

AMERICAN

SUMMER 2019

FORESTS

California, Catalyzed

YEARS OF CATASTROPHIC WILDFIRES
HAVE BROUGHT CALIFORNIA TO
THE BRINK — SO HOW ARE ITS
PEOPLE RESPONDING?



One Million Trees



AMERICAN TOWER®

American Tower is proud to partner with American Forests to plant one million trees across the U.S. over the next decade. Community engagement and sustainability are key components of our business culture, and we are excited to be taking steps to make a positive impact on our environment.

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COVER PHOTO by By N. F. Photography/Shutterstock



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Regrowth occurring in a fire-scarred area on the Sierra National Forest following the 2015 Willow Fire.

A Burning Question for Our Forests

BY JAD DALEY

IMAGINE WAKING UP ONE DAY and finding your neighborhood covered in an impenetrable smoke so thick that it is literally “off the charts” for the federal air quality index, even

though no fire is burning in your community.

Imagine running around your home and shaking your family members

awake because a wildfire is suddenly raging toward your neighborhood, a place that had not seen that kind of fire in generations.

Imagine walking a mountain ridge, carrying heavy equipment and sweating in protective clothing while trying to clear a firebreak — all while uncertain if the fire might jump a ridge and take your life.

While many Americans have never had these experiences, especially Easterners, these kinds of stories are becoming shockingly familiar. When I travel in the West, many of the people I meet have personal stories that connect them to wildfire, sometimes in new and unwelcome ways.

At American Forests, we are challenging ourselves to step into the spaces where our forests and our country need us the most. Wildfire is high on this list. Just consider:

- ▶ 2015 and 2017 are the top two years on record for acres burned by wildfire, more than 10 million acres each year. Carbon emissions from wildfire exceeded 150 million metric tons of carbon dioxide both years.
- ▶ California’s wave of tree mortality killed another 18 million trees last year, bringing the total since 2010 to almost 150 million. As those standing dead trees

fall, they become fuel for “megafires” so intense they can sterilize forest soils, making it difficult for those forests to naturally regenerate.

- ▶ Wildfires are also becoming more dangerous in the Southeast, exemplified by the 2016 fire in Gatlinburg, Tenn. that killed 14 people. The 2018 National Climate Assessment says that such fires will become more common in the region.

- ▶ More than half of all U.S. Forest Service expenditures are now related to wildfire, a three-fold increase in fire-related expenses since the 1990s.

So, what can American Forests do to help?

American Forests has long played a role in wildfire recovery by planting trees. For example, wildfire is the single largest driver of reforestation need on our national forests, leading to many of the partnership projects where American Forests has helped to bring forests back to life with tree planting.

But recovery from wildfire is only half of the story. How can American Forests and others help to prevent more catastrophic wildfires from occurring in our rapidly warming climate? In some places, we need to



subtract trees from forests instead of planting them.

California's forests are a great example. California has many areas of forest where the current density of trees is too great for the water that is available in a drying climate, and leaves these forests vulnerable to pest infestations.

Under the leadership of our new California State Director, Brittany Dyer, American Forests has launched a new partnership with the U.S. Forest Service and the State of California to advance a mixture of forest thinning and replanting in California's hardest hit area for tree mortality — the Southern Sierra Nevada mountains.

Using the "Adaptive Silviculture for Climate Change Framework" developed by U.S. Forest Service researchers, we are establishing side-by-side forest treatments that will test different ways we might need to alter forest structure in this landscape to withstand relentless drought, pest infestations and wildfire. Instead of just repeating traditional forestry techniques that are no longer working, we are helping to test new approaches so we can learn how to create truly climate-resilient forests for the future.

We are matching these on-the-ground efforts with leadership on wildfire policy. In 2018, we celebrated

long-awaited bipartisan action to enact a "Wildfire Funding Fix" for the U.S. Forest Service. This will provide desperately needed additional funding to not only fight wildfires, but also to accelerate the kind of preventative restoration treatments that American Forests is helping to deliver in the Southern Sierras.

We have even bigger policy goals that match the scale of the problem. This Spring, our allies in the U.S. Congress introduced far-reaching legislation, developed with American Forests' assistance, which would provide billions of dollars in new funding to restore forest resilience. This legislation would also dramatically increase the pace and scale of replanting forests lost to wildfire and other causes, planting as many as 3 billion trees over a decade.

This is a pivotal moment in the history of America's forests, and we are doing our best to match the scale and ambition of our actions to the challenges we face. The forest health crisis, fueled by climate change, will provide the organizing principle for much of our future work. Thank you for being a partner with us in creating resilient forests for the future. 🌱



For more news and updates from Jad, follow him on Twitter @JadDaley



More than half of all U.S. Forest Service expenditures are now related to wildfire, a three-fold increase in fire-related expenses since the 1990s.



AMERICAN FORESTS

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PROJECT SHOWCASE

Restoring an Oasis in California's Mojave Desert

BY AUSTIN REMPEL

INSTEAD OF FLOWING toward the ocean like most rivers, the Mojave River winds west into the heart of the Mojave Desert. For most of its length, it flows underground. Nearly a hundred

miles from its origin in the San Bernardino Mountains, the river enters a deep canyon and gradually seeps up from the desert sand. Afton Canyon — located

in the heart of the Mojave Trails National Monument — is one of only two places where the river flows continuously aboveground, brought to the surface by shallow bedrock.

Remarkably, in a landscape that receives just 4 inches of rain per year, and where summer temperatures routinely exceed 110°F, Afton Canyon supports the growth of tall streamside trees and wet grassy meadows. For centuries the canyon's water and lush vegetation



have made it a magnet for wildlife and migrating birds.

Unfortunately, the 20th century brought many changes to Afton Canyon. The Mojave Forks Dam was built in 1967, cutting off the Mojave River's seasonal floods that native trees need to propagate, like Fremont cottonwood and black willow. The river's new flow regime and decades of damage to soils from cattle and off-road vehicle use favored the spread of an exotic tree species called tamarisk, also known as saltcedar.

Originally from Eurasia, tamarisk was intentionally introduced to the canyon in the early 1900s to control erosion around the embankments of the Union Pacific rail line. The plant accumulates salt in its needles and the surrounding soil, which prevents other plants from growing, creating a tamarisk-dominant forest with little biodiversity. Tamarisk also consumes prodigious amounts of water in riparian habitats due to the sheer density of its stands. Free-flowing stretches of the river dwindled in Afton Canyon as the tamarisk multiplied.

In 1990, Tom Egan — a riparian restoration specialist with the Bureau of Land Management (BLM) — was tasked with rescuing the canyon's native plants and wildlife. Along with reining in cattle grazing and off-road vehicle use, Egan developed a plan to replace the tamarisk with cottonwoods and willows. Egan enlisted the help of fellow staff and the Los Angeles Conservation Corps, a program that employs young at-risk Angelinos to work on conservation and community service projects. Focusing on the western end of the canyon, they burned, cut and chemically treated the tamarisk thickets. When they were finished, nearby sections of the Mojave River began flowing aboveground for the first time in years.

Egan and the BLM received one of American Forest's very first reforestation grants to help with replanting. Instead of raising seedlings in a nursery, they used willow and cottonwoods' unique ability to sprout new roots wherever they touch water or moist soil. They harvested live shoots and branches from mature trees upstream of Afton Canyon and planted them deep enough for the young trees to "get their feet wet" and access groundwater.

With support from American Forests, Egan and the LA Conservation Corps workers removed 700 acres of tamarisk and planted more than 10,000



A desert bighorn sheep roams the western Afton Canyon.

cottonwood and willow poles between 1990 and 2002. Fast forward 20 years and the results are undeniable. Some of the original plantings are nearly 40 feet tall. Migratory birds have returned to the area in force — more than 180 bird species have been spotted at Afton Canyon — and the local Desert Bighorn herd has grown from 30 to more than 300 individuals. The cottonwoods and willows are regenerating naturally, another hallmark of success.

"With support from American Forests, Egan and the LA Conservation Corps workers removed 700 acres of tamarisk and planted more than 10,000 cottonwood and willow poles between 1990 and 2002."

This progress could be at risk without the ongoing stewardship of public servants like Egan and the LA Conservation Corps. Tamarisk requires periodic treatments to keep it at bay. Egan, for his part, continues to advocate for thoughtful management of the area in his role as the California Desert Representative for Defenders of Wildlife. 🌱

Austin Rempel writes from Washington, D.C., and is American Forests' forest conservation manager.



Taken in March 2019, this picture shows the western Afton Canyon area where more than 10,000 Fremont cottonwood and Gooding's black willow poles were planted. The area is nicknamed "Tanya's Forest."



Two young volunteers help plant 200 trees at the 3-acre Ballinger Open Space site in Shoreline, Wash.

PROJECT SHOWCASE

Piloting City Forest Credits in Shoreline

BY IAN LEAHY

IT PROBABLY wouldn't come as a surprise to many that the biggest hurdle the field of urban forestry faces is funding. We have gotten quite good at developing elaborate data and master plans. But if there's not sufficient funding to implement them, it's all for naught, and the cycle must begin again.

That's why American Forests has helped develop a new finance mechanism called City Forest Credits. Another formidable arrow in the quiver to reverse tree loss in cities and ensure equitable distribution so benefits reach all residents and businesses, its purpose is to engage the private sector in funding the planting and preservation of city trees nationwide.

The Seattle-based nonprofit City Forest Credits facilitates the sale of "carbon+" credits specifically designed for

the unique dynamics of an urban forest. Scientist Dr. Greg McPherson developed these credits to include not only a metric ton of CO₂ like a traditional carbon credit, but also quantification of stormwater runoff reduction in cubic meters, reductions in air pollutants, and energy savings. There are also less quantifiable community and public visibility benefits that have value for corporate buyers. American Forests has been working closely with City Forest Credits for the past few years to develop the protocols, launch the registry and, now with support from the Doris Duke Charitable Foundation, bring this exciting new urban forestry finance mechanism to scale.

On December 1, 2018, American Forests piloted one of the nation's first City Forest Carbon+ Credit projects in Shoreline, Wash. Community volun-



teers joined locally-based volunteers from Bank of America, staff from the Mountains to Sound Greenway Trust, American Forests and City Forest Credits staff to plant 200 trees at the 3-acre Ballinger Open Space site.

That site had long been inaccessible to the public due to blackberries and other overgrown invasive plants. The site is adjacent to a subsidized public housing facility, so restoring and replanting the site contributes to social equity and environmental justice. This planting was the beginning of a long-term project that will clear out invasive plants to restore public access and eventually plant 2,000 trees on the site.

The Ballinger Open Space site is projected to deliver the following quantified benefits over the next 50 years:

- ▶ Storage of up to 1,000 metric tons of CO₂
- ▶ Reduction of more than 62 million liters of stormwater (rain fall interception), at a savings of approximately \$455,000

- ▶ Energy savings (heating and cooling) of \$73,000
- ▶ Improvements in air quality valued at more than \$5,000
- ▶ Total dollar benefits over 50 years: \$533,000

“This Shoreline project is a great example of bringing private funding into a public project,” says Mark McPherson, executive director of City Forest Credits. “The City of Shoreline, the Greenway Trust, American Forests and Bank of America all deserve recognition for their work to pioneer this new opportunity. Everyone benefits, from the nearby residents at the Ballinger Homes, to the neighborhood, to the City of Shoreline’s budget for managing critical urban forests.” 🌱

Ian Leahy writes from Washington, D.C., and is American Forests’ vice president of urban forestry.



Community volunteers joined locally-based volunteers from Bank of America, staff from the Mountains to Sound Greenway Trust, American Forests and City Forest Credits staff to plant 200 trees at the 3-acre Ballinger Open Space site.

FROM THE FIELD

PHOENIX, ARIZ.

Jennifer Broome, Vice President of Philanthropy

AMERICAN FORESTS had a strong presence at this year's GreenBiz conference, the premier annual event for sustainable business leaders focused on corporate social responsibility, held each February in Phoenix.

