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Presidential Priorities

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This Field Tech review looks at the latest in Haglöf's line of hypsometers, the Vertex Laser Geo, which can make both laser and ultrasound measurements. Ultrasound lets you measure distances by positioning an ultrasound transponder at one point and the Vertex at another point. The Vertex Laser Geo gives you four options for measuring tree heights and gets high marks for its accuracy and versatility. **Page 12.**

The Beauty of Stratification

Dr. DBH, also known as Steve Fairweather, explains stratification, one of the most powerful and easiest to apply tools for making sampling more efficient. "There are a few formulas to learn along the way, but they are not difficult, and the boost in information gained for a given cost over a nonstratified sampling approach can be significant." **Page 15.**

Hagenstein Lectures, Western Edition

A report on the second annual western edition of the Hagenstein Lectures, held at the World Forestry Center in Portland, Oregon, on October 15. The theme of the annual event is Emerging Voices in Forestry, and most of the speakers are under the age of 45 and are "leaders working at the forefront of social, economic, and environmental change." **Page 16.**

Grants for SAF Projects

In 2017, 17 SAF units received a combined \$41,700 in funding from the SAF Foresters' Fund to support local projects that promote education to enhance public understanding of forestry and the profession, support forest-policy activities, and generally strengthen local units to achieve the mission of SAF. **Page 18.**

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SAF Convention 2017: Managing Forests in a Changing World

By Steve Wilent

It is impossible to adequately cover an SAF National Convention in a few pages in *The Forestry Source*. A conclave with so many interesting speakers, scientific and technical sessions, technical tours, panel discussions on policy, and other events cannot be easily summarized. This article offers a look at the perspectives on forest management of the three Plenary 1 speakers, which represent the breadth of Southwest history: Native Americans, who have lived in the region for millennia; the descendents of Spanish settlers, whose families have lived in New Mexico for centuries; and more recent immigrants from the United States. Elsewhere in this edition, look for photo essays from three of the technical field tours: Restoration of Interior West Frequent-Fire Forests, Rio Grande Bosque Ecology, and the Jemez Mountains Forest Restoration Project (pages 6 through 8). On page 10, you'll find Andrea Watts' report on the Town Hall, during which SAF's leaders gave presentations on the state of our organization and goals for its future. And a brief summary of US Forest Service Chief



"Sure, let's talk about fire a little bit, but let's focus on water. If the state doesn't have water, we don't have development, we don't have businesses, we don't have schools, playgrounds—the whole works," said Kim Kostelnik, a natural-resource consultant and technical assistance provider for the New Mexico Forest Industry Association. Photo by Josh Zytkeiwicz, Focal Flame Photography, www.focalflame.com.

Tony Tooke's talk at the annual Breakfast with the Chief is on page 11.

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An Insurance Policy for a Rhode Island Watershed: Boosting Forest Health and Resilience

By Andrea Watts

As a forester managing 13,000 acres of public woodlands surrounding Providence Water's Scituate Reservoir in Rhode Island, SAF member Christopher Riely faced a common dilemma: How should he address regeneration failure? Ten years earlier, a salvage harvest of dead and dying oak was conducted, with the goal of promoting young native pines in the oak-dominated forest in a section of the watershed called Tunk Hill. The rocky, well-drained soil made it a poor growing site, and the three Ds—defoliation, drought, and deer—had resulted in a loss of both seedlings and the remaining overstory trees. This combination created a stand that he described as "what more of the forest could look like if there is a storm or hurricane."

In 2015, Riely designed an experimental project that called for planting more than 1,000 conifers and hardwoods, and to complement Providence Water's managed deer hunt and deer impact monitoring efforts, used a pre-existing deer enclosure fence on one site to determine whether seedlings would grow better within the enclosure. What set this plan apart from the previous silvicultural



Students from Jorge Alvarez High School, in Providence, Rhode Island, planted seedlings around Providence Water's Scituate Reservoir. Photograph courtesy of Christopher Riely.

prescriptions he had developed was consideration of not only the desired future structure of the stand, but also the future climate in which this stand would be growing.

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COMMENTARY

A Failure of Imagination: Why We Need a Commission to Take Action on Wildfire

By Dale N. Bosworth and Jerry T. Williams

It's not the way we fight wildfires in the West that's the problem. The problem is the way we manage our fire-dependent forests.

Since 2000, 154 wildfires in the region have cost more than \$20 million each to control. Many of them cost several times more than that. Together, these costliest fires, which were less than one-tenth of one percent of all western wildfires in the period, cost more than \$9 billion to fight. If you

COMMENTARY ■ Page 3

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Society of American Foresters

The mission of the Society of American Foresters is to advance the science, education, technology, and practice of forestry; to enhance the competency of its members; to establish standards of professional excellence; and to use the knowledge, skills, and conservation ethic of the profession to ensure the continued health and use of forest ecosystems and the present and future availability of forest resources to benefit society.

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A Conversation with New SAF President Dave Lewis

By Steve Wilent

Dave Lewis became SAF's president as of January 1, succeeding Fred Cabbage. Lewis is vice-president/principal at Southern Forestry Consultants Inc., of Monticello, Florida. I asked him to talk about his vision for SAF in 2018 and beyond.

Dave, what are your top priorities for 2018 as president?

This one's easy. I'll be focusing on the areas where I said I would when I ran for vice-president. I want to try to deliver on the promises made in my "vision statement" to work on two areas I identified as my primary concern—declining membership and the erosion of the professional status of forestry.

Regarding membership, SAF's numbers have actually leveled off the past few years after years of decline. But our demographics are a bit ominous—lots of "old-growth" and not enough "regen." Our laser focus should be on young foresters, so we are re-engaging the SAF task force on students and young professionals to listen and act on the recommendations they made some time back.

Foresters are not held in as high esteem as other professionals such as engineers, lawyers, or accountants, but they should be. The path to a forestry or natural-resources degree is pretty steep, but we sell ourselves short to the rest of the world. We need to ingrain credentialing into the profession, set the bar high, and hold ourselves out to be the professionals that we are.

Other areas that I promised members to work on are (1) rebuilding our leadership base, (2) using cost-benefit analyses to make better decisions, (3) increasing communications and transparency to members, (4) expanding non-dues revenue sources, and (5) increasing tangible benefits to members. We have failed to invest in our leadership base in recent years and that has taken its toll. So, we are putting together a team of SAF members and funding to work with staff to work on building a network of regional leadership academies that may ultimately lead to resurrecting the National Leadership Academy. We have made a ton of progress this year on the first two items through the collective efforts of the staff and the Board. To address non-dues revenue, the Board has established a Revenue Development Committee, chaired by Wayne Bell, that will be working hard to find alternate revenue sources.

How can we increase tangible benefits to members?

That's a tough one, but we will start by working to re-vitalize our chapters and state societies, because members tell us that is where they find much of the value in SAF, and then work to "build a bigger stick pile" for members.

What qualities must SAF's next CEO have?

I would start with the two things I look for in any new employee—honesty and a strong work ethic. I believe those are two traits that a person either has or doesn't have once they get become an adult. I would follow that with leadership skills. A good leader creates followers and consensus, and can advance his or her agenda because people trust and believe in them. Good people skills are essential for the job. We also need a CEO who has a forestry/natural-resources background and who knows and understands forestry, and that will be a requirement. Forestry is a passionate profession that requires a leader who understands and can harness that passion. The CEO also needs management skills, some technology skills, an understanding of finances, the ability to fundraise, and an ability and willingness to summon the power of the membership.

It is a tough job that requires an extensive and diverse skill set—you must be a lot of things to a lot of people. But I think it is a job that will be very attractive to someone who enjoys a challenge and has a passion for forestry. We are very fortunate to have two people filling in as interim co-CEOs who the Board has a lot of trust and confidence in. Louise Murgia and John Barnwell are doing a very good job of standing in while we begin the search for a permanent CEO.

Can you give us a snapshot of SAF's financial situation?

Our financial picture has improved in 2017, thanks to the leadership of President Fred Cabbage, Finance Committee chair Rick Standiford, and CFO David Seabrook. They have done a great job of finding ways to save money and cut costs, while making the process far more transparent. Now members can find all our financial statements in the "Members Only" section of the SAF website. I will add that we also had a clean audit for 2016.

Although improved and more transparent, our financial situation is still serious and will require a lot of work and some tough choices as we work to "right size" the organization. The Finance Committee and staff have been turning over every rock to see where we can save money. A great example of this is the publishing contract with Oxford [University Press], shepherded by [publications director] Jennifer Kuhn, that brought us a \$300,000 signing bonus this year and will save us about \$100,000 each year on publishing costs. We have also changed banks and are changing investment advisers to save money and get better returns. Also, as I mentioned before, a big piece of the financial puzzle will be developing new non-dues revenue sources.

There has been a lot of concern over the fate of the land sale proceeds, and the Board listened to those concerns, passing a new General Fund Policy in August. That policy set a maximum annual draw from the investment funds of 3.5 percent



of the average balance of our total net assets over the previous three years for use as operating funds. A two-thirds majority of the Board is now required to exceed that limit. The policy also set a floor that the fund cannot drop below, and that floor adjusts upward every year by 2 percent to account for inflation. Right now, we need that 3.5 percent draw to balance our budget, but if we can develop other revenue streams, the time will come when that won't be necessary.

We also must decide the fate of the Pinchot Building headquarters. A diverse task force under the outstanding leadership of [Board member] Si Balch worked on that issue all of 2017. The Board has recently decided to stay in the DC metro area for the foreseeable future, and a final

LEWIS ■ Page 21

McNulty Elected SAF Vice-President

John W. McNulty, president and CEO of Seven Islands Land Co., of Bangor, Maine, was elected 2018 SAF vice-president in balloting in October. He will serve SAF as president in 2019.

Four members were also elected to serve three-year terms on the SAF Board of Directors: Thomas M. Hanson, CF, District 1; Beverly Yelczyn, District 4; David P. Gwaze, District 7; and Richard W. (Dick) Brinker, District 10. The president, vice-president, immediate past-president, and 11 elected members (one from each voting district) serve on the board. For a directory of the current Board, see tinyurl.com/ycdqzo82.

COMMENTARY

■ From Page 1

factor in property losses, natural-resource damage, and environmental impacts, the true costs skyrocket, but these are rarely measured or accounted for. What can't be ignored is that these unprecedented wildfires tell us we need a much better land-management strategy.

In the aftermath of 9/11, the federal government established a commission to recommend ways to prevent future terror attacks. Among other findings, the commission's report faulted leaders for a "failure of imagination," citing a system hamstrung by convention.

Americans face a similar predicament with the West's wildfires. Nearly every summer, the wildfire season exceeds our imaginations, as each "worst-ever" disaster soon eclipses its predecessor. In the past 20 years, most of the 11 western states have suffered their worst wildfires on record—several states have done so more than once. At a time when firefighting budgets have never been higher, the West is experiencing its worst wildfires since it first organized for fire protection more than a century ago. If the aim is to protect life and property and minimize natural-resource damage—and to do so at the lowest possible cost, without compromising firefighter safety—then we are headed down the wrong trail.

More imaginative approaches need to be explored. Protection of human communities ultimately matters most, but sometimes firefighters are simply unable to save homes. Despite state-of-the-art gear, training, determination, and other resources, firefighters are rarely able to control the worst wildfires until they get some relief in the weather or a break in the fuels. Neither can managers deal with the compounding effects of climate change, deteriorating forest conditions, and uncontrolled residential development at the wildland-urban interface. The West remains tethered to an unworkable protection strategy that is stalled at a dangerous impasse, while costs, losses, damages, and deaths all keep mounting.

Imagine a credible commission tasked with investigating the West's wildfire problem. Its members would examine the full range of contributing factors. They would probably conclude that the West's wildfire problem is much more than a firefighting challenge—that it is, fundamentally, a failure to manage fire-dependent forest ecosystems at appropriate intensities, intervals, and scales. They would find



Dale Bosworth



Jerry Williams

that many of today's worst wildfire disasters are, ironically, occurring in drastically altered forests that tolerated fire better and burned much less severely 100 years ago.

A century of fire suppression and take-the-best-and-leave-the-rest logging has brought the situation to this place. But in confounding ways, contemporary budgeting practices, regulatory controls, land-management plans, and market forces are often at cross purposes with the most effective means to protect the West's fire-prone forests. Here's why:

- Budget appropriations provide almost unlimited funding for wildfire control but starve budgets for wildfire mitigation.
- On national forests, managers are required by law to meet certain regulatory standards for proposed actions aimed at reducing wildfire risks. Yet in the absence of these actions, wildfire impacts that are often far worse are exempt from any analysis of their effects.
- Depending on the way fire-prone landscapes are managed, wildfire risks can become high, but national forest plans don't require that these risks be identified or considered before plans are implemented.
- In most places, thinning the forest understory needs to precede prescribed burning. Yet few markets exist for small-diameter trees and deadfall, even when the true cost of wildfires could easily justify subsidizing their removal. More of these markets need to be developed and encouraged. As this woody material continues to accumulate, wildfire risks only grow, and the business of firefighting becomes ever more lucrative.

In her book, *The March of Folly*, historian Barbara Tuchman observed that governments often remain stubbornly addicted to a counterproductive course of action. They pursue the unworkable, she said, sacrificing the possible.

Everyone knows that the West's wildfire problem is getting worse, but we have been slow to confront this reality. Unable to envision future threats and explore solutions across the full range of contributory factors, we cling to an untenable position. Bound to convention, we are left to suffer the next unimaginable disaster.

It is time for a commission on wildfire. **FS**

Dale N. Bosworth, an SAF member, is a retired former chief of the US Forest Service. Jerry T. Williams is a retired former national director of fire and aviation management for the US Forest Service.

This essay was originally published in High Country News on November 30, 2017 (tinyurl.com/ycg87wn5). It appears here with the kind permission of the publisher and the authors.



A member of a burned area emergency response (BAER) team surveys the Uno Peak Fire area, one of several wildfires that burned more than 230,000 acres on the Okanogan-Wenatchee National Forest in Washington in 2017. In October, the agency warned downstream residents to be alert for flash flooding. Photo: 2017 Central Washington BAER Team, inciweb.nwccg.gov/incident/5633/.



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John Waconda, a native New Mexican and local Native American tribal member, led off Plenary 1, which focused on the history, ecology, and management of Southwest forests and the prominent role they continue to play in protecting and providing water, cultural resources, livelihoods, and recreational and spiritual opportunities.

Waconda has more than 25 years of public service in the resource management field. After serving as a wildland firefighter, Waconda earned a master's degree in forest management from Colorado State University. His career includes more than 20 years in the Bureau of Indian Affairs as a forester and line officer serving tribes in New Mexico and southwest Colorado. He is currently the restoration partnership coordinator for the US Forest Service in the southwestern region. He focuses on regional forest-restoration partnerships that span 11 national forests. He said he is proud to be a forester.

Born and raised about 20 miles south of Albuquerque in the Rio Grande valley, in the Pueblo of Isleta, Waconda mentioned that his grandfather, Miguel Trujillo, a veteran of World War II, wanted to vote in the state election, but the New Mexico Constitution prohibited Native Americans from voting. Trujillo challenged this provision of the state constitution, and in 1948 a federal court in Santa Fe overturned that prohibition.

Waconda went on to speak about his people's heritage and the values they place on the region's natural resources, as well as his "drive to sustain those forest resources and all other natural resources for us—our community, society, and future generations" of his people and all New Mexicans. Forests and other natural resources are deeply ingrained in the lives and culture of the people of the Isleta Pueblo, who have lived in the region for centuries and are federally recognized as a Native American tribe.

"Nature is our religion," he said. "The wilderness, the environment—the protection of that is very important, because without it we would no longer exist. Water, wildlife, crops, forests, streams, rivers, snowfall [are] whole or part of our songs, our traditions, our prayers. We give thanks to them for being able to have that, to be able to live among that. [Nature] does not dominate us; we adapt to it. We live our lives within it, and without it we would no longer exist as a people.... The significance of the forest, its plants, its food, its water—this is the basis of the substance of our people."

Spanish Roots

Jose Varela-Lopez, the second speaker, has served as executive director of the New Mexico Forest Industry Association for the past six years and is president of the Greater Rio Grande Watershed Alliance. He has served in many capacities with natural-resources organizations, including as past chair of the Soil and Water Conservation Commission and the Santa Fe-Pojoaque Soil and Water Conservation District.

