GIANT SEQUOIA
LANDS COALITION

2023 Progress Report for Saving the Sequoias

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Introduction

Over the last decade, extreme wildfires have killed up to 20% of giant sequoias and severely limited their ability to reproduce. The largest trees on Earth face an existential threat, and how they endure in the coming decades will be determined by our actions today.

In this 2023 annual report, the Giant Sequoia Lands Coalition presents its collective ecosystemwide achievements that:

- Increase wildfire resilience in our forests and communities;
- Address long-term planning for climate change through research and monitoring;
- Increase the pace and scale of treatments to reduce destructive forest fuels through prescribed burning and restoration to more natural conditions;
- Increase efficiency through partnerships aimed at policy changes that allow for more swift action.

About the Giant Sequoia Lands Coalition

The Giant Sequoia Lands Coalition (GSLC) is a landscape-scale, multi-partner collaboration dedicated to the conservation and stewardship of giant sequoia grove ecosystems. Our coalition is composed of all federal, tribal, state and local agencies and organizations that manage giant sequoia groves in public, tribal or private nonprofit ownership. Our affiliate partners include select federal and state conservation agencies, nongovernmental organization conservation groups, and academic research partners with a shared commitment to protect and steward giant sequoias and their ecosystems from emerging threats associated with climate change and the extended absence of natural, low-severity wildfire processes on the landscape.

These organizations represent the Giant Sequoia Lands Coalition:

GSLC Members:

- Calaveras Big Trees State Park
- California Department of Forestry and Fire Protection (CAL FIRE)
- Sequoia and Kings Canyon National Parks
- Sequoia National Forest/Giant Sequoia National Monument
- Sierra National Forest
- Tulare County
- Tule River Indian Tribe of California
- University of California, Berkeley
- U.S. Department of the Interior, Bureau of Land Management
- Tahoe National Forest
- Yosemite National Park

GSLC Affiliate Members:

- American Forests
- Ancient Forest Society
- Giant Sequoia National Monument Association
- Save the Redwoods League
- Sequoia Parks Conservancy
- Southern Sierra Conservancy
- Stanislaus National Forest
- US Geological Survey—Western Ecological Research Center
- Yosemite Conservancy

A Letter from the Giant Sequoia Lands Coalition Co-chairs

The strength and promise of the Giant Sequoia Lands Coalition stood tall this year, as evidenced by the incredible science, education and stewardship contributions captured in this report. While the last few years of catastrophic fires and floods have had long-lasting impacts within our environment, local communities and economies, they have catalyzed new and stronger relationships within the coalition, focused our common purpose, and strengthened our commitment to the long-term conservation of our beloved giant sequoia trees and ecosystems.

This report illustrates the power of partnership. As we reflect on our first conversations about what a coalition could accomplish, never did we imagine we would grow to become the organization we are today. As co-chairs, we are grateful for how the promise of working as a collective has been shaped and embodied by all our partners. Together, we can achieve more than we can alone. And through this work, we are not only supporting the health of our sequoia groves, but we are also growing meaningful relationships and experiencing hope during times of crisis. Hope not just for those of us who are privileged to steward these incredible landscapes, but also hope for the next generation of stewards and the many generations to come.

As the coalition enters its third year in 2024, we have much to be grateful for, and we are inspired to see what the next three years can bring as we mature and grow.

With deep appreciation,

Teresa Benson
Forest Supervisor
Sequoia National Forest/Giant Sequoia National Monument

Clay Jordan
Superintendent
Sequoia and Kings Canyon National Parks

In Gratitude for Teresa Benson's Leadership

This year marks Teresa Benson's retirement after an incredible 35-year career. Her great leadership and contributions are captured in this report. Since the concept of the Giant Sequoia Lands Coalition was born, Teresa has been a great champion of the effort and has applied her passion and talent to ensure its success. While we will miss her on the Steering Committee, we are happy that she remains committed and plans to remain engaged in this endeavor. With Teresa's departure, we welcome new Co-chair Kevin Conway, CAL FIRE state forests program manager. Kevin, too, has been a champion since the coalition's inception, and he brings excitement, inspiration, commitment, and leadership to the organization.