GreenBiz 2019 brought together more than 1,200 of the world's brightest thinkers and most influential sustainability leaders for an unparalleled look into the pressing challenges, emerging trends and biggest opportunities in sustainable business. American Forests was there to ensure that America's forests remain front and center in the conversation about

how best to address climate change.

In addition to mounting an informational booth that drew heavy traffic, and speaking at several sessions on topics like "responsible forestry" and "forests as natural climate solutions," we also had the good fortune to partner with Microsoft to conduct a Native Desert Landscape Restoration planting. The planting attracted around 50 conference attendees, as well as volunteers from the Arizona Sustainability Alliance, and resident experts from the Phoenix Parks & Recreation Department. We planted trees, cacti and other native desert vegetation,

including ironwood, saguro and Teddy Bear cholla, in North Mountain Park, part of the Phoenix Mountain Preserve in the heart of the city.

In addition to beautifying the park and helping to restore the fragile ecosystem of the Phoenix area, this planting provided an opportunity to educate participants about the critical work and mission of American Forests in both cities and wild landscapes, as well as to help offset the carbon footprint of attending the conference.

Our participation at this conference has already sparked promising new partnership opportunities with companies who are serious about addressing climate change, engaging their employees and greening their businesses. We are proud to partner with such good corporate citizens! 🌱

AMERICAN FORESTS

GreenBiz Conference attendees celebrate their hard work restoring North Mountain Park with American Forests and Microsoft, with the help of the Arizona Sustainability Alliance and the Phoenix Parks & Recreation Department.





Sarah Anderson spoke on diversifying the workforce at the first National Workforce Summit.

WASHINGTON, D.C.

Sarah L. Anderson, Senior Manager, Tree Equity Programs

A SKILLED WORKFORCE is fundamental to our mission of growing and sustaining healthy urban forests. Unfortunately, urban forestry, landscaping and horticulture professionals are facing a massive skilled labor shortage. Studies show that communities with the highest tree canopy needs generally tend to be those that have the highest unemployment; yet, public agencies, nonprofit groups and tree- and lawn-care companies are struggling to engage and retain women and low-income people of color. In 2017 alone, 71,000 landscaping jobs went unfilled.

American Forests' newly launched Tree Equity: Career Pathways initiative seeks to address this shortage. In February, I was pleased to share successful strategies for diversifying the green workforce at the National Association of Landscape Professionals' first National Workforce Summit held just outside Washington, D.C. During my session, Diversifying the Workforce, summit participants were introduced to scenarios that could be hurting retention like isolation, lack of accommodations and tokenism, and recognized potential solutions to these

obstacles. For instance, ensuring that there is more than just one person of color on a crew is important. Ensuring that women have access to a restroom while on job sites is critical to retaining women in important field roles. And, any senior leader that happens to be part of an underrepresented group should not be the only go-to person for all questions dealing with the organization's inclusion efforts.

Reviewing examples like these, along with definitions of key terms like diverse, divergent, representation, inclusion and equality, have helped reveal opportunities for participants to improve inclusion efforts that ultimately create a more representative workforce. With a qualified and inclusive workforce, we will sustain healthy cities through resilient urban forests for generations to come. 🌱

DONOR PROFILE

Doris Duke Charitable Foundation

THE DORIS DUKE Charitable Foundation (DDCF) has become a catalyst among philanthropies for the growing movement to promote “natural climate solutions,” which entails conserving and restoring ecosystems, including forests, wetlands and other lands to provide a natural carbon sink. DDCF’s commitment to address climate change has become a critical strategy to advance its longstanding mission to conserve wildlife habitat and other natural assets, given the spreading impacts of climate change on lands and waters worldwide. In natural climate solutions, the foundation recognizes an opportunity to demonstrate that society can effectively reduce its emissions while benefiting nature.

DDCF’s broadened focus on climate change aligns closely with American Forests’ own embrace of the climate challenge, sparked by our organization’s recognition of already visible

climate change impacts on forests and the huge role that forests can play in solving climate change. DDCF’s support is touching virtually every aspect of American Forests’ Climate Leadership Strategy, a transformational investment in our organization’s leadership capacity on natural climate solutions. American Forests is just one organization being empowered in this way by DDCF’s work on natural climate solutions, just one example of the foundation’s catalytic leadership for this work nationwide.

Our shared interest first came together through DDCF support that enabled American Forests to host an unprecedented climate change “Learning Lab” in the summer of 2018. The Learning Lab brought together delegations of officials from the 17 states in the U.S. Climate Alliance (now up to 23 states) to develop customized strategies for each state to use forests and other lands as a climate solution. American Forests

assembled more than 60 experts in science, policy and finance to coach the state teams through a series of exercises and presentations of their findings. The results have been remarkable — many of these states have already drafted new policies and aligned financial resources to advance reforestation and other natural climate solutions.

This work with the Alliance continues with renewed support from DDCF via a new grant awarded in February of 2019 that will enable American Forests to convene additional natural climate solutions Learning Labs. American Forests also has new support from DDCF to match this work on state policy with equal efforts aimed at federal policy, including the opportunity to align the funding and activities of the U.S. Forest Service with natural climate solutions.

American Forests also has support from DDCF to lead natural climate solutions by example. American Forests was recently awarded a grant from the Wildlife Conservation Society’s Climate Adaptation Fund, supported by DDCF, to develop new climate-informed techniques for our replanting of

Tamaulipan thornscrub forests in the Lower Rio Grande Valley of Texas. DDCF is also supporting American Forests’ work on urban forests, funding a comprehensive national leadership initiative to provide urban forest practitioners with new tools to reduce energy use and protect public health in our rapidly heating cities. DDCF’s support will also facilitate statewide demonstration of this climate and health-informed approach to urban forestry in partnership with the State of Rhode Island.

We are very grateful for this powerful new relationship! 🌱

JAY ALEXANDER



(L to R) American Forests’ president and CEO, Jad Daley, and vice president & chief of staff, general council, Rebecca Turner, with Sacha Spector, program director for the environment at the Doris Duke Charitable Foundation, at American Forests’ 2018 Learning Lab.



PARTNER PROFILE

Clif Bar

ON A SUNNY DAY in Phoenix, Jad Daley, American Forests' president & CEO, and Lindsey Putz, director of corporate giving, met with Elysa Hammond, Clif Bar's vice president of environmental stewardship. Hammond had joined American Forests the day before in planting 75 native desert trees and shrubs in North Mountain Park as part of the GreenBiz Conference, a convening of the brightest minds in sustainability. After putting shovels in the ground together, Hammond gave us a glimpse into why our historic partnership is such a natural fit for Clif Bar.

Clif Bar and American Forests have been restoring landscapes together



since 2004, planting nearly 150,000 trees across the country. The partnership began in a very organic way, pun intended, as Hammond was spearheading Clif Bar's commitment to going organic, which is the foundation of their sustainability program. Through this process, Hammond was inspired by the deep ecological connection she saw between our food system and climate change. So, she decided to take Clif Bar's sustainability commitments even further.

"When we launched our commitment to organic, we also decided to put a stake in the ground and take responsibility for our carbon footprint," Hammond explained. "It was a holistic approach to addressing climate change."

Clif Bar began investing in numerous environmental initiatives, including a powerful natural climate

solution – trees. In fire-damaged areas of the Sierra Nevada mountains, the range showcased on Clif Bar wrappers, the company worked with American Forests to plant tens of thousands of trees. In Idaho, home of their new one-of-a-kind sustainability-focused bakery, the organizations have been planting the keystone whitebark pine tree species, a main food source for the grizzly bear. To be able to reforest landscapes in places they live and work lines up perfectly with the company's values of striving for a healthier, more sustainable world.

"I'm really excited for the future of our work together," Hammond shared, "to not only continue planting trees but to do so in increasingly more intentional ways that educate and engage people in restoring public lands." 🌱

Elysa Hammond and Jad Daley volunteering at American Forests' planting in Phoenix.

WASHINGTON OUTLOOK

Urging Congress to Protect Our Forests



ON CAPITOL HILL, spring is about more than cherry blossoms. It's when Congress begins the critical process of budgeting and planning for federal priorities for the next year. This year, we have been sounding the alarm because America's forests are in crisis. We are witnessing their loss and destruction at a staggering rate. As a nation, unless we change the way we manage them, we will lose them.

Our forests are struggling to adapt to a changing climate — to extreme drought, low humidity, high winds and shortened "cold spells." These extremes

produce dramatic tree mortality and high intensity wildfires in the West and changing tree species composition and declining forest health in the East. To adapt forests to this "new normal" will often require more active forest management, including harvesting dead and dying trees, reforestation, reintroducing controlled fire and other measures. More active forest management will require increased federal and private investment and level of effort sufficient to halt this crisis.

Unfortunately, the Administration's budget for fiscal year 2020 did the

opposite. It proposed significant cuts or complete elimination to critical forestry programs. This spring, we testified to Congress and asked them to consider what is at stake. In California's forests, more than 147 million trees have died since 2010, with roughly 85 percent of those located in the Sierra Nevada. If Congress continues with "business as usual," many areas will experience fires so intense that they cannot be reforested and will transition to a shrub ecosystem. The best hope for sustaining forests, like those in the Sierra, will be to thin areas with dead and declining trees, while restoring a more resilient forest and using controlled burns more frequently. By providing the U.S. Forest Service with the critical tools and increased resources it needs, Congress can stop this looming crisis. But, it's not only western forests that are under threat. A recent University of Florida study found that southeastern forests are already seeing a changing mixture of tree species in response to prolonged drought. Dangerous forest pests are reaching farther north into New England as its climate warms. New stresses are coming to all of America's forests. Unless Congress significantly increases funding for critical U.S. Forest Service programs, forests across the nation will be in crisis.

Thankfully, this spring marked only the beginning of the federal funding process on Capitol Hill. At American Forests, we will take every opportunity through this summer and into fall to urge Congress to provide the U.S. Forest Service with the tools and resources they need to address this crisis. But we cannot do it alone — Congress needs to hear from readers like you! To get involved, go to our Action Center at americanforests.org/TakeAction

Together, we can stop the crisis threatening our forests and protect them for future generations. 🌱

Alix Murdoch writes from Washington, D.C. and is American Forests' vice president of policy.

CHAMPION TREE SHOWCASE

Saguaro

SCIENTIFIC NAME: *Carnegiea gigantea*

LOCATION: Mesa, Ariz.

NOMINATED: 2014

NOMINATED BY: Joe Orman

LAST MEASURED: 2018

HEIGHT: 30 feet

CIRCUMFERENCE: 119 inches

CROWN SPREAD: 9 feet

TOTAL POINTS: 151



The national champion saguaro currently stands at 30 feet, but the species can grow to be more than 40 feet tall.

DID YOU KNOW?

The saguaro cactus stores large amounts of rainwater and, when fully hydrated, can weigh an astounding 3,200 – 4,800 pounds. In fact, in February, American Forests planted 4 saguaros, among other species, at North Mountain Park in Phoenix as part of a Community ReLeaf project to help restore native habitat along the park's only ADA-accessible trail.

PLANT A SEED FOR FUTURE GENERATIONS

AND INCLUDE **AMERICAN FORESTS** IN YOUR ESTATE PLANS.

