

AMERICAN

FALL 2014

FORESTS

Elders of the Eastern Forest

FOR DECADES, PEOPLE TRIED TO ERADICATE THE GNARLED, UNMARKETABLE "WOLF TREES"
FROM THE EASTERN U.S. TODAY, A CLOSER LOOK REVEALS THEIR TRUE VALUE.

EXPLORE

YELLOWSTONE IN WINTER



FEBRUARY 7-12, 2015

American Forests will be hosting an exclusive trip to Yellowstone National Park to discover its spectacular sights in the heart of winter. Join us as we explore this incredible park as few people get to do, with **behind-the-scenes access** and **excursions led by prominent researchers and guides.**

Glimpse majestic animals such as bison, elk, bighorn sheep and wolves in snow-covered valleys and expansive forests. Savor delicious meals and warm fires in cozy lodges with great company.

To learn more, please contact Matthew Boyer for more details at 202-370-4513 or mboyer@americanforests.org



AMERICAN FORESTS



Departments

2 Offshoots

A word from our president & CEO

4 Ask a Consulting Arborist

Your tree care questions answered

6 Treelines

America's endangered western forests find friends in volunteers and experts, alike. Plus,

GLOBAL RELEAF SHOWCASE:

A neighborhood in Cleveland is recovering from the housing crisis, one tree at a time.

NEW ONLINE: New videos to watch, petitions to sign and other ways to get join us online.

WASHINGTON OUTLOOK:

You've helped us advocate for forests on Capitol Hill. Find out where we've made progress toward a forest-friendly FY2015.

38 Saga of the Spotted Owl

Photography by Francois-Xavier DeRuydts

A photographic journey into the old growth forests that shelter the northern spotted owl.

42 Earthkeepers

A NEW BREED OF FORESTER

Bob Perschel brings a new vision of sustainability to New England's forests.

44 Last Look

By David Kingham



Features

16 Wolf Trees: Elders of the Eastern Forest

By Michael Gaige

Why old pasture trees in young forests are finally getting the recognition they deserve.

24 Little Critter with Big Influence

By Betsy L. Howell

How one tiny salamander affects an entire forest's carbon cycle.

32 Micro Materials from Towering Timbers

By Carrie Madren

Nanoparticles from trees could shape the future.

An American Heritage

BY SCOTT STEEN



WHILE YOU ARE likely reading this in the crisp air of autumn, I am writing this column on the Fourth of July. Earlier today, my neighbor-

hood held its annual Independence Day parade, featuring dogs with Old Glory bandanas, kids with red, white and blue balloons tied to their bike handle bars, and a few open, flag-festooned jeeps led by a big pickup truck squawking out a Souza march. The parade was followed by a community pool party and cookout; neighbors with names R-Z brought desserts. Tonight, there will be fireworks on the river near Mount Vernon. For me, this is a day to think about what it means to be an American, in big ways and small.

Recently, our staff has been talking a lot about what it means to be AMERICAN Forests. We have the forest part down. Our mission is to protect and restore forests. Our passion is to educate people about the benefits and threats to forests. And while we have funded conservation projects in more than 40 countries from China to Chile, American Forests is a remarkably American organization, with a deep American heritage.

Alexis de Tocqueville, the great French political thinker and historian, wrote in 1835 that “Americans of all ages, all conditions, all minds constantly unite ... In America I encountered sorts of associations of which, I confess, I had no idea, and I often admired the infinite art with which the inhabitants of the United States managed to fix a common goal to the efforts of many men and to get them to advance to it freely.”

This idea was central to the creation of American Forests. Our founding represented a uniquely American means to address a characteristically American problem. The problem was that, in our optimism and drive toward the future, Americans believed that our resources —

in this case, our forests — were inexhaustible, and that economic prosperity trumped all other goods. By 1875, the year of our founding, it appeared that America’s timber barons were going to clear-cut their way straight across the country.



AMERICAN FORESTS

Community ReLeaf tree planting event at Price Middle School in Atlanta.



American bald eagles

Our founders, led by physician and horticulturist John Aston Warder, came together as the American Forestry Association (AFA) to educate the public and advance a more sustainable approach to managing our forests. By the first part of the 20th century, the AFA had become a powerful force for change, helping to pass the Weeks Act that dedicated public forests in the east to match those established in the west, advocating for the creation of the Civilian Conservation Corps (the pen that FDR used to sign the bill creating the CCC is framed in my office), and donating the first living national Christmas tree to the White House.

In more recent times, our work has brought us to all 50 states and has, in its way, illustrated both our strengths as Americans and the challenges we still face. Last year, I planted trees with a group of middle school students and teachers at a school in Atlanta. The love, care and passion these teachers demonstrated toward their students was palpable. Together, planting side-by-side, these kids and adults were committed to making both their campus and community better.

A few months before that, I hiked in Yellowstone National Park and the Gallatin National Forest with forest rangers, park rangers and scientists in the high-country feeding grounds of endangered American grizzlies. Together, these researchers and on-the-ground practitioners were learning from each other, combining their knowledge and experience to tackle the enormous threats to whitebark pine, a keystone species in the region and the grizzly's favorite food source.

Today, American Forests' work is still principally focused in the U.S. Over the years, we have planted tens of millions of trees right here, in more than 900 individual forest restoration projects in all 50 states. These projects have restored habitat for bald eagles, grizzly bears, Pacific salmon and dozens of other iconic, imperiled American species. We have worked with local organizations to reforest many of the riparian buffers on our nation's waterways, from the mighty Columbia in the west, to the Mississippi in the Heartland, the Rio Grande in the south and the Chesapeake Bay in the east. And we are helping great American cities such as Atlanta, Detroit and Seattle expand their green spaces and urban tree canopies.

But we are also seeing many American wildlife species brought to the brink of extinction because of human actions and inaction. We are seeing more and more acres of forestland destroyed by development, human-introduced invasive species, and megafires and disease exacerbated by climate change. And we are seeing generations of Americans who seem ever more separated from the natural world.

While environmental and conservation priorities around the globe continue to mount, there is also increasingly more work to do here at home. Our efforts to protect and restore to health our wildlands and wild places — the frontiers that have defined and shaped us as a people — must expand. As de Tocqueville observed, Americans are best when we are bound by a common goal to the efforts of many.

For us at American Forests, that goal is to reignite in our fellow citizens a love of nature and a greater respect for the many gifts that our forests provide. 🌱



AMERICAN FORESTS

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Caroline Brooks**Art Direction and Design**
Brad Latham

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American Forests' mission is to protect and restore forests, helping to preserve the health of our planet for the benefit of its inhabitants.

(202) 737-1944
<http://www.americanforests.org>

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Q&A



ASK A CONSULTING ARBORIST

Weeping for Weeping Cherry

Q: I have a weeping cherry tree that is about 20 years old. Within the last couple of years, the blooms and leaves have been very sparse. I feel that I may be to blame because of insufficient watering or fertilizing. In fact, I have never fertilized it and would not know what to use. Is there anything I can do to get it back to good health?

A: Cherry trees are susceptible to a wide array of insects and diseases. Often, they are attacked by an insect called peach tree borer. You will know this is the culprit if you see an amber-colored goop coming out of the trunk. It is unlikely that the problem is as simple as a lack of fertilization. I would recommend having a reputable arborist in your area inspect the tree if you really want to save it. It is also worth noting that most weeping cherry trees only live around 20 years or so.

Answered by Consulting Arborist Jon Butcher of Milford, Ohio; jon.butcher@mtcandl.com; (513) 576-6391.



OBSIDIAN SOUL/WIKIMEDIA COMMONS

Mealy bugs are a common scale insect and tree pest in California.

To Deep-root or Not to Deep-root?

Q: We are considering deep-root feeding for 189 trees in Folsom, Calif. This will include insecticide to control aphids, scale and bores. Will the current drought conditions in California have any negative effects on deep-root feeding?

A: Fertilizing is best performed in response to known deficiencies and via a method known to address those deficiencies. Not all elemental deficiencies in plants can be addressed by simply adding materials to the soil. Similarly, pesticides must target specific, identified pests to be effective. Neither is effective as a routine application with nonspecific targets. Talk with your pest control company regarding compatibility of the combined materials and details related to timing, targeted pests and deficiencies. Your local University of California Cooperative Inspection Horticultural advisor can also assist and comment as to the validity of the information you receive.

Answered by Consulting Arborist Torrey Young of Castro Valley, Calif.; torrey@dryad.us; (510) 538-6000.



Amber colored goop can be a sign of pests such as peach tree borer.

ROGER GRIFFITH

Dear Damaged “Dora”

Q: Our deodar cedar was loose in the soil so we staked it with wire around the trunk on each side. A year later, it had grown large enough that the wire cut into the trunk. We removed the wire, which left a scar all the way around. Now, the trunk is wider above the scarring and the tree has lost a lot of needles above this area. The limbs below the scar are full with new growth but there is no new growth on the limbs above. We had an unusually cold winter this year. Is there any hope to save “Dora”?

A: The irregular trunk growth and loss of needles above the scar are symptoms of stem girdling from the wire having been wrapped around the trunk for too long. The problem arises when vascular tissues just beneath the bark are restricted, not unlike a tourniquet, disrupting the flow of water, minerals and sugars across the girdled area. If left in place for too long, trunk-girdling wire often results in reduced growth, poor vigor and eventual death of tissues above the girdle. How well your deodar cedar recovers depends on a number of factors, including the severity of the injury and the conditions present at the site. By removing the girdling wire, you have already increased your tree’s chances for recovery. In addition to monitoring the tree for changes, I recommend that you keep your tree properly mulched with organic material and watered during dry periods for the next year or so.

Answered by Consulting Arborist Jason C. Miller of Cinnaminson, N.J.; www.treeres.com; (609) 284-6009.



If left too long, girdling can lead to irregular trunk growth.

AVIDD/FLICKR

DANIEL OINES



These palms were overpruned with just three fronds left and later grew back. Green fronds should be left to allow recycling of nutrients.

Pestilent Pruning

Q: I live in Englewood, Fla. Many of the trees in my area are being cut back. Every day, I see more large oak trees that are brown, though others are green and full. I saw a large oak tree today that had all of its branches cut off. Also, palm trees that are pruned and left with only three fronds on top are everywhere. Are these practices harmful to the tree? With only a few trees left, I hate to see them dying.