Varela-Lopez is a native of La Cieneguilla, near Santa Fe, New Mexico. His ancestors, who left Spain in the late 1400s



John Waconda, a forester and Pueblo of Isleta tribal member, spoke about his people's heritage and the values they place on the Southwest's natural resources. Photo by Josh Zytkeiwicz, Focal Flame Photography, www.focalflame.com.

"In the arid Southwest, intact, functioning watersheds are literally the lifeblood of prosperous communities. A lack of appropriate management of our renewable natural resources leads to their demise."—Jose Varela-Lopez, executive director of the New Mexico Forest Industry Association

for Mexico, eventually moved north and settled in La Cieneguilla more than 400 years ago. He is the 14th generation to live on the family ranch, a Spanish land grant. Land grants were made to individuals and communities during the Spanish (1598–1821) and Mexican (1821–1846) periods of New Mexico's history (see tinyurl.com/ycxc8q49).

"Over the centuries, many millions of acres were granted to these families to provide for their daily sustenance," said Varela-Lopez. "Crops were planted and irrigated through the use of *acequias*, or hand-dug irrigation ditches that siphon water from upstream via gravity flows to the valleys below. The middle reaches of watersheds were used for the grazing of livestock, and the upper reaches, which are forested, were used for building materials and firewood. The picture that I've attempted to describe still exists to this day in numerous rural villages in New Mexico. In many ways, the customs and

culture of northern New Mexicans hasn't changed over the centuries. While the 19th century brought many changes, many of us continue to make use of our renewable natural resources as we have for many centuries."

After New Mexico became a territory of the United States in 1850, the US government appropriated much of the granted land, despite its pledge in the Treaty of Guadalupe Hidalgo to recognize the land grants.

"Numerous land grants were reduced in size to include only the areas where the inhabitants at the time were living and irrigating," said Varela-Lopez. "As a result, all of the upland [areas] became Forest Service or Bureau of Land Management land. The La Cieneguilla land grant, where I live, was reduced from 43,000 acres to 3,200 acres, so I am now dependent on a federal agency allotment to have sufficient forage for my cattle operation.

"My family's longevity on the ranch is, if nothing else, a testament to the wise use of our renewable natural resources—something we have not done on what are now our public lands," he continued. "Misguided policies, regulations, and never-ending lawsuits in recent decades have severely hindered the proper management of our natural resources. Instead of maintaining healthy ecosystems, we now face catastrophic wildfires annually, which cost us enormously, not only in terms of monetary costs, but also long-term damage to our watersheds and their functionality and providing water supplies to agricultural and municipal users at lower elevations."

Varela-Lopez noted that the wildfires he mentioned also destroy timber that might otherwise be available to local forest-products companies, and they destroy wildlife habitat and decrease grazing and recreational opportunities.

"In the arid Southwest, intact, functioning watersheds are literally the lifeblood of prosperous communities. A lack of appropriate management of our renewable natural resources leads to their demise," he said. "The reason I bring this up is because my culture and others, whom I refer to as land-based peoples, have always used the natural resources around for sustenance, shelter, and heat. In other words, we believe that we have a social license to make good use of these resources, as we have for many centuries. However, I fear that the social license to utilize these renewable natural resources is no longer widely accepted by the majority of Americans. After many decades of tepid forest management and the increasing urbanization of the country, most people believe that the overstocked forests of today are what is natural, and many reject any form of watershed management.

"As the urban-rural divide continues to grow, I believe it is incumbent on all of us to become more proactive in educating the general public that our forests and watersheds cannot be 'preserved' and must be managed if society is going to continue to reap the benefits that they provide. If we fail to regain that social license to appropriately utilize our natural resources, the tap will eventually go dry and the vibrancy of our rural communities will die."

New Perspectives

Kim Kostelnik, the third speaker, is owner of SAKAK Natural Resource Consulting and a technical assistance provider for the New Mexico Forest Industry Association and the New Mexico Coalition of Conservation Districts. Before joining the industry association, she retired with 27 years of service in the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD) State Forestry Division.

Kostelnik started by acknowledging the state's three main cultures: Native American, Hispanic, and Anglo.

"New Mexico is very proud that we have three cultures and how we work to integrate each and every one of our thought processes and desires and needs for the resources of the state," she said.



Plenary speaker Jose Varela-Lopez, executive director of the New Mexico Forest Industry Association and president of the Greater Rio Grande Watershed Alliance: "In the arid Southwest, intact, functioning watersheds are literally the lifeblood of prosperous communities. A lack of appropriate management of our renewable natural resources leads to their demise." Photo by Josh Zytkeiwicz, Focal Flame Photography, www.focallflame.com.

She noted that the state had an active logging industry until recent decades.

"We ended up logging about 320 million board feet per year up until about 1968," she said. "By the time we got into the 1990s, we were down to about 20 million board feet per year. So it's kind of difficult to try to keep the industry going and to make sure that we actually manage the lands that we have out there, without having an adequate supply [of timber]. So what do we do? How do we make things work, so that the ecosystem is healthy, so that we can actually keep the industry available to us, so that when we do have a project, they can do the work?"

The Four Corners Sustainable Forest Partnership and the Southwest Sustainable Forest Partnership programs were a good start, she said, but more work remains to be done.

"We're still having fires out there, and they're getting larger and larger. Fire intensity is still increasing," she said.

In the mid-1980s, she said, "when we

had a fire that was 500 acres, we said, 'Oh my, gosh, we've got a fire! Let's go, let's go! And if it was a 1,000-acre fire, whoa, we got a Type I [fire management] team on it. Then, all of a sudden, fires started getting bigger and bigger, until we got to the point where we are now, like with the Las Conchas Fire of 2011. That fire burned 43,000 acres in 12 hours—43,000 acres in 12 hours. That's incredible."

Kostelnik also mentioned the Little Bear Fire in 2012, which burned 44,500 acres and destroyed 242 homes. Erosion after the fire led to the deposition of 50 feet of silt in a lake that supplies the city of Alamogordo and Holloman Air Force Base with drinking water. More than five years later, the restoration of the lake and its water supply is nearing completion, and the lake's recreation facilities may be opened to the public later this year. The Whitewater-Baldy Complex Fire, also in 2012, burned nearly 300,000 acres, the largest known wildfire in New Mexico's history.

"We have tried to convince people

that they [need to] pay attention to the fires that are happening, that they're becoming more and more intense, that we need to get out there and manage these areas. When fires occur and smoke is in the air, human nature is such that people pay attention for about two weeks."

Kostelnik recently began working with Laura McCarthy, of The Nature Conservancy, to increase public awareness for the need to manage forests in New Mexi-

co. (See "Rio Grande Water Fund Invests in Water Security," *The Forestry Source*, November 2017.)

"What Laura was proposing was [getting people to look] outside their normal box," she said. "How do we bring everybody in? What is the common theme that we can all agree on? It turned out to be water. The state's most valuable commodity is water. So we said, 'Let's focus on water.' Sure, let's talk about fire a little bit, but let's focus on water. If the state doesn't have water, we don't have development, we don't have businesses, we don't have schools, playgrounds—the whole works. We need water, and we need our watersheds to function appropriately."

Since everyone depends on water, McCarthy, Kostelnik, and their colleagues have reached out not only to individuals, but also to businesses that use water.

"These are the people who are normally at the table—they are natural-resources people," said Kostelnik. "They are people who need water to keep their businesses going, but they didn't really understand where their water was coming from. We explained that part, and they bought into it. The coalition, collaborative effort that has been happening has been outstanding.

"I've been in this business for a long time," she added. "I haven't been this excited about [my work in the forest sector] in a long time. We brought together all the cultures, all of the entities that actually need to have water, and we said, 'Okay, we've got a problem let's fix it. And let's fix it together.' That's what it's all about: we're all in this together." **FS**



David J. Moorhead, a forestry extension specialist for the University of Georgia for more than 33 years, received SAF's Technology Transfer Award at the 2017 National Convention. The award recognizes outstanding performance in the areas of technology transfer, implementation, and extension. Photo by Josh Zytkeiwicz, Focal Flame Photography, www.focallflame.com.

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Membership eligibility required

Restoration of Frequent Fire-Forests

Attendees of this technical field tour visited sites on the Cibola National Forest, in western New Mexico, where the US Forest Service is working with the National Wild Turkey Federation (NWTf), the Forest Stewards Guild, the Center for Biological Diversity, and other partners on the Bluewater Stewardship Project. The project is designed to restore the ecological function of frequent, low-intensity fire by reducing stand densities and stand structure, which reduces the risk of high-intensity, stand-replacing fires while improving habitat for wild turkey and other wildlife and providing-economic opportunities for the local forest-products industry. NWTf is the project contractor.

The project area had been heavily logged beginning with the advent of railroad logging in the early 1900s. Less than 10 percent of the trees were left as seed sources. Subsequent even-aged management left stands susceptible to crown fire. Under the current plan, large, mature trees are retained and younger stands are thinned, with trees left in groups.

“The product off of the [Bluewater Stewardship] project is not timber,” said Scott Lerich, a NWTf senior regional biologist. “It’s a healthier forest, a healthier watershed, better wildlife habitat, more resistance to wildfires, and more jobs.” **FS**



The harvest in this area is designed to leave groups of vigorous ponderosa pine with space between them, restoring them to historic conditions and leaving the stand more resistant to high-intensity fire, explains Shawn Martin, a silviculturist with the Cibola National Forest.



The Bluewater Stewardship Project has been crucial to Mt. Taylor Manufacturing, a sawmill in Milan, New Mexico, a town of about 3,500 people, said Scott Lerich, National Wild Turkey Federation (NWTf) senior regional biologist: “The mill supports 45 jobs in this community, which needs every job it can get.” NWTf is the project contractor.



A delimitter processes ponderosa pine logs destined for Mt. Taylor Manufacturing, a sawmill in Milan, New Mexico, that produces dimension lumber, cants, wood pellets, playground chips, animal bedding, and other products.

Rio Grande Bosque Ecology

By Andrea Watts

Participants on the bosque ecology tour couldn't have asked for better weather: It was a crisp, sunny winter morning, and the day warmed as it progressed. *Bosque* is the Spanish word for *forest*, and its management has evolved over the years as researchers have learned more about the Rio Grande and its riparian ecosystem. "We've had to change our story about how to manage the bosque, and now our vision is a restored version of the bosque," said Todd Haines, one of the tour leaders.

Yet management of the bosque is intricately linked with the people living along the stretch of the Rio Grande, and each tour stop highlighted how politics affect restoration efforts.

Until recently, fire was not the primary disturbance in the bosque. This riparian forest is adapted to frequent flooding that created a forest with multiple age classes. Now, because of flood-control measures and the diversion of water for agriculture since the 1940s, the lack of flooding has resulted in a single age class of trees in some stretches.

Fire is now the major disturbance. Cottonwood, the primary overstory species, is not adapted to fire, and the lack of flooding reduces leaf litter decomposition, which provides a fuels source. Invasive plant species, such as Russian olive and salt cedar, respond positively following a fire and can dominate the understory. Efforts to remove Russian olive and salt cedar have been undertaken in a number of areas to encourage the return of native grasses and forbs.

Fire is not the only stressor: moisture stress is another. The water table in the bosque is dropping by several inches a year in some places, threatening cottonwoods. In one area on the Pueblo Santa Ana, Allen Hatch, director of the Pueblo's Department of Natural Resources, is deliberately lowering the riverbanks by removing sediment, and in another area he planted willows in an effort to retain the bosque on the landscape for the long term.

In the Village of Corrales' bosque, there has been limited restoration work, such as removing invasive plant species or thinning, due to the local Bosque Advisory Commission's skepticism about active management that requires cutting trees or removing understory that provides wildlife habitat. However, through intensive outreach efforts, Haines and others were able to sell the value of some restoration projects, and five shaded fuel breaks have been created.

In contrast to the Village of Corrales, the City of Rio Rancho has a robust active management program for its stretch of the bosque. Haines described his agency as having a good relationship with the city's Parks, Recreation, and Community Services Department. An active Friends of Rio Rancho Open Space group advocates for restoration efforts that include removal of invasive plant species, as well as installing duck and bat boxes. A number of volunteers even took training to become certified to apply herbicide to contain resprouting Russian olive and salt cedar. **FS**



Anthony Martinez, fire chief for the Village of Corrales, New Mexico, discusses how a public that is skeptical of active management can increase the risk of fire in the bosque. In 2012, a fire that started on the Corrales side of the Rio Grande burned nearly 10 acres before jumping the river and burning more than 300 acres. "The fire changed how we think of the bosque," Martinez said. No lighters, matches, cigarettes, or even electronic cigarettes are allowed in the area managed by the village. Photo by Andrea Watts.



An autumn view of the bosque near Albuquerque, New Mexico, from ground level. Photo by Cristian R. Montes.

Jemez Mountains Forest Restoration Project

This tour included stops in the 89,000-acre Valles Caldera National Preserve, which is managed by the National Park Service, and the nearby Santa Fe National Forest. “Jammer” logging and other harvesting operations in the 20th century left the preserve with one of the highest road densities in the region.

Robert Parmenter, the preserve’s director of science and education, said fires were largely excluded for much of the 20th century, and preserve managers are using thinning and prescribed fire to return the area to its historical regime of frequent, low-intensity fire. Meanwhile, high-intensity fires are an acute threat. The 2011 Las Conchas Fire burned a total of more than 150,000 acres, including 34 percent of the preserve, much of it at a high intensity. In contrast, much of the 2013 Thompson Ridge Fire, which burned nearly 24,000 acres of the preserve and the Santa Fe National Forest, burned at a relatively low intensity, and in these areas the effects of the fire were positive, Parmenter said.

Another stop in the preserve, where thinning and prescribed fire were conducted in the last year, revealed an area that is now resilient to fire. “If a fire did get in here, we would feel comfortable that we could deal with it,” said James Youtz, US Forest Service Region 3 regional silviculturist (Arizona, New Mexico). “It would drop to the ground and burn at a low intensity.” **FS**



The tour stopped at this site on the Santa Fe National Forest where leave trees are marked with orange paint. Smaller trees in the stand, now overcrowded after a century of fire exclusion, will be harvested to help restore the stand to historical composition and density.



“We can still burn pretty big up here,” said Dennis Carril, a fire ecologist on the Santa Fe National Forest, where fire managers conduct prescribed burns of up to about 7,000 acres, when it is safe to burn and when smoke will not impact communities in the region.



This slice of a southwestern white pine (*Pinus strobiformis*) shows a record of fire scars dating back to 1468. This and other fire-scarred samples were provided by Ellis Margolis, a research ecologist at the US Geological Survey’s Jemez Mountains Field Station.

CALL FOR PRESENTATIONS

Forest Policy and Science-Management Interactions



The 2018 SAF National Convention will explore the differences between policy and politics, and how science, management, and policy interact and integrate to inform and influence the conservation of forested landscapes.

From an overview of Pacific Northwest forests to perspectives on how and why science and science communication can and should remain policy neutral and the challenges of transforming forest policy into effective natural resource management, plenary sessions will consider the role of science in policy decisions such as wildland fire policy, the role of scientists and managers in the policy process, and why policy makers don't "listen to us".

Scientific and Technical session presentations and posters are invited for these themes:

Forest Policy — This track is designated for presentations based on empirical research and data analysis revolving around general forest policy questions. Topics may include: evaluation of an existing government program; impact of legislative or administrative policy initiatives; design of policies or programs; emerging trends in forest policy and law related to biomass, carbon, climate change, water quality and quantity, and endangered species designations, among others.

Policy Implications for Private Forest Land Management — This track examines the multiple ways policies at the local, regional, state, and national level influence private land management. This might include case studies and research about: how the emergence of TIMOs and REITs have affected land management and future implications; how state forest practices affect industrial and nonindustrial landowners; the role of tax policy on landowners' decisions and ownership objectives.

The Role of Forest Science in Policy (Not Politics) Forestry is continuously adapting to changing social needs and desires to maintain forested landscapes. What is the changing role of science in informing policy development? How do science and policy drive each other? If information needs are

continually shifting, how do we design long-term research to provide timely answers? Are we unintentionally pitting disciplines against each other in the policy arena? Can we use cross-disciplinary collaborations to encourage consistency in policy? How can we help create consistent policies that will encourage continuity when we are managing ecosystems for century-long or longer time frames? Research, case studies, and thoughtful demonstrations that illuminate these concepts are appropriate to this track.