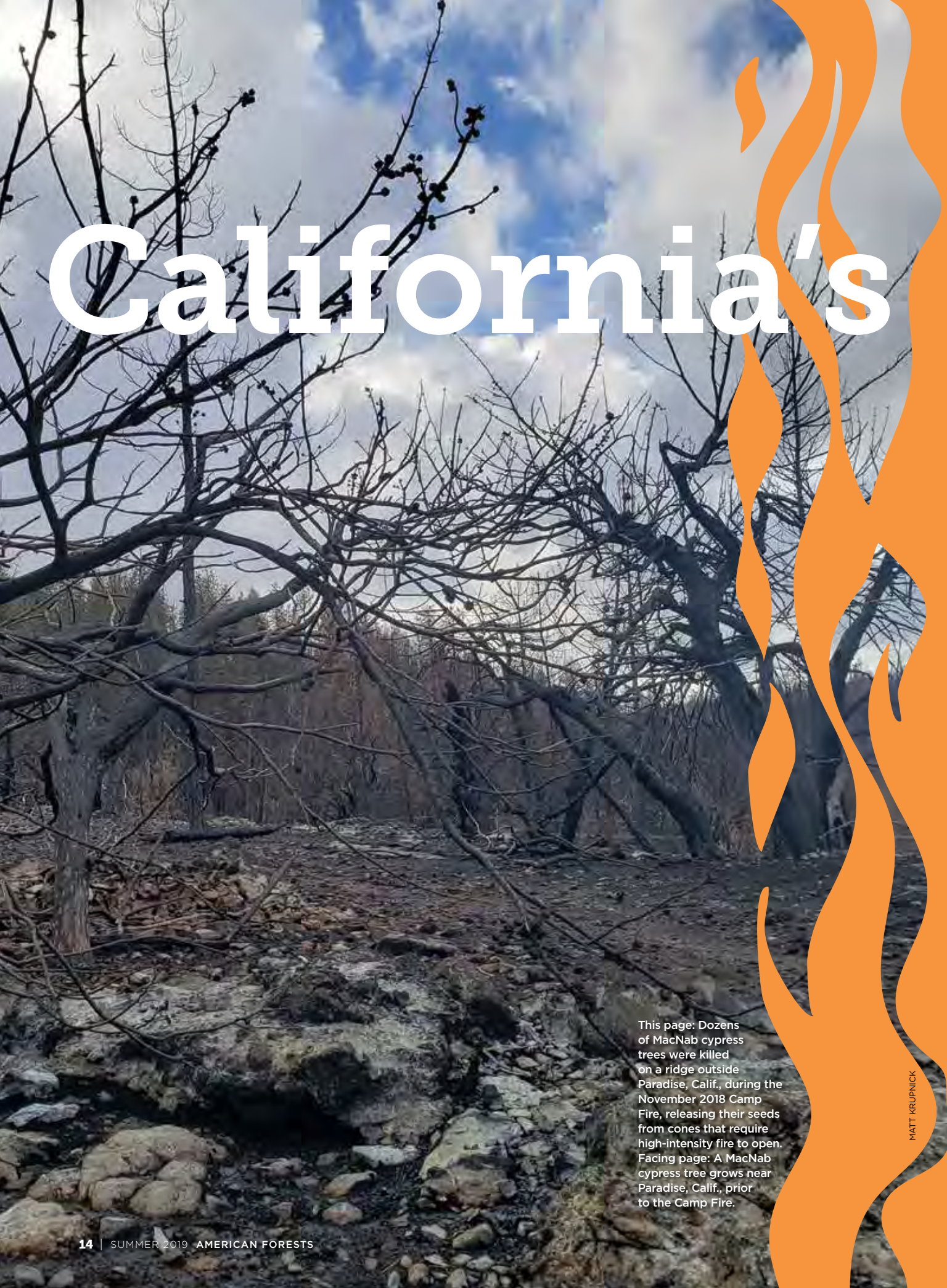
Our Evergreen Society members are lifelong friends who, through their wills, trusts, retirement plans or life insurance, help American Forests plant legacies, one tree at a time.

Learn more about the Evergreen Society by visiting americanforests.org/EvergreenSociety or by contacting Jennifer Broome, Vice President of Philanthropy, at jbroome@americanforests.org or 202.370.4513.



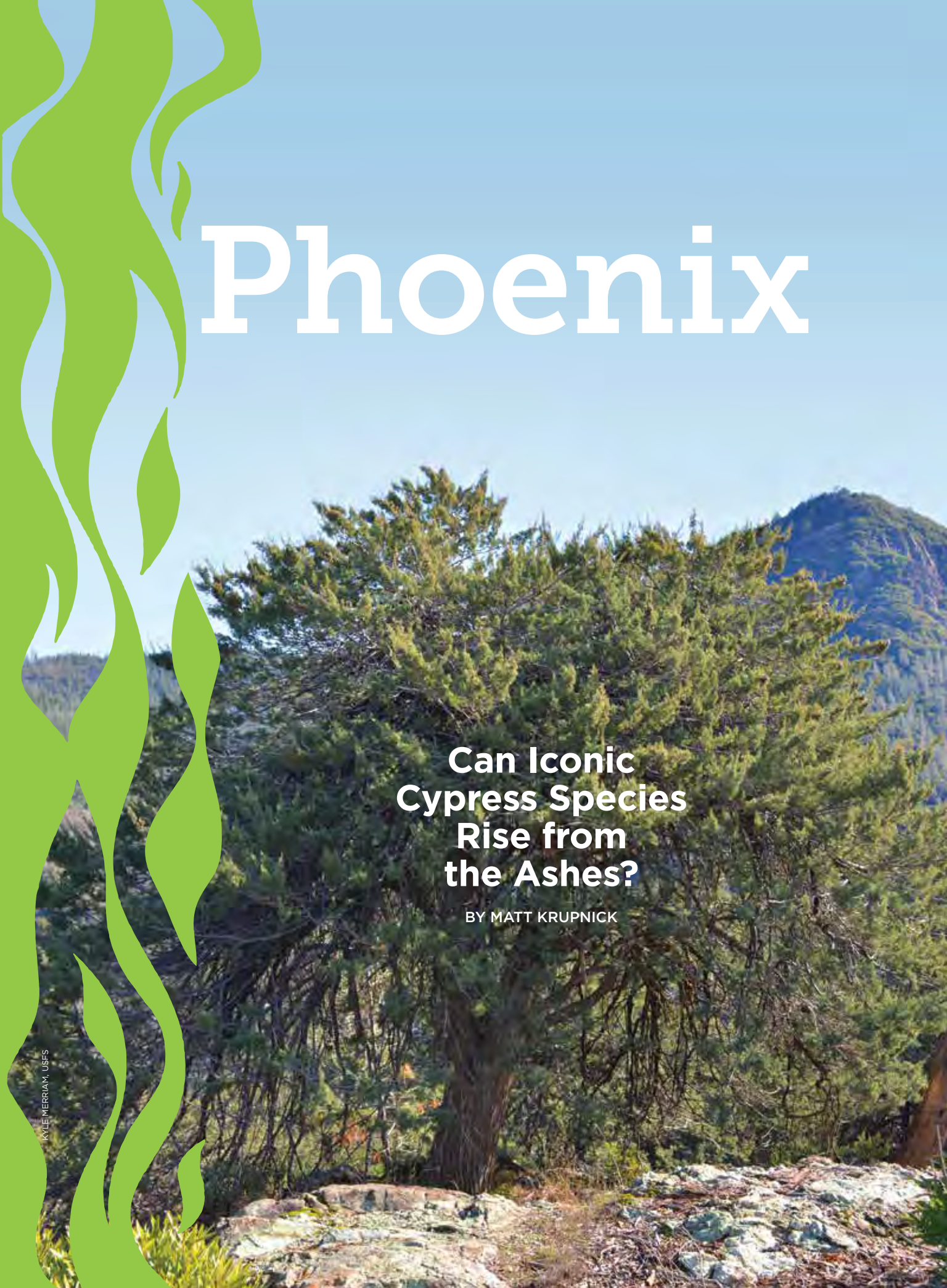
AMERICAN FORESTS

California's



This page: Dozens of MacNab cypress trees were killed on a ridge outside Paradise, Calif., during the November 2018 Camp Fire, releasing their seeds from cones that require high-intensity fire to open. Facing page: A MacNab cypress tree grows near Paradise, Calif., prior to the Camp Fire.

MATT KRUPNICK



Phoenix

**Can Iconic
Cypress Species
Rise from
the Ashes?**

BY MATT KRUPNICK



IT'S BEEN THREE MONTHS since California's most destructive wildfire killed nearly 100 people, and Professor Don Hankins has taken me through the Camp Fire's heartbreaking epicenter, in the scorched hills just outside the devastated town of Paradise. Piles of scrap metal amid the pine trees mark the sites of destroyed houses and businesses; a melted dinghy sits abandoned alongside a road, and crosses have been erected to memorialize the deaths.



But amidst all the sobering devastation, straddling a green-tinged ridge of serpentine rock, scores of MacNab cypress trees — dead MacNab cypress trees — have a rare opportunity to thrive.

Hankins squats to look at MacNab seeds scattered across the burned soil, released from the trees' acorn-sized cones during the Camp Fire's fury.

"These ones are open, and you can see the seeds right here," says Hankins, pointing at the ground underneath a hollowed-out cypress. Hankins, a geography and planning professor at nearby California State University at Chico who teaches, among other subjects, pyrogeography — the study of the distribution of fire, lives on a ridge a few miles away and evacuated with his family as the fire roared toward Chico in November.

California's cypress species — in the *Cupressus* genus, as opposed to the *Taxodium* species found in the southeastern United States — are basically the pandas of the botany world: they only reproduce under rare, specific circumstances. And, like pandas, they increasingly need human help.

Like other serotinous (meaning their reproduction is prompted by environmental events) cypress species, many of them endemic to California, the MacNabs depend on wildfires to open their tightly sealed cones and release seeds. The trees also depend on fire to kill off

Above: Like other serotinous cypress species, the MacNab cypress depends on high-intensity fire to release its seeds. These MacNab cones outside Paradise, Calif., opened during the Camp Fire. **Left:** California State University at Chico Geography Professor Don Hankins examines MacNab cypress seeds released by the November 2018 Camp Fire, near the devastated town of Paradise, Calif.

LEFT, ABOVE AND TOP RIGHT (FACING PAGE): MATT KRUPNICK; BELOW RIGHT: JON KEELEY, USGS

nearby trees and provide the direct sunlight many cypress species need to grow. Unlike some other conifers whose winged seeds can catch the wind and sprout far from their parents, cypress seeds plummet straight to the forest floor and stay put.

In California's recent history, fires have created a two-pronged challenge for these trees.

Most of the cypress species are found in northern California, where the state has been especially effective at fire suppression. Forests there frequently catch fire, but those flames are quickly doused and rarely burn long enough or hot enough to help cypress, such as the MacNab and Baker, reproduce.

Meanwhile, southern California cypress face the opposite problem: too much fire. Cupressus species take more than a decade to mature, so fre-

quent fires kill off young cypresses before they're old enough to release their seeds. In Orange County's Santa Ana Mountains, for example, fire risk has worried scientists who study the Tecate cypress, a tree that needs at least a couple of decades to mature before it can regenerate.

"We have had way more fire in the past 100 years than we ever did historically," says Jon Keeley, a research scientist with the U.S. Geological Survey who has studied the effects of fire on California ecosystems. That trend — repeated fires in the same cypress population within a year or two — could lay waste to the Tecate cypress, he said. "If they burn before they reach maturity, they can't build a seed bank. They're suffering real losses."

Post-fire Tecate cypress on the Otay Ranch Preserve near San Diego.





Little is left of scores of homes and businesses destroyed in the November 2018 Camp Fire in the hills outside Chico, Calif.

The International Union for Conservation of Nature includes two serotinous California cypress species on its Red List of Endangered Species: the Baker and Gowen. Both species are on the decline, notes the IUCN, which lists the Baker as vulnerable and the Gowen as endangered.

Some researchers say the MacNab should be considered vulnerable as well, especially given the human-driven factors that make wildfire patterns unpredictable. Both serotinous species have been on the U.S. Forest Service's radar for some time.

Only a handful of serotinous cypress populations exist on the planet, mostly limited to California and southern Oregon, says Kyle Merriam, the U.S. Forest Service ecologist who wrote the 2011 brief. She worries that a second fire will wipe out the MacNabs that burned in the Camp Fire, some of which were more than 200 years old, because California had cracked down on fire for so long. Destroying one of the few populations of the trees would send the MacNabs on a downward spiral that several cypress species are facing.

"For the past 100 years, we've been really good at putting out fires in ecosystems that have adapted to fire," says Merriam, noting that sagebrush populations also need decades to mature before they burn and reproduce. Frequent fires will turn forests into grasslands, she says. "We've really messed with fire regimes. We're going to lose most of our woody vegetation."

Among the researchers aware of the cypresses' decline is David Greene, a forestry professor at Humboldt State University who has studied Baker cypress in northern California. He has suggested targeted burns to clear space and sunlight for the Bakers to grow.

