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# offshoots

# Climate hope comes home for America

BY JAD DALEY

AS A SUPPORTER of American Forests, you know that we have exhibited unstinting leadership on climate change, including but not limited to the ways that trees and forests can help. For the past five years, we have innovated new climate-focused forestry tools and techniques, pivoted our own

place-based forestry activities to become leadership-by-example in climate-smart forestry, and led the whole forest community to speak out on climate change and to advocate for climate policy.

The Inflation Reduction Act, enacted last August, delivers on American Forests' climate leadership goals unlike any

solutions to advance them all farther and faster than ever before — including protection and restoration of forests. Trees and forests are key to natural carbon removal, whether on city streets, farms or national forests. An average tree in the U.S. captures more than 1,300 pounds of carbon dioxide equivalent over its lifetime. This adds up: Trees and forest products in the U.S. currently capture and store the

equivalent of 17% of our nation's fossil fuel carbon emissions annually.

other piece of legislation in United States

history. At a moment of true climate peril, this legislation pushes aside

decades of political paralysis to choose climate action. It funds diverse climate

But there's lots of room for improvement. Planting more trees would increase U.S. carbon-sequestration capacity. The Reforestation Hub, an online tool jointly created by American Forests and The Nature Conservancy, provides county-by-county data showing 146 million acres of ecologically suitable land for reforestation, enough to grow more than 75 billion trees. Reforesting all of these lands would increase annual carbon capture in our forests by nearly half. Additional actions, like conserving forests at risk from development and supporting adoption of climate-smart forestry practices by private landowners, can increase this number even further.

The Inflation Reduction Act invests in these kinds of forest-climate solutions in unprecedented ways, including dedicating roughly \$8 billion dollars for reforestation, climate-focused restoration and permanent conservation of public forest lands; carbon incentives for private landowners; and funding for agroforestry.

These carbon benefits alone would justify the bill's investment in naturebased climate solutions, but fighting climate change with nature is also



Jad Daley stands with Jerome Foster, CEO and founder of One Million of Us, at the Sept. 13 White House celebration of the Inflation Reduction Act's passage. Foster is a member of the White House Environmental Justice Task Force and also served on the 1t.org stakeholder council.



By expanding urban tree canopy, the investments in the Inflation Reduction Act will advance equity in neighborhoods while creating jobs and bolstering local economies across the nation.

valued for a second reason: Investing in nature can solve many problems at once.

Just consider that our climate crisis is fueling a public health crisis. Extreme heat is our number one weather-related cause of death, and U.S. heat-related deaths are expected to rise to 100,000 annually by the end of the century due to climate change.

Fortunately, those wonderful carbon capture devices — trees — are also our most powerful natural solution for heat, with the ability to cool the air beneath them by more than 20 degrees Fahrenheit. That's why American Forests has called for Tree Equity in our cities and worked with partner cities, such as Phoenix, Detroit and Boston, to help launch initiatives to spread equitable tree canopy citywide. This will save lives and energy while naturally capturing more carbon emissions.

Today, the federal government has only been providing a few million dollars per year in grant funds to help cities advance this vital and often expensive work. We have advocated tirelessly for more than four years with champions in Congress, including Senator Cory Booker, Senator Debbie Stabenow and Representative Donald McEachin, to advocate for a federal investment in equitable tree cover that matches the urgency of this issue. I'm very proud to share that, with the Inflation Reduction Act, we got that investment: More than \$6 billion in funding will focus on increasing urban tree cover and heat resilience.

In our Washington Outlook section of this issue, you can read more about how the Inflation Reduction Act will put forests front and center.

I was proud to join President Biden and congressional leaders at the White House on Sept. 13 to celebrate this historic climate accomplishment. Our only chance against climate change is an "all of the above" approach, and the Inflation Reduction Act makes similarly unprecedented investment in other climate solutions, such as clean energy and electric vehicles.

At this moment of profound climate hope, the American Forests team and our many great partners have already quickly moved from justified celebration to the long game of implementation. For example, we're already forming partnerships with federal agencies to advance projects that can put the new funding to its intended uses. If we stick with it and get the details right, the Inflation Reduction Act will power natural climate solutions with a rigor, speed and scale never seen before.

Thanks for your steadfast support as American Forests has stepped into climate leadership over the last five years. This historic success shows that momentum is on our side.

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



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INNOVATION

# Richmond grows greener using hyperlocal data

ON A SCORCHING SUMMER DAY in 2017, residents of Richmond, Va., put thermometers on their cars and drove around the city to gather data for a "heat map."

"We discovered a 16-degree difference between the coolest place and the warmest," explains Dr. Jeremy Hoffman, a climate change scientist at the Science Museum of Virginia, noting that the extremes clocked in at 87°F and 103°F. The goal: understanding how to direct funding for heat-mitigation measures, drive community engagement on this aspect of equity and improve climate change resiliency.

Dishearteningly, the patterns aligned with census data. Neighborhoods redlined between the 1930s and 1960s, inhabited predominantly by lowerincome communities of color, were hotter and tended to have fewer trees and more impervious surfaces. Wealthier, whiter neighborhoods had far more shade and remained cooler.



Dr. Jeremy Hoffman works with Dr. Vivek Shandas of Portland State University to determine routes for a Richmond, Va. heat-mapping campaign in 2017. Dozens of volunteers worked with professionals to drive, bike and walk different city neighborhoods at three different times in one day to collect temperature data.

"That discovery really invigorated our residents and nonprofit partners to see their missions through the lens of environmental justice and equity," Hoffman says.

As Richmond headed into a second round of heat-mapping, the work began to cross-pollinate with an American Forests' campaign to gather metrics on 150,000 urban neighborhoods that together house more than 71% of the United States population. The effort helped launch the national Tree Equity Score (TES) in late 2020 and the TES website in mid-2021.

Hoffman became a uniting force among the heat-mappers, community members and American Forests in a joint effort to launch a city-specific Tree Equity Score Analyzer (TESA) for Richmond. The tool, launched in fall 2022, helps frontline organizations, leaders and decisionmakers dive deep into how tree cover coincides with a range of socioeconomic data.

"[TESA] allows you to see the problem as a block-by-block issue, then allows you to solve it block by block," says Hoffman, who served as a stakeholder council member for the effort.

The work to develop approaches and tools to address Tree Equity has helped Richmonders attract nearly a million dollars in state and federal funding. This will advance community-driven green space improvements, including efforts to "releaf" the city's historically marginalized Southside. The support includes a grant from the National Fish and Wildlife Foundation to fund the Chesapeake Bay Foundation in planting 650 trees in neighborhoods where residents are 86% Black and Hispanic. It has also helped the Enrichmond Foundation's TreeLab install 420 trees and 1,540 other plants, some along the budding ProtoPath. This two-mile corridor will eventually connect downtown's Leigh Street bike lane and the Science Museum. Additionally, its



According to American Forests Tree Equity Score 2022, Richmond, Va., has an overall Tree Equity Score of 80, with neighborhood scores in the city ranging from 41 to 100.

campus is busting up an asphalt car lot and adding those 2 acres to a 6-acre park called "The Green."

Other benefits are emerging from the heat-mapping and Tree Equity work, like a better sense of how trees aid the stormwater system and could prevent sewer overflow into the James River and Chesapeake Bay. Hoffman says: "It's a natural outgrowth — pun intended! — that we go from trees as a heat-mitigation strategy to talking about how they soak up rainwater and help turn a gray concrete funnel into a great green filter."

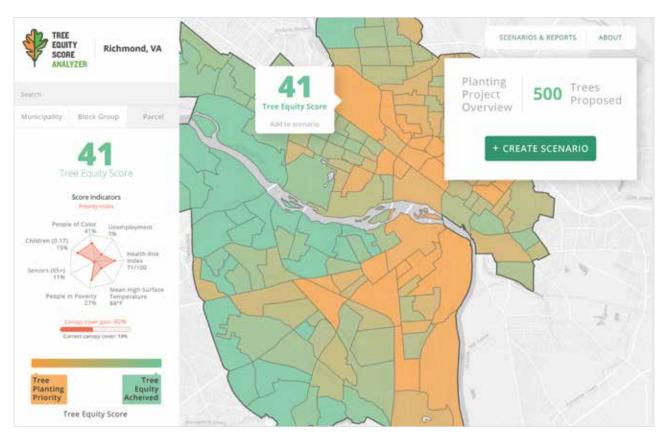
Tree Equity is a long game, however, as Hoffman points out. "Not only do we have to wait 10, 15 or 20 years for the canopy to mature, but we also have to factor in displacement, migration and gentrification."

Yet despite these challenges, the effort is essential for ensuring cities are livable for all residents in decades to come. American Forests' Director of Climate and Health Molly Henry applauds these steps in Richmond and other cities across the U.S. "We have a history of systemic racism that's reflected in our land use. We have a responsibility

to undo some of that harm and provide resources, including trees, to frontline communities that are going to be hit first and worst by climate change."

And trees can not only help protect communities, they can also contribute to climate solutions, Henry adds. "How amazing is it to have something already here in our world that can do all these things?"

Hoffman's colleague Jennifer Guild, the Science Museum's manager of communications and curiosity, agrees that it's inspiring that well-placed trees can have such profound benefits. "Sometimes people get overwhelmed with the amount they feel they have to do to be an environmentalist," she says. "We're showing even small steps can make a big difference." 🍁



The city-specific Tree Equity Score Analyzer for Richmond, Va., launched in fall 2022, helps frontline organizations, leaders and decisionmakers dive deep into how tree cover coincides with a range of socioeconomic data.



PLACE-BASED PARTNERSHIPS

# Reforesting a scorched California landscape for the climate of tomorrow

IN THE EASTERN crook of California lies the Eldorado National Forest, a sprawling wilderness characterized by a mix of conifers and vaulting elevations up to 10,000 feet. The area is beloved by backpackers, horseback riders and other recreationists, who steal out into the wilderness to catch the sweet vanilla scent of Jeffrey pines, the tug of brook trout on a fishing line and the rocky crags of the Sierra Nevada mountains.