The Role of Consulting and Extension Foresters in Navigating the Policy Maze — Many policies are nested and interconnected – taxes, water quality, shoreland zoning, and state credentialing requirements – and may trickle up or down influencing the advice and management planning of consulting foresters. This track is designed to discuss the specific ways that national, state, and local policy affects the work of consulting and extension foresters from local road weight limits to threatened and endangered species to the accessibility and availability of cost-sharing assistance for family forest owners to the way science-based information is and can be communicated.

Urban and Community Forestry — This track will combine scientific research presentations, discussions about the future and employment opportunities in urban and community forestry disciplines, presentations about the opportunities to use urban and community forestry as a conduit to educate about all types of forestry and to attract and retain talent in the profession, and technical sessions with a heavy emphasis on skill acquisition and tool demonstrations and training.

Boots on the Ground — Our approaches for sustainably managing forests and associated resources is ever-changing in response to social, economic, and ecological factors. As such, there is a need to share on-the-ground lessons learned to help advance our practice and conservation of forest resources. This track will present case studies, tips, and research designed to help forest managers achieve diverse forest management and restoration objectives.

Abstracts are also invited for workshops and for the following topic areas:

- Agroforestry
- Biomass, Carbon, & Bioenergy
- Climate Change
- Diversity in Natural Resources Research, Practice, & Education
- Economics
- Education, Extension, & Communication
- Entomology & Pathology
- Fire & Fuels Management
- Forest Ecology
- Forest Threats
- Harvesting & Utilization
- History & Philosophy
- Inventory & Measurement
- Private Forestry
- Recreation
- Remote Sensing Applications & Geospatial Technologies
- Silviculture
- Social Sciences & Human Dimensions
- Soils & Hydrology
- Traditional Knowledge
- Urban & Community Forestry
- Wildlife Management
- Professional Development Workshops



Presentation abstract submissions will close March 31, 2018.

Science Flash and Poster abstract submissions will close August 31, 2018.

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SAF Town Hall Meeting Recap

By Andrea Watts

Following Thursday's plenary sessions, SAF leadership held a Town Hall to update members on the state of SAF and to offer a forum for members to voice their questions or concerns.

SAF President Fred Cabbage opened the session by explaining the philosophy that has guided his decisionmaking during his term as president: "Our obligation, as a profession, is to leave our profession and our Society better for future generations," he said. "We need to do that internally and externally, and I believe that is a vision worth following."

Staff and leadership have made significant progress in addressing the challenges facing SAF, one of which is membership. Cabbage said that membership has been and will remain an issue that needs to be addressed. It remains strong, particularly in the East, and membership trends have been stable in total numbers until 2017. This year saw the number of paying members decrease as the number of Golden members increased. The age class distribution is not a pretty picture, Cabbage explained, with most of the membership being 50 or 60 and older. What this means over the next decade is a significant decline in membership revenue, and two options for remedying this. "We have remarkable increases in revenue per member to balance the budget, or we spend less," he said. "And I'm betting on the latter."

Another accomplishment Cabbage mentioned is passing the new Diversity and Inclusion Policy and its rollout, adding that "I think it's an excellent step forward."

This past year also saw continued budget discipline and transparency. Financial information, such as IRS forms, are now available online, and eventually, the budget will also be available. An audit of the reserve fund found that the fund had decreased from \$17.4 million to \$13.1 million by the end of 2015. Some of these withdrawals had been approved by the Board to invest in new programs. However, in light of the audit, Cabbage said that the Board decided to adopt a reserve policy of a 3.5 percent withdrawal each year, which is conservative and will better protect these funds. In addition, the reserve policy says there is a floor that the reserve fund cannot go below without a significant vote by the Board of Directors.

Cabbage clarified that it may be possible to make higher withdrawals, but it will require a two-thirds agreement by the Board.

Currently, SAF runs at a \$1 million deficit: Revenues have been constant at \$3 million, and expenditures have been between \$3 and 4 million per year. SAF receives income from dues, the national convention, publications, and grant contributions, while administration, member services, and policy work are large expenditures. "Dues are a quarter of the total income that we receive, so we can't cover everything with dues alone," Cabbage said. A balanced budget policy will move the Society toward a balanced operating budget in five years.

The core programs are strong, he emphasized, but there are opportunities for improvement, one of which is membership. "We are an old-growth stand," Cabbage reiterated. "We need to make sure that we have a stable base and that we continue to realize at what level we are at on that base. I think we are on the path to a sustainable SAF, but we really do have to practice what we preach. We have good new policies. I think we have an excellent staff. We need to make sure we follow our common sense and practice what we preach."

Priorities for 2018

Following Cabbage, incoming SAF President Dave Lewis presented an overview of his priorities in 2018. Drawing from the strategic plan, he identified four key pillars that, if approved by the Board, will be worked on: ensuring financial stability and sustainability; increasing tangible benefits to members; elevating the professional status of forestry; growing membership in three dimensions—numbers, diversity, and generational; and lastly, promoting sound science and policy.

Each of these four pillars has one or

two action items that will be selected for implementation, Lewis explained. For example, to ensure financial stability and sustainability, he recommends revisiting the work that was already undertaken in 2012–2014 to explore alternative revenue sources. In elevating the profession, one option is expanding the CF program and incorporating it into the overall profession to make it viable. Growing membership could involve focusing on young professionals and students and identifying ways to attract and recruit them into the organization. As for promoting sound science and policy, "this is really what we're really built on," Lewis explained. "There's a ton of things we're already doing," adding that his emphasis is focusing on SAF's existing efforts and not getting quite so stretched out.

"The way this organization has been sustained is by adhering to a mission of professional excellence. SAF has had to adapt over time and will continue to adapt and evolve to meet the needs of professionals."— John Barnwell, SAF co-CEO and director of government affairs and external relations.

Looking forward to his term, Lewis said, "We got a great Board, and I've got some really good people coming back. [There's] four really good new Board members coming on who will contribute a lot, and I'm really looking forward to working with them and the staff. I think if we all get pull[ing] in the right direction, we can really make some good things happen this year."

Clark Seeley next addressed the audience and shared a few observations from his three years of SAF leadership before looking ahead to the next year. His emphasis remains on SAF's long-term viability:

"We got to be viable in multiple dimensions."

And just as Cabbage emphasized financial sustainability, Seeley did as well. "To provide all that we want and need to provide, given our current budget situation, is going to be a challenge," he said. "Frankly, the gap between where we're at today and where we would like to be relative to services provided by the budget is significant."

Seeley concluded his remarks by saying that the "future couldn't be brighter for what is ahead of us at SAF." He called attention to the enthusiasm of the new emerging leaders at the local and national levels and the increased student involvement, which "is nothing short of miraculous."

Finances and Resilience

John Barnwell, director of government affairs, spoke next and discussed how staff is working with the Board to become sustainable, particularly in regard to finances. But their approach goes beyond finances, Barnwell clarified—it's also about resilience.

"What do we mean by 'resilience'?"

We mean resilience for SAF as an organization," he explained. "The way this organization has been sustained is by adhering to a mission of professional excellence. SAF has had to adapt over time and will continue to adapt and evolve to meet the needs of professionals."

With the departure of Matt Menashes, Barnwell discussed how the co-CEO management structure will work. He will oversee external-facing programs that include government affairs, communications, publications, and the convention, while Louise Murgia, CF, chief of staff and chief operating officer, will oversee the internal-facing programs of business operations, education, and professional development. Barnwell said the organization structure is a work in progress, but the hope is it will increase collaboration and communication between staff and members.

Accomplishments of the external-facing programs include signing the seven-year publishing contract with Oxford University Publishing. Barnwell anticipates that the move will increase the *Journal of Forestry's* presence in the international realm.

With the adoption of the Diversity and Inclusion Policy and the creation of the Diversity and Inclusion Working Group in 2017, Barnwell expects that SAF will continue to push forward in this area in 2018. "We have to attract the best and

the brightest if we want to remain relevant, resilient, and viable."

He highlighted the newest student SAF chapter at Southern University, with many of the students interested in urban forestry, as an example of increasing diversity within SAF. Our work is a "marathon not a sprint," Barnwell said. "SAF is already a diverse organization, but we need to continue to strive and see what we can do to be more welcoming and inclusive in all areas."

Highlights of the government affairs work include developing strategic partnerships with groups that were known and unknown to SAF. For example, SAF now has steering committee members on the Sustainable Forestry Coalition and the Forest Climate Working Group, both of which have national scope and include groups that SAF hadn't been acquainted with. The year also saw the successful launch of the East Coast Hagenstein Lecture series, which attracted two members of Congress and a senator. Barnwell said that in 2018 SAF anticipates strengthening the partnership with the World Forestry Center to raise the profile of the series. As for upcoming legislation, the Farm Bill will feature prominently in 2018.

Membership a Challenge

Louise Murgia provided an overview of the internal-facing programs that she oversees. Although there are challenges with membership, the numbers are strong at 11,000, and she said that this number includes 200 members who joined within the past 30 days. There is a new campaign called Membership Squared to increase membership, and new membership tools were also rolled out during 2017. The online application Leadership Central provides live membership data to local leaders and will be built out further in 2018 to include a national membership dashboard.

David Seabrook, SAF's comptroller, is working with the Finance Committee to increase the transparency of SAF's finances by posting financial statements on the Society's website. He is also working with the IRS to resolve 501(c)3 issues related to several state societies losing their nonprofit status. Seabrook's suggestion of changing banks has also resulted in a savings of administration costs in the form of lower bank fees.

Murgia said that the Committee on Accreditation was busy this year, having conducted 10 site visits, with five scheduled for 2018. "Those two committees have done a ton of work, and we are really grateful for all the volunteer hours they've put into making that happen," she said. Next year, the Accreditation Committee will work with the National Association of University Forest Resources Programs (NAUFRP) to raise the annual accreditation fees, which has not been done in 17 years, with the goal of making the program self-sustaining.

The Forest Science and Technology Board is developing new ways to better utilize the Gottschalk Science Fund.

The hiring of Naomi Marcus, director

of professional development, in 2017 will help raise the profile of the accreditation program and provide more content for members through the SAF education site <https://forested.remote-learner.net/>. New initiatives include improving the online platform where members access continuing education programs and partnering with Michigan State University to repurpose its forest carbon education program into a CE program.

In her concluding remarks, Murgia said, "John and I just want to let everyone know that we're both dedicated to SAF, and we are proud to share in the accomplishments that we've had this year. We look forward to working with all of you, our leadership, [and] the Board of Directors to ensure the continued success of this organization and this profession that we care about and love so much, but also to ensure the continued health, integrity, and use of the forests to benefit society at large."

Following the formal presentations, the floor was opened for a member Q&A. The first speaker said that offering more technical training at Society meetings would enhance the value of SAF membership, and could there be a move toward the national office assuming more administrative work to take the burden off state chapters, similar to how the Northwest Office is structured?

Murgia said that developing more technical training that state societies could offer is one area the national officers and staff would like to work further. Lewis added that this has been a topic of discussion, because state society leaders don't have time to create new programs. The model would be "plug and play" programming, so it wouldn't have to be created from scratch at the state level. He also added that the leadership training programming is being rebuilt.

Another member shared that he

found the content provided informative, particularly the focus on sustainability and transparency. He asked about the current thinking regarding the headquarters building.

Lewis said that the Building Committee will bring its recommendations to the Board at the December Board meeting. Of the options considered, such as renovating the building or moving the headquarters, the costs and tradeoffs were taken into account. The committee's recommendation is to address the deferred maintenance backlog to make the building safe, and in the event the building is sold, the maintenance costs could be recouped. Barnwell added that the Building Committee has done a good job keeping the staff and the Board informed about what is going on. Seeley added that "when the dust settles, it's not about brick and mortar...it's really a matter of how best we serve members' needs based upon location of the staff, and how do we best ensure we can attract and retain the highest quality of staff possible given where our headquarters will be."

A question was posed as to how the CEO search will be handled. Cabbage said that a search committee is being put together, and announcements regarding the position will be released shortly, perhaps with an application deadline of March, with an interview date in May and hiring expected shortly thereafter.

Another member asked about the long-term membership trends and whether it's advisable to expand membership into allied professions. Cabbage said there is a lot of pressure on all natural-resource organizations to maintain membership, so SAF is not unique. While SAF does need to attract all professionals who have an interest in forestry, he explained, that's not going to suddenly increase membership levels. His recommendation is to focus on the people who are interested in forestry and increasing diversity, as well as consid-

ering a sustainable model at a lower level to stay within budget.

Barnwell added that there is an opportunity for greater partnerships with other natural-resource organizations to pull the groups together rather than continue pulling apart, as well as opportunities for sharing information that could be revenue generating. "We see greater opportunity for collaboration than we have probably done in the past," he said.

Murgia said that the accreditation of natural-resources programs may help in regard to membership because it will enable SAF to reach out to individuals who may not be interested in traditional forest management but may be interested in conservation or natural resources.

There were 500 students at the convention, which means 500 opportunities for members, Lewis pointed out, adding, "If we can't engage them, that's our fault."

For Seeley, he sees the five years after graduation as being critical for retaining and engaging members. He has also seen SAF slipping in terms of communicating the value of the Society to employers and their employees, and ramping up those conversations with employers is key. "Imagine if we had the Starker Forest company model implemented and copied around the country at small scale and large scale," Seeley posed to the audience. "Where would SAF be today?"

A member said that while SAF is talking about being welcoming and inclusive, that's not reflected at the Town Hall, with fewer than 100 members in attendance. Because there is great information being presented but the membership isn't hearing it, she suggested that a different format be used in Portland next year.

One member shared that being taken to an SAF convention at 15 years old made him decide to be a forester, and he asked what SAF can do to reach out to students in high school. Lewis said that

SAF always wants to support such opportunities. Barnwell added that the national SAF can support such efforts and that more is needed to engage students earlier, but the challenge is making this happen on a larger scale. Seeley shared that some local student SAF chapters are visiting high schools and making connections. For Murgia, she said that we need to tell the stories of how we found this profession, because that does make a difference and encourages people to join the profession.

Another member then pointed out that although the discussion was mentioning how important students are, the students were currently in another meeting. She asked how is SAF communicating with students during the convention, and how are we communicating with the early-career folks and understanding what their concerns and needs are? Seeley seconded her comments and said that perhaps next year the convention schedule could be modified to allow for more collaboration.

Another member gave a shout-out to Betty Munis, executive director of the Idaho Forest Products Commission and SAF member, for engaging both students and teachers, especially elementary school teachers, when it comes to talking about forestry. He encourages other states to develop similar programs.

The last comment before the Town Hall wrapped up was about why the topic of technician accreditation hadn't been mentioned. The member sees a tremendous opportunity with this accreditation, because it will improve membership and give value to technicians. Murgia said that she thought the House of Society Delegates had moved to pass the recommendation to the Board to reengage the task force working on that topic and explore it further. **FS**

USFS Chief Tooke: Risks at an All-Time High



US Forest Service Chief Tony Tooke announced that the agency had interviewed about 200 jobseekers at the SAF National Convention's Career Fair and had hired 129 new employees during the event. Photo by Josh Zytewicz, Focal Flame Photography, www.focallflame.com.

Although the annual Breakfast with the Chief begins at 6:30 am, the event is always well attended. This year was no exception. US Forest Service Chief Tony Tooke spoke for about 45 minutes about the agency and the challenges it faces.

"While I'm proud and honored to be the chief of the Forest Service—this

agency is the only organization I've ever worked for—I'm also very proud to be a forester," he said. "And I'm very proud to be a member, as I have for many years, of the Society of American Foresters."

Tooke outlined his five priorities for the agency (see tinyurl.com/yb9cqyyb):

1. Uplifting and empowering our

employees through a respectful, safe working environment.

2. Being good neighbors and providing excellent customer service.
3. Promoting shared stewardship by increasing partnerships and volunteerism.
4. Improving the condition of forests and grasslands.
5. Enhancing recreation opportunities, improving access, and sustaining infrastructure.

He spoke at length about his fourth priority.

"The risks and threats are at an all-time high," he said. "Eighty million acres of the National Forest System are at risk of catastrophic fire, insects, disease, invasive species. A third of those [acres] are at very high risk. What's at stake with that? Well, drinking water. Half of the citizens of the western United States get their drinking water from the national forests."

Tooke noted that 70,000 communities are adjacent to Forest Service lands and mentioned other values at risk, such as wildlife habitat, recreation, scenic vistas, historic places, and sites sacred to Native Americans. "Environmental security for the nation is at stake," he said.

Wildfire is uppermost in the chief's mind.