A: If you are seeing trees that have branches cut all the way back to the main trunk, this is a pruning practice referred to as hat racking, or tree abuse. It is not typically allowed in most cities. Check with the city on whether Englewood has a tree protection or tree preservation ordinance. Whoever is doing this pruning or cutting could be liable for damaging or destroying these trees. To find someone qualified to inspect the trees and evaluate whether they have been damaged or destroyed, I recommend finding a Registered Consulting Arborist® in your area. These professionals are trained to provide independent consulting for tree maintenance and standards, beyond the qualifications of an arborist or certified arborist doing tree care work. You can research different Registered Consulting Arborists that work in your area of Florida through www.asca-consultants.org.

Regarding the palm trees, standards for pruning palms specify not pruning the green fronds so as to allow for recycling of nutrients from the fronds back into the palm for new growth. If only three fronds are left on each of them, it sounds like the palms may also be getting overpruned.

Answered by Consulting Arborist John Harris of Hollywood, Fla.; www.landscapeconomics.com; (954) 986-9405.

American Forests thanks the American Society of Consulting Arborists for responding to readers’ tree care questions. Ask your questions at www.americanforests.org/consulting-arborists.

FOREST FRONTIERS

Forest Ecologist Dr. Diana F. Tomback

SCIENCE ADVISORY BOARD member Dr. Diana F. Tomback is a professor and associate chair with the Department of Integrative Biology at the University of Colorado Denver. She also serves as volunteer director for the non-profit Whitebark Pine Ecosystem Foundation, based in Missoula, Mont. Dr. Tomback's area of expertise includes evolutionary ecology, with application to forest ecology and conservation biology. Her research over time has focused on the ecological and evolutionary consequences of seed dispersal by Clark's nutcrackers to whitebark pine and other pine species.

Why did you choose to go into forest ecology?

You could say a not-so-little bird told me to do it! As a Master's student at UCLA, I was backpacking in the Sierra Nevada. As we rested under a whitebark pine, a bird flew in and began tearing apart the pine cones. I was fascinated, having just had an ornithology course. At UCLA, I looked into the literature and discovered that little was known about the Clark's nutcracker.

What was the most difficult moment or encounter that you've experienced in pursuit of your work?



JAMI WESTERHOLD/AMERICAN FORESTS



AMERICAN FORESTS

Left: Dr. Diana F. Tomback gazes up at a whitebark pine; Above: Dr. Diana F. Tomback and American Forests President & CEO Scott Steen.

There have been challenges connected with many projects, including having grizzly bears in our study areas and experiencing extreme weather, but having my two-year-old son in the field with me and my students during a Yellowstone post-fire project was probably the most difficult, logistically.

What do you think the biggest issue facing forest health is today?

The obvious answer is the uncertain future our forests face with climate change. But more challenging and potentially as — or more — damaging is the influx of exotic pests and pathogens, which are damaging our forests at a rapid pace. I study the ecological effects of white pine blister rust, caused by a pathogen introduced more than a century ago, and the effects are absolutely devastating for a group of white pines — commercially and ecologically. Blister rust is not an isolated case — chestnut blight, Dutch elm disease, sudden oak death and pests like emerald ash borer and the hemlock woolly adelgid all threaten our forests.

Who is your favorite fictional scientist and why?

I have several literary favorites, including Sherlock Holmes, who approached his investigations with deductive reasoning. I also relate to the character Dr. Ellie Arroway, played by Jodie Foster in *Contact* and to the characters from *Star Trek: The Next Generation* when they were problem-solving under the leadership of Patrick Stewart's Captain Jean-Luc Picard. 🌱

For an extended interview with Dr. Diana F. Tomback, visit americanforests.org/magazine. To learn more about the Whitebark Pine Ecosystem Foundation, visit whitebarkfound.org.

CJW_MGW_CLEVELAND/FICKR



A view of the Broadway Slavic Village Neighborhood

GLOBAL RELEAF SHOWCASE

Restoring Broadway Slavic Village's Tree Canopy, Cleveland, Ohio

CLEVELAND'S BROADWAY SLAVIC VILLAGE neighborhood was dramatically impacted by the housing market crash. According to Slavic Village Development's December 2013 survey of vacant property, some 1,500 lots in the community remain unoccupied.

This abandonment has led to a loss of tree canopy among the properties: The demolition of houses resulted in degraded soil while empty lots permitted the growth of intrusive plants and illegal dumping, all of which have added stress to the area's urban forest.

This is only the most recent environmental disadvantage for the Slavic Village community. Since its establishment in the early 19th century, the neighborhood has been sullied by nearby industrial plants that have degraded the community's air quality. Today, Broadway Slavic Village has one of the nation's highest rates of asthma.

In an effort to counter these impacts and improve the environmental health of the community, Slavic Village Development is joining American Forests and the Alcoa Foundation in a Global ReLeaf project to plant 55 trees on abandoned land that spans nearly five acres.

Three smaller neighborhoods within the village will be the recipients of these trees. The first is the Willow area, which is among the most underserved parts of Broadway Slavic Village. The Regent section is another area targeted for restoration. This area lost more than 100 homes in the foreclosure crisis and predatory lending environment of the early 2000s. The final area that will benefit from the restoration project will complement the work of the Slavic Village Recovery Area Project, which rents and sells vacant single-family properties at affordable prices. The trees added to these lots will create street-edge plantings.

The initiative to restore Broadway Slavic Village's tree canopy will help mitigate stormwater runoff and improve soil and air quality within these lots. The added tree canopy will enhance the environment through the reemergence of flora and fauna that have escaped industrial effects in the area.

The benefits of the canopy recovery will extend to the people of the Broadway Slavic Village as well. First and foremost, residents will have a renewed sense of pride in their community. The improved air quality will relieve those who suffer from respiratory diseases.

American Forests is proud to help Slavic Village Development achieve its vision of a vibrant, connected and diverse community. 🌱

For more restoration projects, visit americanforests.org/restoration



BIG TREE SHOWCASE

Common Baldcypress

SPECIES NAME: Common Baldcypress, *Taxodium distichum*

LOCATION: Holmes County, Miss.

CIRCUMFERENCE: 667 inches

HEIGHT: 97 feet

CROWN SPREAD: 66 feet

TOTAL POINTS: 781

NOMINATED: 2005

NOMINATED BY: Norman Haigh and Barry Scott

With biting flies, mosquitoes, snakes and alligators, Mississippi swamps can be a daunting place in July, but having the opportunity to see a tree like this makes the trip worth it! The Mississippi Forestry Commission crew, seen here as they prepare to measure the tree, could hear something moving around inside the hollow base and hoped it was a beaver that had made its home there. This tree is an island unto itself.

Visit americanforests.org/bigtrees on October 28 for the fall 2014 release of American Forests Champion Trees.

PARTNERS

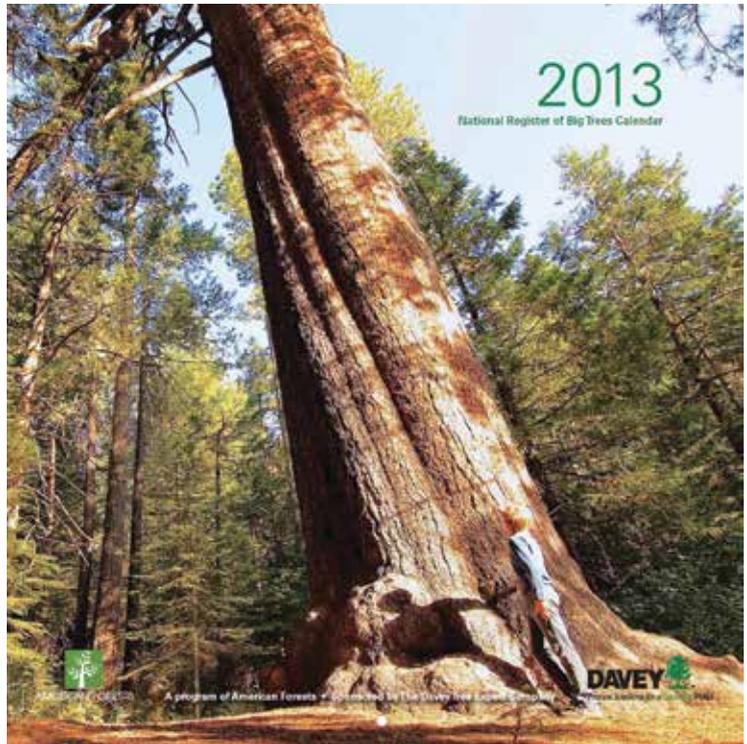
Big Partnership for Big Trees: 25 Years with the Davey Tree Expert Company

NEXT YEAR WILL BE A BIG YEAR for American Forests, as we celebrate the 75th year of the National Big Tree Program. Prompted by forester Joseph Sterns' 1940 article, "Let's Find and Save the Biggest Trees," in this very magazine, the program began that year with the goal of locating the largest native trees across the country in order to preserve them and educate the public about their importance. It proved to be a huge success: Two years after the launch, 500 trees were reported to American Forests by 700 individuals involved in the big tree hunt.

Next year also marks the 25th anniversary of another milestone for our beloved Big Tree Program: the beginning of our partnership with the Davey Tree Expert Company, the program's premier sponsor. Since 1989, Davey has helped increase awareness about our champion trees and the vital role they play in the environment. Today, the program involves participants from all 50 states and the District of Columbia and it has served as inspiration for similar programs across the globe, including Korea and New Zealand. There are now more than 800 champion and co-champion trees from some 786 different species.

One prominent example of the recognition that the Davey Tree Expert Company has helped us to achieve is the popular calendar, featuring stunning photography of current champion trees. This calendar has been a success not only for the program but also for its publishers. In August, Davey was presented with a Silver Award of Achievement for best overall calendar by the Garden Writers Association.

American Forests and the Davey Tree Expert Company will release a special anniversary edition of the calendar for 2015. To learn more, visit americanforests.org/bigtrees. 🌿



Top: the Davey Tree Expert Company won an award for the 2013 National Register of Big Trees Calendar; Bottom: 2014 National Register of Big Trees Calendar



These volunteers from partners Jambu and Amour Vert spent a weekend planting trees in San Bernadino, Calif.