In 2014, the King Fire ripped through the region, burning 97,000 acres over nearly a month. In about half of the area scorched by flames,

90% of the trees were destroyed. From the smolder emerged a partnership between American Forests and Eldorado National Forest that has sought to return resilient, climate-adapted forests to the King Fire scar.

In the past several decades, highseverity wildfires like the King Fire have become more common, permanently impacting landscapes by making it difficult for forests to regenerate on their own and creating conditions that can lead to a vicious cycle of repeat wildfires.

"These are the areas that don't come back as forests," says Luis Vidal, American Forests' Northern California reforestation manager. "If the forest can't develop, the area grows into shrubland, making the landscape vulnerable to another high-severity fire. Hence, the need for us to come in."

Since 2020, Vidal has been leading Eldorado National Forest and American Forests in developing shared stewardship strategies to prepare the site, plant new trees and use monitoring to inform future restoration. The partners have planted 1.1 million seedlings since 2017, 500,000 of them in 2022.

With climate change increasing periods of drought and contributing to conditions that spread pests and disease, innovative practices are necessary to create a new generation of trees that are resilient against environmental stressors. Vidal and his team have been implementing climate-smart reforestation strategies to support forest resiliency.

For example, they are using DNA testing to identify sugar pines immune

#### "As we continue to face the challenges of climate change, holistic strategy and innovation are going to be essential."

- LUIS VIDAL, NORTHERN CALIFORNIA REFORESTATION MANAGER AT AMERICAN FORESTS

to white pine blister rust, a fungus that is killing off swaths of trees. An estimated 3% to 5% of sugar pines are resistant to the disease, making them the ideal progenitors for healthy sugar pine stands. Following the guidance of the U.S. Forest Service, Vidal sends climbers high into trees to pluck fresh samples of needles that the Forest Service then sends out for genetic testing. The seeds from viable candidates are cultivated and subjected to one final test: exposure to white pine blister rust.

Parent trees of sugar pine seedlings that have passed muster serve as the stock from which seeds are collected to grow future generations. In August

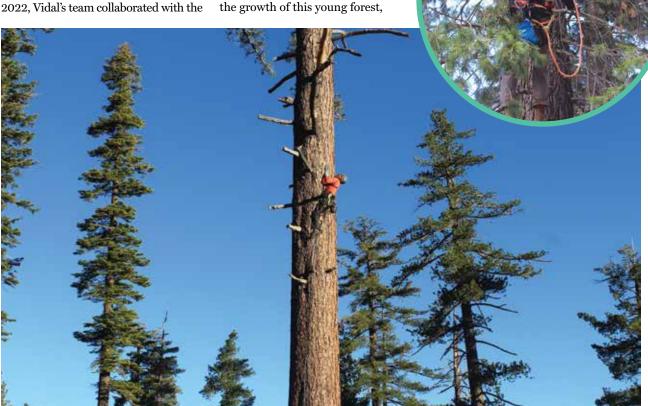
Forest Service to collect 129 bushels of cones from trees with known resistance to white pine blister rust. The Forest Service will extract the seeds from their cones and nurture them in a greenhouse for future planting.

The team plants a hardy mix of drought-resilient native seedlings including sugar pine, Ponderosa pine, Douglas-fir, incense cedar, giant sequoia and Jeffrey pine. They have been experimenting with strategic spacing that imitates nature's design of clustering and spacing trees. Using this technique, they planted approximately 200 acres of seedlings last spring.

Vidal's team is monitoring

collecting more than 100 data points on variables like tree density, species composition and ground cover. Observations are being used to inform decisions about where to plant in 2023, as well as planting techniques to employ.

"As we continue to face the challenges of climate change, holistic strategy and innovation are going to be essential," Vidal says. "We are thinking about the ecosystem as a whole and using a mix of best practices and experiments to inform our efforts to restore forests in California." 🍁



A climber scales a sugar pine in pursuit of new-growth needles for genetic testing. Sugar pines can grow upwards of 200 feet tall, and the best new-growth needle DNA samples are found near the top of the tree. Climbers are trained to safely ascend and work in trees.

MOVEMENT BUILDING

# A movement to celebrate, empower and inspire women in forestry



Beattra Wilson, U.S. Forest Service assistant director of the Urban and Community Forestry Program (far right), moderated the "With the Tip of the Iceberg, We Will Crack the Ceiling" panel, including (from L to R): Hilary Franz, Washington Department of Natural Resources (DNR) commissioner; Heather Berklund, Wisconsin DNR Division of Forestry chief state forester; and Patty Thielen, Minnesota DNR state forester and division of forestry director.

IN OCTOBER 2022, nearly 500 forestry and forest-products professionals who identify as women and nonbinary gathered in Minneapolis for the Women's Forest Congress — the first forest congress to take place in almost 50 years. They gathered after years of planning to address challenges, improve storytelling and empower female leadership within the forestry sector.

American Forests has led or co-led all seven previous forest congresses, which bring together decisionmakers from all walks of life on no set schedule. They are planned ad hoc according to themes identified as urgent by forestry leaders. When a group of female professionals had a conversation about the need to change the narrative surrounding forestry and the dynamic of conferences within the sector, the idea for a women's forest congress was born.

"Movement building is recognizing when the moment is starting," said Ara Erickson, Women's Forest Congress

steering committee member. As the movement gained traction, organizers started looking for an entity that could help provide resources and behindthe-scenes assistance. "We needed an

organization that would let other people lead and allow the Women's Forest Congress to stand on its own."

With American Forests' emphasis on servant leadership, it was a natural pairing, and soon American Forests' Chief Strategy Officer Becky Turner joined the Congress' steering committee to assist with convening the event.

In Minneapolis, attendees from across the globe — from college students to retirees — heard career testimonials, participated in networking and led informative breakout sessions. American Forests' staff hosted a booth on career pathways in urban and community forestry to better inform attendees of potential job opportunities in the field. At the event's conclusion, attendees vowed to uphold a declaration of resolutions and a shared commitment to advance those actions among their organizations, networks, partnerships and spheres of influence.

"From the women who came before and paved the way, to where we are now and the leaders who are setting the example for the future of forestry, the Women's Forest Congress connected inspiring women, all working toward a better future," said Gisel Garza, American Forests' project manager for the Rio Grande Valley. \*



American Forests had a strong presence at the conference, including (from L to R): KP Parrish, senior director of media relations; Kara Ball, senior director of strategic partnerships; Sarah Mitchell, senior director of individual philanthropy; Becky Turner, Esq., chief strategy officer; Sara Kangas, director of policy communications; Britta Dyer, senior director of California and Pacific islands; Julie Foster, senior manager of 1t.org US Chapter; Tia Washington, senior manager of career pathways; and Gisel Garza, project manager for the Rio Grande Valley.



WASHINGTON OUTLOOK

# **Unprecedented urban forest** funding made law through historic climate bill

**President Biden signed the Inflation** Reduction Act of 2022 on Aug. 16 at the White House, surrounded by (from L to R) Sen. Joe Manchin, Senate Majority Leader Charles Schumer, House Majority Whip James Clyburn, Rep. Frank Pallone and Rep. Kathy Catsor.

ON AUG. 16, President Biden signed into law the Inflation Reduction Act of 2022, the most comprehensive climate legislation ever passed by Congress.

The historic legislation invests over \$5 billion in forest-related provisions on both public and private lands, maximizing the power of our forests in the fight against climate change while simultaneously advancing equity. With \$1.5 billion in funding for the U.S. Forest Service's Urban and Community Forestry Program — the largest-ever investment in the only federal program for expanding and maintaining the health of urban tree canopy — this legislation will transform communities by creating jobs, bolstering local economies and saving lives.

But the wins don't stop there: The Inflation Reduction Act also contains \$450 million in voluntary incentives for historically disadvantaged private forestland owners; \$700 million in Forest Legacy grants to permanently conserve and restore wildlife habitat and

recreational areas; more than \$2 billion in wildfire risk reduction funds; funding for wood products innovation and lowcarbon built environment incentives; and much more. This legislation invests

in science-based programs that work, helping to create a safer, healthier, cleaner place for us all to call home.

American Forests has been advocating for robust funding for these crucial programs for years; the organization's leadership in coalitions, such as the Forest-Climate Working Group, Sustainable Urban Forests Coalition, 1t.org US Chapter, Trees for Community Recovery and others, has helped bring a focus on forestry to the forefront of national policy conversations.

There's a lot of work to do to implement the Inflation Reduction Act, but this momentous passage marks a new day for forestry in the United States well worth celebrating.



The bill's largest-ever investment in the U.S. Forest Service's Urban and Community Forestry Program will create and support local jobs while planting and caring for more than 23 million trees to cool our communities.



DONOR PROFILE

# A legacy of love for the Great Lakes

SITTING ON a major intersection of the largest freshwater system in the world, the City of Detroit operated as a hub of commerce and culture long before the automotive boom of the early 20th century. The natural resources of the Great Lakes fueled Detroit's industries and, of course, life. In fact, the Great Lakes Region is the primary water source for more than 40 million people.

Having both been born and raised in metro Detroit, Fred and Barbara Erb knew the value of the Great Lakes to their beloved city. Barbara's admiration of nature began as a young child

spending summers on Lake Huron with her family. As she grew, she became passionate about organic gardening and wholesome eating - teaching others the importance of growing their own food, supporting local farmers,

recycling and other environmentally friendly practices.

Fred traveled as a young adult, studying engineering in Upstate New York and serving in the United States Army. While stationed near New York City, he developed his lifelong love of jazz music. Upon his return to Detroit and inheritance of his family's lumber company, Fred committed himself to growing a successful sustainable business, and by the 1970s, Erb Lumber became the largest lumber supplier in Michigan.