"The past 13 months are a great example of the challenges that we face," Tooke said. "This began in October of 2016 in the southern Appalachians, where we had the worst fires in decades. Then it extended to the Southwest, then the northern Rockies and the Pacific Northwest, and then to California. Almost nine million acres burned—that's 40 percent more than the 10-year average. When I stepped into this job [on September 1, 2017], there were 80 large fires burning at a time of year when we normally only have 25 large fires. How many homes burned [during this fire season] is still being sorted out."

For more about the chief's priorities, see "Tooke Takes Reins of US Forest Service," *The Forestry Source*, November 2017 (tinyurl.com/y85sdrxm).

The Vertex Laser Geo: Haglöf's New All-in-One Hypsometer

By Steve Wilent

Haglöf Sweden AB celebrates its 75th anniversary this year: It has been making measurement instruments for foresters since 1943. The company is widely known for its Vertex line of rangefinders/hypsometers. The VL5 model and the older Vertex VL-402, which was reviewed in *The Forestry Source* in October 2010 (tinyurl.com/ydhnlhp), can make both laser and ultrasound measurements. Ultrasound lets you measure distances by positioning an ultrasound transponder either at a plot center or at the tree and holding the VL5/Vertex at the other end. The devices also have tilt sensors for measuring vertical angles.

Haglöf recently loaned me a Vertex Laser Geo, the newest model, which adds a GPS receiver (2.5-meter accuracy) and electronic compass to the laser and ultrasound features, making it the Swiss Army knife of hypsometers. The device comes with an ultrasound transponder and AA battery, a monopod and "360° adapter" for the transponder, a USB data/charging cable, adapters for US and international power outlets, a cigarette lighter-style USB adapter for charging the device in an automobile, and a user manual, all neatly arranged in a handsome carrying case. The retail price for this package: \$2,515 from Forestry Suppliers. Haglöf also makes a basic Laser Geo model (\$1,770) with all of the features of the Vertex Laser Geo except ultrasound.

With a GPS and compass, the Vertex Laser Geo is capable of making measurements that can be used for mapping as well as for measuring three-dimensional objects such as slash- and chip-pile volume.

After I received the device, Haglöf informed me of the need to update the Vertex's firmware to fix a problem with GPS functions. I followed the company's instructions and successfully completed the update process in a couple of minutes.

I started testing the Vertex Laser Geo by measuring tree heights, likely the most common task for which foresters would use the device. In this function, I give the Vertex high marks for its accuracy and versatility. You can choose from four methods:

- **Height 3P.** You fire the laser at any point on the bole, then the base and the top of the tree, and the Vertex calculates slope distance, horizontal distance (HD), angle, and tree height. You can set the laser to use the first, last, or strongest target.
- **Height 1P.** This mode works only on flat ground (or when you and the tree are at the same elevation) and with the eye height (the distance between your eye and the ground) entered in the device's settings. You fire the laser at the top of the tree, and the Vertex calculates the height of the tree.

- **Height DME.** Ultrasound measures the HD as you fire the laser at two points on the tree: the base and top (or any another point in between). DME stands for ultrasound distance measuring equipment.
- **Height DME, Manual Distance.** At a known HD from a tree, you fire the laser at the base and the top of the tree.

After measuring the heights of a handful of trees with a Suunto analog clinometer/logger's tape and two Haglöf electronic clinometers, I remeasured the trees with the Vertex using each of its height modes. In each case, Vertex heights were equal or very close to the average of measurements made with the three other devices. The largest difference between the average and a Vertex height was with a western hemlock, for which the average of the three devices was 79.0 feet, whereas the Vertex in Height 1P mode calculated the height at 80.2 feet.

The Vertex's laser HD measurements closely matched those I made with a logger's tape. (According to Haglöf, the Vertex's laser can measure distances of up to 2,000 feet, but I did not test the laser's accuracy in measurements of more than 100 feet.) I used the Height 3P mode for these comparisons; the Vertex does not have a simple HD mode in which to measure only horizontal distances. Thus, if you need to measure only HD, you must step through the Height 3P mode. A Laser HD



Haglöf's new Vertex Laser Geo: laser and ultrasound measurements, plus a GPS receiver and electronic compass. Photo by Steve Wilent.

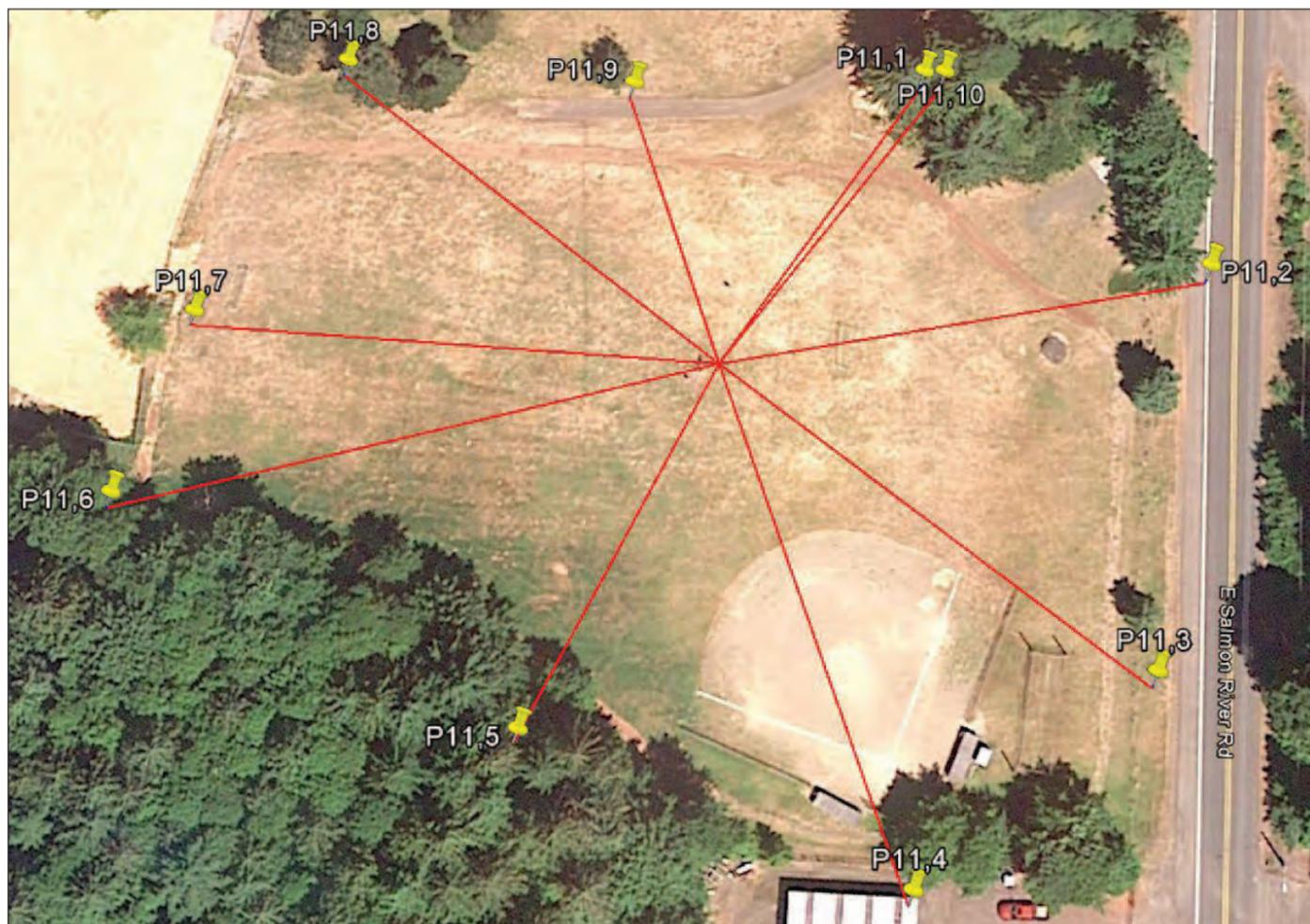
mode would make such measurements simpler and save time. So would a "GPS Offset" mode that measures the distance from a feature to a GPS offset and records its azimuth and coordinates.

Ultrasound

In his 2010 review of the Vertex VL-402, Roger Greene found that ultrasound distance measurements "were within a foot or less each time." That hasn't changed with the Vertex Laser Geo. Haglöf's specifications say that the Vertex can make ultrasound distance measurements of up to 98 feet, or 60 feet when using the 360°

adapter, with a typical accuracy of one percent or better (the adapter is a device that attaches to a mono- or tripod and spreads the ultrasound signal in all directions). The utility of ultrasound is that you can measure distances even when the brush is so thick that you can't see the plot center from a tree, or vice-versa.

As Greene noted, background sounds such as rain on foliage can interfere with ultrasound signals, resulting in erroneous measurements or no measurements. I made my test measurements on a cold, windy day in a mature Douglas-fir stand—the wind was strong enough that it blew



The Vertex Laser Geo can make measurements of areas such as this school field. After the measurement was completed, the Vertex displayed the size of the field on its external screen (2.7 acres) and produced the KML file shown here in Google Earth Pro.



The Vertex Laser Geo with accessories in its carrying case.

a tree across the power lines nearby, and there was no power at my home office as I made the tests. No rain fell during the week or so during which I tested the Vertex—odd for western Oregon in December—but the sound of the wind in the trees offered a good substitute.

As the wind whipped through the canopy, I made test measurements with the transponder and 360° adapter on a tripod at a plot center and with the Vertex more than 60 feet away. In one case, I made five ultrasound distance measurements from one location—from which I could not see the transponder through the brush—that the Vertex measured at an average of 114.84 feet (range, 114.9 to 115.1). From the same location, five laser distances averaged 113.66 (range, 113.6 to 113.8). The difference, 1.18 feet, is about one percent of the laser average. Despite the wind, accuracy was excellent in this case. A stronger wind, heavy rain, a nearby rushing stream, a busy highway, or other sounds could affect ultrasound measurements. If you need to use the Vertex when and where sounds may interfere, I recommend testing measurement accuracy before recording data.

Compass

The Vertex user guide warns users to “Be aware that the expected azimuth error is around 1.5° RSME [root mean squared error]. This is close to 3m/3yrd at 100m/100yrd. The error can be greater

if magnetic objects are closer than 1–2m from the Geo instrument.” The guide also notes that the compass can be affected by metal in such nearby objects as mobile phones, handheld computers, monopods, and eyeglasses that contain ferrous metals.

After calibrating the compass according to the instructions in the user manual (the instrument predicted inaccuracy of about 0.2 percent), I mounted the Vertex on an aluminum tripod and, after removing my metal-framed eyeglasses and metal objects from my cruiser’s vest, compared compass readings to azimuths that I collected with a Silva Ranger hand compass. The greatest difference between the hand compass reading and the Vertex reading was 0.7°. When I put on my glasses and returned my pens and pencils to my cruiser’s vest, the difference between the two instruments remained about the same. When I held my loggers tape within six inches of the Vertex, the difference between the two instruments increased dramatically to as much as 7°. Of course, most foresters wouldn’t hold such metal objects close to any compass, but this illustrates that metal objects do indeed affect compasses.

Mapping

The Vertex Laser Geo offers two mapping functions, Map Trail and Map Target. Map Trail lets you collect a series of points on a linear feature such as a trail, road, skid trail, cable yarding corridor, or stream. To

map a spur road to a landing, for example, you might start at a logical location on a main road, then collect a series of waypoints (“targets,” in Haglöf terminology) with the laser or DME as you walk to the landing location. If the Vertex’s GPS is active, each of the targets’ coordinates and the distance between them is stored in a CSV (comma separated values) file that you can open in Excel and a KML file for use in a GIS, Google Earth, or another application.

Map Target works in a similar manner for mapping two- or three-dimensional areas (a regeneration harvest or meadow, for example) or objects (a log deck or a chip or slash pile). I used the Map Target mode to measure the area of a field at a local middle school. Standing in the field, I used the laser to target 11 points on the edge of the field. When I finished collecting the positions, the Vertex displayed the size of the field on its external display screen: 2.7 acres. Figure 1 shows the resulting KML file in Google Earth Pro.

I also made numerous attempts to use Map Target to measure the volume of a large pile of gravel. The process involved firing the laser at various points on the pile, from each of several reference points around the pile, then downloading the resulting CSV file to a Windows desktop computer and opening it in Haglöf’s free Windows utility application, HeapCalc-Vol. None of my attempts resulted in a successful volume calculation. As far as I can tell, these failures may have been due in part to the GPS inaccuracy; the pile I used is surrounded by dense forest, and satellite signals may have been blocked. I sent my data and KML files to Haglöf’s Sixten Haglöf and Jonas Wikners, who found problems with my measurements that they and other Vertex users have not previously encountered; their tests of the Map Target function have been successful. Part of the problem may have been my inability to follow the correct Map Target procedures; I found the section on this mode in Haglöf’s user guide to be confusing and incomplete. Haglöf ought to provide more-detailed, step-by-step instructions.

The Vertex’s Value

The Vertex Laser Geo has other modes of interest to natural-resource managers:

- **BAF** (basal area factor) mode uses a BAF setting and either laser or ultrasound to measure the distance to a tree to give the minimum diameter for the tree to be counted in a cruise plot.
- **3D Vector**, which lets you measure the distance, angle, and azimuth between two remote points. You might use this mode between a yarder and spar tree, for instance, or to measure tree canopy width.
- **Angle**, for measuring slopes in degrees, percent, or GRAD (gradian, or grade).
- **Line Clear**, which lets you calculate whether a tree would hit a power line, road, building, or other feature if it were to fall.

The device has many strengths—and one significant weakness: its scope, or sight. The Vertex’s specifications describe the sight as “Red dot aim 1 x magnification.” Although the red dot is helpful for aiming at a target, the view through the sight is tiny and tinted blue, to make the data displayed in red via the sight easy to read. On a bright day, the scope is adequate for aiming at boles, but it is less than adequate for picking out tree tops in a crowded stand. With the blue tint, the view is a bluish monochrome, and in deep shade or on cloudy days, sighting can be difficult at best. If you wear eyeglasses for distance vision, as I do, you’ll need to be careful not to let your lenses come into contact with the hard plastic of the Vertex’s body, lest they be scratched; a rubber eyepiece or eyecup would help, but there is no place to attach one. I would guess that Haglöf opted to use this small sight to make space for all of the Vertex Laser Geo’s other features—and the company did well to pack so much into such a small, lightweight package. In my opinion, however, that was too much of a sacrifice.

The retail price of the Vertex Laser Geo: \$2,515. That sounds like a lot of money, and it certainly is, if all you need is a laser rangefinder. There are less-expensive instruments, such as Laser Technology’s TruPulse 200 (\$799 from Ben Meadows) and the Nikon Forestry Pro (\$399.95 from Forestry Suppliers), both of which are fine instruments. Laser Technology’s TruPulse 360B or 360R line of products (\$1,295 and \$1,795, respectively) provide many of the same functions as the Vertex, such as the 3D Vector (“missing line”) mode and the ability to measure volumes (with the 360R, used in conjunction with the company’s MapSmart Android app). But to my knowledge, no other device is as versatile as the Vertex Laser Geo. Having the option to use ultrasound to make measurements in brushy conditions is a big plus. With a better sight, I would have given the Vertex Laser Geo a five-star rating. Instead, I give it four and a half. **FS**

Share Your SAF News

The Forestry Source welcomes news about SAF members and chapters/divisions for the People in the News and SAF News sections.

People in the News: Significant professional accomplishments and awards by individual SAF members. Length: up to 500 words.

SAF News: Articles about professional activities and accomplishments by SAF members, chapters, state societies, and divisions that highlight sound forestry, enhance public understanding of forests and forest management, and provide service to the Society and society. Length: up to 700 words.

“Even before climate change was on the map, the whole forestry program on our watershed lands could be billed as an insurance policy,” said Riely. “We’re trying to mitigate risk to drinking water supply from disturbances and other impacts that could have a negative effect on it.” Since the 1960s, Providence Water has employed foresters and land managers, many of whom were and are SAF members, to manage the watershed.

For Riely, climate change had been on his radar before he became a forester, and being an employee of a public utility that is responsible for providing drinking water for nearly 600,000 residents, or 60 percent of Rhode Island, requires him to take a long-term view that extends beyond one rotation. Climate change and resilience were also being discussed elsewhere in the state, particularly in the low-lying coastal areas and urban centers, and he wanted to see forests included in that discussion.