"They're not very good at this game," Greene says of the Bakers. Their seeds drop "like bowling balls," which he says is a significant disadvantage in the reproduction contest. The game used to be different, back before humans started playing, but now the trees need to adapt to the new rules. "It's like you're playing musical chairs, but you're only allowed to sit in one particular chair, the one you started from. Whereas the other guys will take any available chair."

And although it's difficult to imagine, for instance, some parts of the California coastline without the Monterey cypress, the Bakers are hidden away in remote forests and are relatively useless commercially, says Greene, who admits some admiration for the scrappy trees. "These cypresses don't matter to anyone in this state."

But his research could also illuminate severe risks to other serotinous species that do matter to California, ecologically, economically and culturally. A weighty example: the giant sequoia, the world's largest tree.

And that's why Greene is driving me along a bumpy logging road, his two young sons bicker-

“Only a handful of serotinous cypress populations exist on the planet, mostly limited to California and southern Oregon... Merriam worries that a second fire will wipe out the MacNabs that burned in the Camp Fire, some of which were more than 200 years old...”

ing in the back seat, just outside Lassen National Forest in far northern California. He's taking us to a hard-to-find stand of Baker cypress his graduate students have been studying, trying to quantify how threatened the species really is. We dodge logging trucks as we rumble up the unpaved road as Greene grumbles that California's sprawl makes the state reluctant to allow prescribed burns, which would help cypress and other species bounce back. Prescribed burns would also protect lives and property by clearing out underbrush and other species that wouldn't have been there without human firefighting.

“Where we used to have surface fires, now we're going to have crown fires, and those we can't stop,” says Greene. California's firefighting agencies have put themselves in a tough spot by being too tough on fire, he says, leaving too much vegetation that then serves as fuel to larger, fiercer fires. “In effect, they're saying, ‘We were so amazingly good that we've now created problems for ourselves.’”

The lack of fire also creates other problems for forests. In forests that have not burned, the growth is denser and the taller trees create too much shade for species, such as the cypress, that require sunlight to flourish. In turn, the crowding kills off sunlight-dependent species, which attracts insects that then damage healthy trees and destroy large swaths of forest.

Those effects can be seen already in northern parts of California, says James Johnston, an Oregon State University research associate who studies fire ecology.

“Species in California have been severely fire-starved,” he says of the state's northern half. It's not just cypress species that are being hurt, he adds, but other fire-dependent species as well. “We've denied them fire and, as a result, there are many old-growth species that are dying out. Fire plays an important role as a thinning agent.”

The implications of fire suppression are also visible in more populated parts of California.

Left: Tecate cypress cones pre-fire on the Otay Ranch Preserve near San Diego.





“At some point, a community is going to need to decide, ‘Do we want a forest to be here?’ It can’t just be the scientists. To me, conservation is a moral issue. It reflects badly on us if we let things go because we’re lazy.”

In the suburban hills east of Oakland, Calif., another similar scrubby fire-dependent species, the knobcone pine, is disappearing in areas that haven’t been allowed to burn in at least 75 years, says Joe McBride, a professor emeritus of landscape architecture and environmental planning at the University of California at Berkeley who studies the effects of fire on the California landscape. Some of the hills formerly populated by knobcones, he says, have turned into chaparral.

“These trees are called firepines because they’re very dependent on fire,” McBride says. He worries California will lose much of its forest unless it figures out how to balance fire suppression and ecosystem protection. “I have hope that this will not be ubiquitous.”

But fire suppression — and, importantly, increased fire frequency — across the western United States is worrying scientists who study serotinous species and other trees. They see significant changes coming soon to ecosystems as fires burn the same forests year after year, and not just in California.

In Yellowstone National Park, for example, the massive 1988 fire burned more than one-third of the park. Researchers say we should expect those kinds

Below right: Hankins counts the rings of a MacNab cypress tree killed during the Camp Fire. The rings show the tree, and others nearby, may have survived another fire about 40 or 50 years ago, he says. **Below left:** Hankins examines the burned-out stump of a MacNab cypress tree.





MacNab cypress trees covered the landscape of Paradise, Calif., prior to the Camp Fire.

of fires — in the past limited to, perhaps, once a century — nearly annually from now on. That frequency could wipe out species such as the lodgepole pine.

“Our findings suggest a shift to novel fire-climate-vegetation relationships in Greater Yellowstone by midcentury,” several researchers wrote in the *National Academy of Sciences* journal in 2011, “because fire frequency and extent would be inconsistent with persistence of the current suite of conifer species. The predicted new fire regime would transform the flora, fauna, and ecosystem processes in this landscape and may indicate similar changes for other subalpine forests.”

These changes could be quick, says Brian Buma, an assistant professor of integrative biology at the University of Colorado at Denver who studies forests. One fire on the heels of another could devastate a species.

At some point soon, Buma says, society is going to have to figure out what role to play in saving forests from fire and how to balance that need with that of fighting fires.

“There’s a lot of value judgments people are going to have to make,” Buma says. “At some

point, a community is going to need to decide, ‘Do we want a forest to be here?’ It can’t just be the scientists. To me, conservation is a moral issue. It reflects badly on us if we let things go because we’re lazy.”

That argument resonates with Hankins, the Chico professor. Humans have caused the problems facing cypresses and many other serotinous species, he says, both through climate change and firefighting strategies, and we owe it to those plants to help them.

“I think about all these species and their purpose,” Hankins said as we hiked along the burnt serpentine ridge. “If humans are doing something that leads to their extinction, that needs to be corrected. I feel a sense of obligation when we’re in a position to recognize our impact.”

He stopped and wrinkled his nose as he looked at the ruins of burnt houses and a restaurant across the road. A faint chemical smell permeated the air.

“Normally I like the smell of wildfire,” he said. “This one, not so much.” 🌿

Matt Krupnick is a freelance journalist in Brooklyn, N.Y., whose work has appeared in *The New York Times*, *The Guardian* and *HuffPost*.

American Forests Works to Save California's Forests

California's forests are among the most carbon-rich forests in the world, supply more than 65 percent of the state's drinking water and contain some of America's most treasured landscapes, including Yosemite National Park.

Yet, these forests are facing unprecedented threats from a changing climate, increased and prolonged drought, and more severe wildfire activity. The combined effects of these changes and extreme events are severely stressing the region's iconic forests and diminishing the natural benefits that California forests provide people every day. Since just 2010, more than 147 million trees have died in California.

To meet these challenges, American Forests is building partnerships and using science to develop climate-informed restoration strategies to improve forest health across the state. This includes collaborative efforts to scale up forest restoration, testing out new adaptation strategies, and implementing climate-smart projects.

In 2019, American Forests hired its first California State Director, Brittany Dyer, to lead these efforts. For the last five years, Brittany has worked with the Madera County Board of Supervisors in the Sierra Nevada to address the forest health crisis in the Southern Sierra. She also serves on the State of California's Forest Management Task Force, acting as the co-chair of the Tree Mortality Working Group, and will continue this important state-level leadership role at American Forests.

American Forests' will lean on its long-standing history of collaborative conservation throughout the state of California to implement these efforts. Starting in 1991, American Forests has partnered with numerous organizations, including local, state and federal government agencies as well as local nonprofits, to support our forest restoration projects.



Brittany Dyer writes from North Fork, Calif. and is American Forests' California state director.

ACROSS CALIFORNIA:

139 wildlands projects

More than

7.8 million trees planted

More than

\$2.6 million invested

IN CALIFORNIA FIRE-BURNED AREAS ONLY:

96 wildlands projects

5.9 million trees planted

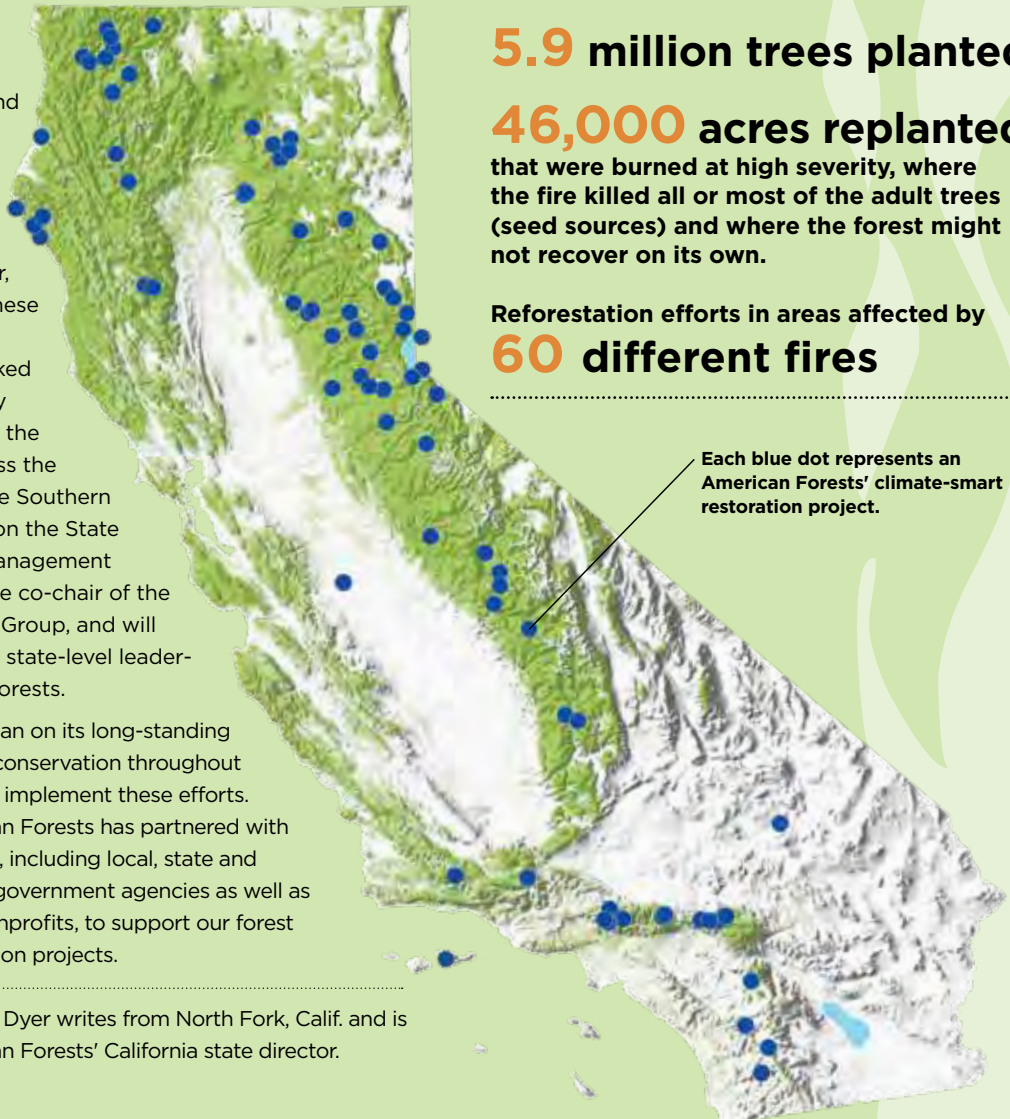
46,000 acres replanted

that were burned at high severity, where the fire killed all or most of the adult trees (seed sources) and where the forest might not recover on its own.

Reforestation efforts in areas affected by

60 different fires

Each blue dot represents an American Forests' climate-smart restoration project.