Together, Fred and Barbara's collection of passions and experiences inform the funding strategies of the Fred A. and Barbara M. Erb Family Foundation. Established in 2007, the foundation supports urban and agricultural runoff reduction, Great Lakes stewardship, environmental health and justice, sustainable business, jazz education, anchor arts, and — in recognition of Fred's hard-fought battle at the end of his life — Alzheimer's research.

"The Foundation's board of directors chose to partner with American Forests because we could envision the multi-faceted impact the tree canopy would have on metro Detroit," says Neil Hawkins, president of the Erb Family Foundation. "The Foundation supports Great Lakes water quality and asthma initiatives, and we believe trees have an important role to play in both issues when neighborhoods are thoughtfully forested." In 2020, the Erb Family Foundation began supporting American Forests by funding



"The Foundation's board of directors chose to partner with American Forests because we could envision the multi-faceted impact the tree canopy would have on metro Detroit."

save the City of Detroit money while preserving the Great Lakes ecosystem.

Two years after the completion of the initial urban canopy stormwater research funded by the Erb Family Foundation, Detroit is set to become center stage to the Detroit Tree Equity Partnership, a major collaboration among public and private sector entities, including foundations and nonprofits. The partnership aims to plant 75,000 trees, create nearly 500 new jobs and secure \$30 million in investments for Detroit neighborhoods during its first five years. This ambitious undertaking is a maturation of the work first set in motion by American Forests and the Erb Family Foundation. In addition to funding the critical research that now informs the priorities of the Detroit Tree Equity Partnership, the Erb Family Foundation has ensured the longevity of the project by contributing \$900,000 to multiple partners in this collaborative initiative. The Foundation's continued support is bolstering this path-breaking initiative that will reduce stormwater runoff and flooding and contribute to improved water quality in the western Lake Erie basin.

"The Foundation provided the startup support to get the Detroit Tree Equity Partnership going," says Hawkins. "This work could completely change the City of Detroit. Trees can clean and cool the air, provide shade and help manage urban runoff. We are excited to see American Forests implement its ideas and plans on a large scale to benefit neighborhoods and residents in metro Detroit." \*

To learn more about the Detroit Tree Equity Partnership, read "Changing the face of urban forestry" on page 42.

ZOE BREDESEN is supposed to be posing for a photograph, but instead she's squatting out of frame, tugging at the root of an English ivy vine.

"I hate these guys," she says by way of explanation, frowning as she tosses the vine behind her. Then she resumes her camera-ready smile.

The ivy vine, an invasive species in Bredesen's home of Reston, Va., was getting a little too close to a dogwood sapling, one of 50 trees that she planted in this grove just two years before. And while the 19-year-old has planted plenty of other trees since then — 420 in total — she still feels protective over each one.

"I've always really cared about the environment and wanted to learn all I can," Bredesen says. "Being blissfully ignorant isn't an option for young people. [...] For Gen Z, climate change is so topical because it's the future we're going to be living in."

Bredesen spent the last three years fighting back against climate change by

planting trees in public spaces. A Girl Scout of the Nation's Capital since age 6, Bredesen got the idea for the project while aspiring to earn the organization's highest honor, the Gold Award, which requires recipients to identify an issue in their community and work to solve it through 80 hours of community service.

Bredesen teamed up with the forestry experts at her local community association to identify planting locations and recruited volunteers from other Girl Scout troops and the environmental club she led at her school.

The project experienced a major setback with the onset of COVID-19, which delayed the first planting by seven months. By the time she finally got her shovel in the dirt, Bredesen had to adjust her expectations without losing her ambition.

"Given all the unpredictability, I didn't tell people the goal was to plant 400 trees. We just took it one step at a time, one planting at a time."



After speaking at the 1t.org US Chapter summit, Zoe Bredesen got a business card from U.S. Forest Service Chief Randy Moore — and a personal invitation to work for the agency when she is ready.



In total, she led 12 plantings, each featuring 30 to 50 trees, 5 to 8 volunteers and about three hours — except for the last planting, which occurred after a local community publication wrote about the project and invited neighbors to join.

"We had 50 people show up to that one," Bredesen says, beaming even months later. "I'd never seen so many people in my neighborhood come together for something like this. Not only were we planting trees, we were bringing a community together."

In the end, Bredesen exceeded her goal by 20 trees. The total 420 trees will be included towards the 5 million trees the Girl Scouts pledged to "plant, protect and honor" through the Girl Scout Tree Promise. American Forests serves as the subject matter expert to Girl Scouts of the USA for the initiative.



"By planting and protecting trees, Girl Scouts are taking concrete action to tackle climate change and protect their future," says Kara Ball, American Forests senior director of strategic partnerships. "Through their leadership and advocacy for trees, Girl Scouts are showing their friends, families and communities that trees are a climate solution that anyone can participate in."

And Bredesen says this is only the beginning.

Last summer, she led a protest to demand congressional action on climate change and also spoke at the inaugural

1t.org US Chapter summit in Washington, D.C.

"Zoe's passion and courage brought the room to sustained applause and set the tone of the conference to think bigger and act boldly," Ball says. "Many in the room said Zoe was their favorite speaker of the conference."

During Bredesen's visit to the summit, the thrill of giving a speech came second to one-on-one conversations with her fellow climate leaders, like U.S. Forest Service Chief Randy Moore. who told her to call when she was ready for a job, and the Forest Service's Director of Urban and Community Forestry

for environmental justice. Last fall, Bredesen began her freshman year at the University of California Santa Cruz to pursue a major in psychology, with a possible second major in

At the Reston photoshoot, Bredesen finishes up her poses and heads to a local coffee shop for a chai latte. Before she can even leave the shop's patio, she's scanning her surroundings with the same vigilance that helped her spot the creeping vine of English ivy.

either art or international relations.

"Wait. Do they seriously not have recycling bins here?" she says. "Maybe we need to fix that." \*

#### THE UNDERSTORY

**A High-Elevation Hero:** 

# Whitebark Pine

Found among towering mountain ranges, whitebark pine is an iconic symbol of the North American West.

- 1 Whitebark pine is a keystone species many other species rely on. It supports a biodiverse ecosystem that would change dramatically if whitebark pine was removed.
- 2 Found only at high elevations, whitebark pine retain snowpack and prevent soil erosion, providing clean water downstream.
  - 3 Each year, millions of people hike, hunt, camp and ski in whitebark pine forests.



Whitebark pine relies on Clark's nutcracker for seed dispersal. The bird gets a high-calorie snack it can store for times of scarcity, and whitebark seeds are dispersed across the landscape, sometimes as far as 20 miles.

#### **ELEVATION**

Found as high as 12,100 feet above sea level

#### LIFESPAN

Up to 1,270 years

80.6 million acres across 7 U.S. states and 2 Canadian provinces

Whitebark pine cones are 2-3 inches long and contain an average of 50-70 seeds per cone. The seeds have more calories per gram than chocolate offers humans. Because the seeds are so high in fat, protein and calories, they are a desirable food source for dozens of animals, including the grizzly bear. **MOTIVATIONAL MUSINGS** 

"We just have to make clear, forests are more valuable when they're preserved than when they're destroyed. It's that basic."

PRESIDENT BIDEN, @POTUS, TWITTER

"I think it's one of the most important things we could be doing right now, especially with all the largescale fires that have been going on and the backlog of reforestation that's needed."

PATRICK MURPHY, U.S. FOREST SERVICE, ON CONE COLLECTION WORK. **NEW YORK TIMES** 

"This project...is a lot more than just about planting trees. It's really about investing in people. It's about investing in neighborhoods, it's about the quality of life. It's about the climate crisis."

U.S. SEN. DEBBIE STABENOW, OF MICHIGAN, ON THE DETROIT TREE EOUITY PARTNERSHIP, THE DETROIT NEWS

"The congress has ignited 000 a deep sense of enthusiasm in me. I was able to meet. talk and listen to mentors and idols in our sector. The congress helped me navigate answers to the questions I have been asked over the years. Today, a month after the congress, I am confident enough to roar aloud to anyone that 'forestry is a field for everyone."

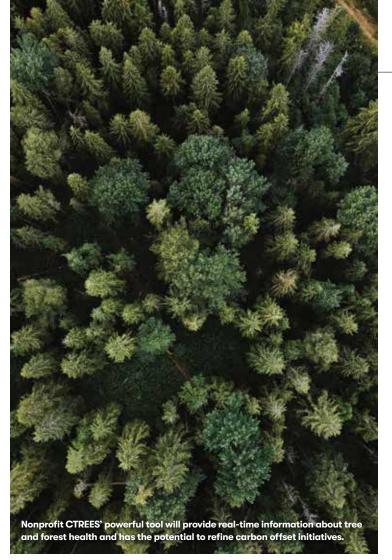
**APSANA KAFLE**, INTERNATIONAL FORESTRY STUDENTS' ASSOCIATION REGIONAL REPRESENTATIVE FOR NORTH AMERICA, ON THE WOMEN'S FOREST CONGRESS, IFSA.NET

"Our urban forests can no longer just be a preferred line item on local and state budgets. They are truly a testament of whether we are truly fulfilling our moral responsibility to a more socially, racially and economically just society."

HILARY FRANZ, WASHINGTON PUBLIC LANDS COMMISSIONER, AOL.COM

"If we lose whitebark pine, it's going to eliminate that ecosystem and habitat at the higher elevations, and that will have an effect on everything down below."

SHINAASHA PETE, REFORESTATION FORESTER WITH THE CONFEDERATED SALISH AND KOOTENAI TRIBES, PHYS.ORG



**FOREST FOOTNOTES** 

# New technology will track carbon in every tree

From the Amazon to the Arctic, trees are working overtime to capture carbon pollution from the atmosphere and lock it safely away in their wood. Now, thanks to a new digital platform designed by scientists and data engineers, we know just how hard they are working. Nonprofit CTREES will soon launch what might seem like a tool of a futuristic world: a digital platform offering highaccuracy, artificial intelligence-enabled satellite data that allows stakeholders to measure carbon emissions and removals from every tree on the planet, with complete accuracy. This powerful tool will provide real-time information about tree and forest health and has the potential to refine carbon offset initiatives that often struggle with calculating their emission reduction efforts.

