: Jay O'Laughlin, IESAF policy chair, 208-885-5776, jayo@uidaho.edu.

Forestry Day at the Idaho Legislature. On January 10, the Inland Empire and Intermountain Societies joined forces to present the 11th annual forestry information session for policymakers during a Forestry Day at the Legislature luncheon. The SAF was one of six groups sponsoring the event. This year's turnout was the best ever, partly due to careful scheduling to avoid conflicts, and partly because the featured topic was something on the legislative agenda—the Idaho Ranch, Farm and Forest Protection Act mentioned above. Contact: Jay O'Laughlin, IESAF policy chair, 208-885-5776, jayo@uidaho.edu.

OSAF Tracking Legislative Proposals on Federal Forest Management. Earlier this year Rep. Peter DeFazio's (D-OR) office released a draft bill (available at www.defazio.house.gov/index.php?option=com_content&task=view&id=357&Itemid=) that would significantly affect the management of both USFS and BLM forestlands in the region, and Sen. Ron Wyden (D-OR) has publicly discussed similar legislative proposals. Both legislators are targeting the issues of forest health and wildfire hazards, as well as old-growth forests on federal lands. The scope of these issues and legislative proposals are substantial, and thus both OSAF and national SAF leaders are tracking their development and also asked some members to review and comment on the proposals. Contact: Paul Adams, OSAF Policy Chair, 541-737-2946; paul.adams@oregonstate.edu.

OSAF Landslides on Forest Lands Position Extended, Others Now Under Revision. In January 2008 the OSAF Executive Committee approved a one-year extension of the position statement on "Landslides on Forest Lands," which had expired in December 2007. The extension considered the recent news media spotlight on some major landslides, which have raised questions about possible links to forestry activities. The OSAF Policy Committee plans to draft a new position later this year that will address both landslide and other steepland or wildland-urban interface issues, but the landslide position will remain useful until this new position is adopted.

Several OSAF position statements will expire in 2008, and the Policy Committee has been working on some revisions, with the goal of executive committee approval of the revised positions before the expiration dates. The positions are "Salvage Harvesting," "Clearcutting," "Using Pesticides on Forest Lands," and "Active Management to Achieve and Maintain Healthy Forests." OSAF members are encouraged to take a look at both current positions and the draft revisions and send comments to local chapter officers or the Policy Committee. All OSAF position statements are online at www.forestry.org and draft revisions have been posted in the "members only" section. Contact: Paul Adams, OSAF Policy Chair, 541-737-2946; paul.adams@oregonstate.edu.

CORRECTION

The photo caption on page 18 of the January/February issue of the *Western Forester* identified the women's log birling champ as Lesa Hollen. Teri Anderson was actually pictured and was the birling champ, although Lesa won the overall women's champion (most total points across events). The photo was taken by Lesa Hollen. We apologize for the confusion.

OSAF Comments on BLM Western Oregon Plan Revision DEIS. The OSAF Policy Committee reviewed the BLM Western Oregon Plan Revision (WOPR) Draft EIS (DEIS) and developed comments for the OSAF Executive Committee to submit to the BLM. The WOPR covers about 2.6 million acres of BLM land, most under a mandate (O&C Act) for economic benefits to local communities. The BLM's preferred alternative (No. 2) would substantially increase timber harvesting over the 1990s levels of the federal Northwest Forest Plan (NWFP). The NWFP was a relatively risk-adverse approach to timber harvest activities, a feature that expanded in its actual implementation. In the DEIS the BLM proposes a greater balance between its economic and environmental mandates. OSAF's comments on the DEIS drew from concepts found in several relevant OSAF position statements, including "Commercial Timber Harvest on Public Lands" and "Active Management to Achieve and Maintain Healthy Forests." Contact: Paul Adams, OSAF Policy Chair, 541-737-2946; paul.adams@oregonstate.edu.

Landslides in the news. The flooding in the upper Chehalis Valley from the storms in December and the landsides that occurred at the same time on timberland managed by an industrial landowner has contributed to a controversy about how human management may influence the impacts of storms. Photos of landslides and harvest units in the Stillman Creek drainage have been the center of attention. The State Senate Natural Resources, Ocean and Recreation Committee held a hearing on January 10 titled "The relationship between forest practices, flood events and climate change."