In 2014, Riely says he decided to get “up to speed” on the latest climate change science and attended the day-and-a-half Forest Adaptation Planning and Practices training offered by the Northern Institute of Applied Climate Science (NIACS). The motivation to get up to speed is a common reason why participants attend the workshop, according to Maria Janowiak, deputy director of NIACS and an SAF member. “I think sometimes they have a sense of the biggest, most general climate trends, but what the training really does is give people the space to think about how it affects their land, which they haven’t thought about as much,” she said.

NIACS was started 10 years ago as a way to disseminate the climate change research being conducted by scientists from the US Forest Service (US FS), academia, and the forest industry. At that time, the scientists were having really great conversations, Janowiak explained, but they weren’t talking to land managers, and there were a lot of barriers to getting the research out to people.

To this end, NIACS’s mission is to “provide applied ecological, economic, social, and cultural information that can be used in climate adaptation and forest carbon management, including carbon sequestration and bioenergy.” It’s a collaborative effort led by the US Forest Service, with partners that include universities, the forestry industry, and conservation and tribal organizations.

This collaborative approach, drawing upon the expertise of a range of professionals, attracted Riely to the training. He found the five-step adaptation workbook particularly helpful for identifying strategies that could address the regeneration failure on Tunk Hill; the workbook is a section within *Forest Adaptation Resources: Climate Change Tools and Approaches for Land Managers*, a general technical report published by the US FS Northern Research Station (available at www.nrs.fs.fed.us/pubs/52760).

Based upon the climate risks and vulnerabilities summarized in assessments by NIACS and other organizations, land man-



On a section of Providence Water’s Scituate Reservoir called Tunk Hill, forester Christopher Riely faced regeneration failure following a shelterwood harvest conducted 10 years earlier. Drawing upon the information presented in the Forest Adaptation Planning and Practices training offered by the Northern Institute of Applied Climate Science (NIACS), he designed an experimental regeneration that included planting tree species native to Rhode Island and those found in the mid-Atlantic region. Photograph courtesy of Christopher Riely.

agers can select strategies in response to their specific management vulnerabilities and objectives. However, these regional assessments are just the starting point. “We use the managers’ expertise [when identifying the strategies], because they know their own lands, to say how their site is uniquely vulnerable,” Janowiak said.

For the Providence Water watershed, Riely identified several management vulnerabilities that could be magnified by a changing climate, such as the road system being negatively affected by more severe precipitation events, increases in invasive species, and new forest health issues.

“The thing that is good about this workshop is it takes a big, sometimes nebulous topic and gives you some useful ways to approach it in a concrete way that you can apply to where you work,” he said. And Riely appreciated that the training emphasized that climate change is just another factor to consider in forest management.

This was demonstrated in the 2015 climate-adaptation planting proposal he developed. The most noticeable difference compared to previous planting plans was the inclusion of tree species not native to Rhode Island. Janowiak worked with Riely to review the climate models for the region, and based upon those results, and in conjunction with projected changes in tree species habitats from the Climate Change Tree Atlas (available at www.fs.fed.us/nrs/atlas/), he selected a mix of tree species that includes both Rhode Island natives and others currently found in the mid-Atlantic region, such as black locust and loblolly, shortleaf, and Virginia pines. The mid-Atlantic species are anticipated to be capable of growing in Rhode Island in the future. He also included a monitoring component to track comparative growth of the native and “climate-adapted” seedlings over a number of years to inform fu-

ture planting projects. Early results have shown that deer browsing has a significant impact on seedling survival. A drought following the planting killed a number of seedlings, but the survivors growing outside the enclosure that have evaded deer have since recovered.

In 2016, Riely implemented another plant-adaptation project that called for planting more than 300 seedlings in a 38-acre upland oak stand that had recently been thinned and was anticipated to have future regeneration challenges. This project was funded by a grant from the Arbor Day Foundation’s TD Green Streets Program (tinyurl.com/ydhjtr2s), and the planting work was carried out by students from Providence’s Jorge Alvarez High School on a field trip to the watershed.

A challenge with implementing any forest-management project can be the lag time between taking the training, getting management on board, and finding funding. Riely credits having a project in hand when he attended the workshop and a forestry staff supportive of incorporating climate change into forest management as reasons why he could implement the two projects within a short timeframe. “I think having a tangible project to undertake within a year after participating in the training certainly helped bolster my enthusiasm and interest in it and developing the project,” he said. “And being able to actually implement something on the ground instead of just considering it conceptually.”

At Providence Water, climate change adaptation is now on more people’s radar because of Riely’s work. Not only will the soon-to-be updated forest-management plan address climate change, but the public utility is also working with a consultant to consider the feasibility of climate-adaptation planning throughout the 60,000-acre watershed and collabo-

rating with partners to help private landowners prepare for climate change.

“Our ultimate goal is that land managers consider climate change as part of their daily operations and jobs,” Janowiak explained. “We want to mainstream it into the process of good forest management and land stewardship, so when people are thinking about the long-term sustainability of forests, climate change is just part of the conversation. The end game is that it’s just something that everybody’s thinking about.”

Because this climate change-adaptation work is still relatively new—NIACS initiated the first adaptation projects in northern Wisconsin in 2010—there is still the sense of experimentation surrounding it; however, it is experimentation based upon already established forest-management principles. “Forest adaptation [in response to climate change] doesn’t mean foresters have to completely change what they’re doing,” said Janowiak. “We’re not throwing out 150 years of sustainable forest management. We’re doing that and building on it.”

Riely views managing for climate change and these new projects, which build upon the work of previous Providence Water foresters, including SAF Fellow Hans Hergey and others, as a new twist on some old principles: “It’s humbling to know that we’re not doing something entirely new, but also it helps put it into the context of the long-term management of this watershed.” **FS**

To learn more about Riely’s Providence Water Scituate Reservoir project and other climate-adaptation projects, visit the Climate Change Response Framework at www.forestadaptation.org. Maria Janowiak (mjanowiak02@fs.fed.us) and other NIACS staff are available to help implement climate-adaptation projects.

The Beauty of Stratification

By Steve Fairweather

One of the most powerful and easiest-to-apply tools for making sampling more efficient is stratification. This is the process of breaking a population of interest into component parts, sampling in each component, and combining the component estimates to arrive at an estimate for the population. There are a few formulas to learn along the way, but they are not difficult, and the boost in information gained for a given cost over a nonstratified sampling approach can be significant.

I'll review the basic formulas for stratified sampling estimation using the following example: A 120-acre ownership that has been stratified into three different cover types. Each cover type has been cruised, and the results are shown in Table 1.

For each cover type, we have the acres in the type, the number of cruise plots installed, and the cruise estimates for average tons per acre, the standard deviation, the variance, and the variance of the mean. The variance is simply the standard deviation squared, and the variance of the mean is the variance divided by the number of plots.

The last two columns in the table are necessary for calculation of the stratified sampling estimate of the average tons per acre for the ownership, and for the calculation of a confidence interval around that estimate. The stratum weight is simply the acres in the stratum divided by the total acres in the ownership, and the last column is just the weight times itself. You can easily make all of these calculations in a spreadsheet; a good check on the calculation of the weights is that they must add up to 1.0.

The stratified sampling estimate for the average tons per acre for the ownership is the weighted average of the stratum averages. In this case, the value is $0.417 \times 20.0 + 0.250 \times 22.0 + 0.333 \times 16.0$, which equals 19.167 tons per acre. We can get the same result by using the stratum areas and averages to estimate the total tons in each stratum, add up those totals, and divide by the total acres. In this case, that would be $1,000 + 660 + 640 = 2,300$ tons, divided by 120 acres, which is 19.167 tons.

To calculate a confidence interval for an estimate of tons per acre for the ownership, use the variance of the mean and the squared weight for each stratum. You start by finding the stratified sampling estimate of the variance of the mean, which is $0.1736 \times 4.033 + 0.0625 \times 9.800 + 0.1111 \times 0.800$, or 1.402. The square root of this result is the stratified

sampling estimate of the standard error, 1.184. The confidence interval is the average, plus or minus "t" times the standard error. You can read the value of t from a student t table, found in the back of many textbooks on statistics, or find by using built-in functions in your favorite spreadsheet program. When using the stratified sampling formulas, the degrees of freedom for t is equal to the total sample size, minus the number of strata. In this case, the degrees of freedom would be the number of plots, 70, minus 3, which is 67. For a 95 percent confidence interval, t is 1.996. The 95 percent confidence interval for average tons per acre for the ownership becomes $19.167 \pm 1.996 \times 1.402$, or 19.167 ± 2.797 tons per acre. Expressed as a percentage of the mean, the confidence interval is 19.167 tons per acre, plus or minus 12.33 percent.

The beauty of stratification is twofold. First, we get individual estimates for each stratum, as well as an estimate for the whole stand. Second, stratification will usually result in a more precise estimate for the overall average (or total) than if we did not stratify and instead treated the same number of plots as a simple random sample of the whole stand.

Here's an illustration of the second advantage: Suppose we have a small parcel with a uniform grid of 16 cruise plots on it. An aerial view of the parcel suggests that half the area is one timber class and the other half of the parcel is in a different timber class. So we decide to treat this cruise as a stratified sampling situation with two strata. The results are shown in Table 2.

Using the stratified sampling estimation formulas provided earlier, the estimate of the average MBF/acre for the parcel is 18.0. The standard error is 0.784, resulting in a 95 percent confidence interval of 18.0 ± 9.3 percent. (You should be able to verify these results using the formulas discussed earlier.)

If for some reason we had not realized we had two different strata and had treated the 16 plots as a simple random sample, the estimate of the average volume per acre would still be 18.0 thousand board feet (mbf). The variance of the mean for the 16 observations is 0.95, resulting in a standard error of 0.975. This leads to a 95 percent confidence interval of 18.0 ± 11.5 percent. This is a larger interval than was realized using the stratified sampling approach, so the payoff for doing the stratification is a more precise estimate of volume per acre. If the cost to do the stratification was small, then the

	Plot #	MBF/acre	
Stratum A	1	15	8 = n 15.63 = Average MBF/acre 3.20 = Standard deviation 1.28 = Variance of the mean 0.5 = Weight 0.25 = Weight squared
	2	10	
	3	14	
	4	19	
	5	17	
	6	13	
	7	19	
	8	18	
Stratum B	1	23	8 = n 20.38 = Average MBF/acre 3.07 = Standard deviation 1.18 = Variance of the mean 0.5 = Weight 0.25 = Weight squared
	2	26	
	3	17	
	4	20	
	5	22	
	6	18	
	7	18	
	8	19	

Table 2. The results of cruising two strata, A and B

stratified sampling design is more efficient than the simple random sampling design—in other words, better precision for the same cost. **ES**

Steve Fairweather is a senior biometrician with Mason, Bruce and Girard Inc., in Portland, Oregon, and has been a member of SAF since 1974. Questions or comments or suggestions for future topics? Contact him at steve@fairweatherbiometrics.com.

Journal Archives

Gold, Platinum, and Student SAF membership includes access to the current edition and archives of the *Journal of Forestry* and *Forest Science*, as well as the archives of the three regional journals prior to 2014, when they merged with *Forest Science*. See www.eforester.org/publications.

Forest Inventory Data Collection Bids

Notice of new upcoming 2018 federal government Blank Purchase Agreement (BPA) to complete forest inventory data collection work in the following locations:

1. Urban Forest Inventory of New York City and Bridgeport, CT and surrounding commuting areas in NY and CT.
2. Urban forest inventory of Chicago and surrounding commuting areas in IL, IN and WI
3. Statewide forest inventory in the state of North Dakota including urban inventory in Fargo and ND statewide urban forest inventory plots.
4. Statewide forest inventory of Ohio and the urban inventories Cleveland, OH, urban statewide and the urban inventory of Pittsburgh, PA.
5. Statewide forest inventory of WV with the option of statewide WV urban plots
6. Future undefined FIA call solicitations are likely throughout 2017 and 2018

This work and future contract work will be posted on the Federal Business Opportunities website at: <https://www.fbo.gov/>

To become a qualified contractor with qualified data collection crew leaders in this BPA, contractors should check for these opportunities beginning November 2018 and throughout the life of the BPA contract – usually 5 years. To search for opportunities, contractors can type in the NAICS 115310 in the Keyword/Solicitation # prompt on the Home page. The North American Industry Classification System (NAICS) is a Federal business classification system based on type of work performed. The NAICS code used to classify the FIA work is 115310, Support Activities for Forestry.



USDA Forest Service,
Northern Research Station
Forest Inventory & Analysis

Cover Type	Acres	Cruise Plots	Average Tons/acre	Standard Dev.	Variance	Variance of Mean	Weight	Weight Squared
H1c	50	30	20.0	11.0	121.0	4.033	0.417	0.1736
H2c	30	20	22.0	14.0	196.0	9.800	0.250	0.0625
H1a	40	20	16.0	4.0	16.0	0.800	0.333	0.1111
Total	120	70					1.000	

Table 1. Cruise results for three strata comprising a 120-acre ownership

Hagenstein Lectures West Features Emerging Voices in Forestry

By Steve Wilent



“Foresters in the City” was the title of this Hagenstein Lectures panel discussion at the World Forestry Center in Portland, Oregon, in October. Left to right: panel moderator Abe Wheeler, a forester with the Bureau of Land Management; Michael Ahr, a forest conservationist at the West Multnomah Soil & Water Conservation District; Angie DiSalvo, outreach and science supervisor with Portland Parks & Recreation Department’s Urban Forestry Division; and Ciara McCarthy, an urban and community forestry professional based in Bend, Oregon. Photo by Wasim Muklashy, www.wasimofnazareth.com.

The second annual western edition of the Hagenstein Lectures was held at the World Forestry Center in Portland, Oregon, on October 15. The debut of the eastern edition of the lecture series was on October 3 in Washington, DC. The bicoastal lectures, presented by the World Forestry Center and the Society of American Foresters, honor the legacy and memory of William D. Hagenstein, who died in Portland at age 99 in 2014. See “Hagenstein Lecture Focuses on Forest Communities,” *The Forestry Source*, November 2017.

The theme of the western Hagenstein Lectures is Emerging Voices in Forestry, and most of the speakers are under the age of 45 and are “leaders working at the forefront of social, economic, and environmental change.”

The October 15 event, which drew an audience of about 120 people, featured three panel discussions: Green Wood/Green Buildings, Foresters in the City, and WOW—Women Owning Woodlands. The first panel included two foresters: Edie Sonne Hall, who is part owner of a family tree farm in South Carolina, and Nicole Strong, an Oregon State University forestry and natural resources extension agent. The third panelist was architect Kristin Slavin, lead architect of the Carbon12 project in Portland, Oregon, which, when completed, will be the tallest mass-timber building in the United States.

Hall said her passion is looking at how forestry can play a role in larger issues.

“I worked with the World Business

Council on a sustainable-development project, looking at how the forestry sector can solve big-picture issues, how we as a forestry sector globally reduce net greenhouse gas emissions. It turns out that we not only need to and can use more wood products as replacements for alternative materials—because wood is a renewable resource—but that also means that we can have more forests as well ... so we can have more forest products, more forests, and transition to a bio-economy.”

Slavin, the architect, said that “people enjoy being in wood buildings—it’s a very human experience. It’s more personable than feeling inside of a concrete box. Wood can do a lot of things that connect us back to nature and can provide a nicer experience when we’re indoors, which is most of our lives, and can also do great things for sustainability and livability.”

“We [humans] aren’t going to stop building,” Slavin added. “But if we can build out of renewable materials and manage our forests to accommodate that renewable-material building growth, I think we’re going to be far better off than if we continue to use concrete and steel.”

After a period of early-career idealism, Strong said she has become more focused on practical issues.

“When I started my forestry career, I wanted to save the Amazon River delta. I was not very cognizant of everything that was going on right here in my own backyard,” she said. “Twenty-something years later, I like to think of myself as a ‘YIM-BY’—yes, in my backyard, as opposed to not in my backyard, or NIMBY.... I’m re-

ally excited about everything that’s going on with cross-laminated timbers, because I see opportunities not only to get the work done that needs to be done on our lands, but also [this is] a way to encourage a sustainable workforce and economy in our rural communities. We still see a lot of poverty and unemployment in a lot of our rural communities, especially in central Oregon, and I think this could be a really cool opportunity.”

Foresters in the City

The second panel on urban forestry featured Michael Ahr, a forest conservationist at the West Multnomah County Soil & Water Conservation District; Angie DiSalvo, outreach and science supervisor with Portland Parks & Recreation Department’s Urban Forestry Division; and Ciara McCarthy, an urban and community forestry professional based in Bend, Oregon.