# Denver organization provides forestry career opportunities for the formerly incarcerated

Just as a seedling needs nurturing to grow, people sometimes need support to grow and thrive as well. The Park People in Denver are giving those formerly incarcerated just that. The organization's recently launched preapprenticeship program, TreeForce, is made up of formerly incarcerated individuals who will help expand and care for Denver's tree canopy and in the process prepare for meaningful career paths with family-supporting wages. Participants will explore forestry career pathways through classroom-based, work-based and hands-on learning. Upon completion of the program, they will be encouraged to apply to the Colorado Arborist Apprenticeship Program or pursue employment opportunities in private tree care, municipal forestry, seedling production, tree planting, urban wood reuse or higher education.





By planting fruit and nut trees, cities are expanding the list of benefits their tree canopies offer.

# **Planting fruit trees** in cities helps put food on the table

Across the United States, communities looking to tackle both food insecurity and urban heat are finding success with a multi-tasking solution: food-bearing trees. For example, in Philadelphia, a city where 1 in 6 households face food scarcity, the Philadelphia Orchard Project has planted hundreds of fruit and nut trees in 67 sites over the last 15 years. The resulting produce and protein — over half a ton of food every year — go to food pantries, farmers' markets and passers-by. So far, the trees have fed an estimated 6,532 Philadelphians, often at no cost to them. The project has also offered residents the chance to grow culturally significant food, which many miss after migrating to the area. With additional benefits like cooling temperatures, cleaning the air and stopping water run-off, it's no wonder that fruit trees are also showing up in Baltimore; Birmingham, Vt.; and beyond.

# Saving the red spruce and its high-flying friend

Ruby the red spruce — a 78-foot tree from North Carolina's Pisgah National Forest — may be one of the best things to happen to the Carolina northern flying squirrel. Ruby's role as the Capitol Christmas tree for 2022 drew major media attention to efforts to restore high-elevation spruce-fir forests of the Southern Appalachians, the country's second most endangered ecosystem and home to this elusive endangered species. The nocturnal squirrels' survival depends on fungi found on the floor of mature red spruce forests. But over the last century, hardwoods have crowded out the red spruce in the Blue Ridge Mountains, creating an environment more hospitable to the squirrel's rival: the southern flying squirrel. The Southern Appalachian Spruce Restoration Initiative, a public-private partnership, has been working to turn that around. One partner, Southern Highlands Reserve in western North Carolina, has grown more than 10,000 mature red spruce trees in the last decade to help restore the species on public lands. At 4,500 feet, the reserve's climate mimics that of high-elevation spruce-fir forests, so the 18-month-old trees can better adapt when they're transplanted to their permanent homes. The U.S. Forest Service took note of the reserve's 90% success rate, tapping it to grow another 50,000 trees. That's great news for spruce-fir forests. And for their high-flying residents. 🍁



A young red spruce at the 120-acre Southern Highlands Reserve in western North Carolina. The reserve is a founding member of the Southern Appalachian Spruce Restoration Initiative.

# The



Robbie Lefebvre of the **Oregon Department of** Forestry displays cones from two recently harvested Douglas-fir trees at the Schroeder Seed Orchard in St. Paul, Ore.

# in America's forests

The solutions to the seed shortage are out there, but will we apply them in time?

BY LEE POSTON

LUIS VIDAL SHOULD BE USED TO THIS BY NOW. Wildfires are an ever-present threat in the Sierra Nevada Mountains where he currently lives, and the wildfire season is no longer restricted to the dry, hot summer months. So he was surprised to find a lump in his throat as he watched from afar as the massive Mosquito Fire bore down on his current home at the U.S. Forest Service ranger station, where he works as the Northern California reforestation manager for American Forests.



He was tracking the fire's progress from his parents' home in Utah. The fire maps showed the flames getting perilously close to a stand of rare Ponderosa and sugar pine trees. The latter are among the 3% to 5% of this species that are genetically resistant to white pine blister rust, an invasive fungus from Asia that is laying waste to these trees across the West.

He was relieved that luck had been on his side just a week earlier, when he worked with a crew of skilled tree climbers to collect more than 1,000 cones from these very trees, which can reach heights of 200 feet. The cone-collecting team must take action during a small window — as little as two weeks — when the cones are just right for harvesting. Thankfully, the crew completed collecting the week before the Mosquito Fire neared.

#### THE ROOTS OF A CRISIS

The near miss was a reminder that America's forests face a quiet crisis - a massive nationwide shortage of seeds and the workforce and infrastructure

Above: Luis Vidal, **American Forests'** Northern California reforestation manager, kneels in front of sugar pine cones he collected in Eldorado National Forest in California. These cones are essential for postfire restoration and were collected shortly before the Mosquito Fire burned close to their parent trees. **Right: The Mosquito** Fire illuminates fire retardant dropped from a tanker airplane in California's Sierra Nevada Mountains. The fire came dangerously close to a stand of rare pines from which Vidal had just collected diseaseresistant seeds.







American Forests' Vice President of Forest Restoration Brian Kittler describes the seed shortage as "America's quiet crisis," but remains hopeful that new public-private partnerships will make a difference.

needed to supply them. The shortage is a major roadblock for the movement to reforest the nation's increasingly stressed landscapes.

But the tide is turning as more people learn about the problem and the science-driven solutions that conservationists are implementing across the country. American Forests first brought this issue to a wide audience by co-leading a 2021 study that concluded that, at the time of publication, the United States has 133 million acres of land that need reforestation. Meeting that goal will require 3 billion seeds every year — a very tall order. To get even halfway there by 2040 — focusing on the highest-priority sites current seed supplies need to more than double to produce 34 billion seedlings.

The study and resulting publicity made clear that reforesting our country will not succeed without serious, sustained attention to the insufficient supply of seed.

There are three main root causes for the crisis, says Brian Kittler, American Forests' vice president of forest restoration. First, climate change-induced drought and fires, pest infestations and diseases like white pine blister rust are causing a decline in viable cone crops throughout the western states. Increased tree mortality resulting from these pressures is removing important seed sources, which has a cascading effect as we lose trees with strong genetic resistance to disease or climate change.

"It was kind of a wake-up call for us — great, we want to reforest, but if we don't have that seed source, we're up the creek," Kittler says. "We can't predict what we're going to need in the future. To do the climate-adapted reforestation work following an unplanned disturbance like a wildfire, oftentimes you're kind of thrown into emergency-response mode."

Kittler describes how his team often must "get creative" about where to find the right seed for the



**Right: A planting** crew member holds a Douglas-fir prior to planting in the Santiam State Forest that was heavily impacted by the 2020 Beachie Creek Fire. **Below: Young** Douglas-fir trees grown at Schroeder Seed Orchard, a major component of Oregon's efforts to reforest areas burned by recent severe wildfires.

right location with the right genetics, all against the backdrop of a changing climate. "What we're seeing in places like California and central Oregon is that more often than not we don't have the right seed that we're looking for."

The second major driver of the seed shortage is that seed collection programs are not keeping pace with demand from areas that have been devastated by increasingly common wildfires. In California, the situation is especially dire because much seed is collected "wild" directly from trees instead of a seed orchard. With wild collection, as Vidal found, timing is of the essence. Kittler notes that for some tree species, the right conditions for seed collection may only be present one or two times a decade.

Finally, finding and keeping workers to collect, process, clean and grow seeds remains a major impediment to progress, along with the high cost and uncertainty of running a nursery. The work is seasonal and requires skillsets that are not currently widespread. Additionally, many experienced nursery managers are retiring, leaving gaps in technical skills and knowledge.

The good news is that there are solutions: invest in workforce capacity; expand production capacity at existing nurseries and build new nurseries; work across boundaries and bureaucracies; and use the



power of science to ensure that the best-adapted seeds are being harvested from the right places, processed efficiently and end up where they are most needed. American Forests and its partners are working in some of the most heavily impacted places to implement these solutions on both a small and large scale.





"Bringing everyone together and sharing information will allow us to collect more seed cheaper by pooling resources and creating economies of scale."

- BRIAN MORRIS, PACIFIC NORTHWEST DIRECTOR AT AMERICAN FORESTS



#### THE OREGON WAY

Kittler lives in Oregon, a state that has been particularly hard hit by wildfires in recent years. Since 2018, an area twice the size of New York City burned so intensely in Oregon that all the trees died, meaning hundreds of thousands of acres of seed sources went up in smoke. The largest contiguous high-severity patch, part of the 2021 Bootleg Fire, was four times the size of Manhattan.

The recognition that the lands these fires torched could take decades or centuries to return to forests without intervention inspired the formation of a powerful public-private partnership and the development of the South-Central Oregon Integrated Post-Fire Resilience Strategy. This complex landscape strategy covers lands severely burned in six recent fires in a high-desert area in Klamath and Lake Counties known as "The Oregon Outback."

**Above: Douglas-fir** cones are stored in a large barn to dry at the Schroeder Seed Orchard. They will later be dissected to harvest their individual seeds.



Above: Gisel Garza, American Forests' project manager for the Rio Grande Valley, washes down granjeno berries as Girl Scouts help to remove the pulp during a learning event at the U.S. Fish & Wildlife Service's Marinoff Nursery in Texas. Right: Two Girl Scouts pause after learning about seed selection and processing at the Marinoff Nursery. Garza says it is important to help Hispanic girls know they can pursue careers in conservation, biodiversity and seed collection.

Kittler describes it as a way of "getting out of the vicious cycle of high-severity fire through climate-smart reforestation that scales up the workforce, the seed collection and the work on the ground."

One climate-smart strategy involves assessing the likely future climate and moisture regime of a planting site and using seed from an area with those same characteristics to capture climateadapted genetics at planting time.