–*Clay Jordan*

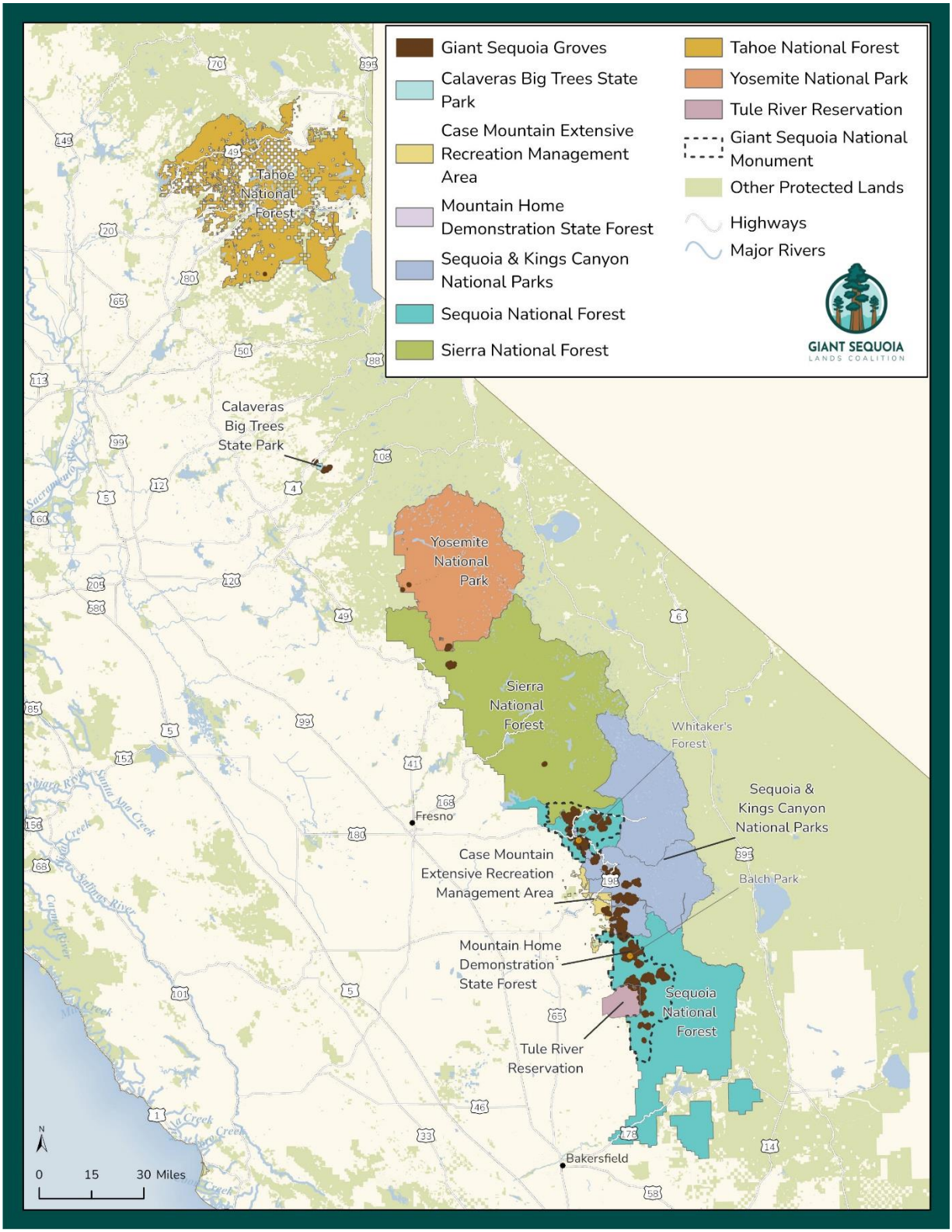
Scientific Studies Guide Restoration Work

Scientific studies provide critical insights that form the foundation for the restoration work happening across the giant sequoia range. While there exists a broad array of mandates and management cultures among the entities stewarding giant sequoias, there is strong scientific consensus for how we can address the emerging threats from a lack of recent beneficial fire, too much extreme and high-severity fire, and changing conditions associated with anthropogenic climate change. This consensus is based on decades of scientific research and observed results, and it is reflected in the coalition's conservation planning and the restoration initiatives described in this annual report.

Teams of scientists and partners also continue to collect and analyze data throughout the giant sequoia range to further advance our knowledge and inform land management activities. Teams include ecologists and professionals from:

- Ancient Forest Society
- California State Parks
- Colorado State University
- National Park Service
- Save the Redwoods League
- Tule River Indian Tribe of California
- University of California, Berkeley
- University of California, Los Angeles
- University of California, Santa Barbara
- University of Nevada-Reno
- U.S. Department of Interior, Bureau of Land Management
- U.S. Geological Survey—Western Ecological Research Center
- USDA Forest Service

Giant Sequoia Grove Locations



Map by Save the Redwoods League.