FROM THE FIELD

SAN BERNADINO, CALIF.

Shawn Berriman, Account Executive

IT'S 6:00 AM ON A SATURDAY and while I'm not sitting anywhere that I'd expect Billy Joel's "regular crowd" to shuffle in to, I'm enjoying the opportunity to down several cups of strong coffee before I hit the road.

I've flown all the way from the East Coast to sunny San Bernardino, Calif., to take part in this year's *Mountain Communities Wildfire ReLeaf* resto-

ration project located in Cedar Glen in the nearby mountains. Due to an unexpected flight snafu a few days earlier, I'm running on very little sleep as I try to prepare myself for the fun day of planting ahead. And it is just that — lots of fun. And it's also very important.

The area of the San Bernardino Mountains that we're restoring has been hit with a number of devastating

wildfires over the years. While typically we would expect nature to help out by regenerating portions of the forest from its seed bank, these fires have burned so hot that without some assistance, the only thing that will be growing here is weeds.

It's a very nervous drive up the long and winding mountain road to get to the planting site. I think I'll be OK, but if anyone expects me to go any faster on a tight curve with a 5,000 foot drop on the other side, they are sorely mis-

taken. Sorry, experienced locals, there are no mountains for me to practice on in D.C.!

I arrive safely and am pleased to meet the regular tree planters that show up year after year to help make a meaningful difference. Cheryl Nagy, the local project coordinator, has been running this program diligently for the past 10 years. With her are Chief Glenn Barley & Captain Debbie Chapman of Cal Fire and volunteers from the Tzu Chi Foundation and Southern California Edison.

Helping out for the 10th anniversary of this project are some of American Forests' corporate partners — Jambu, an adventure shoe company with a passionate following, and Amour Vert, a high-end fashion clothing company with an environmental focus.

Jambu has sent several of its staff to help plant some of the 50,000 trees they are supporting during 2014. Yetzalee Cubero, their marketing director, is dedicated to helping preserve the great outdoors for future generations. The company uses 100 percent recycled, recyclable and re-usable packaging and their shoe outsoles are made from partially recycled and re-usable compressed rubber. As Yetzalee would say, "Jambu is great for the sole/soul."

As the day draws to a close, I'm impressed at just how many people have chosen to dedicate their weekend to giving back to nature. My gut feeling is that if more people chose to put their time and money into restoring our shared environment like these volunteers have, maybe we'll have a chance at protecting these landscapes for the benefit of those to come.

I hope so, because just a few short days after that planting, I receive an email from Cheryl telling me about another 2,200 acres burning not too far away from where we planted. We're in for a long fire season and it's not a melody that's going to leave anyone feeling alright.

PNY, MONT.

Jami Westerhold, Director of Forest Restoration

NOTHING QUITE SOOTHES the soul like a breath of mountain air filling your lungs with the fresh scent of pine ... and freedom. This June, I joined volunteers and several foresters from the Bureau of Land Management and U.S. Forest Service out west to plant whitebark pines.

At 9,000 feet, the Windy Pass in Montana's Gallatin National Forest lived up to its name; it was foggy, wet and cold. The landscape all around was spectacular, but the planting site at the peak of the mountain was a bit ghostly. It is covered with charred trees. Whitebark pine. No survivors. Less than two years ago, this area was a majestic stand of elder whitebarks, several of which were identified as plus trees — high-value trees that are both producing cones and possibly resistant to the infamous white pine blister rust.

These volunteers navigated the snow, planting 5,000 whitebarks on both Bureau of Land Management and U.S. Forest Service land. Before the physical act of planting, there is a lot of work to prepare these seedlings. Professional climbers collect their cones, which is labor-intensive. Seeds are manually extracted from the cones and their coat is cut with a special sander — a process known as scarification — followed by four months of a specific warm and cold process to ensure germination. The resulting seedlings are injected with blister rust spores to determine their blister rust resistance and cold hardiness. These whitebarks are grown for two years before they are planted. All this time and hard work is worth it to assist the whitebark pine's regeneration, helping to maintain ecosystem function.

Thanks to Banrock Station's support, these volunteer activities in the Greater Yellowstone Area offer people the opportunity to help the whitebark pine and to get a breath of fresh air.



Director of Forest Restoration Jami Westerhold plants a whitebark pine seedling on a planting trip in Montana.

NEW ONLINE

New Videos!

We're liking the view from the producer's chair! We've got two new videos available on our YouTube channel: Saving Endangered Wildlife, starring ocelots, grizzly bears, gopher tortoises and some of the other threatened and endangered species whose habitats you've helped us restore over the years. Plus, we're excited to share our new video about the work we're being doing with the Alcoa Foundation and TreeFolks in Bastrop County, Texas, to help restore areas damaged by wildfire. You can watch both videos at youtube.com/AmericanForests. 🌱



Watch our new videos at youtube.com/AmericanForests.



New Champion Trees for Fall

We are the champions! Coming October 28, visit americanforests.org/bigtrees to see which champions made it onto the American Forests Champion Trees national register. New champs will be crowned, old champs dethroned and there may be some surprises you never saw coming!

Think you've found a champ that will knock any of those champs' socks off? You'll need to know how to measure it. Luckily, our webinars on tree measurement are now available online if you missed them. Visit americanforests.org/measurement-webinar to learn how to measure tree canopy, girth and height like a pro. 🌱

Forest Digest

Have you been following our Forest Digest? Every Friday in our blog, *Loose Leaf*, we bring you the latest news in forestry from around the world. What's the state of deforestation in Brazil? What's new in our understanding of how forests and climate change relate to one another? Join us each Friday to stay up-to-date at americanforests.org/blog.

Check out Forest Digest every Friday!



Take Action Online

Help us send a message to President Obama to make forestry a priority in his Climate Change Action Plan! Accessing new research, protecting critical areas, and introducing wildlife habitats in both urban and rural forests will help ensure a healthy future for generations to come. Sign our petition requesting that President Obama place importance on forests in his plan and take advantage of the social, environmental and economic benefits trees provide communities. Visit bit.ly/Sign4Climate to add your voice.

Visit bit.ly/Sign4Climate to tell the president that forestry matters in the fight against climate change.

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WASHINGTON OUTLOOK ► FALL 2014

Wildfire Disaster Funding Act

EARLIER THIS YEAR, representatives from American Forests met with numerous legislative offices in the U.S. House and Senate in an effort to gain support for the Wildfire Disaster Funding Act (WDFFA). This bill proposes an efficient way of responding to wildfire emergencies without having to borrow from — and ultimately sacrifice — other Forest Service programs to fund wildfire suppression. To correct these inefficiencies, an emergency disaster cap account would be used in the event of a serious fire disaster. As of August 13, 2014, bipartisan support for the legislation was shown through the 18 cosponsors in the Senate and 131 in the House. The FY15 Senate Appropriations Bill, released prior to the August recess, includes WDFFA language, along with reporting requirements. However, this will not

come into effect until FY16. To address this problem in FY15, the committee included a one-time emergency access to the disaster cap for FY15. 🌿

Longleaf Five Year Update

AMERICA'S LONGLEAF Restoration Initiative celebrated a five-year landmark for re-establishing the longleaf pine in the south. Addressing the loss of 90 million acres of longleaf forests, American Forests joined diverse stakeholders, including conservation and forestry groups, private landowners and multiple state and federal agencies, to work towards restoring this valuable tree species. Planting 1.38 million acres in the past five years has reversed the decline of longleaf from Virginia to Texas. In celebration, the initiative held a panel moderated by Secretary of Agriculture Tom Vilsack to discuss the success of efforts so far and how to



JUSTIN MEISSEN

America's Longleaf Restoration Initiative celebrated a five-year landmark for re-establishing longleaf pine in the south, like those shown here.

continue. Following the panel, a reception was hosted by Natural Resources Conservation Service Chief Jason Weller and U.S. Forest Service Chief Tom Tidwell. The final key component of the benchmark took place in the

The Wildfire Disaster Funding Act proposes a way to fund wildfire response without borrowing from other important conservation programs.



MIKE LEWELLING, NATIONAL PARK SERVICE



offices of senators and representatives, with landowners and constituents, ensuring their elected officials of the benefits of reforestation. 🌱

The SAFE Act

RECENTLY INTRODUCED in the Senate is the SAFE Act, S. 1202, which adopts the National Fish, Wildlife, and Plants Climate Adaption Strategy to protect, restore and conserve natural resources under the threat of climate change. It also requires review and revision of the strategy every four years. The bill is currently moving through the Committee on Environment and Public Works Subcommittee on Water and Wildlife. Its most recent hearing was June 17. Legislation to defend American natural resources is crucial to ensure the continued survival of precious species of animals and plants in the face of extreme weather patterns. 🌱

The SAFE Act would adopt a strategy to conserve natural resources in the face of climate change, helping protect species like the Canada lynx.