American Forests plants tree species like giant sequoia and Jeffrey pine that have evolved with fire. These trees have:

Widely spaced branches and open crown

Fire-resistant needles with high moisture content

High branches so fire can't climb into the crown of the tree

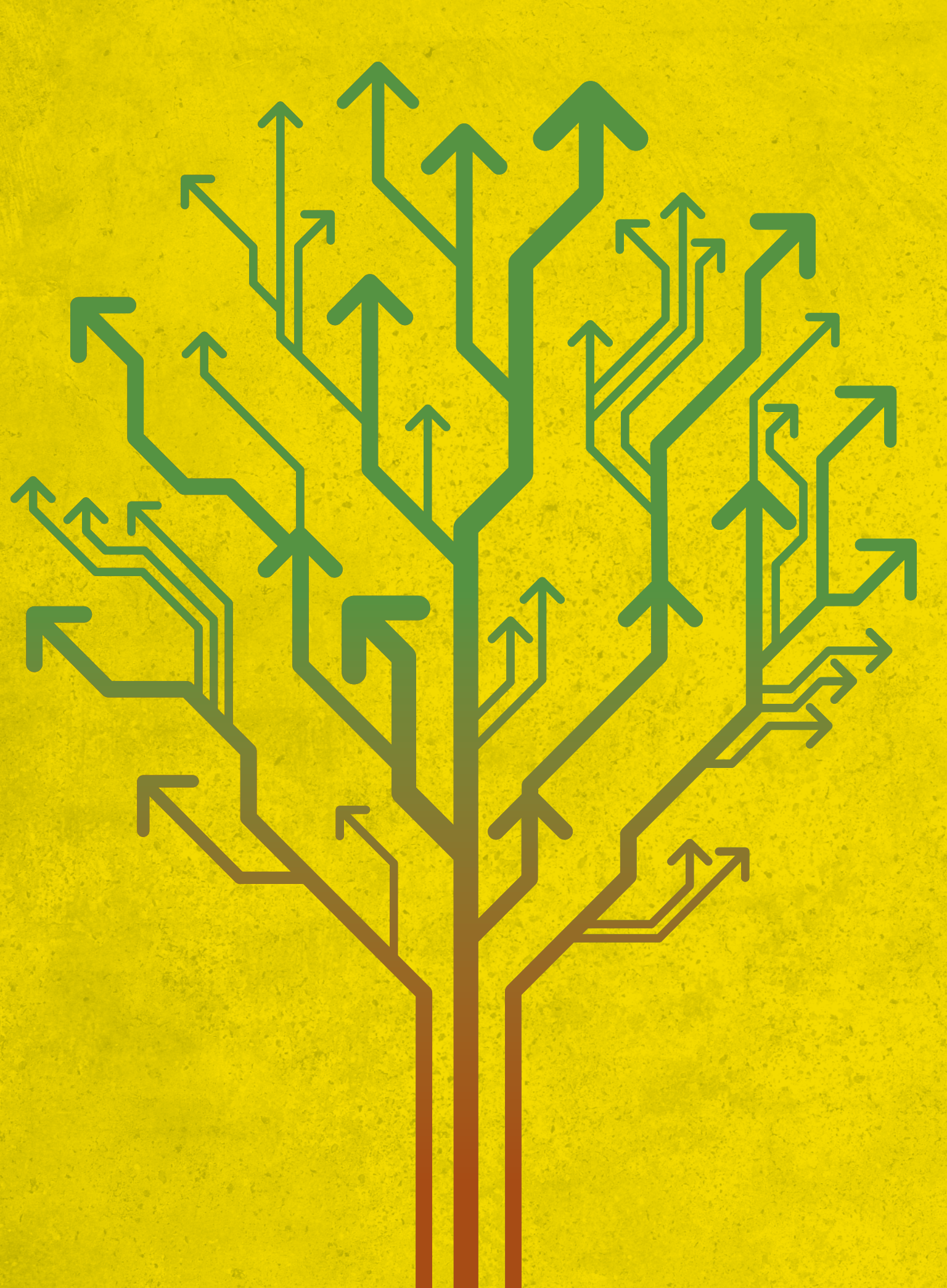
Thick, inflammable bark that insulates the tree from heat

After a fire, giant sequoia seeds establish in bare soil and abundant light and grow quickly



How the Fire Funding Fix Will Help Address Wildfires:

American Forests helped lead the Fire Funding Fix Coalition which advocated for the comprehensive wildfire suppression funding solution and passed in the fiscal year 2018 omnibus appropriations bill. This fix, now being implemented in fiscal year 2020, changes how the U.S. Forest Service is able to fund and fight wildfires, ensuring stable funding and removing the need to transfer funds from other programs to use in wildfire suppression. This is great news as it not only addresses the rising costs of fighting wildfires, but allows projects that help reduce the risk of wildfires to go forward without the risk of those funds being needed to fight fires.



TREES ON THE MOVE

As Tree Species Migrate, the Forests We Care about Transform

BY MIRANDA WEISS

I REMEMBER IMPORTANT PLACES IN MY LIFE BY THE TREES THAT GROW THERE.

In the yard of the first house in my memory, a 1925 brick colonial in suburban Maryland, a mimosa tree erupted in fantastical pink blossoms each summer. The fern-like leaves closed magically each night. As a kid, I had no idea that this tree was an invasive species in the region, only that a few weeks after my eighth or ninth birthday party, during which my friends and I ran relay races in the front yard carrying spoonfuls of beans, the shoots of bean plants appeared in the spare grass beneath that tree — as if called up by the mimosa itself — and I was thrilled.

Fei looked at 86 tree species over the past 30 years and found two distinct migration patterns: hardwoods are heading west and softwoods are moving north.

Treeline in Denali National Park will continue to advance into higher elevations while white spruce fill in the corridor along the park's single road, blocking wildlife viewing for some half million visitors annually.

In the decades since, with every new phase of life, with every new shift in my personal geography, trees have played a role. I grew attached to the tulip poplars with mitten-shaped leaves that towered behind the house we moved into when I was 11. And in New England, where I went to college, I grew to adore American beech trees and the way their smooth, grey bark made me think of the skin of the elephants I saw roaming the enclosure at the National Zoo. It was amongst the beech and hemlock forests of the region where I first observed aphid-herding ants — insects that farm — under rotting logs and caught dragonfly larvae that lurked in shady creeks. Those woods were wondrous places, propelling me to explore more.

My memory holds these landscapes and their trees as constants, unchangeable, but recent research shows that tree species are on the move,



migrating in response to climate change and shaking up forests across the country.



Scientists call the phenomenon “range migration,” which means that tree species are shifting into landscapes in which they don’t typically grow. Individual trees, of course, can’t pick up and leave when conditions get tough. But seedlings in favorable habitat will survive, grow and cast off their own seeds, while harsh conditions, such as drought, flooding and temperature extremes, can kill off young and old trees alike and prevent the growth of new seedlings where they once grew.

Songlin Fei, a researcher at Purdue University, has uncovered clear evidence that eastern tree species are already moving in conjunction with changing temperature and precipitation patterns. Fei looked at 86 tree species over the past 30 years and found two distinct migration patterns: hardwoods are heading west and softwoods are moving north.

Fei and his team used U.S. Forest Service (USFS) Forest Inventory data, which is gathered by field crews who bushwack into woods across the country to census adult trees and saplings. Their study reports that over the last three decades, hardwoods — such as red maple, scarlet oak and sweetbay magnolia — ranged west at an average clip of one and a half kilometers each year, while softwoods — including red pine, short-leaved pine and bald cypress — shifted north an average of one kilometer per year.





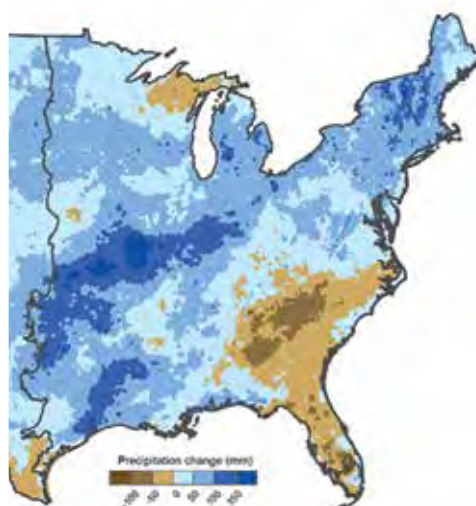
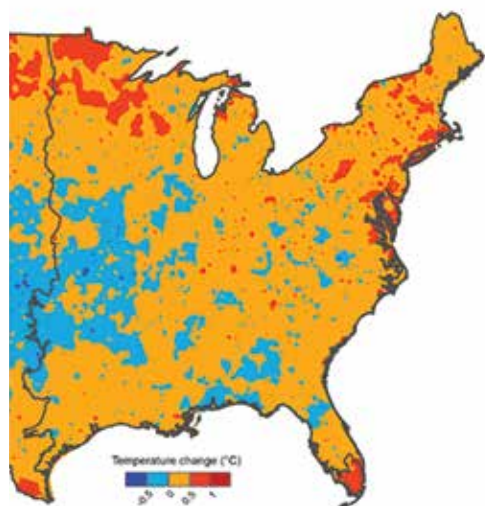
Over the last century, average annual temperatures across the U.S. have increased — most notably in the north and at night, and precipitation patterns have changed. The West has seen record droughts, while the Northeast has seen increased precipitation. These radical, climate change-caused shifts in conditions open new habitat for tree species and make existing habitats unsuitable.

While increased precipitation in the Midwest appears to be luring many eastern hardwoods west, the most profound tree migrations are happening in the north. The highest latitude species in Fei's study, including balsam fir and black spruce, shifted the greatest distances over the last 30 years. These shifts are part of the dra-

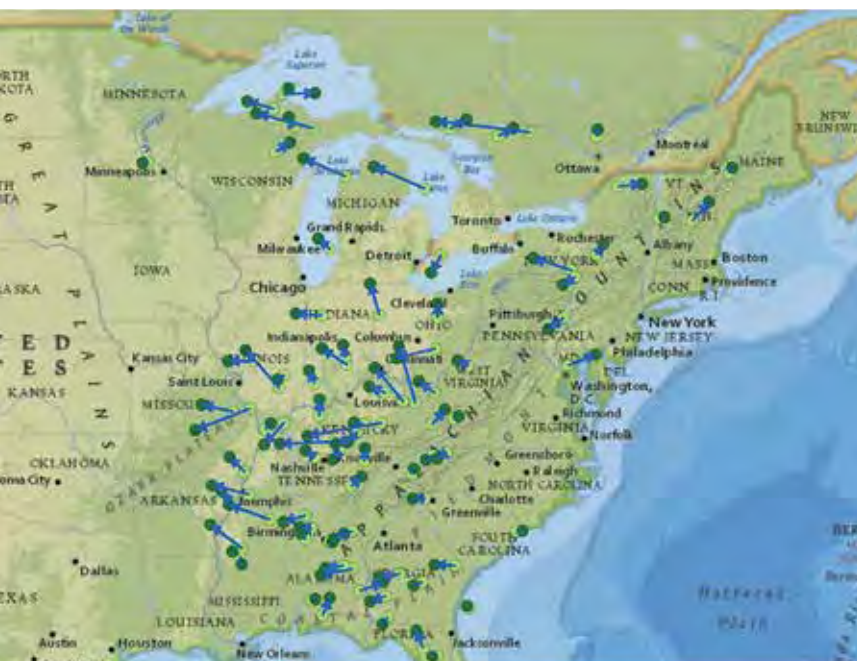
matic changes we're seeing in subarctic, boreal forests worldwide.

In Alaska, tree range is limited by cold — to the north by the harsh Arctic environment, to the west by the chilly summer winds whipping off the Bering Sea, and up mountain slopes. As temperatures warm in this state twice as fast as in the rest of the nation, we're seeing positive responders and negative responders, explained Glenn Juday, an emeritus forest ecologist at the University of Alaska Fairbanks. The results, Juday said, will be a migration of trees out of the relatively warm, dry interior of the state and into the colder, damper regions to the north and west. In Alaska's far north, white spruce are already barging into tundra landscapes where

Above: Ponderosa seedlings aren't able to survive warming temperatures and drier conditions in the West, creating park-like forests. Below: In the last 30 years, temperatures in the eastern U.S. have increased and precipitation patterns have changed, with the southeast seeing drier conditions and the central U.S. getting wetter.



Mountainous terrain creates harsh conditions for trees, but a tree species that might have to shift 550 feet upslope in order to reach a more suitable climate, would, in flat terrain, have to move 90 miles north to achieve the same result.



only shin-high shrubs have been the tallest vegetation for perhaps thousands of years.