The immediacy of the problem makes the region a good home base from which Brian Morris, American Forests' Pacific Northwest director, can work to develop a regional network of land managers and nursery owners to solve the reforestation pipeline problem at a scale big enough to matter.

"I really want to go as large of a geographic scale as we can, to cut across different Forest Service regions, so that we can break down any administrative barriers that might be there because of an arbitrary line in the sand," Morris says.

The network will enable the sharing and transferring of seed among landowners. Small landowners often face the biggest challenge in accessing seeds, so Morris will focus on improving that through public-private partnerships — making connections among those who have seed and those who need it.

"Bringing everyone together and sharing information will allow us to collect more seed cheaper by pooling resources and creating economies of scale," he says. "It'll allow for easier transfer of seed across landowners, where a landowner in Northern California might have a good seed crop that might work really, really well for south central Oregon."



#### **DEEP IN THE HEART OF TEXAS**

American Forests' Project Manager Gisel Garza has just returned from scouting the Lower Rio Grande Valley National Wildlife Refuge in search of Texas ebony seed pods, which she happily reports are ready for collecting. Seed collection here doesn't require climbing trees; Garza can collect seeds by hand from low branches, sometimes using a long pole or standing in the back of her pickup truck.

These thornforests are about as different as it gets from the conifers of the Pacific Northwest, and unlike out West, the seeds here are plentiful. But Garza has the same concerns as Kittler and Morris about labor shortages: There just aren't enough people to collect and process the seeds.



Many workers are close to retirement, and there's little interest among younger people.

For this reason, American Forests decided to pioneer its "Seed Collection Corps" here, with support from Nespresso, to build a well-trained cadre of workers who can collect enough seed to meet reforestation goals. So far, the Corps has collected 122 pounds of seed in the Rio Grande Valley, which can grow 274,647 seedlings to eventually reforest 274 acres.

This is music to Garza's ears. She currently has to drive long hours across four counties to find the right seeds for harvesting, and frequently drives through one of the major threats to her beloved thornforests: rapid suburban development. As trees disappear, so does the genetic information inside their seeds, which is important for drought-resilience strategies.

Garza is passionate about getting more young people, especially Latina girls, excited about her work to help make it sustainable over the long term. She says they are not usually exposed to issues like conservation, biodiversity and seed

collection. She recently worked with the U.S. Fish and Wildlife Service's Marinoff Nursery to take a local Girl Scouts of the USA troop through the ins and outs of seed collection and processing.

"It gave us an opportunity to show the girls that there's potential for them to be interested in science, technology, engineering and mathematics (STEM) as females, and since the population in the Valley is pretty much Hispanics, there's potential for them to see careers in the science world," she says. "And more specifically, it's important for them to be interested in careers in conservation, in seed selection or production."

Garza is also working with a student from her alma mater, the University of Texas, Rio Grande Valley, on a research project around the impacts of climate change, deforestation and invasive species on seed availability in the Valley. The student recently presented her research at the National Diversity in STEM Conference in Puerto Rico, a program of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science.

Above: Garza collects Barbados cherry fruits at the Marinoff Nursery. Her work is a critical component of efforts to reforest 85.000 acres of endangered thornforest in the Rio Grande Valley.

# TOP LEFT: KAT BARTON / AMERICAN FORESTS; TOP RIGHT AND BELOW LEFT: TERRANCE REIMER / AMERICAN FORESTS

#### **CALIFORNIA DREAMIN'**

Vidal's seeds are now in a refrigeration unit at California's Placerville Nursery waiting for their moment to help restore the many fire scars across



Above: A professional

assess the viability of the seeds. American

cone collection effort

tree climber cuts

open green giant

sequoia cones to

Forests supported

a cross-boundaru

on both Sequoia

and Kings Canyon National Park and

Sequoia National

Forest in California.

the region. And they are at the heart of an ambitious initiative known as the Reforestation Pipeline Partnership (RPP), a collaboration among the Forest Service Region 5, California Department of Forestry and Fire Protection (CALFIRE) and American Forests. The RPP

consists of the Reforestation Pipeline Cooperative, which coordinates key agencies in the state on all aspects of reforestation, and the California Cone Corps, a workforce development program focused on increasing cone collection initiatives. The Cooperative and Cone Corps, major priori-

ties of Governor Gavin Newsom, are demonstrating a successful model for climate-smart reforestation that other states and regions can learn from - and come at a moment of crisis in the Golden State. An analysis by CALFIRE found that the state-operated seed bank is short more than 76,000 bushels of the conifer seed necessary to replant just 25% of recently burned non-industrial private lands.



Between 2018 and 2021, the bank was only able to receive and process 1,433 bushels of seed, or about 2% of the current shortfall.

The cone collection sector is tiny in California, with a handful of collection outfits and no discernible career pathways, says Britta Dyer, American Forests' senior director for California and Pacific Islands: "Without seed, a robust





"The fact that we at American Forests are focusing in on the issue of seed with concerted collaborative effort with manu partners feels like the start of something hopeful, something restorative. Collecting seed feels like keeping hope alive for the conifer forests that so many of us cherish, as well as for the generations of land stewards to come."

- SHELLEY VILLALOBOS, CALIFORNIA REFORESTATION PIPELINE MANAGER AT AMERICAN FORESTS

response to the current crisis is not possible. The genetic diversity of California's forests will continue to dwindle due to the mounting natural threats."

As a member of California's Wildfire and Forest Resilience Task Force, Dyer has spent much of the past year helping draft the California Reforestation Strategy, which highlights what is at stake and why massively increasing seed collection is vital in the state. In just three fire seasons, between 2019 to 2021, 1.5 million acres across California

became at risk of transforming from forest lands to non-forest systems such as shrublands. The resulting loss of biodiversity and ecosystem services, such as watershed and climate protection, will have devastating effects well beyond those burn scars. The Cone Corps and the RPP are essential to ensuring that the tens of millions of seeds needed to reforest these areas are available.

"I have witnessed and experienced the devastation that comes with the loss of these forests — showing me that reforestation is absolutely necessary for the wellbeing of the people, wildlife, water and climate of California," says Dyer. "However, reforestation will not be achieved without all agencies working collaboratively on this effort and, of course, without native seeds to sow."



#### A MONTH TO REMEMBER...AND TO BUILD ON

There's an obvious need for a huge awarenessraising effort across the country about the under-reported seed shortage. With that in mind, American Forests led a major initiative last fall called Seed September, which used social media, webinars and creative visual content to bring attention to the issue, including among many who didn't know this crisis exists.

"The fact that we at American Forests are focusing in on the issue of seed with concerted collaborative effort with many partners feels like the start of something hopeful, something restorative," says Shelley Villalobos, who manages the California Reforestation Pipeline for American Forests. "Collecting seed feels like keeping hope alive for the

**Above: Francey** Blauarund of the U.S. Forest Service (left) and Britta Dyer, **American Forests'** senior director for California and Pacific Islands, discuss reforestation strategies during a restoration project in the Creek Fire and French Fire burn scar area in California's Sierra **National Forest.** 



**Above: Vidal** demonstrates how to analuze suaar pine cones during Dreamforce 2022 sponsored bu Salesforce. The event was one of several ways American Forests raised awareness about the nationwide seed shortage during Seed September. **Below: American Forests launched** Seed September in 2022 to highlight the seed shortage crisis that threatens forest restoration efforts.

conifer forests that so many of us cherish, as well as for the generations of land stewards to come."

Seed September featured Nespresso USA's Head of Sustainability Anna Marciano explaining why her company is so committed to supporting American Forests' Seed Collection Corps. "Looking at the big picture, we want to help build resilient ecosystems that create stronger communities," she said in a Q&A. "Nespresso's support of this seed stockpile is the first step in achieving that goal and our larger mission to have a positive impact on the world."

Austin Rempel, American Forests' senior manager of forest restoration, thinks awareness raising is critical in spurring public sector support for seed collection. "States are definitely taking this more seriously, although many don't have sufficient funding to fully support it," he says. But he's encouraged by the work in Oregon, Texas and California, and by innovative initiatives such as the creation of The New Mexico Reforestation

Center, which pools the forestry expertise and resources of three state universities.

"I think public investment and ownership are what's needed most, because seeds are a public good," he says. "And awareness is really important, so that [awareness] migrates up to the folks who make investment decisions and determine priorities for foresters."

Vidal's contribution to Seed September was to turn his experience into a powerful, teachable moment at the world's largest software conference. It just so happened that Salesforce, a longtime supporter of American Forests' seed collection and nursery work, was holding its annual Dreamforce event in San Francisco last September. With the Mosquito Fire mandatory evacuation order lifted just days before the conference, Vidal was able to gain access to 200 freshly collected pinecones and run a citizen science project during the conference; Vidal cut open the cones and extracted the seeds, and attendees examined them under a microscope.

"It was important to have the citizen science component of our Dreamforce presentation so that participants could see for themselves how difficult and complex it is to assess seed quality," Vidal says. "Participants gained education and awareness that not all of the seeds in a cone will produce trees and the many challenges associated with that."

And just as important, the seeds Vidal helped collect with funding from Salesforce will likely be used to replant the areas scorched by the Mosquito, King and Caldor Fires.  $\blacklozenge$ 

A forest in your hands

Seed September

American Forests

Lee Poston is a communications advisor who works with mission-driven organizations and writes from University Park, Md.



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Most importantly, she has just witnessed the culmination of a two-year project to bring new life to the whitebark pine forests in Oregon's Deschutes National Forest, one more step in a monumental effort to save this species from a deadly, invasive fungus impacting whitebark pine across its range in seven U.S. states and western Canada.

"It gives me great joy to see these intact forests that are still here, to hear nutcrackers cawing around us, to watch these forests vibrate with energy, and to think about all the services that they're providing for us, for wildlife," says Pansing, a whitebark pine researcher and forest restoration scientist at American Forests. Her job entails making sure the organization integrates the best available science into the projects it supports and implements on the ground.