Appropriations FY2015

THE SENATE APPROPRIATIONS Subcommittee on the Department of the Interior, Environment, and Related Agencies released their FY15 bill prior to the August recess. Below are highlights of American Forests' priorities and comparing the President's requests with the House and Senate Interior Appropriations bills. While a Continuing Resolution is expected through the mid-

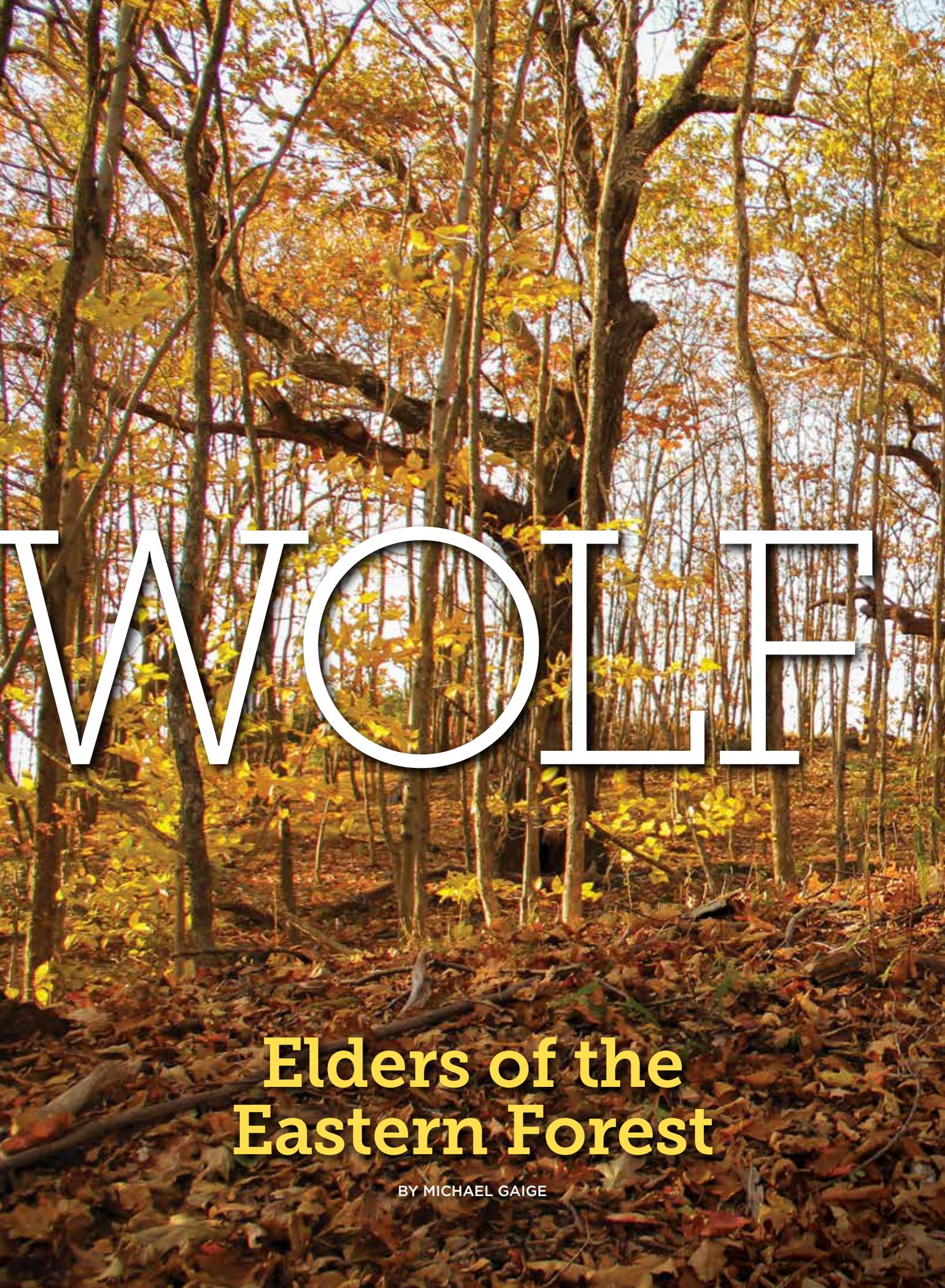
term elections, these numbers represent how effective American Forests and our partners have been in ensuring adequate funding for forest conservation. 🌱

Rebecca Turner writes from Washington, D.C., and is American Forests' senior director of programs and policy.

Sofia Maia Goldstein was American Forests' summer 2014 policy intern and is a junior at Elon University in North Carolina, studying environmental and international studies.

FY15 Appropriations Comparison

PROGRAM/AGENCY	AMERICAN FORESTS' PROPOSAL	PRESIDENT'S REQUEST	CHANGE FY14 ENACTED	HOUSE INTERIOR APPROPS	CHANGE FY14 ENACTED	SENATE INTERIOR APPROPS	CHANGE FY14 ENACTED
FOREST SERVICE							
State and Private							
Urban and Community Forestry	31.37 m	23.6	-4.4	28.04	0	28.04	0
Forest Health Management	104.57 m	104.57	0	104.57	0	104.57	0
Forest Legacy	53 m	53	+2.035	24.2	-26.8	53	+2.035
Forest and Rangeland Research							
	295.3 m	275.3	-17.5	297.5	+4.7	292.8	0
National Forest System							
Collaborative Forest Landscape Restoration Program	60 m	60	+20	40	0	50	+10
BUREAU OF LAND MANAGEMENT							
National Landscape Conservation System	34 m	34	+2.2	30.8	-1	34	+2.2
FISH AND WILDLIFE SERVICE							
National Wildlife Refuge System	476.40 m	476.40	+1.8	476.86	+4.6	475.4	+3.2
NATIONAL PARK SERVICE							
National Park System	2.28 b	2.28 b	+30.3 m	2.26 b	+31.8 m	2.278 b	+42 m
Centennial Challenge	10 m	10	+10	10	+10	10	+10
LAND AND WATER CONSERVATION FUND							
	900 m	900	+571.3	0	-328.7	340	+11.3



TWO LIFE

Elders of the Eastern Forest

BY MICHAEL GAIGE

A large, gnarled tree trunk dominates the foreground, its bark deeply textured and dark. The background shows a forest of thinner trees with sparse, autumn-colored leaves (yellows and oranges) against a clear blue sky. The ground is covered in fallen leaves.

TREES

IN THE OCTOBER 1945 ISSUE OF AMERICAN FORESTS, in an article titled, “Woodman, Spare That Wolf Tree,” Charles Elliott writes, “...these ugly wolf trees, these snags, these trees classified as worthless space fillers are valuable wildlife units in the vast stretch of North American woodland.”

A group of gnarled and wind-battered red oaks and an ash (far right) stand on the summit of a low Vermont mountain. Ridges and hilltops were common sites for pasture trees and for today’s wolf trees.



Author Michael Gaige explores a Vermont white oak that predates the American Revolution. Encroaching sugar maples shade the tree and threaten its vitality.



MICHAEL GAIGE

Elliott, contrary to popular sentiment at the time, was spot on. And nearly 70 years later, we're due to revisit the wolf tree.

High above the shores of Lake Champlain, I trace a stone wall through a Vermont forest. Where the wall ends, I continue following a faint field line — where a hedgerow once ran — through sugar maple, basswood and eastern hemlock. At its end, I find the day's first specimen: a huge white oak with a girth of over 15 feet and branches spreading into surrounding trees.

I've been hunting wolves for nearly a decade. Not four-legged wolves, but wolf trees in the eastern forest. Growing up as a forest Rambler, and today as a practicing ecologist, I have always been lured to large, old trees, especially those in a forest setting.

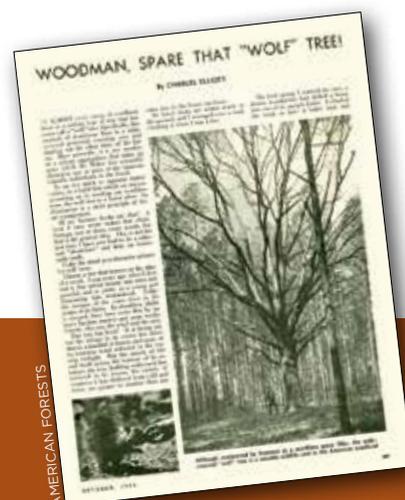
This particular sweep of Vermont forest has a dozen of them: sugar maples, shagbark hickories and a number of massive white oaks. The white oak I encounter today, which I estimate to be approximately 300 years old, is the largest of them.

Happening upon such a gnarled, old tree, one cannot resist being pulled in. It is charismatic and animated. Its limbs reach wide, like arms. These are the trees of childhood imagination, the trees of fairy tales and folklore. These are the trees of sprites and gnomes and enchanted woodlands. Wolf trees are our Ents.

Wolf trees are also the storybooks of American history.

HISTORY OF THE WOLF TREE

Arriving on the shores of North America, early European settlers and colonists encountered the wooded wilderness of the eastern deciduous forest. As agriculturalists and pastoralists, the forested landscape was unsuited to their land-use practices; it was an impen-



AMERICAN FORESTS

See how the new outlook on wolf trees all began. Read Elliott's 1945 article, "Woodman, Spare That Wolf Tree" in *American Forests* at americanforests.org/WolfTree.

Charles Elliott's article in *American Forests*, "Woodman, Spare That Wolf Tree," asked readers to rethink the prevalent attitude towards wolf trees.



MICHAEL GAIGE

In a scene that could be from Thoreau's day, sheep find shelter in the shade of a young pasture tree. Most forested wolf trees began as open-grown pasture trees.

etrable fortress harboring fearsome beasts — not a place for cows and sheep and fields of barley.

But by axe and animal, colonists carved settlements out of the forest. They cut trees to build farms and villages, let livestock loose to browse forests into fields. Domestic animals were, perhaps, more effective at clearing land than axe-wielding humans. Within a few years of woodland grazing by cows, sheep, hogs and horses, the groundcover and understory trees would be gone, leaving an open woodland. With neighborly competition removed, the remaining trees were free to spread their branches far and wide.

By default or by decision, however, some trees remained in the pastures. On his walks around Concord, Mass., in 1860, Henry David Thoreau noted this process, somewhat anthropomorphically, in his journal, "... pasture oaks are commonly the survivors or relics of old oak woods ... as an old oak wood is very gradually thinned out, it becomes open, grassy, and park-like ... This final arrangement is in obedience to the demand of the cow. She says, looking at the oak woods: 'Your tender twigs are good, but

grass is better. Give me [trees] at intervals for shade and shelter in storms, and let the grass grow far and wide between them.'"

But by the late 1800s and through the 1900s, the era of small-scale livestock farming as a viable living was sliding by. Northeastern farmers moved west to less rocky, more fertile ground. Later, small farms were supplanted by larger operations and economies of scale. Farms went under. Pastures were abandoned. And the remarkably resilient forest began its return.

With the end of pastures we mark the beginning of wolf trees. As the art and science of forestry grew with the emerging forest, early foresters saw old shade trees as hindering, not helping, their bottom-line. They suggested, as so many forestry books do, the spreading trees were like wolves, preying on forest resources and preventing the growth of smaller, marketable timber trees. Like wolves, they advised, pasture trees in the forest should be culled.