Achievements Since the Extreme 2020-2021 Wildfires	
Sequoia grove acres treated	14,143 of 26,000 acres
Native trees planted	542,243

In two years of coordinated, systematic restoration work, the Giant Sequoia Lands Coalition has completed treatments of priority areas in approximately half of the giant sequoia grove acres. The coalition's cumulative accomplishments demonstrate tremendous progress in protecting these world-renowned groves from existential threats.

The achievements of the coalition's partners over the past few years are significant. Together we are addressing short-term threats through continued stewardship and emergency actions, and our partnership is primed to address the longer-term needs of the giant sequoias at a landscape scale.

2023 Annual Report Summary	
Sequoia grove acres treated	9,886 of 26,000 acres
Total number of groves treated	28 of approx. 80 groves
Native trees planted	294,243
Cost of restoration work in 2023	$32.9 million
Number of personnel	941

Rangewide Restoration Achievements

In 2023, its second year, the Giant Sequoia Lands Coalition conducted restoration treatments on nearly 9,900 of 26,000 acres in 28 of approximately 80 groves. This is more than twice the amount of giant sequoia grove acres treated than the previous year. This essential restoration work increases the wildfire resilience of the groves by reducing the unnatural accumulation of hazardous and combustible plant material (fuels) through manual and mechanical fuels reduction, prescribed fires, managed wildfires, and cultural burning practices.

The coalition also worked to improve giant sequoia grove health through reforestation and planted more than 290,000 locally sourced native trees, including 119,000 giant sequoias on 1,340 grove acres. Combined with the previous year, the coalition has now planted more than 542,000 trees in two years. These reforestation projects focus on areas that experienced uncharacteristically high wildfire intensity where overstory seed trees have died, burned seeds were not able to develop, and insufficient regeneration has occurred naturally.

Project costs associated with the science and restoration work exceeded $32.9 million, and 941 people conducted the work.

Scientific Advancements and Monitoring

In 2023, research teams and land managers continued to focus ongoing studies on:

- Measuring the amounts of combustible and hazardous materials (fuel loads) within giant sequoia groves and the surrounding adjacent forests;
- Deepening the understanding of sequoia bark beetle biology and dynamics;
- Quantifying and responding to the impacts of high-severity fire on sequoia groves, including sequoia regeneration following severe fire conditions.

Several of those studies are described below and in the GSLC Member and Affiliate Member reports.

Sequoia Regeneration

To inform land management decisions and reforestation programs, researchers worked to identify whether areas needed replanting; these areas burned at high-severity and showed low densities of naturally regenerating sequoia seedlings. Two teams, using different scientific approaches, conducted studies in Sequoia and Kings Canyon National Parks to understand the densities of giant sequoia seedlings (the number of seedlings per area) that were needed to one day result in a population of adult trees at an abundance similar to groves that experienced fire regimes similar to historic norms.

Dr. Nathan Stephenson, scientist emeritus at the U.S. Geological Survey—Western Ecological Research Center, and collaborators submitted their findings for peer review in 2023. Available in preprint, their study, “Post-fire reference densities for giant sequoia seedlings,” analyzed 42 sites in eight giant sequoia groves that burned in 26 fires over the past 48 years. This study provides

conservative reference estimates of sequoia seedling densities following past fires, which can be used to interpret the effects of wildfires on regeneration.

Additionally, this team observed that after the initial post-fire burst of giant sequoia seedling reproduction, the amount and density of young giant sequoia seedlings declines rapidly. These findings are consistent with previously reported findings (Hartesveldt and Harvey 1967, Harvey et al. 1980, Harvey and Shellhammer 1991, Miller et al. 1994, Shellhammer and Shellhammer 2006, and York et al. 2013) and are due to high seedling mortality rates and low germination and establishment of new seedlings in subsequent years. Collaborating institutions on this work include the National Park Service and University of California, Los Angeles.

David Soderberg and Adrian Das, ecologists at the U.S. Geological Survey—Western Ecological Research Center, and collaborators applied the reference densities obtained in the Stephenson study to further assess sequoia mortality and regeneration. In their study, which is also available in preprint and was submitted for peer review and publication in 2023, the team found that areas experiencing high-severity fire are at substantial risk for loss of grove area with tree mortality rapidly increasing and giant-sequoia-seedling density simultaneously decreasing.