To understand her enthusiasm, you must understand this tree. The whitebark pine is like a grizzled prizefighter that keeps hanging on for one more bout. Pummeled by chilling, sub-alpine winds, wounded by blister rust fungus and subsisting in a harsh, unforgiving environment, it still lives to a ripe old age, sometimes up to 1,000 years.

"The West holds a collective magical space in the imagination of our nation, and whitebark pine really is an iconic species that exists within those iconic spaces," Pansing adds. "If you think





about Glacier National Park, if you think about Yellowstone National Park, if you think about any high-elevation ecosystem throughout most of the western United States, you are coming face-toface with whitebark pine."

As such, millions of people hike, hunt, camp and ski among whitebark pines without even knowing it. And in an era of rapidly warming climate, these trees are the linchpin that holds back snowmelt in the spring and ensures a steady supply of water for massive parts of the country.

But despite its ecological importance and enduring characteristics, this majestic western icon is being wiped out in many places.

#### A TREE ON THE EDGE

White pine blister rust was introduced to western North America in the early 1900s and spread rapidly through whitebark pine and other five-needle pine species. The disease chokes a tree to death by forming cankers on the trunk and branches that starve it of nutrients.

Now, there are more dead whitebark pines than live ones across the tree's U.S. range, and only 10% remain in Montana's Glacier National Park. These "ghost forests" of mostly dead trees cover the landscape of the western U.S. and Canada.

At Newberry National Volcanic Monument's Paulina Peak, where Pansing was having her moment of joy, the infection rate is actually quite low, at around 5%. However, across Oregon, few stands are untouched by this insidious fungus, with as much as 60% of the trees in some areas infected.

"This is a great example of a white pine blister rust canker," Pansing says, pointing to a tree that

Above and facing page: A whitebark pine tree shows some of the characteristic symptoms of white pine blister rust. Toward the bottom of the trunk are blister-like cankers containing spores that resemble macaroni and cheese powder. The roughened bark higher on the trunk, dried sap throughout and ochre needles show the scars where old cankers already did their damaae. Left: U.S. Forest Service Genetics and Reforestation **Technician Chris** Jensen readies a genetically resistant whitebark pine seedling for planting atop Paulina Peak in Oregon's Newberry **Crater National** Volcanic Monument.





is almost entirely covered by dry, ochre needles. "If you look in here at the trunk of the tree, you can see these little orange pouches that kind of look like macaroni and cheese powder. Those are the spores of the fungus. And what happens here is that it essentially grows around the trunk of the tree, and it strangles the tree."

To add insult to injury, blister rust is not the only killer that stalks whitebark pine. The species is also heavily impacted by voracious mountain pine beetle infestations and climate-changeinduced wildfires.

"This old boy's growing out of pure rock almost — it's incredible what survivors they are," says Chris Jensen, a reforestation technician in

Deschutes National Forest who has been furiously planting seedlings at the summit, searching the dry, rocky soil for soft pockets that will give the newborns a fighting chance.

He pokes his shovel at a gnarled, weatherbeaten tree trunk that has a single remaining branch with live pine needles. "Looks like a combination of white pine blister rust and mountain pine beetles that killed this poor guy."

#### **SCIENCE TO THE RESCUE**

Jensen and Pansing are here today to assist with the third of three tree planting sessions supported by American Forests. Together, these plantings have introduced 5,000 seedlings carry-



Left: (From L to R) Forest Service Restoration Program Coordinator Andrew Bower; American Forests' Forest Restoration Scientist Libby Pansing, Ph.D., American Forests' Vice President of Forest Restoration Brian Kittler; and Forest Service Plant Geneticist Matt Horning discuss why genetically resistant "elite" trees, such as the one pictured here, are so important for restoring the species. The yellow marker nailed to the tree lets cone collectors, scientists and others know its status.

Right: Forest Service Silviculture Technician Michael Dominguez plants a whitebark pine seedling at Paulina Peak, which overlooks the Big Obsidian Flow, the result of a volcanic eruption 1,300 years ago.

ing blister rust resistance to Deschutes National Forest, a 1.6-million-acre expanse spread across four counties on the eastern fringe of the Cascade Mountain Range in central Oregon. Newberry Monument is within its boundaries, including its highest point — Paulina Peak — where today's planting project is taking place. The entire area is one of the most important recreational sites in

the state for skiing, hiking, hunting, fishing and wildlife viewing.

Overseeing the planting is Matt Horning, a plant geneticist with the U.S. Forest Service, who has spent the past 14 years working here.

"My role is to support this whitebark pine program and make sure that we're getting genetically resistant seed into our seed inventory for

"Everything is a natural process. We're not breeding super trees. We're not genetically modifying. We're working with the resources that are available naturally, but just speeding up that process. We're picking the best of the best. In a way, you could say we're sort of nudging natural selection along."

- ANDY BOWER, ZONE GENETICIST FOR THE FOREST SERVICE NORTHWEST OREGON AND WESTERN WASHINGTON REGION

reforestation," he says. This means helping identify candidate trees that show signs of resistance to blister rust, supporting the climbing efforts to collect those seeds, interfacing with the blister rust resistance screening center to make sure that trees are being screened, and helping manage the plantings of these rust-resistant seedlings.

Horning accomplishes this by working side-by-side with the Dorena Genetic Resource Center in Cottage Grove, Ore., south of Eugene. Situated in a bucolic setting next to Dorena Lake, the center was established in 1966 as the headquarters for the Forest Service's White Pine Blister Rust Resistance Program. While it looks from the outside like a large nursery operation, inside, genetic science posters cover the walls, a giant seed extractor resembling a massive laundry drum sits in an open workshop, and computer screens display microscopic images of whitebark pine seeds.

Lisa Winn, the center's director, notes that Dorena is one of two Forest Service facilities dedicated to researching rust resistance of whitebark pine. The other is in Montana. If the species is to be saved, these facilities will play a major role.

"We have cones sent to us from different government agencies and partners throughout its range in the U.S. and Canada," Winn says. "We're a very key part of the restoration of whitebark pine and trying to keep it as a very important component on our landscape."

The work toward that goal is a complex mix of genetic science, careful nurturing and relentless record keeping. It begins with a selective screening process in the forest. Back at Paulina Peak, Horning walks down a gentle slope to a healthy-looking tree with a metallic vellow ID marker resembling a giant Post-It note nailed to its trunk.

Some whitebark pine trees have natural resistance to blister rust, he explains, and that makes them first-round picks in the genetic draft. He has already collected cones from this tree and is now awaiting the results from their screening at Dorena.

"When we get those results, we'll know whether this tree has resistance or not," he says. "If it does have resistance, it'll become one of our elite trees in the program."

#### "NUDGING NATURAL SELECTION ALONG"

Elite trees are the Holy Grail of whitebark pine resistance. Horning mentions one tree that is close to a ski lift at nearby Mt. Bachelor Ski Resort, named a "Whitebark Friendly Ski Resort" by the Whitebark Pine Ecosystem Foundation. The analysis of its seedlings reported high resistance to blister rust, and it is also a source tree for scientists who are sequencing the whitebark pine genome to better understand it.

"If we just collected seed from any old tree, grew the seedlings and planted them, there's a pretty high likelihood that those seedlings would succumb to the disease and wouldn't survive to maturity to eventually produce seeds on their own to perpetuate the forest," says Andy Bower, a Forest Service zone geneticist for the northwest Oregon and western Washington region.

"That's why the rust resistance program is so crucial to the restoration program in the region," he adds. "By identifying those rare individuals that have resistance and using seed from those individuals, we're trying to ensure that the seedlings that get planted have the greatest chance for success."

Bower takes great pains to stress the "organic" nature of the restoration work that takes place at Dorena.

"Everything is a natural process," he says. "We're not breeding super trees. We're not

Facing page, clockwise from top: Forest Service Horticulturist Lee Riley shows **Pansing seedlings** at various stages of arowth in the Dorena **Genetic Resource** Center nurseru: **Riley shows Pansing** newly x-rayed whitebark pine seeds to determine how well they will germinate; A whitebark pine seedling in the nursery at **Dorena Genetic** Resource Center.





Left: A Clark's nutcracker pauses atop a rock at Paulina Peak. Whitebark pine relies on Clark's nutcracker for seed dispersal. The bird gets a hiah-calorie snack it can store for times of scarcity, and whitebark seeds are dispersed across the landscape, sometimes as far as 20 miles. **Right: Forest** Service Plant Geneticist Matt **Horning inspects** whitebark pine seedlings that have been exposed to blister rust to determine their resistance to the invasive fungus and their suitabilitu for replanting.

genetically modifying. We're working with the resources that are available naturally, but just speeding up that process. We're picking the best of the best. In a way, you could say we're sort of nudging natural selection along."

At Dorena, when pine cones are sent from the field, they are air-dried so the scales containing the seeds will open. Then small lots are extracted by hand because every seed is important. Larger lots are placed in a mechanical tumbler to allow the seed to drop from the cones.

Horticulturalist Lee Riley describes the process of determining the viability of seed embryos and their chances of success once germinated and grown in the nursery.

"Once extracted, seeds are x-rayed to determine whether they contain embryos, are mature or have any damage," she says, pointing to seed embryos that are not fully formed. "Seeds with at least 50% of the embryo cavity filled are considered viable, although seeds in the 50% to 70% range may produce smaller, weaker seedlings. But every filled seed counts, which is why we try not to throw anything away."

The seeds are placed in conditions that mimic natural moisture and temperature for 140 days,

a process known as stratification. They are then germinated, planted and moved to the vast greenhouses next door until they are old enough to grow outdoors. Once planted outside, they grow for several years until scientists can assess their degree of resistance to blister rust by counting the telltale cankers on branches and boles.

#### A WINGED REFORESTATION CREW

Richard Sniezko, a geneticist at Dorena, bends down at a research plot and looks at one seedling with hundreds of yellow spots and blister rust cankers, flatly stating that it will be dead within a year. In another planter box, he finds a completely different story.