The Western U.S. is also seeing profound changes to its forests in conjunction with our changing climate. Low elevation forests are experiencing the most radical shifts, Solomon Dobrowski, a landscape ecologist at the University of Montana, explained.

Along the low elevation slopes in the Bitterroot Mountains near where Dobrowski lives and works, for example, he sees stands of mature ponderosa pines where conditions have become too hot and dry for ponderosa seedlings to grow. Seedlings are more sensitive to harsh environmental conditions like extreme heat and drought; they lack the kind of well-developed root structures and stored nutrients that adult trees rely on. In some of these forests, the summer temperature at the surface of the ground — the zone where seedlings are trying to gain a foothold — can be a scorching 120 degrees Fahrenheit. So, while a ponderosa forest might occupy a certain part of the landscape now, in the years and decades to come, it won't be replaced.

The West's basin and mountainous topography influences how tree ranges shift in this part of the country — and will shift in the future. Unlike the broad migration patterns we're seeing in the East, here, tree range shift is more of a leap frogging type of business, proceeding in fits and starts where mountain ranges dictate dispersal. Dramatic topographical changes play a critical role: Tree species can be squeezed into an elevation band — constricted at the bottom by warming temperatures and drought and limited at the top by lack of soil.

Mountainous terrain creates harsh conditions for trees, but a tree species that might have to shift 550 feet upslope in order to reach a more suitable climate, would, in flat terrain, have to move 90 miles north to achieve the same result. Already, foresters are testing the limits of tree survival by planting trees far outside their natural range. One study is

Top: A recent study in the Eastern U.S. showed that, over the last three decades, hardwoods ranged west at an average rate of one and a half kilometers each year, while softwoods shifted north an average of one kilometer per year. **Bottom:** American beech in forests of the eastern U.S. are heading west.

attempting to grow ponderosa in northern Minnesota, hundreds of miles from their natural geographic limit, where the experimental plot sees summer rain showers that are more frequent than in the Rockies, which might give ponderosa seedlings the leg-up they need.

One aspect of tree range shift that is both fascinating and troubling is that tree spe-

A large sequoia tree in a snowy forest with people at its base.

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MAX FORSTER

cies in the same forests, even those that are deeply ecologically linked, are responding in different ways to climate change. American beech and hemlock, for example, are iconic species of old-growth forests east of the Mississippi. These trees colonized landscapes left bare 10,000 – 20,000 years ago as the Holocene ice sheets retreated with warming temperatures and have been linked for millennia. Today, climate change is driving a wedge. Fei's study shows that, over the last three decades in the eastern U.S., hemlock have moved 13 kilometers north while beeches have roved nearly 12 kilometers west.

"It's sort of like an old family being broken apart," Fei said. Changes to tree ranges affect everything in an ecosystem, from the hair-thin strands of fungi that help feed tree roots to top predators.

Disruptions like that — as well as from wildfire, changing land use and increased development — provide openings for invasive species and pathogens, such as Japanese barberry shrubs that are favored by Lyme disease-carrying ticks, the hemlock woolly adelgid, and the emerald ash borer. It's a dismal feedback cycle in which ecosystem disruption begets disruption, which begets disruption.

"Whole ecosystems are getting jumbled up," USFS scientist Louis Iverson said. Iverson relies on a handful of climate models to predict future tree ranges. Models show us that there will be some winners — southern oaks and pines will likely increase their ranges — and some losers — most notably northern species.

Forests are one of Earth's most important carbon sinks. Across the U.S., forests sequester 10-20 percent of the nation's annual carbon output each year.

So, what does range migration mean for the ability of our forests to sequester carbon from the atmosphere? "This is really a frontier that we're trying to understand," Fei said. This complex question involves many unknowns. While warming temperatures bring longer growing seasons and, presumably, increased carbon storage, climate change often causes drought, which restricts growth.

No one yet knows for sure what tree migration will mean for the ability of our forests to store the carbon we're dumping into the atmosphere, or for the many other ecosystem services our



“Health, well-being, spiritual well-being...that’s all part of it. The psychological and spiritual benefits of a forest that’s been a longtime friend are degraded.”

— USFS SCIENTIST LOUIS IVERSON

forests provide. And, while there are many other unknowns when it comes to tree range shift, one thing is clear: the effects of greater carbon emissions stress trees more, forcing their ranges to shift greater distances and putting forests as we know them at greater risk.

“You can see the writing on the wall for a lot of these forests,” Iverson said.

Change and succession are, of course, natural processes in forests. And fossil evidence shows us that trees have migrated vast distances in the past. After the last glacial retreat, fossil pollen

suggests that tree species migrated as rapidly as one kilometer per year. But those species moved across a landscape uninterrupted by human development. And today, as each new year seems to bring record high temperatures, it’s clear that tree species aren’t able to out-pace the impacts of climate change in all cases; one study showed that trees would need to migrate more than twice as fast as their current rate in order to reach suitable habitat.

And, unfortunately, tree range migration poses ecological, practical and economic challenges. But the other ramifications of tree range shift are impossible to quantify.

“Health, well-being, spiritual well-being...that’s all part of it,” Iverson explained. He likes to walk in a nearby oak-maple woods in his home state of Ohio. As climate change puts pressure on trees, “the psychological and spiritual benefits of a forest that’s been a longtime friend are degraded.”

ABOVE: NICHOLAS A. TONELLI VIA FLICKR



As we walk through the forests we love, as we remember the landscapes we hold dear in our minds, the impacts of climate change force us to ask: Will this tree survive? Will this forest?

Life has taken me from the East Coast's glorious hardwood forests to where I live now, in Homer, Alaska, at the edge of the northernmost extent of temperate rainforest. There are only a handful of native tree species at this northern latitude. Each one plays an important role in the lives of people here. In the fall, birches provide a burst of gold amidst our monotone spruce. In the spring, cottonwoods give off a pungent, herby perfume. Local folks collect the buds to make a healing balm. Alders can be weeds but can also provide needed privacy, and we burn spruce in our woodstoves and bonfires all year long.

I'm raising my two daughters here in this land of spruce, alder, cottonwood and birch. They're six and

nine years old, and on summer days we adventure in our local woods. When it rains, we often seek a shady trail under a thick canopy of spruce. On sunny ones, we'll head through a tunnel of alders on a trail down to a wild expanse of beach. Or sometimes, we visit a friend with a grassy yard that has a view of the mountains across our bay. There, my girls will fly skyward on a swing made out of a pink fishing buoy that hangs from the bough of a beautiful old birch.

These days, I think of the forests of my daughters' lives. What trees will they remember? What woods? How will the places they come to know and love change throughout their lives?

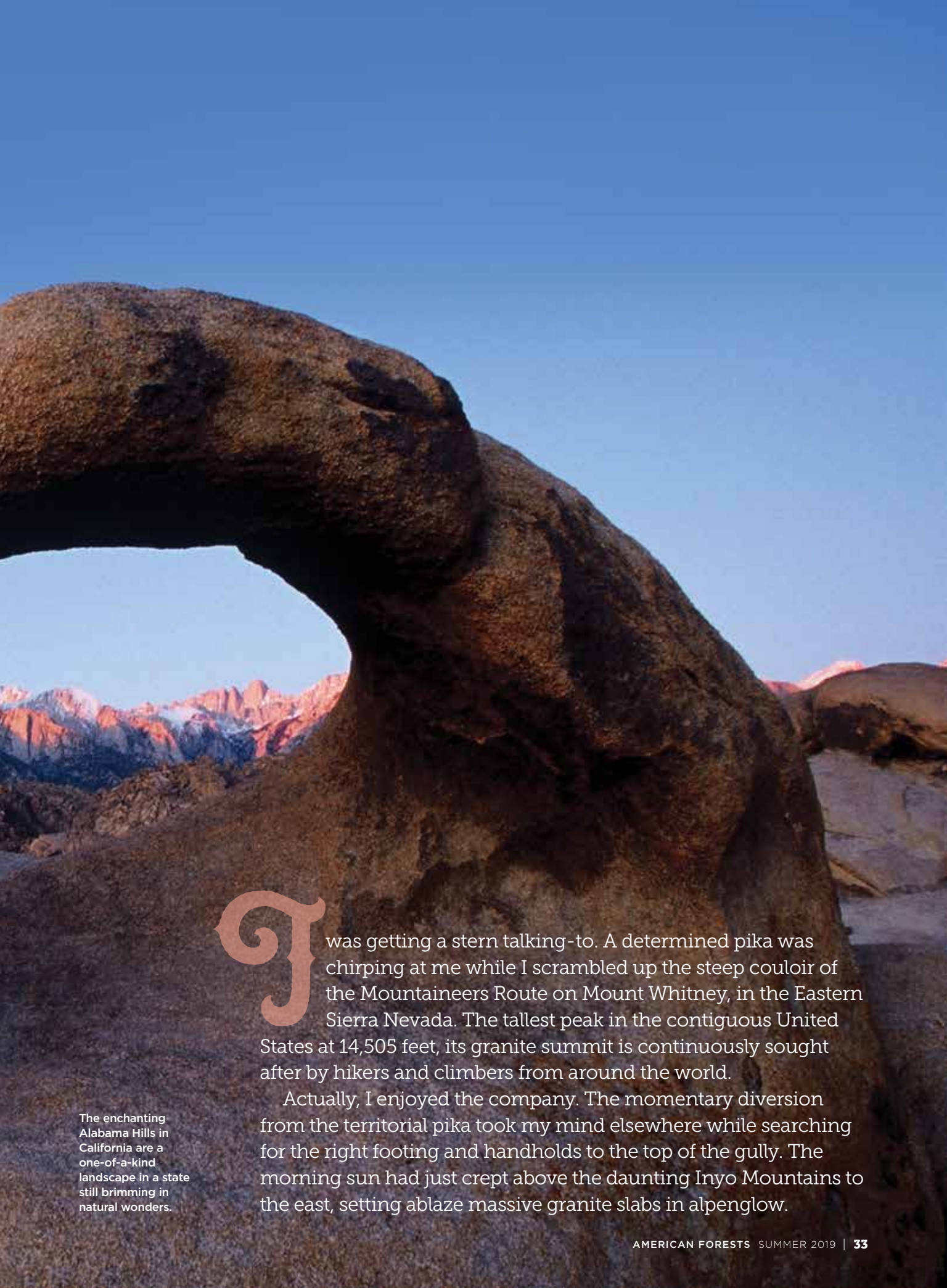
Forests will continue to be fertile grounds for magic and memory, as they have been. But as tree species move and our forests transform, what we hold dear changes too. 🌱

Miranda Weiss is the author of *Tide, Feather, Snow: A Life in Alaska* and lives in Homer, Alaska.

Left: American beech and eastern hemlock have been ecological partners for thousands of years. Climate change is moving them apart.
Top and bottom right: Climate change asks us to consider the forests of our children's future.

PEAKS AND VALLEYS

BY CHUCK GRAHAM



I was getting a stern talking-to. A determined pika was chirping at me while I scrambled up the steep couloir of the Mountaineers Route on Mount Whitney, in the Eastern Sierra Nevada. The tallest peak in the contiguous United States at 14,505 feet, its granite summit is continuously sought after by hikers and climbers from around the world.

Actually, I enjoyed the company. The momentary diversion from the territorial pika took my mind elsewhere while searching for the right footing and handholds to the top of the gully. The morning sun had just crept above the daunting Inyo Mountains to the east, setting ablaze massive granite slabs in alpenglow.

The enchanting Alabama Hills in California are a one-of-a-kind landscape in a state still brimming in natural wonders.



Top: Climber Ryan Rogers scrambles up the steep couloir of the Mountaineers Route on Mount Whitney.

Bottom left: A pika entertains Graham as he climbs Mount Whitney.

Bottom right: The Mount Whitney summit hut provides hikers and climbers with a spot to rest and soak in the views.

Just one other climber separated me from Iceberg Lake more than 1,700 feet below. And, there remained only 300 feet between me and another summit on Mount Whitney. The last section was steeper than the couloir minus the loose scree, but with many solid handholds and reliable ledges, climbing was bliss.