Foresters preferred tidy, well-managed timberlands and loathed the gnarled, snaking wolf trees for their unmarketable form. Charles Elliott summarizes this sentiment, writing that all the forestry books of the day treat the wolf tree as "a forest ulcer," whose "elimination is a strict principle of forest management." Elliott admits to having written such a book himself, but his outlook had changed as he came to see the importance of wolf trees to the eastern forests. "Woodman, Spare That Wolf Tree" marked his transition to an advocate for these forest giants.

Though Elliott's is the earliest voice I have found that speaks positively of wolf trees, over the past couple of decades, sentiment toward wolf trees has started to change. Whereas during the latter half of the 1900s, when nearly all forestry texts advised the removal of wolf trees, a review today of forestry documents targeted to the landowner from extension offices and state resource agencies shows that about half note wolf trees' virtues. This reflects the changing nature of forest management from a singular focus on timber to something encompassing forest ecosystems, human values and wildlife.

WOLF TREES TODAY

I walk around the base of the white oak looking into the branches and among the roots. The bark texture is coarse, showing its age. The ground is covered in slabs of fallen bark from branches now dying because of shade. Three carnivore scats left at the base post an olfactory "no trespassing" sign at what is the largest tree in the forest. Scats are typical at the bases of wolf trees, more common

Top right: A wound early in this chinkapin oak's life allowed rot to hollow out the base. For at least three years, the tree has housed a denning coyote and her litters totaling 20 pups. Center right: Young coyote pups like these have grown up in the hollows of wolf trees.

than “posted” signs put up by people (which also tend to occur on wolf trees).

Clearly, I’m not the first person to spend time at this tree. An old flip-flop lays half buried on the ground. And four rusty tree steps screwed into the trunk lead to the first live branch. I oblige, and make my way up.

The fat, low branch greets me with the husks of acorns and a half-eaten mushroom. A squirrel has eaten here with a commanding view of the forest; horizontal branches make fine places for resting and watching. Mosses and lichens cover the limbs. On closer inspection, insects, mites, spiders and other invertebrates occupy every cavernous niche. Earlier, I counted 80 distinct spider webs on the lower six feet of a sugar maple wolf tree. In the same tree, bees zoomed in and out of a hollow, while moths covered the inner walls, waiting for nightfall.

I climb higher into the oak wishing for the balance of a cat or wings of a bird. I reach a dead branch, chipped open by woodpeckers and hollowed by rot. Collected grass, falling from a hole, reveals the remnants of a nest. I rap on it to avoid surprises. Two hairy woodpeckers descend. Looking up, two more woodpeckers hitch around large limbs.

I watch a white-breasted nuthatch corkscrew down the trunk, gleaning the mites and insects I had seen hidden among the bark. Above, vireos work the highest branches for caterpillars and larger invertebrates. Perched in the center of the tree, I am encircled by a sphere of animal activity. Seemingly everywhere, life has embraced the opportunities presented by this tree.

Wolf trees also draw mammals, though they are challenging to see. In addition to carnivore scats, the bases of trees often reveal tunnels and dens of



MICHAEL GAIGE



DANNY BARRON

chipmunks or other small mammals. Cavities get filled by fox squirrels. I’ve found denning porcupines, raccoons and a young bear in wolf trees. Twice I discovered denning coyotes in the hollow bases of Kentucky chinkapin oaks. And though I haven’t looked specifically for them, bats likely use the loose bark or small cavities of wolf trees too.

I, like Elliott did in his observations, have found snakes tangled up in the spreading branches of wolf trees. The reptiles were probably awaiting the return of a bird or a chipmunk. Either way, the bustle of the wolf tree makes it a good place to wait for a meal.

Many species utilize the hollows of wolf trees: Raccoon, white-breasted nuthatch, chipmunk.



There is a great irony here: Wolf trees have been scorned for shading emerging timber trees. But now, surrounding trees are shading and killing the wolves.

I size up a nearby sugar maple: straight, tall, clear. I look closely for spiders, moths, scat or birds. I see nothing. Despite that it's a lovely forest tree with great promise to a cabinetmaker, in comparison to the wolf tree, I find it woefully uninspiring.

In the early days of my wolf tree hunting, I studied the trees more systematically. I looked for animals at wolf trees, and I looked equally as hard in surrounding, commercially mature forest trees. I then compared the two to assess whether birds and mammals use wolf trees disproportionately to other trees. They do. Wolf trees offered opportunity to more individual animals from a greater number of species for longer periods of time than did typical forest trees. For every minute birds spent foraging in a typical forest tree, they spent 20 minutes foraging in wolf trees. For singing, the ratio was 30 to one.

Wolf trees are like the forest's town square for animals. With their larger diameter, horizontal limbs, furrowed and sloughing bark, cavities and hollows, they offer more structural complexity than tall, straight, typical forest trees. Structural features don't generally appear on eastern deciduous trees under 100 years old. In most of the eastern forest, old pasture trees have a 100- or 200-year leg-up on the surrounding trees and thus have had time to develop the features wildlife depend on.

In many forests, the abundance of certain bird or mammal species is limited by the abundance of cavities and hollows for them to dwell in. Because of this, ecologists consider such trees keystone

structures; that is, their effect on the landscape is disproportionate to their abundance. Provide the animals with an opportunity, and they will use it. Without it, they don't appear.

WOLF TREES IN THE FUTURE

Back on the ground, I observe the old white oak with admiration. This tree saw the birth of a nation. It saw forest turn to pasture and return again. Today, the forest closes in tight around it. Sugar maples push up through the oak's branches; I count 60 maples rising from inside the drip line of the oak. A wall of maples and other species surrounds its outer limbs like an angry posse circling, well, a wolf.

Though the threat of wolf tree culling still exists today, shade is perhaps a greater threat; trees that are not intentionally killed grow weaker as encroaching trees grow taller. I see this everywhere: Trees emerge around, through and beneath an old pasture tree. Because the old tree was shaped in full sun with a certain photosynthetic input to hold up its mass, shading forces the tree to shut down branches that no longer receive enough sun. The lower limbs on this oak, like most others, are dead. It's hard to find a wolf tree today without senescent low limbs. In time, as neighborly competition dominates, a wolf tree's new growth will reach up, not out.

There is a great irony here: Wolf trees have for a long time been scorned for shading emerging timber trees. But now, the reverse is true; surrounding trees are shading and killing the wolves.

The decline in wolf trees in the eastern forest corresponds with the decline in large, old trees globally. It takes a long time to grow a tree with features wildlife can use. On a human timescale, they are, essentially, a finite resource. In the eastern forest, wolf trees survive in a matrix of young trees that rarely surpass 100 years. So when the elders die, the young even-aged trees lack the complex structure of a healthy forest. But with some attention, we can slow the loss of wolf trees and preserve both wildlife habitat and our heritage.

Managing for the benefit of wolf trees is as simple as keeping the shade at bay (trees can also be trimmed and pruned to increase their longevity). In the United Kingdom, a similar phenomenon of ancient trees — called veteran trees — has attracted attention. The book *Veteran Trees: A Guide for Good*

Many animals use the symbolic strength of a forest's largest tree to post messages. Here, a person posted a "No Hunting" sign on a white oak wolf tree. A look at the ground around wolf trees often reveals scats from carnivores presumably posting similar messages.



MICHAEL GAIGE

MICHAEL GAIGE



This Kentucky chinkapin oak began as a forest-grown tree in the mid-1600s. The forest around it was cleared in the early 1800s only to return in the 1910s. Though they are up to 100 years old, the surrounding forest trees offer little complex structure to forest wildlife.

Management by Helen Read outlines how to manage young trees encroaching a veteran.

The same guidelines can be applied to wolf trees in the eastern forest. Encroaching trees can be thinned, ideally over several years so as not to shock the elder tree's leaves, bark or roots. This is particularly true on southern aspects where a tree could be scorched, or on sides facing strong winds. Girdling emerging trees can work well, though falling branches and small trees can create a hazard for woodland walkers. Wildlife will appreciate the standing dead trees.

Because wolf trees are often oaks, keeping them makes good forestry sense too. Oaks in general, and white oaks in particular, are valuable timber trees that are in decline in many regions. The wolf tree has value as a seed tree, since, compared to typical forest trees, large, old trees are prolific seed producers.

I spend time at the Vermont oak writing down my observations and shooting photographs, trying to capture the history held within the tree. These are the most storied trees in the eastern forest. In their youth, they glimpsed Native American culture; in midlife, perhaps they hosted a colony of passenger pigeons. They witnessed the settling of the country as they shaded cows, sheep, people or all three. And today, as elders of the eastern forest, their legacy lies with wildlife; the birds, the bugs, the bears and all the beasts in between find opportunity in wolf trees.

The recognition that wolf trees have ecological and cultural significance is growing. Rather

than labeling them as outlaws or rogues, we can celebrate their story and their important role in today's eastern forest. Such an epiphany struck Charles Elliott 70 years ago when he said, "I take the stand as a character witness to wolf trees ... [These] dead, dying, and decaying trees are the most interesting places in the forest."

I regard the white oak, turn my back and set forth to find the next one. Long live the wolf tree. 🍀

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Michael Gaige became fascinated with wolf trees after hundreds of old tree encounters in the eastern forest. He is a freelance conservation biologist and educator based in Saratoga Lake, N.Y.

A charismatic old sugar maple in New York provides habitat to countless creatures in its coarse bark, hollow trunk and dead wood.