"This is a demonstration where we got some seed from Deschutes National Forest," Sniezko says. "And this particular seedling family of one parent tree has over 93% survival — one of the best ever for whitebark pine. It gives us a lot of hope."

These elite, rust-resistant trees are, unfortunately, few and far between. So they get intensive care when they are found, including caging the cones to prevent Clark's nutcrackers from taking the seeds. Dorena, as home of the Forest Service's



Tree Climbing Center, trains potential seed collectors to safely ascend trees, both to collect seeds and to put mesh cages over the cones.

member exactly where they buried the majority

While Clark's nutcrackers are apt to make off with whitebark pine seeds, they are not the villains of this story. In fact, these noisy, sociable and always active birds are the heroes. As the main disperser of whitebark pine seeds, they are a winged reforestation crew. Their long, strong beaks are tailor-made for tearing open sticky pine cones to get at the seeds inside, which they store in a unique pouch below the tongue. They deposit their cargo in thousands of ground holes, maintaining a remarkable ability to re-

of the seeds.

This process makes these birds a powerful ally of the whitebark pine, since the buried seeds they fail to retrieve spur natural regeneration of

> the original source tree. This mutualism, which has evolved over time, has also resulted

whitebark pines as far as 20 miles from

in the pines developing cone "platforms" that the nutcrackers use as a perch while harvesting seeds.

"Whitebark pine, when seed sources are healthy, depend on Clark's nutcrackers nearly exclusively for seed dispersal and forest regeneration," says Diana Tomback, professor of inte-

grative biology at the University of Colorado Denver and founder of the Whitebark Pine Ecosystem Foundation.

"Nutcrackers, which are only trying to preserve food for later use, often bury excess seeds and are **Above: Recreation Crew Lead Drew Peterson places** mesh cages on whitebark pine cones at Paulina Peak to protect seeds from being harvested by Clark's nutcrackers, squirrels and other would-be seed predators, ensuring that enough seeds are available for reforestation from trees resistant to blister rust fungus. Left: Whitebark pine seedlings at the Dorena Genetic Resource Center that have been inoculated with white pine blister rust show a wide range of reactions. Living trees show resistance to the fungal pathogen, while those with orange needles will eventually die.



Pansing sits at the summit of Oregon's Paulina Peak, surrounded by her beloved whitebark pines, which she describes as "magical."

inadvertently planting trees that will eventually provide them the very energy-rich whitebark pine seeds they prefer."

In addition to discovering this mutualism, Tomback wrote the definitive book on whitebark pine ecology. And even though she's studied them for decades, she remains in awe of their abilities.

"Nutcrackers have the most remarkable spatial memory known," Tomback adds. "They must recall the exact spatial locations of more than 10,000 seed caches each year. Laboratory studies show they have unique ability to relocate these

seed caches, triangulating off nearby objects. But their memories of cache sites start to fade after about nine months in preparation for the new round of seed caches."

Tomback was instrumental in Pansing's early career, serving as her master's and Ph.D. advisor for almost 10 years, and they have continued collaborating on projects in the years since. Back at Paulina Peak, Pansing points out a clump of whitebark pine stems growing from a single Clark's nutcracker cache. They are right next to a tree that was planted in 2006 and is now helping



"It gives me great joy to see these intact forests that are still here, to hear nutcrackers cawing around us, to watch these forests vibrate with energy, and to think about all the services that they're providing for us, for wildlife."

- LIBBY PANSING, WHITEBARK PINE RESEARCHER AND FOREST RESTORATION SCIENTIST AT AMERICAN FORESTS

range and identifies priority restoration sites where funding and work will do the most good.

The second punch is the new "threatened" listing under the Endangered Species Act (ESA) that was announced in Dec. 2022, which brings much-needed funding and attention. The whitebark pine is the widest-ranging tree species ever listed.

Oregon resident Brian Kittler, American Forests' vice president of forest restoration, stresses why the time is perfect for the restoration plan and listing: "We have the science in place. We have the partnerships. We have the experience to take the early restoration that's been ongoing for the last 20-plus years and really scale that up across the range and bring the species back."

He notes that the ESA listing sends a strong signal that the species is in decline and alerts the public about the state of the ecosystem. It also adds additional protections to the species and should drive more funding to its conservation and restoration.

These steps in the right direction delight Pansing, who is effusive about why she's made restoring the tree her life's mission.

"Whitebark is kind of magical," she enthuses. "If you haven't had an experience to get out and touch one, hug one, I encourage people to take the time to do it. And I hope that we start thinking of whitebark pine as being as iconic as the sequoias, as the bristlecone pines — because they are just as special and inhabit just as many iconic spaces." \

Lee Poston is a communications advisor who works with mission-driven organizations and writes from University Park, Md.



other whitebark regenerate naturally, with a big assist from an unknowingly helpful bird.

#### PLANNING FOR AN ICONIC TREE'S FUTURE

Along with the feeding habits of the Clark's nutcracker, a one-two punch of more bureaucratic initiatives is expected to substantially help bring whitebark pine back to its former glory. The National Whitebark Pine Restoration Plan, created by the Whitebark Pine Ecosystem Foundation, American Forests and the Forest Service, lays out what it will take to recover the species across its

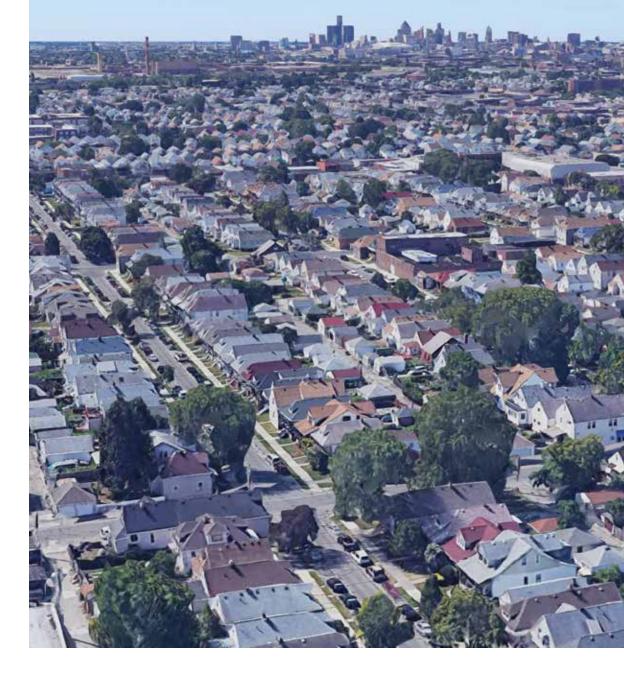




WHEN JERMELL COLEMAN was a high schooler in Detroit, he occasionally helped the local "tree man" cut limbs and branches, but he never expected to pursue a career in urban forestry. Yet decades later he's now employed by the new Detroit Tree Equity Partnership (DTEP), working to increase the equitable distribution of trees around the city - a concept called Tree Equity.

Tree Equity work is needed because communities of color have 45% less tree canopy on average than predominantly white neighborhoods, and low-income areas have 36% less tree canopy on average than the wealthiest neighborhoods. This is a problem because trees provide important benefits, such as heat reduction that can save lives, improved air quality and recreational access.

Facing page: As a member of the Detroit **Tree Equity Partnership** Flex Crew planting trees around Detroit. Jermell Coleman has found a new career in which he can take pride after more than six years in federal prison. Above: (From L to R) Jerry Norcia, DTE **Energy CEO; Senator** Debbie Stabenow: Jad **Daley, American Forests** president and CEO; City of Detroit Mayor Mike **Duggan; several DTEP** Flex Crew members, including Coleman; and Undersecretary Homer Wilkes help plant trees in the median of Oakman Boulevard at the DTEP launch event on Oct. 11, 2022.

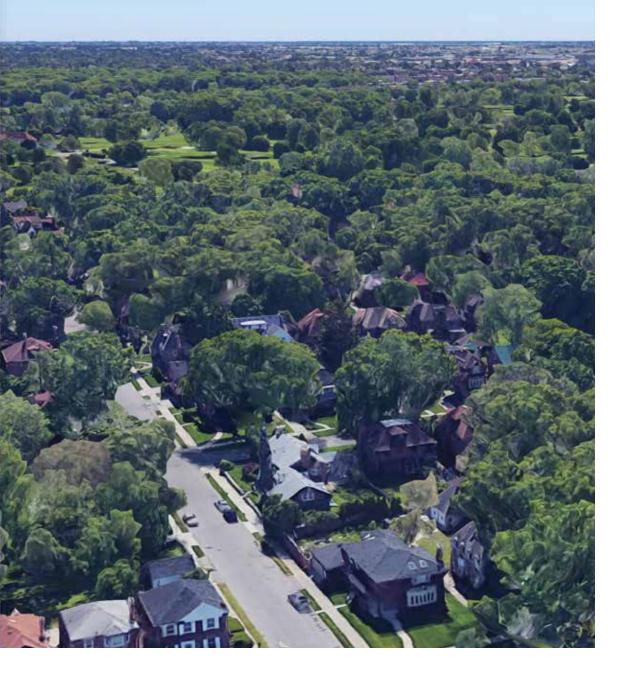


"When we think about the long-term climate issues we're seeing — from flooding to extreme heat — those most impacted should have a say in the solutions. All of these steps and the processes that we're thinking of putting in place are about that."

- ALEXIS GOMEZ, SENIOR MANAGER OF COMMUNITY ENGAGEMENT AT AMERICAN FORESTS

The partnership, a major civic initiative launched publicly by DTE Energy, American Forests, the City of Detroit, The Greening of Detroit and an array of additional partners in October 2022, has ambitious goals for its first five-years: planting 75,000 trees, investing \$30 million in greening Detroit neighborhoods and placing nearly 500 Detroit residents in jobs in the tree-care industry.

"We have a lot of big goals for DTEP," says Jenni Shockling, American Forests' senior manager of urban forestry in Detroit. "But it all starts with 'the one.' The one tree we plant or maintain that survives to realize its full potential; the one resident who has opportunity and takes pride in what they do; the one case of asthma or heat illness that may be prevented."