From the summit hut, hikers and climbers reveled in another great day on the mountain. As I stood overlooking the starkly beautiful Owens Valley, I knew I was only getting started. The high desert landscape has gone through some ecologi-

The revival of the 62-mile Lower Owens River is the largest river restoration project in the history of the American West.

cal changes revitalizing the Eastern Sierra and the Owens Valley. As I gazed at it below, it was time to make my descent and trade my trail shoes in for a paddle.



Left: The Lower Owens River provides resources and habitat to wildlife, including Tule elk. Below: Graham's friend Kyle Denitz paddles the waters of the Lower Owens River amidst the beauty of the surrounding landscape.

A RIVER REJUVENATED

The put-in was a gentle drop-off from a barren, sandy shoal, but as soon as my bow pierced the shimmering, royal blue water, the river came to life. A school of brown trout fanned out beneath me. Several western king birds perched on the impenetrable Tule reeds fortifying the runnel's banks swayed in the warm breeze. A majestic great blue heron patiently foraged the river's bounty, standing motionless in the shallows.

However, this wasn't an ordinary put-in. As I paddled this liquid lifeline that had been dormant since 1913, I stared at a snow-capped Mount Whitney and the rest of the craggy Eastern Sierra towering to the west, while the desolate Inyo Mountains flanked the runnel to the east.

The revival of the 62-mile Lower Owens River is the largest river restoration project in the history of the American West. It's been a long time coming for residents of the Eastern Sierra. Just over a century ago, the river vanished from the Owens Valley and was diverted to the Los Angeles Aqueduct, supplying water to the city of Los Angeles. But in December 2006, the Los Angeles Department of Water and Power (LADWP) under court order — redirected snowmelt from the Eastern Sierra into the Lower Owens, breathing life back into the river. Inyo County is hoping the river will eventually support a recreational industry for kayakers, anglers, hikers and bird watchers.

However, river ecologist Mark Hill says it could be another decade before the river is fully restored. But, if the early returns are any indication, the Lower Owens is on a steady track to recovery.



Bottom: The revival of the 62-mile Lower Owens River is the largest river restoration project in the history of the American West. **Top:** The Lower Owens River beneath the towering peak of Mount Whitney provides kayakers with picturesque views.

During that time span, Hill, with Ecosystem Sciences Foundation in Idaho, will monitor the river's vitality, everything from its 3,500 acres of wetlands, increased flows and water quality to its ever-increasing inhabitants such as Tule elk, bobcats and other wildlife.

Hill has worked on several river restoration projects around the globe including the Nile, Mekong and Ganges, and in North America along the Columbia, Snake, Rogue, Yuba and American Rivers. The Lower Owens, however, will be the first restoration Hill has literally started from the ground up.

"This is a young river," said Hill, as we paddled down from Independence in the Eastern Sierra. "We had to start from scratch, but right now our biggest challenge is changing the river flows."

Because Tule reeds, bulrushes and cattails are the first vegetation to spring to life out of a born-again river, they've thwarted access along the entire section of the runnel. Although Tule reeds act like a natural filtering and cleansing system, the growth of cottonwoods and willows will eventually grow above the dense reeds, creating a shady canopy that will stunt their growth. An increase in river flows would also help thin out the Tules and, in the process, widen the river's channels.

Even as Hill, his son Zach — a keen paddler and an environmental planner for the Lower Owens — and I eased down a 5-mile section, we did come across many new, robust willow trees hugging the edge of the runnel, the beginnings of that much needed riparian canopy.

"Nature does a tremendous job of planting," continued Hill, as we navigated some tight, narrow turns in the Tule reeds and made our way toward Owens Lake. "The water has done all the heavy lifting."





DUST-UP ON OWENS LAKE

All was calm on Owens Lake, just south of the Lower Owens River. The many ponds were mirror-like with reflections of the Eastern Sierra and the Inyo Mountains. The air was still, crisp and cool with cumulus nimbus breaking up pale blue sky between mountain ranges.

A northern harrier was all that gratefully disrupted my walk out to the Plover Wing Plaza, part of the aesthetic appeal that came with restoration efforts through the Owens Lake Dust Mitigation Program (OLDMP).

Initiated in 2001 by LADWP, the program has used several techniques to curb dust particles wafting across the Owens Valley. Gravel beds, native flora, wetlands restoration and shallow flooding has reduced potential environmental issues, and when the dust finally settles, the LADWP will have mitigated dust by 99 percent on roughly 50 square miles of Owens Lake.

To enhance visitor's experience on Owens Lake, the LADWP has also created about 4 miles

of easy walking trails and interpretive sites for public access, bird watching being the main draw to the revitalized lake. Three access points lead to various ponds, salt pans and grassland habitats. Just off Highway 395 between Lone Pine and Olancho are Highways 136 and 190 and the access points are named Boulder Creek, Dirty Socks and Plaza.

Most of the trails are raised above the water, offering terrific viewing platforms for spotting migrating waterfowl and 22 species of shorebirds. It's not uncommon during peak spring and fall migration for 75,000 to 115,000 birds to utilize Owens Lake in a single day. An impressive 270 species of birds have been recorded in the Owens Lake region. Some of the common species include eared grebe, American avocet, western sandpiper, horned lark, side-blotched lizard, California gull and red-necked phalarope.

After paddling the Lower Owens River and basking along Owens Lake, it was time for one last change in vehicle.

An impressive 270 species of birds have been recorded in the Owens Lake region, including those pictured here: (clockwise from top) western sandpiper, horned lark and the great horned owl.



The unique clusters of granite boulders at the base of these snowcapped mountains have provided breathtaking backdrops for a myriad of television series and movies.

HELD UP ON MOVIE ROAD

Furiously pedaling my mountain bike up a dark and steep serpentine-like road, the Eastern Sierra beckoned. All I could hear was my steady breathing,

5,000 feet above sea level. Silhouetted against a multitude of fading stars and the first light of a new day, the tallest mountain peaks in California dominated the wide-open western horizon.

Then on my right, I heard the rush of a stream, Lone Pine Creek was cascading out of the mountains, feeding the expanse of the Owens Valley below. I followed it along, dipping down a gully, then shifting gears, pedaling back up again. A slight chill blew down the Eastern Sierra, a hint of winter still clinging to the granite.

After ascending another deep gully, I found the turn-off to my destination, Movie Road, one of the greatest motion picture backdrops right here in the rugged Alabama Hills of the Eastern

Sierra. In the shadow of Mount Whitney, the unique clusters of granite boulders at the base of these snowcapped mountains have provided breathtaking backdrops for a myriad of television series and movies.

Just off Highway 395 and Whitney Portal Road, Movie Road will take movie buffs back to the American Southwest and Old Mexico, but also to faraway places like Khyber Pass in India, and Peru, Argentina and Spain. That's because the Alabama hills — and its high desert, low alpine movie set landscape — has played out all those epic scenes during its decades-long Hollywood career.

Hopalong Cassidy rode these dusty, gritty hills. The Lone Ranger and Tonto knew every nook and cranny, every hideout in the endless expanse of granite boulders and high desert vegetation. Clint Eastwood fought the ruthless, greedy land baron, played by acting icon Robert Duvall in the western, "Joe Kidd," in 1972. Mount Whitney and Lone Pine Peak can be seen in the early part of the film.

Other movie legends, such as Tom Mix, John Wayne, Cary Grant and Errol Flynn, all left their stamp on the ruggedly scenic landscape.

However, westerns aren't the only movies filmed here. William Shatner and Leonard Nimoy came here to film "Star Trek V: The Final



Frontier” in 1989, Kevin Bacon for “Tremors” in 1990, Brad Pitt for “Kalifornia” in 1993, and Demi Moore for “G.I. Jane” in 1997. In 2000, a wounded Russell Crowe galloped across the Alabama Hills in his Academy Award-winning performance as Maximus, the Roman general, in “Gladiator” with Mount Whitney in the background. And, in 2012, “Django Unchained” was released starring Jamie Foxx, Christopher Watz, Kerry Washington and Leonardo DiCaprio, where Foxx and Watz discuss a business arrangement by the glow of a campfire in the Alabama Hills.

Why would all these stars leave their Hollywood sets and travel five hours north to Lone Pine? It’s because of these enchanting Alabama Hills, a one-of-a-kind landscape in a state still brimming in natural wonders.

Managed by the Bureau of Land Management, this geological wonder was formed by chemical weathering over the millennium when the climate was much wetter and streams of water percolated down cracks and fissures in the granite and separated the bedrock into massive clusters, ledges and rock arches — perfect locations for shooting films.

Each October since 1990, the Lone Pine Western Film Festival is held and includes movie set tours through the Alabama Hills. Stop by the visitor’s center in Lone Pine to pick up a map of Movie Road. Inside the map are photos and clips of some of the old westerns filmed here. An easy self-driving tour will take movie buffs back in time to their favorite western flicks.

However, there’s nothing better than wandering off on your own into the Alabama Hills before sunrise, scrambling up to the apex of one of those granite clusters, and stumbling across a granite archway, watching pink and purple hues sweeping across the high peaks of the Eastern Sierra, a backdrop that may work for any movie in the making. 📍

Chuck Graham is a freelance writer and photographer living in Carpinteria, Calif. His work has appeared in *National Geographic for Kids*, *Backpacker*, *Natural History*, *BBC Wildlife* and *Canoe & Kayak Magazine*. To see more of his work, visit www.chuckgrahamphoto.com.

Left: Bird watching is a major draw to Owens Lake.
Below: The Alabama hills — and its high desert, low alpine movie set landscape — has played out all those epic scenes during its decades-long Hollywood career.





California, Catalyzed

Years of catastrophic wildfires have brought California to the brink — so how are its people responding?

BY DOYLE IRVIN

CALIFORNIANS: WE DON'T ALL SURF.

We do, however, all drink the water — the supply of which is reliant on healthy forests. Until recently, it was largely understood that there is no truly

ubiquitous experience here in California, besides death and (state) taxes. The state is large enough and diverse enough to seemingly lack a unifying thread. However, the truth is that wildfire has now directly or indirectly impacted every resident of our state — even those insulated by massive urban areas and their own considerable personal resources.



I spoke to Silicon Valley CEOs, self-described nerds who found themselves in gas masks on their way to work, suddenly confronted by the outdoors. I spoke with Hollywood types who washed the ash off their cars on the way to a sound stage. I spoke to people whose towns had been burnt to a husk. I spoke with elderly evacuees, retired in rural communities, counting their blessings that they got out in time. Finally, I spoke to the folks on the ground trying to prevent wildfire catastrophes from happening again.

A HOME IN PARADISE

Dave Derby is the unit forester for the California Department of Forestry and Fire Protection's (CAL FIRE) Butte unit. His team is responsible for enforcing the Forest Practice Rules and the vegetation management program. He's been living in Butte County for 14 years and has experienced firsthand the frustrations — and consequences — of forest management, or lack thereof.

"My home is in Paradise," Derby said. "Every home on my street was burned, except for mine. I'm not sure why mine survived."

Derby's experience is but one of many — many of CAL FIRE's employees have left to fight a fire only to return home to a destroyed town. More than 18,000 structures were destroyed in 2018's Camp Fire, causing \$16.5 billion in damage. And while it was the deadliest in state history, it was just one fire. The state has averaged 7,777 fires per annum since the year 2000, according to the National Interagency Fire Center.

"A lot of these timbered communities, they're in shock," Derby added. "Especially the ones that lost their homes."

Far left: Search and debris operations took place after the Camp Fire. Hazardous materials required the use of special protection.

Near left: A 7-year-old California native plants seedlings in the midst of a fire scare in the Sierra Nevada mountains, just a small example of the way in which California is being catalyzed. Below: In December 2017, the Thomas Fire consumed 281,893 acres throughout Southern California, making it now the second largest fire in California history.





Top: Satellite imagery of the Camp Fire. Smoke would eventually reach as far as New York. Center: The wreckage of the Camp Fire. Bottom right: The view from Angora Ridge.

SPURRED INTO ACTION

This direct experience with wildfire is galvanizing Californians into action. I spoke with camp director and volunteer firefighter, David Bunnett, who lives in South Lake Tahoe. His camp is on Fallen Leaf Lake, which in 2007 nearly succumbed to the Angora Fire.