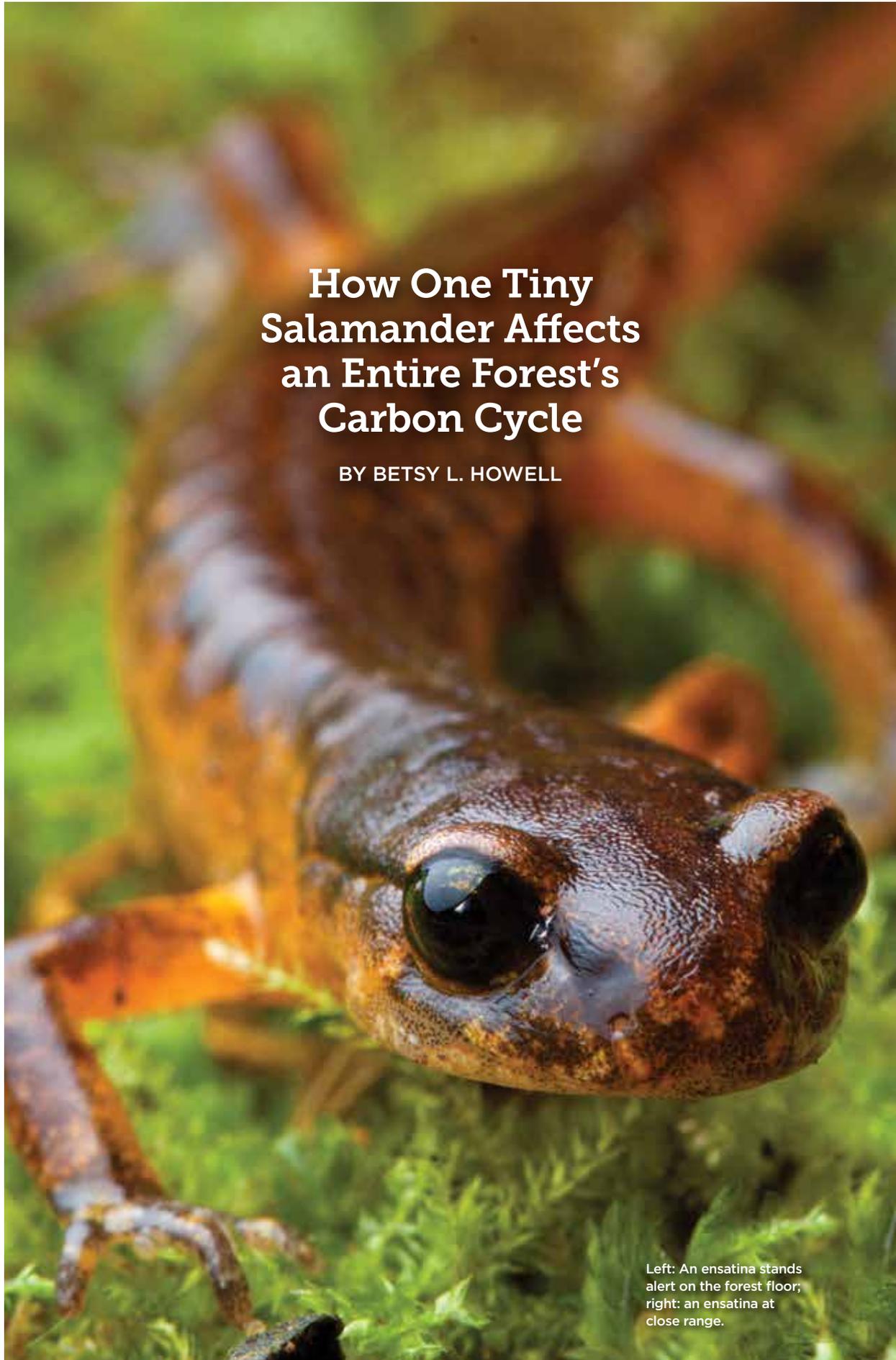
MICHAEL GAIGE

LITTLE CRITTER WITH
BIG
INFLUENCE





BOTH PHOTOS, THIS PAGE: NATALIE MCNEAR



How One Tiny Salamander Affects an Entire Forest's Carbon Cycle

BY BETSY L. HOWELL

Left: An ensatina stands alert on the forest floor; right: an ensatina at close range.

THE ENSATINA, A SMALL SALAMANDER with shoe-button eyes and orange and brown mottling, lay very still on the forest floor. As a warm, Pacific Northwest rain fell gently on both of us, I could almost hear this animal thinking, “Here I was, perfectly happy beneath that piece of bark you just overturned. Now, what can I help you with?” Ensatinas, unlike the other terrestrial amphibian I most often encounter — the western red-backed salamander — rarely hurry off when I find them. In anthropomorphic terms, they seem very patient, almost polite. I have seen many ensatinas in my years as a wildlife biologist with the U.S. Forest Service and my admiration for a creature that lives such a different life from my own is great. These creatures’ small size belies the essential role they play in the complex system of the forest — a system that we all depend on. When I finally leave and replace the bark roof over the salamander, it’s as if there is the faintest of whispers: *Thank you.*



GREG SCHECHTER



ABOVE RIGHT: SARA VIERNUM

Above left: Ensatina eggs; above right: Ensatina adult and hatchling

LIFE UNDERGROUND

Ensatinas (*Ensatina escholtzii*) are about half the length of a pencil when full-grown and completely terrestrial. They leave their underground worlds only on warm, moist days and nights, when they come to the surface to take refuge from the sodden ground under pieces of bark. Apart from their large eyes, they are easily identified by bright, yellow markings on the tops of their legs and a slight constriction at the base of their tails. “Ensatina,” a Latin word meaning “sword-like” refers to the way the tail is held straight and displayed to predators. They are a lungless salamander, meaning that they absorb oxygen solely through their skin. This makes them extremely sensitive to changes in air tempera-

ture and humidity. However, they also seem to be a very adaptable species. I have observed them in older forests, younger forests and even sometimes on the edges of clear-cuts. The species also has an extensive geographic range, occurring along the west coast of North America, from Baja California in Mexico to southern British Columbia in Canada.

Because ensatinas live only on land, they do not lay their eggs in water as some salamanders do. Instead, after an elaborate dance between the male and female that signals the beginning of the breeding cycle, the male will deposit a packet of sperm, known as a “spermatophore,” on the forest floor. The female then takes the packet into her cloaca and the sperm moves from this transport vessel into a

part of her body called the spermatheca. When she decides that conditions are favorable, generally in the spring, the sperm is released inside her body and she will deposit her fertilized eggs in rotten logs, underground burrows or any location that is protected and contains adequate moisture. The new mother then guards the eggs throughout the summer until they hatch in August or September.

For biologists, the life of the ensatina is fascinating. For the average person, it may be less so. If I tried to describe this subterranean world at a social gathering, I would likely encounter polite boredom. If I tried to use the word spermatophore in general conversation, I would definitely regret it. I can hear people's questions already. What have ensatina salamanders to do with me? What does it matter if they live in the forest or they don't live in the forest? In short, who cares? Conserving the unusual, little-known species and making its presence relevant in the world of people can be a

terrific challenge. Yet, there is reason to care. If I have learned one thing, it is this: Everything is connected. Every living creature affects, and is affected by, every other living creature.

In the mid-1970s, studies conducted in New Hampshire determined that land-dwelling salamanders existed in tremendous numbers in eastern forests. In one hectare — an area the size of a football field — approximately 2,950 salamanders were counted. This biomass — that is, the total weight of all of the salamanders — was double that of birds during the breeding season and equal to that of small mammals year-round. Most of these salamanders were the eastern red-backed, a cousin of the western species I so often spot. In another study in New York, it was found that the eastern red-backed salamander directly influenced the community of invertebrates that consume leaf litter. In essence, the salamanders were a kind of super predator on animals like beetles. Because ensatinas are the most common terrestrial

Red-backed salamander on leaf litter. Eastern red-backed salamanders were found to have tremendous influence over the invertebrate community.





Michael Best
with ensatinas

salamander in western coastal forests, is it possible that they fulfill the same role? And if so, what is the significance of such an ecological job? These questions were waiting for someone to answer them.

BEST MAN FOR THE JOB

Michael Best is a research scientist who has been studying ensatinas in northern California since 2006. His work has taken him far from his childhood home of Queens, N.Y., where growing up in an urban environment didn't deter his inherent interest in the natural world. As a child, Best explored vacant city lots, capturing insects and observing small animals. When only six years old, he started a "bug club." One accomplishment of this club included breeding praying mantises and populating one of the vacant lots with them. Still, amphibians and reptiles, even more than bugs, became the animals that captured his imagination.

"The most significant salamander moment for me as a youth," Best recalls, "was discovering the adorable, solitary tiny red eft (juvenile eastern newts) wandering through the forest, completely unafraid due to their deadly toxins."

Likewise, witnessing the migration of thousands of spotted salamanders and spring peepers (small chorus frogs), as well as observing a snapping turtle digging her nest in the Adirondacks propelled Best toward a bachelor's degree in conservation biology at State University of New York College of Environmental Science and Forestry. After his undergraduate work, he read a 2004 scientific review by Robert Davic and Hartwell Welsh, two well-known herpetologists. "On the Ecological Roles of Salamanders" explained the abundance of salamanders in forest ecosystems and how these animals function as regulators of food webs, species diversity and ecosystem processes. However, despite much being known about these amphibians, there were still many questions. The mystery of how western forest salamanders affect invertebrate densities gave rise to a master's project for Best. He soon found himself in the King Mountain Range in southern Humboldt County, less than 10 miles from the Pacific Ocean, peering into the little-known world of the ensatina.

Best's study area, shielded from maritime influence by a rugged landscape known as the Lost Coast, is dominated by a Mediterranean weather pattern. The cool, very wet winters are perfect for the ensatina who, being lungless, requires damp environments to breathe through its skin. During the dry summers, ensatinas take refuge underground. The forest here is mixed hardwood and conifer and includes such species as Douglas-fir,



WENDY SELTZER



MICHAEL RIGHT

tanoak and madrone. Owing to private ownership that has allowed the trees to grow for many decades, the forest floor is largely open. There is no herbaceous layer of ferns and herbs except for tree seedlings and a shrub component that includes only huckleberry bushes. The leaves of the deciduous tanoaks and madrones accumulate every year in deep, wide swaths on the ground, eventually curling and drying into brittle crackling forms.

SOLVING THE MYSTERY

The project began with Best building and transporting 12 "salamander housing units" to the study area. These were walls constructed from sheet metal sections a foot tall, inserted into the ground to enclose a 100 square-foot area of the forest floor. This area was then further divided by interior walls, creating four salamander plots. Best made sure each contained slabs of Douglas-fir as cover for the animals.

He then removed all salamanders from half of the plots, while the other half had just one adult male ensatina each. "We used male ensatinas," Best explains, "because it was possible that nesting females could exhibit specific behavior attributes that would have biased our results. After laying

Top: The rugged terrain of the Lost Coast protects the study site, just 10 miles inland, from maritime influence.; **bottom:** As a child, Best thrilled at finding red efts, the bright orange juvenile stage of the Eastern newt.