Reforestation

Given the high severity of the wildfires in 2020 and 2021, National Park Service scientists were concerned that there might be a need to plant seedlings to augment natural regeneration in some areas if mortality rates were high and natural regeneration rates were low enough to prevent recovery without intervention.

Sequoia and Kings Canyon National Parks completed an environmental assessment (EA) of re-establishing tree seedlings in severely burned giant sequoia groves and adjacent fisher habitat in 2023. Following public review of the EA, National Park Service released its decision to replant sequoias and other mixed conifers in the affected areas in the approved Finding of No Significant Impact (FONSI). The FONSI and supporting documentation, including a revised EA and response to public comments, are available on the NPS Planning, Environment, and Public Comment website. This is also where the public can keep informed of replanting efforts for each area, including data analysis and work plans.

Based on the decision tree outlined in the EA, up-to-date field surveys conducted by National Park Service and partners in 2022 and 2023 quantified seedling densities for giant sequoia and associated mixed conifer species. The densities were analyzed for Board Camp Grove and Redwood Mountain Grove. Based on these densities being unlikely to restore mature forest

without intervention, decision documents to proceed with planting in areas of these two groves were published in October 2023. Planting began in late October 2023. More than 100,000 tree seedlings were planted in Redwood Mountain Grove and the adjacent fisher habitat. Approximately 7,000 seedlings were planted in Board Camp Grove.

Assisted Gene Flow

Scientists from Sequoia Kings Canyon National Parks and Save the Redwoods League, advised by Dr. Rainbow DeSilva, University of California, Berkeley, conservation genetics expert, planned a research program on assisted gene flow. Assisted gene flow, or facilitated adaptation, means bolstering the genetic diversity or genetic attributes of giant sequoias (in this case) within their natural range. The scientists used seeds found in cones or on the ground, without altering these seeds. Save the Redwoods League created a planting experiment with a mix of arid-adapted seeds from three groves, a mix of regionally, genetically diverse seeds from three groves, and the local provenance, to compare growth. The planting experiment began in May 2023, and tree growth will be measured annually. See the Save the Redwoods League Affiliate Member report below for additional information.

Sequoia and Kings Canyon National Parks created four 2-acre plots with seedlings that were open grown (where no vegetation was removed and no other shrubs or conifers were nearby); grown with other nearby sequoias; grown with shrubs nearby; and grown with local and non-local genetics. This was designed as a two-factorial experiment to assess neighboring plants and genetics. Soil moisture and temperature sensors were placed to assess growing conditions.

Additional Research Programs

- The Ancient Forest Society continued their ongoing study examining where different giant sequoia trees get their water and how tree water use is affected by fire. See the Ancient Forest Society Affiliate Member report below.
- The National Park Service continued its studies on bark beetles, fuel load assessments and stand condition changes pre- and post-treatments.
- Monitoring in Sequoia National Forest continued on burned and treated giant sequoia groves to understand impacts of the fires on the large, burned trees and on the regeneration ability following high-severity fire.

See the member reports below for additional studies and monitoring.

Member Organization Reports

California Department of Forestry and Fire Protection (CAL FIRE)

The California Department of Forestry and Fire Protection managed restoration projects for Mountain Home Grove within Mountain Home Demonstration State Forest.

CAL FIRE completed a post-fire re-inventory revealing that more than 7% of the old-growth giant sequoias died in this grove as a result of the 2020 Castle Fire. Additional old-growth giant sequoia mortality was observed in 2023. CAL FIRE, USDA Forest Service, and tribal representatives investigated the dying trees with forest pathologists and entomologists who observed beetle activity and collected fungal specimens to investigate potential root diseases. A Forest Health Research Grant has been awarded to Ancient Forest Society to further study this phenomenon in 2024 within numerous groves throughout the range, including Mountain Home.

In 2023, a 10-person crew treated 440 acres, including the planting of 1,500 trees, 100 of which were giant sequoias. Other treatments of the acreage included pile burning and removal of hazard trees. CAL FIRE also awarded Forest Health Grants for giant sequoia conservation, provided crews to support numerous partners, and supported biomass processing and transportation infrastructure in the Southern Sierra Nevada through business development grants. The forest was closed to the public due to extensive damage to the county roads during winter storms.

California State Parks

California State Parks manages the North and South groves at Calaveras Big Trees State Park. Crews continued stewardship in both groves and conducted 279 acres of restoration treatments through broadcast and pile burning and manual fuels reduction. In the South Grove, approximately 650 giant sequoias and 100 mature sugar pine trees were prepared for future burn treatments (removing fuels around the trees' bases), and well over 350 snags were felled and over 200 were removed in preparation for the burns.