Above: Two Detroit neighborhoods have widely varying tree canopy. Trees are critical city infrastructure, and those with less tree cover have increased health risks, fewer recreational opportunities and higher utility costs. DTEP aims to reduce this inequity in tree distribution.

Coleman, now 42, is one of those residents finding new opportunity with the project. After his release from a six-year stint in federal prison in early 2022, he participated in The Greening of Detroit's training program, Detroit Conservation Corps (DCC). After graduating from the DCC program and learning how to be a "tree man" in his own right, he joined the 10-man DTEP Flex Crew, which plants an average of 45 trees each day in season.

It's a job that provides its own satisfactions, as well as inspiring the joy of community members who appreciate the improvement in the city they love.

"There's a feeling of accomplishment, of pride," he says. "And I haven't seen this many smiles from strangers since I've been home [from prison]. There are a lot who are very happy about it; I'd go so far as to say 'elated.' People pull over when they see us and just clap."

#### **DIVING DEEP IN DETROIT**

Creating robust, effective urban forestry requires much more than putting trees in the ground. It starts with building partnerships, which are the bedrock of DTEP. A slew of public- and privatesector stakeholders have been involved since the first planning stages in 2016. Groups of participants meet as often as once a week to hash out everything from big-picture concepts to detailed logistics. DTE Energy is a driving force behind this work, helping

"That tree that we're putting in the ground is providing a job, which provides a wage, which is providing a livable income for an individual to live and succeed in life. It isn't just changing the landscape, but it's truly changing the lives of individuals."

- MONICA TABARES, VICE PRESIDENT OF OPERATIONS AND DEVELOPMENT AT THE GREENING OF DETROIT

> position the effort with elected officials and other corporate and philanthropic funders in the city.

The partnership seeks to embody servant leadership and elevate community perspectives. DTEP does this by working to include city residents in meaningful ways, as decision makers, neighborhood experts and long-term stewards. The goal is to develop a model that progresses from year to year, and that can adapt as a city's urban forestry priorities evolve.

"When we think about the long-term climate issues we're seeing — from flooding to extreme heat — those most impacted should have a say in the solutions," says Alexis Gomez, American Forests' senior manager of community engagement. "All of these steps and the processes that we're thinking of putting in place are about that."

Science guides every step of this partnership's work. It begins with the Tree Equity Score (TES), a first-of-its-kind, free, public tool that synthesizes complex data into a single number for every neighborhood to focus limited resources on maximum impact. To turn that number into action, the partnership deploys American Forests' comprehensive "change model" that incorporates a suite of technical tools, analyses and initiatives to help optimize urban forests for climate and public health benefits and achieve Tree Equity. These include community engagement, workforce development expertise and innovative financing. The change model also incorporates tree nurseries of genetically resistant varieties in vacant lots and building a local Tree Equity Score Analyzer tool, which allows local users to do scenario planning down to the parcel level.

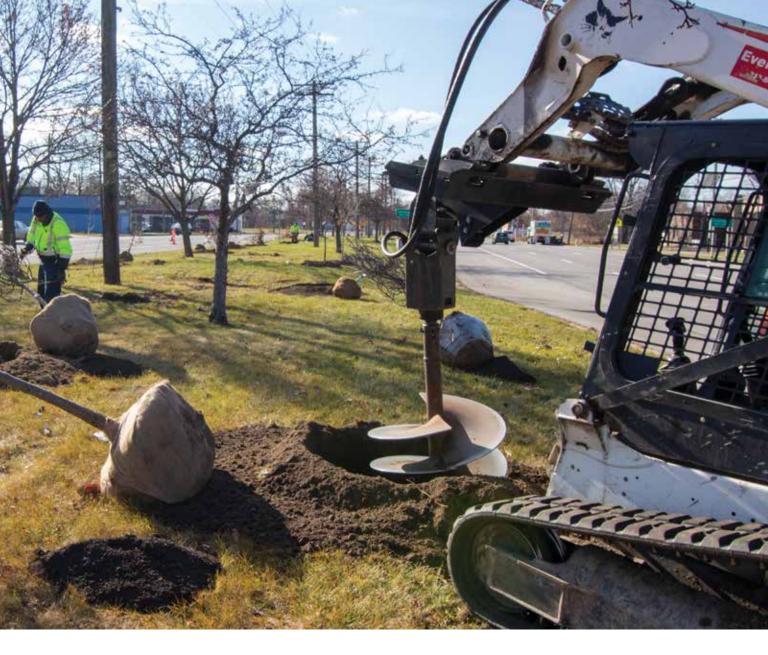
As the first city to incorporate every aspect of this change model, Detroit offers lessons for other cities that are looking to increase Tree Equity.

"I really like how this is unfolding, and how this model we're creating could be picked up

Top right: The members of the **DTEP Flex Crew** have formulated a productionline-type system to safely place 5-8 trees in rapid succession, a process that includes a skid steer with an auger attachment to efficiently dig holes. **Bottom right:** Coleman and the other members of the DTEP Flex Crew put the finishing touches on a planting on Fort Street. They are proud of their work to improve Detroit's



tree canopu.



and taken to other areas outside of Detroit," says Christy Clark, director of the environmental management and safety group at DTE and the company's coordinator for DTEP. "It's fantastic."

#### "A VIRTUOUS CIRCLE"

The partnership is also making the city's treecare job training and employment pipeline more efficient by coordinating two existing programs that aim to help people get long-term, secure employment in the industry. These are DTE's Tree Trim Academy, which helps Detroiters pursue careers as tree trimmers, and Detroit Conservation Corps, a workforce training program in urban forestry run by The Greening of Detroit.

"That tree that we're putting in the ground is providing a job, which provides a wage, which is providing a livable income for an individual to live and succeed in life," says Monica Tabares, vice president of operations and development with The Greening. "It isn't just changing the landscape, but it's truly changing the lives of individuals."

And beyond those benefits, it's influencing the city's economy, says Eric Candela, director of local government relations for American Forests: "We have the trees being grown in Detroit and planted in Detroit neighborhoods by Detroit residents. It's kind of a virtuous circle that keeps all the funding and opportunity in Detroit."

Coleman is a poster child for this approach. The neighborhood of his youth was full of trees - "It was shady and comfortable," he remembers. But over time, pests, diseases and weather wiped out the leafy canopy. "There used to be a tree at every house, and now you're lucky if you get a tree per block."

Living there again, he is now planting with his crew in nearby areas and feeling satisfaction from supporting his family by bringing nature back to struggling neighborhoods like his.

"This is my city," he says. "I get this real feeling of 'I'm at home.' It feels like it's getting to be Detroit again."





### **CREATING A BETTER COMMUNITY**

At the center of DTEP's approach is treating trees as assets that can support job and business opportunities, keep money in the community, and provide benefits for neighborhood safety, public health and recreational access.

"We're leading with equity, we've expanded capacity and we're looking at innovative funding mechanisms," Candela says. "The net effect is that people who live and work here are going to experience a much-improved quality of life... It's holistic and it's sustainable."

For residents like Erica Mixon, 49, the return of trees couldn't be more important for quality of life. Growing up in Detroit's leafy Rosedale Park area, she often sought solace for tumultuous emotions under a tree.

"All I knew how to do was pretend that things were all right, but in nature things were all right," she remembers. "Those were moments when things were okay, and I felt safe."

When she moved to her grandfather's house in a part of the city devoid of trees, she experienced what she calls a profound "culture shock." The leafless neighborhood — the site of a civil rights uprising in 1967 and a casualty of the subsequent crack epidemic — felt hot and desolate.

Now, more than three decades later, Mixon is a professional booster for the residents of that same community in her role as a community advocate for Central **Detroit Christian Community** Development Corporation. One thing she does in that role is help residents see the power of nature to improve their quality of life.

"I would so often say to myself 'I can't wait to be an adult so I can move far away from here," she says. "And now I'm that area's community advocate, and I am proud to be that."

She calls this irony, but it's also a sign of the power of civic engagement. By building on such pride-of-place and desire for change, DTEP is building a groundswell of support for trees and the benefits they bring — not a given in many Detroit neighborhoods.

"A lot of citizens believe the trees might be a problem for the plumbing; I've heard several reasons they might not want a tree near their residence," says Coleman. But "as soon as it's explained to them, they want more than one tree. They want to place trees all around the house."

The work is as much resident-to-resident as it is directed by the many organizational partners that unite to push it forward. Coleman often speaks to people whose neighborhoods the team is planting in, his chattiness making him the crew's unofficial spokesman.

"It's a great feeling to spread the understanding as well as participate in putting [trees] there," he says. "There are a lot of positive feelings tied with this job. There is a great benefit to me mentally to be coming into such a positive work environment and doing such a positive thing...You see smiles from people who are happy to see their city improving, tree by tree." •

Katherine Gustafson is a freelance writer specializing in helping mission-driven changemakers like tech disruptors and dynamic nonprofits tell their stories.



Above: Erica Mixon, a lifelong Detroiter, has always sought solace in trees. "A lot of mu friends didn't have a lot of the tangible things that I had, but none of that really made a difference in my life," she says. "What really made the difference was nature." **Bottom right:** Members of the **DTEP Flex Crew** used 4,000 pounds of Nespresso coffee compost to plant 72 trees on Fort Street in Detroit in December 2022. The Crew offers transitoru employment as its members seek fulltime placement in the private sector.

## **Deloitte.**



# Equity is at the core of a better future

At Deloitte, our purpose is to make an impact that matters by creating trust and confidence in a more equitable society. As part of the World*Climate* commitment to netzero with 2030 goals, we are embedding sustainable operating practices throughout our organization, helping our clients accelerate their low-carbon transformations, and catalyzing ecosystem-wide innovation. Deloitte is proud to donate to American Forests and their Tree Equity efforts to help make cities more inclusive, safe, resilient and sustainable.



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