Top to bottom:
Best weighs a male ensatina;
A salamander housing unit;
Best at work among the salamander housing units

eggs, females might stay underground longer and feed less, or they might consume only certain kinds of invertebrates and not others. We wanted to be careful not to introduce that kind of bias.”

Best had constructed short, overhanging edges on the tops of the structure walls to prevent escape by the study salamanders, as well as immigration by other salamanders. However, in the first few weeks after setting up, he still encountered baby ensatinas and California slender salamanders that had emerged from the leaf litter. These extra animals were then carried to areas outside of the study. Though the treatment salamanders weren’t marked, Best could identify them by their length and weight, which he had previously measured.

Finally, into each plot went three bags of forest leaf litter weighing exactly three grams each. Invertebrates consume leaf litter, and with that consumption, carbon is released into the atmosphere. These invertebrates will keep eating until something stops them — say, a hungry salamander that sees them as a meal. Since fresh, dry leaf litter is 50 percent carbon by weight, the amount of leaf litter weighed later in the study would reflect changes in the amount of carbon remaining on the forest floor in the plots. Best wanted to measure the difference between the plots in which some of the invertebrates were being eaten and those in which they faced no threats, leaving their leaf litter-eating mission unchecked.

With the plots now ready, Best began his study by creating a grid pattern of 100 points, then randomly selected five points for invertebrate sampling.



Firmly inserting a soup can with both ends removed through the leaf litter down to mineral soil, he extracted cores full of different species of insects. Samples were taken each month in each plot for four months. In the first year of the study, Best documented a staggering 14,000 individual invertebrates from the plots, while in the second year — owing to early spring rains and an increase in soil moisture — he found almost 33,000. Since he had sampled only five of the 100 points in each plot, “this number,” he says, “is conservatively less than five percent of the invertebrates actually on the plots in each year.”

STEWARDS OF THE FOREST

Similar to earlier results obtained in the east, Best found that ensatina salamanders have enormous effects on their environment. Only a month into the study, the experimental plots that had a salamander showed a marked decrease in the number of large invertebrate leaf-litter shredders, such as beetles and fly larvae. This in turn resulted in 13 percent more leaf litter remaining in these plots than in the plots with no salamanders, which meant that more carbon continued to be stored in the ecosystem. Conversely, plots without salamanders had more invertebrates, which consumed the leaf litter, resulting in the release of carbon into the atmosphere. The ensatina’s removal of these large and competitive shredders also opened up food resources for tiny grazers, such as mites and barklice. These animals, which are crucial in the consumption of fungi and bacteria, could then increase in numbers.

Having ensatina salamanders doing their job seems to clearly mean more leaf litter is retained on the forest floor, which means less carbon is released into the atmosphere. This retained material is then available for another forest process called humification. In contrast to decomposition, which is about decay, humification involves the creation of humus, the rich, organic matter that is the basis for all life in the forest. “Each process is always happening simultaneously,” explains Best, “but the ratio of each to the other may increase or decrease based on weather patterns and trophic dynamics.” Measuring humification is difficult, so Best does not know to what extent this process is happening, but he can definitively say that an ensatina salamander’s presence in his study plots resulted in a smaller proportion of leaves being converted into carbon dioxide, thus making this organic material available for the creation of humus.

In a perfect world, every species would be valued and given ample space to simply be without needing to justify its existence. With so many creatures

In a perfect world, every species would be valued and given ample space to simply be without needing to justify its existence.

whose function we still don’t understand, it seems prudent to make no such judgments about which are, or are not, important. Yet, we don’t live in a perfect world, and judgments, acknowledged or not, are made every day. Even the tendency for humans to conserve animals most like ourselves doesn’t always hold true. Certain species, coyotes and crows for example, with their tremendous adaptive capabilities, intelligence and devotion to family (characteristics all much admired in the human realm), often inspire our greatest wrath. Yet, prudent thinking and sound research show again and again the wisdom of Aldo Leopold’s words about maintaining all the pieces of an ecosystem: *A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise.* This is a moral and practical philosophy. Michael Best believes that woodland salamanders are the stewards of the forests, silently channeling invertebrate biomass into energy and maintaining productive ecosystems. Even if the ensatina’s shoe-button eyes, interesting courtship rituals or strange life underground aren’t enough to pique someone’s attention, the animal’s effect on the storage of carbon in a world whose atmosphere is already overloaded with it should be. ↓

Betsy L. Howell is a wildlife biologist who has worked for the U.S. Forest Service for 20 years.



Ensatina

KEN-CHI UEDA

Micro Materials from Towering Timbers

The emerging field of cellulosic nanomaterial promises a sustainable technology

BY CARRIE MADREN



Above: The width of a cellulose nanorod is just .007 percent of the width of a strand of hair;
Left: Many of the products we consume, like fruits and nuts, are harvested from trees.



From books to the shelves they sit on, we harvest trees for a wide variety of uses.

IT'S NO EXAGGERATION TO SAY THAT SOCIETY AS WE KNOW IT IS

dependent on trees. For centuries, humans have harvested trees for a wide variety of uses. From our books to the wooden bookshelf they sit on, fruits, nuts, lumber, paper and maple syrup, forest products are all around us. And it's not just the products we can see. Cellulose, tiny fibers that make up wood, is found in dinnerware, cellophane and even rocket fuel.

Now, 21st century researchers are gleaning a new material from trees: Nanocellulose, cellulose broken down to the nano-scale. These tiny particles come in two structures: short, rigid nanocrystal rods and longer, flexible, spaghetti-like nanofibrils. Visualizing the miniscule scale of this material takes some work of the imagination. Take a strand of your hair between your fingers. Depending on your hair type, this single strand might be anywhere from 80,000 to 100,000 nanometers wide. Now imagine a structure just six nanometers wide — approximately

.007 percent of a strand of hair. That is the width of one nanocrystal rod or nanofibril. Lined up side by side, more than 4 million of these could fit in a single inch.

THE AMAZING NANOCELLULOSE PARTICLE

Don't let their size fool you. These tiny particles pack in powerful properties. Nanocellulose is strong and lightweight. The super-strength of cellulose nanocrystals and fibrils is "strength in the order of Kevlar," says Alan Rudie, supervisory research chemist at the Forest Products

“These particles are so small, we can get them from the less desirable wood. In that way, we can get more from every single tree.”

— ROBERT MOON, U.S. FOREST SERVICE

Laboratory in Madison, Wisc. Its unique properties make it a prime candidate for improving end-products as diverse as vehicles, sidewalks and paint.

For example, cellulose does not absorb light, so cellulosic nanomaterials can be made into clear films or composites such as impact-resistant windows. Rudie has had discussions with a well-known logging equipment supplier about the possibility of developing these windows for logging vehicle windshields, which are often assaulted by rocks kicked up by cutting blades. “[Rocks] come at their cab windows with almost ballistic speeds,” Rudie says.

Loggers aren’t the only ones for whom nanocellulose could improve life behind the wheel. Other companies see the potential for lightweight, tree-harvested nanomaterial in steel or even foam padding. Cellulosic nanomaterials could be substituted in just about anything that contains fibers. Such lighter, better-reinforcing materials in cars would help improve fuel economy and reduce carbon emissions.

Skipping the car trip to get around on your own two feet? The sidewalks of the future could contain nanocellulose too; it can be used as a plasticizer and reinforcing material in cement.

Nanocellulose can also help modify the viscosity of paints, cosmetics and even pancake syrup,

Nanocellulose could help paint to go on smoothly and set with less dripping.



BOTH PHOTOS EMPA PICTURES/FLICKR

A sponge made with nanocellulose that floats on water, but absorbs oil could be used to clean up oil spills.

explains Robert Moon, materials research engineer at the U.S. Forest Service. In the case of paint, nanocellulose’s distinct properties could help paint to go on smoothly and then set with less dripping.

Scientists have even invented new products using nanocellulose: Researchers at the University of Wisconsin-Madison created a water-repelling aerogel, or special sponge-like foam, that floats on water and soaks up oil — a product that could be useful for oil spill clean-ups and more, explains researcher and professor of biomedical engineering Shaoqin Gong of the Wisconsin Institute for Discovery in Madison, Wisc. The oil-soaked aerogel can even be squeezed out and reused.

And what if one day, these tiny particles could even help heal our bodies? Researchers are studying how nanocellulose could help form blood vessels and new bone.

PRIMED FOR SUSTAINABLE PRODUCTION

As scientists continue to learn how to best generate cellulosic nanomaterial, they’re also figuring out how to produce it more efficiently and cost-effectively.

“One of the big advantages of cellulose as a nanomaterial is that it’s abundant and renewable,” says Michael Goergen, director of P3Nano, the new public-private partnership between the U.S. Forest Service Forest Products Laboratory and the U.S. Endowment for Forestry and



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Communities. “Reducing the expense of producing nanomaterial will make it more attractive in the marketplace overall.”

It’s not just expense that can be reduced, but also waste. “The other potential advantage of

nanocellulose is that you don’t need to have the best wood,” Moon says, and tree species doesn’t matter. So while a lumber company wants prime wood from the tree’s core, nanocellulose can come from branches, wood chips or other parts of the

Supervisory Research Chemist Alan Rudie shows nanocellulose samples to visiting researchers.



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Alan Rudie (left) and Richard Reiner of the Forest Products Laboratory removing pulp from a filter. This pulp will be run through a homogenizer to produce cellulose nanofibrils.

Using polymers that contain nanocellulose would help disposable products like coffee cups to biodegrade.



wood waste stream. “These particles are so small, we can get them from the less desirable wood,” he says. “In that way, we can get more from every single tree.” If these technologies advance, a budding nanocellulose industry could tie in to the current infrastructure of pulp, paper, bio-fuel or other forest-centric industries. So, as other products are

produced, cellulose nanoparticles can be one type of material that’s extracted.

And as a biodegradable resource, nanocellulose won’t persist forever in the environment or landfills. “We believe that it’s going to be sustainable, recyclable, compostable,” Rudie says.

“That might be good for products such as electronics,” says Moon, “where we produce a lot of plastic that takes a long time to degrade. By using nanocellulose, we’re putting a greener component within the plastic itself.” Similarly, nanocellulose might help to lessen the impact of popular disposable products

such as coffee cups. Using polymers that contain nanocellulose would help the product to biodegrade.