California State Parks spent more than $5.1 million on restoration work done by 225 people. The park's fuels reduction project was assisted by the California's Wildfire & Forest Resiliency Program, CAL FIRE, California Climate Investments Program in partnership with Save the Redwoods League, and Leslie Heavy Haul LLC.

California State Parks also focuses on public outreach and education programs virtually and in the park. Interpretive staff members facilitated 273 in-person summer programs, including campfire programs and guided hikes explaining beneficial fire. More than 9,000 students attended school programs virtually, and more than 2,500 students attended programs in person. In addition, the park provided free webinars, pop-up programs, special events and town hall meetings.

Thousands of giant sequoia seedlings sprouted in the North Grove of Calaveras Big Trees State Park in 2023 around "The Orphans" trees. Photo by California State Parks.

Also, after two old-growth giant sequoias in the North Grove, known as "The Orphans," were scorched during the 2022 prescribed burn, the park invited giant sequoia and wildfire ecologists to assess the trees' health. They observed that both trees are still alive and thousands of giant sequoia seedlings are growing around them.

Observing the trees in October 2023, Dr. Kristen Shive, assistant cooperative extension forest and fuels specialist at the University of California, Berkeley, noted in a statement, "Sometimes there are minimal losses of ancient trees even in a restorative prescribed fire. Giant sequoias are not museum pieces, and some mortality is part of this living, dynamic ecosystem. But the potential for minimal losses in prescribed fire is far preferable to the thousands of ancient trees that were killed in 2020 and 2021, when fuel-loaded forests burned in severe wildfires. It's great to see the park relying on the best available science to protect these incredible trees."

National Park Service

Sequoia and Kings Canyon National Parks

Sequoia and Kings Canyon National Parks contain 37 giant sequoia groves, ranging from a few to tens of thousands of giant sequoia trees per grove.

Crews planted giant sequoia seedlings in Board Camp Grove to re-establish the population after the extreme 2021 KNP Complex fire. Photo by the National Park Service.

In 2023, Sequoia and Kings Canyon worked closely with several partners to accomplish critical work to protect giant sequoias. Beyond the important research initiatives mentioned in the Scientific Advancements and Monitoring section above, fuels treatments and replanting were critical in post-fire recovery efforts. Not to be outdone, nature joined these efforts with a lightning strike that resulted in a beneficial, largely low-intensity wildfire near Redwood Meadow in Sequoia National Park. The Redwood Fire, which was ignited in August, was beneficial because of above-average precipitation the previous winter. The precipitation allowed for a confine-and-contain strategy instead of immediate fire suppression. This strategy resulted in beneficial burning in three remote giant sequoia groves that had been identified as at high risk. Now the groves will be much better protected against future potentially catastrophic wildfires.

Crews conducted a critical replanting project in two giant sequoia groves and adjacent fisher habitat. Replanting was deemed necessary in areas of Board Camp and Redwood Mountain groves, where natural regeneration wasn't sufficient to establish a new generation of sequoias following the catastrophic 2021 KNP Complex fire. Support and collaboration for this project stemmed from USDA Forest Service; Ancient Forest Society; University of California, Berkeley; American Forests; Eastern Sierra Conservation Corps; and University of California, Davis.

The accomplishments of 2023 were made possible in large part thanks to congressional funding from the Inflation Reduction Act, Bipartisan Infrastructure Law, and disaster supplemental funding for giant sequoia preservation, along with other federal, state and philanthropic funding.

Fuels treatments and replanting were critical in post-fire recovery efforts in Sequoia and Kings Canyon National Parks. Photo by Kristen Shive.

Yosemite National Park

Yosemite National Park contains three giant sequoia groves: Mariposa, Tuolumne and Merced groves.

In 2023, the park treated more than 350 acres in and around the Merced and Mariposa groves with biomass removal and broadcast burning as part of its parkwide fire management program. In Merced Grove, 11 acres within the grove and 31 acres around the grove were mechanically treated in preparation for prescribed fire. In Mariposa Grove, 20 acres within the grove and 134 acres around the grove were mechanically treated.

In late May, 68 acres within Mariposa Grove and 100 acres around the grove were broadcast burned. This burn connected the grove with the 2022 Washburn Fire footprint to the west, decreasing the potential wildfire threat to the nearby community of Wawona. According to the mechanical treatment prescription in both groves, conifers fewer than 20 inches in diameter were thinned, thousands of hazard trees were removed, and slash and large, downed woody debris was removed, chipped or piled.