In his work with the conservation district, Ahr focuses on about 20,000 acres of forestland north and west of Portland, about three-quarters of which is owned by private landowners, with most of the remainder in the city’s popular Forest Park. Ahr helps the private landowners, most of whom own relatively small parcels, develop management plans; many of the landowners are new to the concepts of forest management.

“You might be inclined to think that these people are not very inclined to cut trees, but they’re actually very interested in active management. I think that some of them will in the future be able to harvest some merchantable timber,” said Ahr.

“These landowners are really important because they have a lot of wildlife habitat, and because we have a 5,000-acre city park next door, it’s great to work with these folks on conductivity corridors for wildlife. And we want to encourage good forest health and, hopefully, not too many invasive species from there all the way out to the Coast Range.”

DiSalvo described the distinction between urban forestry and traditional forestry.

“In urban forestry, the ‘products’ that we are managing are not lumber or chips. Our trees are considered as essential infrastructure that provide a vast array of benefits for all of our city’s residents,” DiSalvo said. “And they’re not just providing ecosystem benefits—clean air and clean water—but benefits for people and communities such as health—whether it’s mental or physical—reduced crime rates, higher property values, and the list goes on and on.”

DiSalvo noted that more than 80 percent of the US’s population lives in urban areas.

Most people’s “first interaction with nature is generally with the trees that are right outside their door,” she said. “So if we want to help people connect better to our forests in our natural areas, [then] I think we need to start thinking of our urban forests as gateway forests.”

McCarthy, owner of ArborSurveys Urban Forest Management, said she “helps residents get along with their trees and manage their properties” in Bend, a city of more than 91,000 people in the



Kristin Slavin, of PATH Architecture in Portland, Oregon, is the project architect of Carbon12, the tallest mass-timber building in the United States at completion. Photo by Wasim Muklashy, www.wasimofnazareth.com.

high desert of central Oregon.

“When it comes to trees, it’s constant education, whether you’re talking to one property owner or to a homeowners’ association or to a multidisciplinary team of engineers, architects, and planners,” she said.

McCarthy is a member of the board of directors of Oregon Community Trees, a nonprofit organization established to promote healthy urban and community forests through leadership, education, awareness, and advocacy. The organization works around the state “to teach some of the practical skills needed to manage trees in the urban environment—tree pruning, protection, selection, and planting.”

The organization works with private property owners, government agencies, other organizations, and youth groups, such as Boy and Girl Scouts and correctional institutions.

“Sometimes that’s a gateway into a new career for some of these individuals,” McCarthy said. “It’s really great when you meet somebody a couple of years later, and they say something like, ‘I’m working with a tree surgeon in Portland, and I love

it!’ To have made that connection—it’s very rewarding.”

WOW

The Women Owning Woodlands panel was moderated by Fran Cafferata Coe, a certified wildlife biologist who is a member of both the Wildlife Society and the Society of American Foresters. One of the three panelists was Wylda Cafferata, Fran’s mother; Wylda and her husband Steve Cafferata were named Oregon’s 2017 Outstanding Tree Farmers of the Year by the Oregon Tree Farm System. The other panelists were Sarah Deumling, who manages the 1,300-acre Zena Forest, a Forest Stewardship Council-certified forestland near Salem, Oregon; and Edie Sonne Hall.

Although the lecture series is focused primarily on speakers who are under the age of 45, Wylda Cafferata and Sarah Deumling are over 45. As Meghan Tuttle, a forester who works for Weyerhaeuser as a forest land-use manager, observed when she introduced the panel: “Forestry is multigenerational, and that’s the focus of this panel. We’re not all young, emerging voices—it’s important to hear from all generations in forestry,” she said.



“I’m really excited about everything that’s going on with cross-laminated timbers, because I see opportunities not only to get the work done that needs to be done on our lands, but also [this is] a way to encourage a sustainable workforce and economy in our rural communities,” said Nicole Strong (center), an Oregon State University forestry and natural resources extension agent.

Cafferata Coe, who noted that forestry is largely a male-dominated profession, asked the panel to talk about their perspectives as women in forestry.

“That’s a tough question, and I think that it really depends on your unique circumstances,” answered Hall. “For better or worse, when you’re dealing with people who are managing the land, whether it’s a forestry consultant or contractor, [sometimes] they’re not quite used to dealing with a woman landowner. It’s not bad, it’s just not part of their run-of-the-mill, day-to-day experience. That is changing, but I have had experiences—say, I’m talking to the logger out on a site who is sort of like, ‘Why are you here?’ and ‘Why are you so interested?’”

Hall also talked about the need to communicate with family members and other partners in private ownerships.

“I have always felt that, whenever I bring a suggestion to the table, I need to be very prepared, and come with facts and have everything thought through. Which is a great thing, but sometimes [the attitude] is, ‘Do you really know what you’re talking about?’ Well, yes, because I do have a background in forestry. But, ultimately, I think it makes the decisions better, because it really does force me to be well prepared to make my case.”

Deumling talked about her inclination as a landowner to be nurturing when it comes to her trees.

“I think there’s more difference between people, from A to Z and their own orientation, than there is between men and women,” she said. “We often say that forestry is a combination of art and sci-

ence, and women [tend to be stronger] on the art and intuition side over the science side. But that’s not to say that some men don’t do that, and some women are very data-oriented.”

Like the other panelists, Wylda Cafferata said that the question about women and forestry was a difficult one.

“It’s hard to answer this question without sounding sexist, and I don’t want to sound that way. But I do think that women bring two somewhat unique approaches to forestry. One of them is that, in general, women tend to be more flexible, just because we’ve had to make so many compromises in our lives. On our forest, we have multiple objectives. I think it’s easier for me, within my family, to find balance for those objectives. It seems like some of the men in our family [focus on] timber. And I say, ‘Well, we have wildlife and we have timber and we have other values.’”

Wylda Cafferata also talked about the importance of nurturing.

“I love our forest, and I love it with a real passion,” she said. “It’s not that men don’t love their forests—they do. But women feel maternal about growing things. So that’s something else that women can bring to the table when it comes to forest management.” **ES**

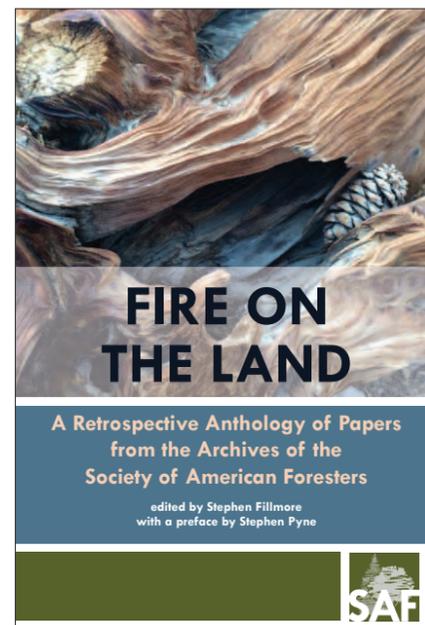
See www.hagensteinlectures.org for more information and videos of the presentations.

Preparations for the 2018 Hagenstein Lectures in Portland are underway. For information, contact Rick Zenn, World Forestry Center, 503-488-2103, rzenn@worldforestry.org.

Fire on the Land

Featuring a preface by Dr. Stephen Pyne

Fire on the Land brings together the best research and thinking on fire ecology, policy, and application to examine fire’s place in forest management. A collection of peer-reviewed scientific articles from the SAF archives, this anthology provides a comprehensive examination of how fire has shaped America’s forested landscape and the people who care for it. Each new section is led by a science synthesis introduction that bridges the history of these pivotal papers and the current practices and work that lies ahead regarding fire science in forestry.



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Foresters' Fund Helps SAF Units Achieve Goals

By Lori Rasor

If you bought or won a book, bottle of wine, artwork, or other gift at the silent auction and raffle at the SAF National Convention, you not only have a memento of the event, you also made a contribution to the SAF Foresters' Fund. Many such auctions, raffles, and other fundraisers at chapter, state, and division meetings and other SAF events also benefit the fund. In 2017, 17 SAF units received a combined \$41,700 in funding from the fund to support local projects.

Approved projects promote education to enhance public understanding of forestry and the profession, support forest-policy activities, and generally strengthen local units to achieve the mission of SAF. Regular grants provide funding up to \$1,500, and special grants, which are approved once a year, provide up to \$5,000.

The following projects received funding in 2017.

Appalachian SAF received \$1,200 to support the Be a Leader! A Leadership Workshop event that provided leadership skills to SAF members and others.

Allegheny SAF was awarded \$1,500 toward the Conservation Trail at the Boy Scout Jamboree. The West Virginia SAF Division and partners set up an educational area that exposed 25,000 Scouts to forestry via hands-on learning activities and technology-driven challenges; many Scouts earned their forestry merit badge during this experience.

Washington State SAF received \$1,500 to cover awards and T-shirts for the Washington State Envirothon, an annual high school event at which teams vie to attend the North American Envirothon.

Colorado/Wyoming SAF was awarded \$1,500 in support of the Wyoming Interagency Timber meeting, which took place the day before the chapter's annual meeting. The timber meeting brings together public and private foresters and logging contractors from the area, many of whom are not SAF members, which provided a good recruitment opportunity.

Washington State SAF received \$1,400 to provide substitute teachers and transportation to middle school students for hands-on learning about forestry at the Darrington Seed Orchard on the Mount Baker-Snoqualmie National Forest. SAF student chapters were involved in this project, which was coordinated by the North Puget Sound Chapter. (See "Foresters' Fund Helps Connect Youth and Nature," *The Forestry Source*, July 2017.)

Missouri SAF earned a \$1,000 grant to provide training instruments to high school teachers as part of the Missouri Agricultural Teacher Forestry Workshops. Teachers were shown tools foresters use to measure trees and assess forest-stand conditions and were provided tips to teach these skills to their students. All teachers were sent home with training materials in print and electronic form.

Forestry Day at Fort Missoula combines a one-of-a-kind Pro-Am timber sport



The SAF Foresters' Fund provided funding for two busloads of Missoullans to attend the 2017 Timber Tour to educate them on the value of Montana timber.

competition and hands-on forestry, historical logging exhibits, and displays to educate and entertain the community. Missoula Chapter members run the sawmill, staff the display booths, and give walking tours of the forestry interpretive area, while University of Montana Student Chapter members barbecue lunch as a fundraiser for travel expenses to attend the national convention. The \$1,450 Foresters' Fund grant paid for radio and TV advertising to promote the event and covered the costs to rent bleachers and purchase memorial trees.

Colorado/Wyoming SAF received \$1,500 for a project to develop "Trunks" (containers) of forestry tools and equipment to raise awareness about SAF and sound forest-management practices. The SE Colorado Chapter teamed up with partners to develop the corresponding curriculum, with an emphasis on reaching Ski Naturalist program participants through which free tours are given to educate skiers and snowboarders about the land they are recreating on. The curriculum was also created to align with a youth ecological literacy program that works to strengthen young people's connectedness to the natural world.

Public Day in the Woods at the University of California's Russell Research Station, organized by the Bay Area Chapter of NorCal and the UC Berkeley Student Chapter, received \$1,500. Goals include illustrating key roles that resource professionals play in maintaining and enhancing the many benefits that forests provide to society and strengthening the chapter's ability to promote forestry in the area. Prior to the event, several workdays are being organized to clear debris, improve access and safety, and determine trail stops.

Southeast SAF received \$1,500 in support of conducting a stand-alone Leadership Academy, with emphasis on outreach to early-career professionals. Both general leadership concepts and SAF-

specific leadership training were provided.

Wisconsin SAF was awarded \$5,000 for trail system maintenance and upgrade of Trees for Tomorrow, an outdoor educational facility and program that draws 7,000 students and 4,000 adults annually. The campus includes a 20-acre forest with a trail system where students can identify trees and investigate forest ecosystems. Funds will go toward building a boardwalk over a perennially wet area to minimize erosion and degradation of the area. Many partners will be involved in the construction of this project.

Appalachian SAF received \$4,350 to increase understanding about urban ecosystem services in Clemson, South Carolina. The Keowee Chapter is planning a field event on Arbor Day to promote public/student understanding of the role of foresters in urban management and a Walk in the Clemson Experimental Forest activity for the public and media to educate them about ecosystem services. The Keowee Chapter is using these public education events to re-energize the chapter and to collaborate and strengthen ties with other organizations.

Forest Health in Oregon: State of the State, a conference organized by the Oregon SAF, received a \$4,800 grant. The two-day conference, held on the Oregon State University campus, will synthesize current forest-health conditions in Oregon. The conference is aimed at practitioners, and free attendance will be marketed university-wide to clubs and students in allied programs such as botany, biology, and exploratory students.

Wisconsin SAF received \$5,000 to establish a martlescope, or silvicultural training site, on the Argonne Experimental Forest in the Chequamegon-Nicolet National Forest in northern Wisconsin. The site will serve as a field-based educational tool to train professionals, students, and educators on northern hardwoods.

Intermountain SAF received \$5,000

to support the Sustainable Forestry Tour for Teachers and Counselors. The purpose is to expose teachers and school counselors (grades 3–12) to the various aspects of sustainable forestry. Forty-eight cosponsors support this week-long program.

Oregon SAF received \$3,000 in support of a riparian management workshop for state legislators and congressional staffers. The one-day event informed and educated policymakers on how current regulations affect forest and rangeland riparian areas on federal, state, and private lands. It also connected decisionmakers with SAF members, so that expertise can be provided to help assess regulatory proposals that come before these officials.

Montana SAF received a \$500 grant to support the Timber Tour, which was part of Missoula Montana Forest Products Week. The Forest Resource Committee of the Chamber of Commerce, which includes several SAF members, organizes the event. The tour focused on fires and salvage opportunities and was marketed to the general public.

Congratulations to all of these SAF units for putting the time, energy, and focus into developing innovative proposals and advancing the mission of the Society.

SAF state societies contributing to the Foresters' Fund in 2017 include Appalachian, Colorado/Wyoming, Indiana, Kentucky/Tennessee, Louisiana, Michigan, Ohio, and Oregon. The Valley Forge Chapter of Allegheny SAF also contributed.

If you have an SAF project that promotes forestry education and enhances public understanding of forest management, submit a proposal to the Foresters' Fund; \$60,000 is available for 2018 projects. Deadlines are February 15, June 15, and September 15. Visit www.eforester.org/grants for additional information. **ES**

Lori Rasor is SAF's national program support manager.

Honor Your Colleagues: National Awards Nominations Due March 15

SAF awards are an important way to recognize those among us who make significant contributions to SAF and forestry across the nation. Nominations are due March 15 for a suite of awards that recognize excellence in the forestry and natural-resource professions.

The full slate of awards is presented each year at the SAF National Convention. Nominations are being accepted for the following awards in 2018.

Forest Science and Technology

- The Barrington Moore Memorial Award recognizes outstanding achievement in biological research leading to the advancement of forestry.
- The Award in Forest Science recognizes distinguished individual research in any branch of the quantitative, managerial, and/or social sciences leading to the advancement of forestry.
- Members showing outstanding performance in the areas of technology transfer, implementation, and extension should be nominated for the Technology Transfer Award.

Communications

- The Outstanding Forestry Journalism Award recognizes high-quality journalistic coverage of topics that increase the American public's understanding of forestry and natural resources.
- SAF members who lead innovative and exemplary communications initiatives and programs that increase the general public's understanding of forestry and natural resources qualify for the W.D. Hagenstein Communicator Award.

Professional Development

- The John A. Beale Memorial Award recognizes outstanding efforts over a sustained period by an SAF member in the promotion of forestry through voluntary service to the Society.
- The Carl Alwin Schenck Award recognizes devotion and demonstrated outstanding performance in the field of forestry education.
- The Gifford Pinchot Medal recognizes outstanding contributions by a forestry professional in the administration, practice, and professional development of North American forestry.
- The Sir William Schlich Memorial Award, presented in even-numbered years, recognizes outstanding contributions in the field of forestry, with emphasis on policy and national or

international activities.

- The Young Forester Leadership Award recognizes outstanding leadership by a young forestry professional in the development and promotion of an individual program or project, or for a sustained leadership role benefiting the practice of forestry and the Society of American Foresters.
- The Diversity Leadership Award recognizes outstanding individual achievement leading to innovative and exemplary diversity and inclusion efforts.
- The Employer Leadership Award recognizes an employer that demonstrates leadership through consistent support of employee participation in SAF and broad engagement in the profession.
- The Student Leadership Award recognizes individual student achievement and leadership at the local, regional, or national level.
- The Honorary Membership Award recognizes individuals whose contributions to forestry are viewed as outstanding by their peers.