Reporting by mainstream media has continued on this controversy and opinions about the connections between logging and landsides have been published in several of the state's major newspapers. It has been reported that in the area of the slides 20 inches of rain fell and that the storm had a magnitude of a 500-year recurrence interval event. Some environmental activists have called for the state Forest Practices Board to review the state's forest practice rules governing logging on steep slopes. Industry representatives have said that facts need to be collected and reviewed before making judgments on what affected the floods and landslides. At press time, the Forest Practices Board was scheduled to discuss the storm, timber harvest on unstable landforms and the Stillman Creek landsides at its February 13 meeting. Contact: Doug St. John, 425-452-5702, dougstjohn@greencrow.com. ◆

We Remember

Troy Moore

Troy Moore passed August 19, 2007. He held a variety of jobs during his long forestry career, including field forester for Publishers Paper in Oregon, forester for ITT Rainer in Washington and county forester for Clackamas County. He was the first forester Clackamas County hired after an advisory committee reviewed timber theft problems from county lands and recommended to the Board of County Commissioners that they hire a professional manager. During his tenure, which began in 1983 and lasted until his retirement in 1999, a forest management plan was developed to manage 4,000 acres of county-owned forestland to produce revenue from timber sales as well as park land for use by the public. He was active in his church and the Society of American Foresters.

Sonny O'Neal

Sonny J. O'Neal, who served 16 years as supervisor of the Wenatchee, then Okanogan-Wenatchee National Forest, passed away December 2 in Wenatchee, Wash., from a long-term illness.

O'Neal, 69, embraced a 40-year Forest Service career in National Forest management after spending his boyhood fishing and hunting in the woods of rural Arkansas.

"Sonny O'Neal was a remarkable leader and a fine human being," said Becki Lockett Heath, current supervisor of the Okanogan-Wenatchee Forest. "Sonny was a humble man, a caring mentor, who brought out the best in people around him," she said. "He was visionary, always seeking new approaches to managing the forest. He was always conscious of the public trust placed in him as a federal employee who cared for national forestland."

The most difficult event in O'Neal's career was the Thirtymile Fire, which killed four young firefighters in the Chewuch River Drainage north of Winthrop, Wash., in 2001. He consoled grieving families and firefighters, calmed a devastated work force, and devoted much of his remaining career to better understanding the tragedy and seeking safer approaches to firefighting.

O'Neal began his Forest Service career as a junior forester in 1963, and had served on national forests in Utah, Idaho, Wyoming and Washington. He was forest supervisor of the Bridger-Teton National Forest in Wyoming before moving to the Wenatchee National Forest in 1987.

Bill Hallin

Umpqua SAF Golden Member Bill Hallin passed away on December 27, 2007. He was a member of SAF for 76 years. Bill's forestry career began in 1929 as a research forester with the U.S. Forest Service. He wrote technical bulletins for the Forest Service and was a published author, including the 1936 *Journal of Forestry* article, "Saving Reserve and Seed Trees from Redwood Slash Fires." Bill retired in 1967 after a 38-year career.

Bill's 76 years of SAF membership are a testament to his outstanding dedication to the forestry profession and the long-term vision for which foresters are famous. The Umpqua Chapter sent Bill a recognition letter in 2007, expressing appreciation for his long-term membership. ◆

"Practical Application of New Technology for Foresters" Seminar: April 29-30, 2008

This seminar is designed for Foresters and Timber Cruisers who want to learn how to utilize the latest technology to make their jobs easier and more rewarding. Products and topics covered include:

- Navigate and Map w/ ArcPad®
- Find plots the EASY way
- Learn how to make a $75 GPS work like a $4000 model
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- Use color 1 m. Imagery w/ Pocket PCs

Call Jon Aschenbach at 503-646-5393 for more information.

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"Using ArcPad in Forestry" Seminar: May 15, 2008

This seminar is designed for Foresters, Managers and Timber Cruisers who want to learn how to use ArcPad® software on Pocket PCs and desktops. Topics include:

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- Run ArcPad® and a GPS unit with no connecting cables (using Bluetooth)
- Free demo copy of ArcPad®
- Only $295.00 per person

Call Jon Aschenbach at 503-646-5393 for more information.

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Western Forester
4033 S.W. Canyon Road
Portland, Oregon 97221

Non-Profit Org.
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