“We evacuated the 300 or so guests in about 15 minutes, and six or seven of us stayed on site,” Bunnett said. “I was actively fighting the fire, up on the ridge, and we managed to contain it there.”

The Angora fire burned 3,100 acres, and destroyed 242 residences, but they successfully managed to contain it before it reached the camp Bunnett directs. But even with “success” (he probably

wouldn’t call it that), Bunnett realized they had to change how they interacted with the environment.

He brought back the 60 staffers and spent a week drastically improving defensible space. His staffers are all college students up in the mountains for the summer, and their normal duties might include arts and crafts, hiking, leading youth group activities — they had never used trimmers before.

“There’s a realization when you watch a 300-foot flame coming off the top of the ridge, you understand that you have to be a lot more proactive about fuel reduction,” Bunnett said. “We were already pretty good about tree removal, because we didn’t want dead trees to fall on campers. For us, it was more just years and years of neglect with brush clearing.”

As I’ve seen with all of the conversations I’ve had across the state, once this realization happens,



TOP: NASA; CENTER: CAL OES; BELOW: CAL OES



there is no returning — and that is one of the Pyrrhic victories we can attribute to the last few years of catastrophic wildfires: everyone now understands that we do need to actively manage our forests.

A SHIFT IN PERCEPTION

Brittany Dyer, American Forests California State Director, shared with me the history of forest management in our state.

“The tree mortality and drought situation have put us in this pendulum,” Dyer said. “We’ve seen natural resource management swing to the right, arguably too far to the right, and then we pulled back to the left, arguably too far to the left. And right now, we are able to see the results of our past decisions — the human decisions that have created the forest condition.”

Her point about left and right reflects my experience with the various people I spoke to about California wildfires. There’s a growing willingness to put politics aside and only pursue agendas that look at all the moving parts in a particular landscape/ecosystem.

“Not all fire is bad, and not all trees are good,” Dyer said. “It’s a middle ground and depends on the landscape/ecosystem — a constantly moving target.”

In my conversations with Mark Egbert, the district manager for El Dorado County and the Georgetown Divide, he mentioned that there’s been a shift in how people interpret his work. One of the recreational attractions in his area brings in roughly 30,000 people every summer, and the

nature of the questions he gets has changed in the last four to five years.

“A couple years ago it was ‘What are you guys doing? You’re destroying the environment,’” Egbert said. “Now, you have hikers, bikers, fishermen, and they’re coming up to us and asking ‘How are you doing this? How can I do this in my area? You guys are doing a really good job and I understand it now, I know why it’s happening.’”

This kind of feedback is really motivating for him and his team. It is true that the state is being catalyzed, and the lion’s share of this momentum comes from the blatant necessity.

“I’m looking at a mountain right now where the entire ridge, as far as I can see from left to right, is

Above: The Angora Lakes are in the foreground, and the ridge where Bunnett stopped the Angora Fire is clearly visible, with Fallen Leaf Lake off to the left and Lake Tahoe in the Distance.

Below: A Black Hawk helicopter flies through the Feather River Canyon with a bucket of water, on its way to the Camp Fire.





Volunteers work with 3rd and 4th grade classes in Sacramento, Calif. to collect native acorns, grow them into seedlings, and then reforest areas affected by wildfire — all while learning about healthy forests.

covered with ponderosa pine mortality — about 98 percent,” Dyer told me while I was on the phone with her. “The sense of urgency has erupted. Now, with this social and political momentum, we must actively manage our forests and intentionally create our desired conditions, or by default we compromise the future generation’s health and safety.”

The good news is that the actions we take *do* impact the outcomes of our environment and the ecosystem services provided.

PROTECTING OUR FUTURE

Education is a huge part of these efforts. I spoke with Jennifer Szelinga, the director of the Sacramento Tree Foundation. A large part of her responsibilities is funneling the new influx of volunteers who just want to help, however they can.

“We get a lot of calls where that person feels that giving money is not enough,” Szelinga said. “You see on TV the massive destruction of the trees, but you don’t really think about what happens to them afterward, how they might regenerate — or if they do at all.”

One of the programs her foundation runs is called Seed to Seedling, and it directly addresses this. Volunteers pair up with teachers of third and fourth grade classes who have prepared a special curriculum, and the groups go out and collect acorns native to regions that have been affected by catastrophic wildfire. The students then grow the acorns into seedlings, eventually planting them in affected zones, all the while learning about healthy forests.

Actions like these make a difference, there’s no denying it. Organizations like Szelinga’s came to the Angora Ridge 12 years ago, and a healthy forest is now well on its way to replacing the unhealthy one that preceded it. Bunnett tells me that the firefighting station he volunteers at has now mostly gone professional, as the local community rethought how it managed its land and services. However, not every



county that needs this kind of focused attention has the resources to provide it. Large swathes of vulnerable forests still depend on understaffed volunteers to protect them.

The question is not whether the actions we take will positively impact our ecosystem. The question is also not whether there is the willpower in our state to solve this problem. From the urban centers in Los Angeles and San Francisco, to the mountain communities like Paradise and Lake Tahoe, there is a deep understanding that something needs to be done. The make-or-break is whether or not we can move from being mostly reactive, to mostly proactive. It’s about whether or not we can organize the bewildering amount of resources available to our state in an effective manner. The fact that former governor Jerry Brown and current governor Gavin Newsom are both on board is vital, but state processes often operate slowly.

This is where American Forests comes in, and why Brittany Dyer is so excited to be a part of the team — she joined at the start of 2019. As a national nonprofit, American Forests is able to act and organize at a pace and scale that can make a difference.

“There’s a role for our nonprofit to bridge discussions from coast to coast, from the Atlantic to the Pacific,” Dyer said. “The moment in time is now.” 📌

Doyle Irvin has been hiking through California forests since he learned how to walk and is a contributor to *American Forests Magazine*.

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earthkeepers



Revering, Recovering the Whitebark Pine

BY KATE MICHAEL

MICHAEL DURGLO JR. had no idea how important the whitebark pine would become to him.

Living on a reservation all of his life, Durglo considered himself quite in tune with nature. After earning his degree in Environmental Science, he has worked with his tribe, the Confederated Salish and Kootenai, for 35 years in a variety of capacities,

including game warden and environmental director.

As environmental director, Durglo was tasked with coordinating the tribe's climate change strategic plan. The Confederated Salish and Kootenai were one of the first tribes in the United States to develop the idea, and within it, they identified nine sectors for which they wanted to do

Durglo stands next to the Great Great Great Grandparent whitebark pine.

vulnerability assessments. Forestry was one of those.

The Confederated Salish and Kootenai is a timber resource tribe. The ponderosa pine, the douglas-fir and even the lodgepole pine are primary sources of timber revenue for the tribe. However, the whitebark pine? In the beginning, the name only vaguely registered with Durglo, whose tribe manages 245,000 acres of the 459,000 acres of forestlands within their Flathead Reservation of 1.3 million acres.

Yet, the tribe has long acknowledged the cultural value of whitebark pine and the environmental threats to its long-term sustainability, including wildfire, insects and disease. In the mid-1990s, the tribe formed an interdisciplinary team that included an ad-hoc group from the tribal community to begin developing a new Forest Management Plan. During the planning process, the group identified restoration goals for whitebark pine and its habitat. The Forest Management Plan was approved in 2000 and is currently being implemented.

But, it was not until the more recent development of the climate change strategic planning process that the Confederated Salish and Kootenai truly focused on whitebark pine restoration. The tribe then realized that many neighboring federal agencies were already well into studies on the species. The Confederated Salish and Kootenai Tribes Forestry Department received three years of funding from The Wilderness Society's partnership with the Dreaming Tree Foundation for student internships working with whitebark pine inventory and is also part of the Crown of the Continent's High Five Working Group, which consists of three major players currently drafting a Crown Whitebark Pine Restoration Strategy.



The Confederated Salish and Kootenai manages 245,000 acres of the 459,000 acres of forestlands within their Flathead Reservation of 1.3 million acres.

You see, the whitebark pine is a quite particular, but important, species.

“Whitebark pine is a high elevation, slow growing, kind of gnarly tree,” Durglo says. It grows at elevations above 6,000 feet, and the tree is an essential source of food for many birds and small mammals, like the Clark’s nutcracker, the pine’s primary seed disperser. Other animals depend on it for various reasons as well, including for nesting and summer habitats.

However, blister rust infections and mountain pine beetle infestations, as well as climate change and other disturbances in timberline fire ecology, have caused severe whitebark pine population decline. A study in the mid-2000s showed that the species had declined by 41 percent. So, the tribe has been working to keep — and strategically grow — their whitebark pine forest since 2012.

The Confederated Salish and Kootenai’s ultimate goal for whitebark pine restoration is to reintroduce the seed into its culture. The tribe has recognized the nutritional value of the seed for thousands of years, and it was once part of the traditional diet. The tribe hopes that someday soon, it will have healthy whitebark pine populations that will contribute to a healthy tribal lifestyle with generational understanding of high elevation forest ecosystems.

The effort involves trying to locate healthy, “plus” trees that have been resilient to blister rust, collect their cones,

“The whole process, and the tree’s resiliency, reminds me of us. Indigenous people have survived much trauma for many years, and we’re still surviving. So, for me, it became an intimate relationship with those trees.”

— MICHAEL DURGLO JR

process the seeds and send them to a lab for testing. With funding assistance from the Dreaming Tree Foundation, Durglo and his team hope to find which are the most resilient trees of the species and plant more of them.

“We have not done whitebark pine planting yet, but have planned our first planting site this year, in 2019,” he said.

Until then, he reveres those whitebark pines that have survived time and other trials.

“Just this last summer, we hiked up to an area where there’s a whitebark pine tree that, in our native language, translates to Great Great Great Grandparent. We figure that tree is about 3,000 years old,” he shared. “When I hiked up there, and I got to touch that tree, it was pretty special.”

“The whole process, and the tree’s resiliency, reminds me of us. Indigenous people have survived much trauma for many years, and we’re still surviving. So, for me, it became an intimate relationship with those trees.”

Since formulating his own tribe’s climate action plan, Durglo has also been helping other tribes around the country.

“You become intimately connected; almost like you become a tree hugger, you know?”

In 2016, Durglo was received at the White House, where he accepted the Champion for Change Award. And in 2017, he was again recognized for his work with an award for Climate Adaptation Leadership in Natural Resources.

The whitebark pine still holds his admiration. Durglo and his brother — a forester — have even begun writing a children’s storybook about the species and the Clark’s nutcracker, the bird that distributes the tree’s seeds.

“It’s almost a creation story,” he shared, explaining that he was fascinated by the way the tree and the bird work together to sustain life. “You learn that everything is interconnected. What happens to one happens to all. This whole process has taught me a lot about interconnection.” 🌲

Kate Michael writes from Washington, D.C. and is a lifestyle editor and publisher.

last look



SCREEN ACTORS GUILD AWARDS



Clockwise from top left: Stars Patricia Arquette, Faithe Herman, Patrick Fabian, Elizabeth McLaughlin and Jason George share stirring stories of personal connection to our forests.

Screen Actors Guild Gives Forests a New Voice

American Forests took a star turn on the “Silver Carpet” for the 25th Anniversary Screen Actors Guild Awards, taking our forest message to new audiences. We committed to plant 25,000 trees in honor of the anniversary show, continuing the SAG Awards’ legacy as the only awards show to win the coveted Green Seal for sustainability 10 years in a row.

Part of our job at American Forests is to give our forests a louder voice. At the SAG Awards, we gave the microphone over to celebrated actors, like those pictured here, to share stirring stories of personal connection to our forests and passion for issues like using forests to slow climate change. Thanks to new friends like Jason George and others, our videos and social media from this event engaged whole new audiences with our work, even inspiring some to spontaneously start American Forests fundraisers on their social media pages.

Our forests need us more than ever, and we need them more than ever, too. American Forests will continue to use our creative and award-winning approach to communications to engage America in this effort — including letting our friends, like the Screen Actors Guild, do some of the talking for us!

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