SAF Fellow nominations are also open and due March 15. Full descriptions of these awards, submission criteria, and how to nominate individuals are available at www.eforester.org/awards.

Please take a few minutes to identify and recognize your worthy peers for the service they provide to the Society and the forestry profession. To submit award nominations and get more information, contact Lori Rasor, national program support manager, at rasorl@safnet.org or 503-224-8046.



Ralph Nyland receives the Barrington Moore Memorial Award from then vice-president Dave Lewis at the SAF National Convention in Albuquerque in November 2017. The award recognizes outstanding achievement in biological research leading to the advancement of forestry. Photo by Josh Zytkeiwicz, Focal Flame Photography, www.focallflame.com.

Willard Berry, 91, died on June 7, 2017, in Tillamook, Oregon. He earned a degree in forestry at Oregon State University. Berry served in the US Air Force during World War II and was honorably discharged in 1946, but continued to serve the Army Air Corp until he was 60 years old. For more information, see tinyurl.com/ybg9h4jr.

Gerd Hildebrandt, 94, died on December 11, 2017, in Freiburg, Germany. Hildebrandt, a German forestry scientist, was the longtime head of the Department of Aerial Imaging and Remote Sensing of the Forestry Faculty of the Albert Ludwigs University of Freiburg. He authored more than 200 papers on forestry and remote sensing. He edited *Remote Sensing in Forestry: Proceedings of the Symposium Held During the XVI IUFRO World Congress*, Oslo, Norway, June 21–26, 1976. In 1985 Hildebrandt was named an honorary member of the Society of American Foresters for his commitment to the worldwide “implementation of the sustainability principle with all available technical means.” For more information, see tinyurl.com/y97nt8rx.



Gerd Hildebrandt

Alvin “Tyke” Sorseth, 98, died on November 7, 2017, in Eugene, Oregon. Sorseth enlisted in the US Navy in 1942 and became an aviator; he was attached to the US's Atlantic Fleet and ultimately became a patrol bomber commander, searching for submarines and escorting ship convoys from Nova Scotia to Brazil. After the war, he attended Oregon State College, majoring in forestry, and graduating in 1948. Sorseth started his 35-year career in the US Forest Service on the Willamette National Forest, where he ultimately became district ranger on three ranger districts. His first district ranger assignment was on the Malheur National Forest. He retired in 1977 as a staff officer on the Willamette National Forest. Sorseth's passion for forestry blossomed after retirement, when he committed himself to converting his wife's parents' farm near Sweet Home, Oregon, from pasture to timber production. He began planting trees in the early 1990s, and, joined by his sons, planted seedlings and pruned trees until he was well into his 80s. The 35-acre farm is now well stocked with Douglas-fir and ponderosa pine. In 2003, Sorseth and Arlene were honored as Tree Farmers of the Year by the Linn County Small Woodlands Association. For more information, see tinyurl.com/y9r49fqd.



Alvin Sorseth

management. He followed his older brother, Bond, to work for Starker Forests, a company founded by their grandfather, T.J. Starker. An article about Barte's death in the *Corvallis Gazette-Times* (tinyurl.com/ya5emekz) stated that “Together, the brothers grew the family business into one of the most respected private timberland owners in the state. Headquartered in Philomath, Starker Forests today has 22 employees and about 86,000 acres of standing timber in Benton, Linn, Lincoln, Lane, and Polk Counties.” The *Gazette-Times* noted that Barte took an active role in timber industry affairs by serving on numerous boards and committees, helped guide research to improve forestry practices as chair of the Coastal Oregon Productivity Enhancement Program, and helped shape timber policy as a member of the Oregon Board of Forestry. He served on the boards of the Oregon Forest Resources Institute, Oregon Natural Resources Education Fund, Keep Oregon Green, World Forestry Center, and Western Forestry and Conservation Association (serving as president in 2005). In 1990, he was named Forester of the Year by the Society of American Foresters. In 2017, Starker Forests received the first annual SAF Employer Leadership Award, which recognizes an employer that demonstrates leadership through consistent support of employee participation in SAF and broad engagement in the profession. For more information, see tinyurl.com/yc84gwfg.



Barte Ball Starker

Where Do I Send It?

Employment Ads

All job announcements in the Classifieds are drawn from the SAF Career Center website, careercenter.eforester.org. Information about posting employment ads is available on the SAF Career Center website. Space is limited. Publication of employment ads in *The Forestry Source* may be subject to posting date limits.

Continuing Education Calendar

Events in this category are drawn from the Event Calendar on SAF's website, tinyurl.com/hb2uamr. All events posted in the Event Calendar must offer Continuing Forestry Education credits. The instructions and forms for submitting events are available on the Event Calendar page. Space is limited. Publication in *The Forestry Source* cannot be guaranteed.

Diversity and Inclusion

I understand that a number of readers question why there should be articles on diversity in *The Forestry Source*. Andrea Watts' sidebar, "Why the Message of Conservation Needs to Be Inclusive," to the article "Black Family Land Trust" in the November issue emphasizes why our message of conservation and forest values needs to be inclusive, not only for traditional white (male) forest owners and corporations, but across the spectrum of "African, African American, First Nation, and other indigenous people," and immigrants such as myself. There is no need to belabor the point, but if there is a legitimate opportunity to include a photo or to quote a person other than a "traditional" one, why not seize the moment?

Thomas H. Schubert
Leesburg, Florida

A Thank-You from Seely

To my fellow SAF members: On December 31, I completed my three-year term as an SAF national officer on your behalf. I simply want to say, thank you so much for giving me the opportunity to serve you and the profession. It has been an honor and privilege to serve your best interests and help move all of us forward, and I will be forever grateful. My best regards,

Clark W Seely, CF
New Smyrna Beach, Florida

On "Rethinking the Stand"

"The Map Is Not the Territory: Rethinking the Stand," by Zack Parisa and Max Nova, in the October 2017 issue of *The Forestry Source*, was presented as "Biometric Bits" (a factual theme repeated in previous issues), when in reality it is an opinion piece without evidence of fact or reference to a factual basis. The reader (and authors) should back up to "The Stand: Revisiting a Central Concept in Forestry," by Kevin O'Hara and Linda Nagel in the September 2013 *Journal of Forestry* when considering the concept of a stand. They provided a very good discussion of the ecological and operational characteristics that define a stand.

Stand delineation is mostly about silvicultural management and the objectives of the forest landowner. The actual practice of silviculture within these stands may then move the forest in a direction necessary to achieve these objectives. Once the initial stratification into stands is achieved, the forest manager should never go back to "frequently updated satellite imagery" as a basis for maintaining inventory information.

In our western forests, we manage from one to 10 species per stand, depending on silvicultural history and management objectives. The topography, soils, and climate are highly variable. These factors make access and operability equally variable. Therefore, the ability to apply silvicultural regimes in a temporally and spatially meaningful way is a significant challenge.

The dynamics of forest growth are ex-

pressed in the matrix of species, size, density, and spatial patterns of trees within stands. The rates of change in stand structure are driven by species growth forms and local site productivity. In the West, once a forest ownership is stratified into stands, the typical forest has evolved into a forest inventory containing stands from five to 60 acres in size (the average usually in the range of 15 to 35 acres). This is the result of a combination of ecological and operational factors. Most forest ownerships have now evolved to approximately 65 to 85 percent of these stands having been field sampled at least once (some as many as three times over 40 years). These field samples provide unique stand-by-stand detail about species and structure composition not possible from satellite imagery.

In forest-planning analyses, each field-sampled stand (species and structure) is projected with alternative silvicultural regimes using a tree-list growth model calibrated to the local forest. The best combination of silvicultural regimes across the ownership is then developed, which may move the forest in the direction of the ownership objectives. This level of resolution is not possible from satellite imagery and a small sample of on-the-ground "training plots."

While there is much discussion about ecosystem services, variable-retention harvesting, variable-density thinning, and multiage silviculture, each of these result in significant variations in resulting species composition, volume, and value realizations at the forest level. I have personally analyzed alternative silvicultural scenarios with alternative ecological and management goals for more than 20 species across 17 million acres in six western states. Until someone demonstrates a more robust and resilient alternative to stands, I will default to the conclusions provided by O'Hara and Nagel:

1. The stand is the logical landscape unit for forestry for both ecological and operational usage;
2. We find no justification to replace it with patches or some other term that does not have a significantly different meaning; and,
3. The term *stand* needs to be flexible for different usages, even if that means a stand is defined differently in the same space.

The application of satellite imagery suggested in this opinion piece, "Rethinking the Stand," appears to be a solution looking for a problem. The concept of a stand in a forest inventory is not that problem.

James D. Arney
President, Forest Biometrics Research Institute
Portland, Oregon

The authors respond:

We are excited about the interest there has been in the recent Biometrics Bits col-

umns, particularly the recent article on the stand concept and its implications for forest inventory practices. We have had great discussions with many readers and are glad to continue the conversation in this response to Dr. Arney's thoughtful letter.

In the O'Hara and Nagel article that Dr. Arney references, the authors state that "the stand is the logical landscape unit for forestry for both ecological and operational use." We agree with that. The "rethinking" we encouraged in our original article is the idea that the stand is not the logical unit for maintaining information about a forest. This is true because:

- Stands are not homogenous and stand bounds are dynamic
- New technology enables forest managers to get cost-effective sub-stand information

Let's first take a step back and consider a common practical situation. At one time or another, we've all found ourselves in a stand that clearly has areas of different structure, composition, or productivity. These differences are sometimes large enough that we choose to vary our silvicultural treatments significantly within the stand and expect varied responses. This is one of the reasons that foresters have used aerial photography for decades. By using imagery to assess the stand at a higher resolution, foresters avoid surprises in the field. Modern remote-sensing methods serve the same purpose, only more systematically and with greater quantitative rigor.

Dr. Arney says that (emphasis ours), "Once the initial stratification into stands is achieved, the forest manager should never go back to 'frequently updated satellite imagery' as a basis for maintaining inventory information." This suggests a rigid adherence to static stand bounds. However, O'Hara and Nagel clearly state that "in reality, stands shift due to changing management objectives or because of disturbance." They go on to cite Oliver and Larson's *Forest Stand Dynamics*, describing the complex dynamics of how stands shift and change over time.

As the saying goes, you can't manage what you don't measure. For operational stands to be useful to forest managers, they must account for variation and be responsive to changing management objectives. As stands evolve, the information that managers use must keep pace.

In this regard, again, we agree with O'Hara and Nagel that "modern technology provides opportunities for remote sensing from satellites and geographic information systems to delineate and map stands over time." Fifty years ago, the tools to acquire and maintain this type of sub-stand information didn't exist. However, as we wrote about in our August Biometrics Bits column, "Imagery in Forest Inventory: Platforms, Sensors, and Analysis," the last 10 years have seen an explosion of new technologies for assessing forests at high spatial and temporal resolution. As O'Hara and Nagel ask, "If we recognize that

the uniformity and boundaries of stands are dynamic, then do we have the capability to recognize these distinctions from imagery and recognize the distinctions that are important to management?"

Dr. Arney suggests that "this level of resolution [for species and structure] is not possible from satellite imagery and a small sample of on-the-ground 'training plots.'" That has not been our experience. For nearly a decade, we have been doing just that for many of the largest timberland owners in the United States. For more information on pairing auxiliary data with plot measurements to improve inventory precision and resolution, we recommend reviewing *Model Assisted Survey Sampling* (Särndal et al., 2003).

Forests are complex and our map will never exactly match the territory, but maintaining inventory information at the sub-stand level moves us closer. The appropriate resolution and frequency of updating forest information will ultimately be decided by forest managers. If the current inventory practices of the largest landowners in the US are any indication, this shift is well underway.

Zack Parisa and **Max Nova** are the founders of SilviaTerra (www.SilviaTerra.com).

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- Oliver, Chadwick Dearing, and Bruce C. Larson. *Forest Stand Dynamics*, updated edition. John Wiley and Sons, 1996.
- Särndal, Carl-Erik, Bengt Swensson, and Jan Wretman. *Model Assisted Survey Sampling*. Springer Science & Business Media, 2003.

Seeking GIS, Science & Tech Articles

The Forestry Source welcomes contributions for the GIS for Foresters and Science & Technology sections. GIS for Foresters articles cover geographic information systems, Lidar and remote sensing, tips and techniques for being more productive with ArcGIS and other software, and related topics. Science & Tech focuses on recent research, technologies, and techniques for forestry and natural-resources management. These articles are not peer reviewed; they may include references and links to resources. Length: 700 to 1,200 words; photos, charts, and graphics welcome. Information: Steve Wilent, Editor, 503-622-3033, wilents@safnet.org.

Sanders Receives Governor's Award

Montana SAF member Gordy Sanders, CF, resource manager at Pyramid Mountain Lumber, recently received the Governor's Award for Excellence in the Use and Promotion of Montana Wood. Sanders was nominated for the award by Brian Kahn, of Artemis Common Ground, for his work as the chair of the Montana Forest Products Roundtable. Kahn noted that Sanders has been "a tireless advocate and participant in conservation collaboratives in western Montana. He was a co-founder of the Montana Forest Restoration Committee and has helped oversee the formation of four local restoration committees." **FS**



LEWIS
■ From Page 3

decision on the fate of the building will likely be made at our spring Board meeting.

We certainly have some challenges, but you sound optimistic about SAF's future.

SAF is blessed with a truly excellent staff that is dedicated, smart, and hard-working. We have a diverse and talented Board of Directors that sacrifices their own time and interests daily for those of SAF. I plan to let our committees and their chairs do much of the heavy lifting next year, and I am confident that

we will be able to move the ball down the field some more in 2018.

I want to thank the membership for electing me and putting their trust in me. I am honored to be serving as the SAF President for 2018, representing 10,000-plus foresters across the country, and I look forward to visiting with many members this year at state society meetings and the SAF National Convention in Portland. Although we have many challenges ahead, yes, I am excited about the prospects for SAF. It is a great organization of passionate, hard-working members who care deeply about forestry and the forestry profession, and I think there are great things to come for SAF. **FS**



Sasquatch Sighted at SAF Convention

For a moment, Rachel Powell thought she had seen Sasquatch at the SAF National Convention in Albuquerque, but it turned out to be Dick Powell, her husband, in costume. Rachel was later heard to say that "a big, hairy, obnoxious, smelly creature" had invited her to visit Portland, Oregon, for the next convention, October 3-7, 2018. Dick and several other Oregon SAF members, acting as "SAFquatch," roamed the Albuquerque Convention Center to promote the event. Photo by Trevor Sartnurak, an Oregon State University forestry student.

Canfor Southern Pine – High Quality Fibre



Diminishing supply of the BC timber base

AAC reduction primarily due to the Mountain Pine Beetle infestation and First Nations land claims.

Strong fiber supply in the US South

High quality timber across the region
Positive growth to drain ration – long term supply

Provides species and geographic diversity for our markets and customers



Canfor Southern Pine recently announced plans for a \$28 million expansion of its sawmill in Moultrie, Georgia.

ITC Finalizes Canada Duties

On December 7, the United States International Trade Commission (ITC) announced its determination that the US forest-products industry is "materially injured by reason of imports of softwood lumber from Canada that the US Department of Commerce has determined are subsidized and sold in the United States at less than fair value." As a result of these determinations, the Commerce Department will issue antidumping and countervailing duty orders on imports of softwood lumber from Canada. Most Canadian producers will pay combined countervailing and antidumping duties of 20.23 percent, down from the preliminary rate of 20.83 percent.

"The US Lumber Coalition fully supports the enforcement of America's trade laws," said coalition co-chair Jason Brochu, who also is co-president of Pleasant River Lumber Co., which is based in Dover-Foxcroft, Maine. "The evidence presented to the ITC was clear: The massive subsidies that the Canadian government provides to its lumber industry and the dumping of lumber products into the US market by Canadian companies cause real harm to US producers and workers."

The US Lumber Coalition is an alliance of large and small lumber producers from around the country.

"The ruling today, while not unexpected, is completely without merit," said Susan Yurkovich, president of the BC Lumber Trade Council. "The ITC finding of 'injury,' despite the current record-setting profitability of the US lumber industry, makes it very clear that this was not an objective evaluation of the facts."

Lumber Price Volatility

The countervailing and antidumping duties on Canadian lumber exports to the US are expected to cause more short-term market and price volatility, according to the International Wood Markets Group (www.woodmarkets.com). The duties "will cause lumber prices to remain near record levels in 2018 and even higher at various points over the next five years. This is because Canadian lumber production and Canadian exports to the US are forecast to ease in 2018."