And the benefits of adding nanocellulose to products go beyond the environmental. Once this new technology catches on, a nanocellulose industry could have a \$600 billion worldwide impact by 2020, according to U.S. Forest Service estimates.

Companies and researchers are currently trying to get the material to the point of commercialization for use in practical products. Other nanomaterials are already being used in commercial products. If you have odor-absorbing socks, there might be nanosilver in them, for example. Nanosilver is also used in some medical products today.

To help advance nanocellulose commercialization, the Forest Products Laboratory opened up a new \$1.7 million nanocellulose pilot plant in 2012 — the first of its kind in the U.S. The partnership will also help speed the development of the first U.S. commercial facility for producing nanocellulose. In addition, the new P3Nano partnership has dedicated some \$3 million to funding nanocellulose research by individuals, universities, companies and other research groups.

The future is here. And it’s tiny. 🌱

Carrie Madren is a freelance writer based in northern Virginia. www.carriemadren.com

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PHOTOGRAPHY BY
FRANCOIS-XAVIER DE RUYDTS

THE OLD-GROWTH FORESTS

of the Pacific Northwest, captured in these stunning photographs by Francois-Xavier De Ruydts, are often imagined as a sort of last frontier, a magical wilderness still untouched by human hands. In reality, these forests — home to the northern spotted owl — have our fingerprints all over them.

In the last few centuries, destructive activities such as clear-cut logging have become a threat to old-growth forests and the spotted owl. Much of what's left of the Pacific Northwest's old-growth forests lie on public land,

Saga

of the

Spotted Owl



A northern spotted owl in the Western Cascades near Seattle



Untouched old growth forests like the Avatar Grove in Port Renfrew, British Columbia, are where the northern spotted owl thrives.

Northern spotted owls in HJ Andrews Experimental Forest in Oregon.



managed by the U.S. Forest Service and the Bureau of Land Management, which allow for some timber harvesting. Despite their rich history and diverse plants and wildlife species, these forests remain targets for logging activities.

For a bird as territorial as the northern spotted owl, such habitat disturbance and fragmentation is devastating. Over the past 20 years, the owl's population has declined by 40 percent. In June 1990, the U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species under the Endangered Species Act throughout its range of northern California, Oregon and Washington. Loss of old-growth habitat was cited as the primary threat.

American Forests' battles to bring the northern spotted owl population back to health have been waged on two fronts. In Washington, we've submitted comments to the U.S. Fish and Wildlife service, weighing in on their 2012 rule designating critical habitat for the species. The public comments contributed to a final rule that set aside 9.6 million acres to help the recovery of the threatened bird.



A logged area within northern spotted owl habitat in Chilliwack Lake Provincial Park in British Columbia shows an environment that will not be hospitable to spotted owls again for centuries.

In the field, we're working with partners like the U.S. Forest Service to help these forests recover. In Washington's Gifford Pinchot National Forest, we're planting 60,000 ponderosa pine across 600 acres. In neighboring Oregon, we're planting another 20,000 pine in Fremont-Winema National Forests.

Why do we care so much? Because it's not just about the northern spotted owl. As with almost all battles that call out a single species as a symbol for a cause, the spotted owl is an indicator species — what we metaphorically call a canary in a coal mine. It is part of the fabric of ecosystem health. We mourn its declining numbers because it is a charismatic creature, but the decline of this owl is telling us something deeper and more disturbing about the consequences of destruction to this habitat.

Owls are often viewed as a symbol of wisdom. Let's hope that we have the wisdom to keep these birds and their habitat around for a long time. These breathtaking images should remain a testament to the beauty and biodiversity of the Pacific Northwest — not become a memorial to it. 🌱



If an owl carries away a mouse, it probably has fledglings and is taking the mouse back to its nest. Here, white mice were provided by researchers looking for nests to monitor.



earthkeepers



A New Breed of Forester

BOB PERSCHEL could be described as an activist, a forester and a leader in his field, but what stands out most about him is his passion for the mission. Brought on as executive director of the New England Forestry Foundation (NEFF) in early 2012, Perschel wasted no time in putting in motion a landmark report that not only describes a remarkable vision for sustainability as it relates to forests — calling for New England to preserve 30 million acres by 2060 — but also charts a course to achieve it. The report marks a culmination of the decades that Perschel has worked as a new breed of forester, one who helped shape a ground-breaking manifesto of land ethics to prescribe a different kind of relationship with forests — a relationship in which the forests are valued for their inherent worth apart from human needs.

It's an idea that stretches back to Perschel's time with the Forest Guild,

of which he was a founding member. "Our belief was that the forests have intrinsic value — that it's not all about us humans. And that was a switch. The guild set out the concept that if you're an employee of someone that is asking you to do what you think is the wrong thing to the forest, your obligation is to the forest and you should disassociate from the employer. In the profession it's very controversial. We took a stand. We work for the forest."

But as devoted as he is to the forest, Perschel's path to this work wasn't a straight one. After graduating from Yale with a bachelor's degree in psychology, he got a job at IBM, figuring he would work for a while, save some money, then go to law or business school. But along the way, he got the suspicion that his path in life wasn't meant to

follow that particular trail. He says, "I went out to sit under a tree and thought — now what do you really want to do? This is where I want to be, out here, but — how do you do that?" It was then that he made a turn. He decided to go back to school — Yale School of Forestry.

"I didn't go there to be a forester," says Perschel. "I had other ideas — like be an environmental planner. But I started taking forestry courses and that's when it hit me that this is a natural system that's intact, that also yields benefits for people. And we can help people know how to best manage it —



DAMIAN STROHMEYER

Perschel enjoys a New England winter in the woods.



New England's forests are famous for their fall colors.

ERIC BRUMBLE



Bob Perschel

ROBERT PERSCHEL

keep it intact and also get the benefits. That's what really hooked me."

And many would say the forestry industry in New England is lucky he was hooked. "We needed a spark plug for the board and fellow staff," says Tim Ingraham, president of the board. "And that has been Bob."

With Perschel at the helm, NEFF's vision is to keep forests as forests, accessible to the public and an active training ground for foresters learning to optimize forest yields for wood products. But there are obstacles to getting all those forests into conservation, and particularly, in actively managing them for lumber.

"The public has a problem with harvesting trees and the prospect of increasing the harvesting of trees," says Perschel. "That's our audience, the people who are environmentally sensitive but don't really understand how forests fit into the equation of sustainability and what it means to their lives. The person who doesn't want to see a tree cut but has a wooden table or floors."

Part of working for the forest is communicating about the forest, and NEFF

chooses to do that by cataloguing the benefits of trees to health, recreation and the economy. If managed as outlined in Perschel's NEFF plan, in addition to ancillary benefits like preserving wildlife habitat, the forests will directly contribute at least \$5 billion to the region's economy each year. On top of that are the indirect benefits: improving air quality, thus reducing health care costs and crop damage that could otherwise top \$700 million each year; purifying rainwater naturally, saving up to \$6 billion otherwise needed to produce clean water; keeping 3.5 million metric tons of carbon out of the atmosphere by using 400 million board feet of local wood for building, as opposed to steel and concrete.

One of the central assertions is that some of the products we get out of the forest are actually better than the other alternatives that we're using. "Our assumption is that you, our audience, wants to be sustainable, and we show you how regional forests and wood

products can help you lead a sustainable life. We can't demand the products and have them imported from someplace that we don't know, or instead of making the table out of wood, make it out of steel and never think about the impact on the environment," says Perschel.

"In the profession [our belief is] very controversial. We took a stand. We work for the forest."

— BOB PERSCHEL

"The best choice, we think people will agree, is to do it in our region, on your watch, sustainably under your eyes, with your input. You'll have some assurance that it is better than the alternatives." ↓

Lea Sloan writes from Washington, D.C. and is American Forests' vice president of communications.

last look



DAVID KINGHAM



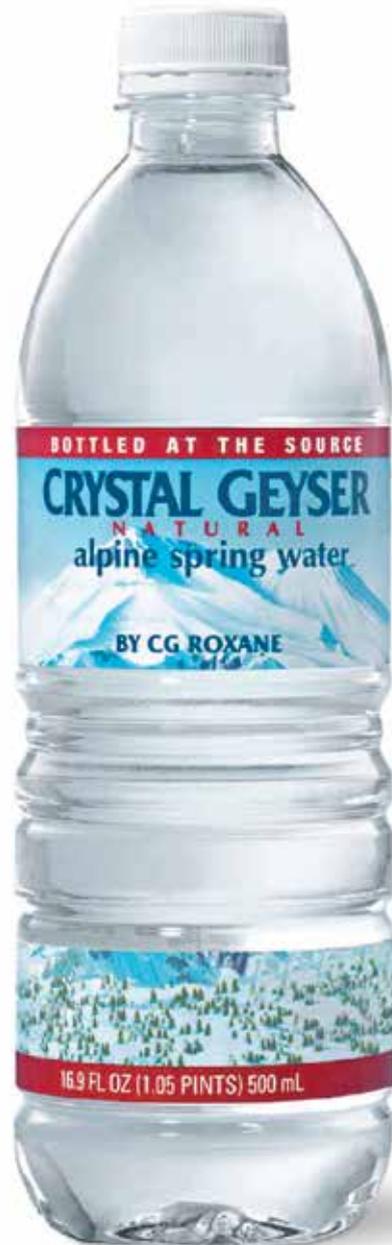
String Lake at Night

I shot this at one of my favorite locations in the Tetons: String Lake. The water pouring over the rocks creates a beautiful white noise that cancels out all your worries.

David Kingham is a nature photographer with particular interest in night photography and author of *Nightscape: A Complete Guide to Photographing under the Night Sky*. For Kingham, photography was the answer to a desire for something more than the cubicle walls of the working world he felt constrained by. Photography helped him discover his creative side and once he started, he says, he knew he had found his purpose in life and could never return to any other type of work.

When alone in the mountains with his camera or staring at the night sky, Kingham feels humbled by the vastness and reminded of how small we are and how short our time is. His hope is for his artwork to trigger a similar response in viewers — to remind them of all the beauty in the world and to enjoy every day and continue to follow their passion.

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