In a December 15 press release, Russ Taylor, the group's managing director, said, "Simply put, by restricting incremental Canadian lumber exports via import duties, there may not be enough lumber supplies to adequately balance with projected US demand. There will need to be major increases in US lumber capacity (which is starting to build), more offshore imports, and/or record-level prices to stimulate more supply. The question that we have seen coming for a number of years is: Where will the US get all of the lumber it needs, and at what price?"

Interfor to Upgrade Arkansas Mill

Interfor Corp., which is headquartered in Vancouver, BC, recently announced that it will invest \$46 million to upgrade and modernize its sawmill in Monticello, Arkansas. The project, which includes the installation of new state-of-the-art machine centers in the sawmill, as well as upgrades to the planer mill and the addition of a new continuous lumber drying kiln, is scheduled to be completed in early 2019. The upgrades would boost the mill's efficiency and double its production to about 150 mmbf per year.

Canfor to Expand Georgia Mill

According to the Moultrie, Georgia, *Observer*, Canfor Southern Pine has announced that it will spend \$28 million to expand its sawmill in that city, adding 10 employees at the mill and creating 30 supporting jobs. The former Beadles Lumber Co. mill is now owned by Canfor, a Canadian firm.

Rex Lumber Announces New Mill

Random Lengths (www.randomlengths.com) reports that Rex Lumber, which is based in Graceville, Florida, has plans to build a new sawmill in the Southeast with a capacity of at least 240 million board feet, and has identified several potential sites for the new facility. Company officials expect to make a decision on the location in early 2018 and begin construction shortly thereafter. Rex Lumber currently operates three sawmills, including two in the Florida panhandle and one in Mississippi, with a total production capacity of 575 mmbf.

CONTINUING EDUCATION CALENDAR

More Events at tinyurl.com/gnd78jh (www.eforester.org)

Continuing education events for **January 2018 through March 2018**. SAF Continuing Forestry Education (CFE) credits are available at all events. Visit SAF's Continuing Education Calendar at tinyurl.com/gnd78jh for more information on these events and others that may have been recently added to the list. **Note the webinars at the top of the listings.**

CFE Providers: To obtain pre-approval of Continuing Forestry Education credits for an event, complete and submit the CFE Provider Application Form on the Certification & Education/Continuing Education page at eforester.org (or tinyurl.com/z2zqc3o). Submittal instructions are included on the form.

CFE Post Approval for Individuals: If an event was not preapproved for CFE credit, SAF will evaluate the meeting on an individual basis. This service is available to members and SAF-certified professionals at no cost; non-members are assessed an annual fee of \$30. To apply, complete and submit the CFE Post Approval Form on the Certification & Education/Continuing Education page at eforester.org (or tinyurl.com/z2zqc3o). Submittal instructions are included on the form.

WEBINARS

1/9/2018, Forest Management Responses to Invasive Insects
1/15–3/2/2018, Forest Adaptation and Planning Practices (online course)
2/13/2018, Heard In the Woods: Learning from What Forest Landowners Have To Say
3/13/2018, Restoration of degraded forests
3/15/2018, Pacific Northwest Timberlands Management

COLORADO

1/26/2018, 2018 Natural Resources Leadership Academy, Fort Collins

GEORGIA

1/29–30/2018, SESAF 2018 Annual Meeting, Pine Mountain

IDAHO

1/19/2018, Family Foresters Workshop, Coeur d'Alene
1/25/2018, 2018 Professional Markets Technical Seminar - Forestry, Spokane, Wash.

INDIANA

2/15/2018, Indiana Invasive Species Council 3rd Biannual Conference, Danville

LOUISIANA

1/19/2018, Ag-Expo Forestry Forum 2018, Monroe
1/29–31/2018, Louisiana Society Annual Meeting & Program '18, Baton Rouge

MAINE

1/19/2018, 2018 Stream Restoration Workshop, Bangor
3/12/2018, Markets and Forest Industry, Orono
3/13/2018, Soils and Forest Management, Orono

MASSACHUSETTS

2/6/2018, Landscape Safety Conference – 2018, Milford
3/6/2018, Community Tree Conference, Amherst

MINNESOTA

2/6/2018, 14th Annual Forest Health Workshop, Walker

MISSISSIPPI

1/25–26/2018, 2018 Annual Conference Trees Forever, Raymond

MISSOURI

1/9/2018, Insect and Disease Seminar, Springfield

1/10/2018, Insect and Disease Seminar, Joplin
1/24/2018, Rigging Class, Springfield
1/25/2018, Rigging Class, Joplin
2/14/2018, Chainsaw safety for tree care workers, Joplin

MONTANA

1/23/2018, 2018 Montana Economic Outlook Seminar, Helena
1/24/2018, 2018 Montana Economic Outlook Seminar, Great Falls
1/26/2018, 2018 Montana Economic Outlook Seminar, Missoula
1/30/2018, 2018 Montana Economic Outlook Seminar, Billings
1/31/2018, 2018 Montana Economic Outlook Seminar, Bozeman
2/1/2018, 2018 Montana Economic Outlook Seminar, Butte
2/6/2018, 2018 Montana Economic Outlook Seminar, Kalispell
3/13/2018, 2018 Montana Economic Outlook Seminar, Lewistown
3/14/2018, 2018 Montana Economic Outlook Seminar, Havre

NEW HAMPSHIRE

2/7/2018, Winter Wildlife Tracking Workshop, Barrington,
2/9/2018, GSD-SAF Winter Meeting, Concord

NEW JERSEY

1/22–23/2018, Identification of Wetland Plants in Winter, Basking Ridge

NORTH CAROLINA

1/13/2018, NC ProLogger Mod 18, Dudley
1/25/2018, NC ProLogger Mod 18, Dudley
2/6–8/2018, Leadership Training Program: Growing in the Next Generation of Leaders, Charlotte
3/20–22/2018, Leadership Training Program: Growing in the Next Generation of Leaders, Charlotte

OHIO

1/25/2018, Tailgating with Trees: Winter Plant Identification #2, Dayton
3/22/2018, Tailgating with Trees: Winter Plant Identification #3, Dayton

OREGON

1/18/2018, Western Region Council on Forest Engineering Seminar, Eugene
2/26–2/2018, 2017 Forest Vegetation Simulator Training, Central Point
3/15–16/2018, "Pacific Northwest Timberlands Management: Regulations, Litigation, & Business", Portland
3/21/2018, Applied Forest Finance and Timber Forecasting, Portland

SOUTH CAROLINA

1/16–17/2018, South Carolina Forest Carbon

Conference, Dorchester
1/24–26/2018, 2018 APSAF Winter Meeting and Leadership Workshop, Greenville
2/7/2018, Pee Dee Waterfowl Habitat and Hunt Management Wksp, Marion
2/10/2018, SC Timber Producers Association 2018 Annual Meeting, Myrtle Beach

TENNESSEE

1/24–26/2018, SAF Winter Meeting, Buchanan

TEXAS

2/13/2018, 2018 Texas Timber Income and Property Tax Workshop, Diboll

UTAH

3/5–9/2018, 2017 Forest Vegetation Simulator Training, Ogden

WASHINGTON

1/24/2018, Sawmilling 101: Introduction to Softwood Sawmill Operations and Financial Perf., Vancouver
1/25/2018, Timberlands, Forest Products Processing, and Fiber Issues for 2018, Vancouver

WEST VIRGINIA

2/20/2018, 2018 A. B. Brook Symposium, Charleston

WISCONSIN

1/22/2018, Forest Metrix: Forest inventory for your iPhone or iPad, Tomahawk
1/23–25/2018, Division of Forestry Statewide Training 2018: Trust...A Forestry Product We can Grow, Wisconsin Dells
1/26/2018, Fundamentals of QGIS and Avenza Maps, Tomahawk

Where Do I Send It?

Employment Ads

All job announcements in the Classifieds are drawn from the SAF Career Center website, careercenter.eforester.org. Information about posting employment ads is available on the SAF Career Center website. Space is limited. Publication of employment ads in *The Forestry Source* may be subject to posting date limits.

Continuing Education Calendar

Events in this category are drawn from the Event Calendar on SAF's website, tinyurl.com/hb2uamr. All events posted in the Event Calendar must offer Continuing Forestry Education credits. The instructions and forms for submitting events are available on the Event Calendar page. Space is limited. Publication in *The Forestry Source* cannot be guaranteed.

SCIENCE & TECHNOLOGY

Rx Fires Limit Wildfire Severity

Prescribed burning helped to limit the severity of the 2013 Rim Fire, one of California's largest wildfires, according to Penn State geographers (tinyurl.com/yalbqja6). The researchers studied the more than 257,000 acres of burned forest and found the fire severity was lower in areas recently treated with controlled burns than in other areas. The scientists examined 21 previous fires within the Rim Fire's perimeter, which burned in and around Yosemite National Park. They found that areas that had burned at low severity within the preceding 15 years fared better in the 2013 blaze.

The study "points to the potential use of prescribed fires to reduce severe fire effects across landscapes," said Alan Taylor, professor of geography and an associate in the Earth and Environmental Systems Institute at Penn State. "You can fight fire with fire. You can fight severe fires using these more controlled fires under conditions that are suitable."

More Forest, Less Sediment

Researchers at the US Forest Service's Rocky Mountain Research Station, in partnership with the American Water Works Association, found that forest cover is associated with lower levels of sediment at water intakes, and that development and grazing are both associated with higher levels of sediment at water intakes (tinyurl.com/ycg29snd). The researchers found evidence of costs savings from both reduced sediment and reduced total organic carbon (TOC) in drinking water sources. In addition, they found that:

- Increasing forest cover by one percent in a watershed decreases turbidity by about three percent.
- Increasing development by one percent in the watershed increases turbidity by about three percent.
- Reducing sediment in the water by one percent reduces water treatment costs by 0.19 percent; reducing TOC in the water reduces water treatment costs by 0.46 percent.

Greenhouse Gases: Wood Is Better

Substituting wood for concrete and steel in the structural systems of commercial buildings reduces fossil fuel use and cuts emissions of greenhouse gases by an average of 60 percent, according to a recent analysis by researchers at Oregon State University's College of Forestry and College of Engineering (tinyurl.com/yagv21nx). These materials are a significant component of the carbon dioxide emissions associated with construction. In the United States alone, building construction and use contribute about 40 percent of total carbon dioxide emissions, according to the US Department of Energy. The researchers used a life-cycle approach to analyze structural systems in six types of buildings: an office building, exercise facility, medical center, basketball arena, residential building, and warehouse.

Forestry News from across the Nation

Innovation in Oak Wilt ID

The University of Minnesota College of Food, Agriculture and Natural Resource Sciences recently unveiled a cheaper and faster method for testing for oak wilt. The current identification methods are either a visual observation, which occurs after a tree is infected, or laboratory analysis, which can cost \$60–\$120 per sample and take up to two weeks to confirm the diagnosis.

The new method is a two-step process: Wood chips are dipped into a solution to extract DNA, which is then mixed into a solution of gold nanoparticles. These nanoparticles generate a chemiluminescent signal that can be read by a hand-held luminometer. The cost of this detection method is less than \$5, and a diagnosis is made within 30 minutes.

In Minnesota, more than 260,000 trees were infected by oak wilt between 2007 and 2016. “Oak wilt is the second greatest invasive-disease threat to Minnesota’s plants, second only to Dutch elm disease,” said Robert Venette, director of the Minnesota Invasive Terrestrial Plants and Pests Center (MITPPC) at the University of Minnesota. “The loss of elms transformed many of our urban and hardwood forests. We don’t want our oaks to be next.”

CA: Lowest Urban Forest Canopy

In a new report issued by the US Forest Service Pacific Southwest Research Station, researchers found that the state of California has the nation’s lowest urban canopy cover per capita. The state currently has 173.2 million street trees, which was calculated to equate to 109 square yards of city tree canopy per person that provides an estimated \$8.3 billion in ecosystem services per year. In comparison, other urban canopy-poor states, Wyoming and Nevada, have 146 and 110 square yards, respectively. Two states with robust urban forest canopy are Alabama (1,182 square yards) and Connecticut (1,214 square yards).

“There’s no question that Californians are deriving significant benefits from their urban forests,” said Greg

McPherson, lead author of the study and a research forester with the US Forest Service’s Pacific Southwest Research Station. “However, the fact remains that more can be done and will need to be done in light of the recent tree mortality epidemics plaguing some of our urban forests.”

With nearly 236 million vacant tree sites within cities, new tree plantings are available, researchers said.

The Structure, Function, and Value of Urban Forests in California Communities is available at <https://www.fs.fed.us/psw/pubs/55313>.

New Longleaf Partnership

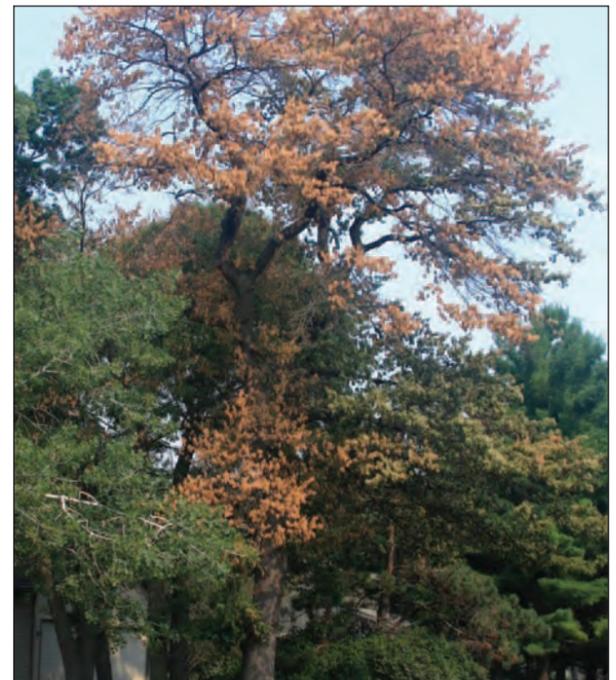
A multiyear, multipartner partnership will assist private forest landowners in the Florida panhandle to restore longleaf pine and certify their forestland through the American Tree Farm System. The leading partners in the project include Enviva Holdings, the American Forest Foundation, and The Nature Conservancy.

The Nature Conservancy will create a 38-acre demonstration site on the Apalachicola Bluffs and Ravines Preserve to provide landowners an example of what the restoration will look like. “The Conservancy is pleased to demonstrate the lessons we’ve learned in nearly 30 years of longleaf habitat restoration. Private landowners will be an important part of bringing this imperiled forest back to prominence, and that starts with technical assistance,” said Brian Pelc, restoration project manager at The Nature Conservancy.

Project to Boost Thinning in AZ

The US Forest Service and The Nature Conservancy are collaborating on Future Forest, a new project to accelerate the thinning of forests in Arizona and simulate rural economies that depend upon a reliable source of wood. The use of technology and business practices to streamline and accelerate the thinning needed to restore Arizona’s forests distinguishes this project from other projects.

“We’re in a new era that demands efficiency and an accelerated response. Arizona water supplies and com-



Oak wilt is a fungal disease found in 21 states, and a distinctive sign of infection is the leaves turning brown. Once an oak tree is infected, it cannot be saved. Photograph courtesy of S. Katovich, USDA Forest Service.

munities are at risk,” said Cal Joyner, regional forester for the US Forest Service Southwest Region. “Rather than painting individual trees to remove, we now use tablet technology to digitally map the forest and guide operators where to harvest. We are getting the work done faster and cheaper, and we have a digital record that enables us to track progress.”

The first Future Forest project will entail thinning 20,000 acres in the Kaibab and Coconino National Forests near Flagstaff. Campbell Global will work with The Nature Conservancy to develop a management strategy that balances economic and environmental considerations when implementing the thinning projects.

FOREST TECHNOLOGY WORKSHOP

May 8–9, 2018 • Columbia, South Carolina

Want to know more about using technology in the field?

Join us for a two-day intensive workshop in forest technology designed to get you up to speed on the newest equipment for solving your toughest challenges. Work smarter with the tools you need to be more productive and more efficient.

Earn continuing forestry education credits while you hear about case studies in data gathering, analysis, and modeling. From equipment and hardware to software, GIS, and drones, this event will be focused on demonstrations, discussions, and field exercises to help you learn how to use these state-of-the-art resources. Work directly with representatives from leading forest technology companies in the US as you gain valuable hands-on experience.

Registration opening soon. Limited attendance.

Visit www.eforester.org to learn more.