Approximately $2.5 million was spent on fuels reduction in and around Merced Grove and Mariposa Grove through grants by California Climate Investments and California Wildlife Conservation Board; 66 people conducted the work.

Tulare County

Tulare County manages Balch Park, which includes part of Mountain Home Grove. Approximately half of Balch Park was affected by the 2020 SQF Complex fires, one of the largest fires in Tulare County history.

In 2023, Balch Park was impacted by extreme flooding due to historic rain and snowfall. The park remains closed due to road washouts requiring repair as well as reconstruction of the upper and lower pond dams. Staff members are working on obtaining a previous inventory of the Balch Park giant sequoia grove to determine a baseline of tree health and a resiliency assessment. The inventory will be used to create a priority framework to establish recovery planning elements that will restore and promote a sustainably managed forest.

A fuels-reduction project along main transportation corridors on USDA Forest Service land was developed to maximize resources and capacity between Tulare County and the Forest Service. Tulare County executed a Special Project Agreement of $4.5 million with the Forest Service. The county was awarded a $2.5 million grant from the Sierra Nevada Conservancy to provide matching funds for the project. A request for proposals was solicited for a Registered Professional Forester with a contract for services pending. Implementation of these projects will begin in early 2024.

Tulare County also collaborated with Yosemite Sequoia Resource Conservation and Development Council on an environmental study for the Posey and Sugarloaf communities on adjacent Forest Service lands. A public engagement effort to provide information and gather community input was held at the Posey Fire Station. Residents from the Posey and Sugarloaf communities attended and heard from partners from the Forest Service, Tulare County Resource Management Agency, Yosemite Sequoia Resource Conservation and Development Council, Tulare County Fire Department and the project consultants. The California Environmental Quality Act and National Environmental Policy Act environmental analyses will be completed in early 2024.

Tule River Indian Tribe of California

The Tule River Indian Tribe of California stewards portions of or all of five giant sequoia groves. These groves include Black Mountain, Red Hill, Peyrone, Parker Peak, and Cold Springs.

In 2023, the tribe continued its ongoing restoration efforts by treating 35 acres in the Parker Peak and Black Mountain groves and 175 acres in the surrounding forest. Restoration efforts

included fuels reduction, hazard tree removal, and reforestation. Crews hand planted 11,200 native trees, including 1,200 giant sequoias grown from seeds collected from Tule River Reservation sequoia trees.

As in previous years, fieldwork was completed by personnel employed by the Tule River Tribal Natural Resources Department. Approximately 20 experienced seasonal employees completed the 2023 restoration treatments. Restoration work in 2023 cost approximately $300,000.

University of California, Berkeley

The University of California, Berkeley, stewards Whitaker's Forest Research Station within Redwood Mountain Grove. This area was affected by the 2021 KNP Complex fire.

In 2023, the university conducted fuels reduction treatments across 2 acres by hand cutting, piling and burning. We also constructed a fence to help restore a meadow that was burned in the KNP fire. In addition, 300 giant sequoia trees were planted. This work sets the foundation for new, long-term research related to post-fire alternatives for enhancing resistance of large, old giant sequoias so that propertywide resilience can be enhanced. We also are monitoring giant sequoia seedling regeneration in response to the wildfire. Forty people completed 2023's work at a cost of $5,000.

U.S. Department of the Interior, Bureau of Land Management

The Bureau of Land Management manages the Case Mountain Extensive Recreation Management Area, which contains six giant sequoia groves totaling about 444 acres.

The Case Mountain Forest Health Improvement Project is an ongoing fuels-reduction and restoration project that made significant progress in 2023 toward achieving the planned fuels-reduction and restoration goals, treating 366 acres. Federal and contractor fire crews burned 91 acres of piles. Contractors also masticated (mulched fuels) on 275 acres, both within and around the groves. About 30 people worked on project operations, costing approximately $555,000. The project is expected to be complete in March 2025, and is well on its way to meeting that goal.

Additionally, staff members gave multiple tours and presentations of the ongoing work occurring at Case Mountain. The Resource Advisory Council, a committee serving as a sounding board for BLM projects and initiatives, attended a tour and a formal presentation of the project phases, objectives and accomplishments. A similar presentation was given at the BLM State

Forestry Leadership meeting. Attendees of both presentations were excited about the plans and progress made so far, and the project has the support of BLM headquarters and our citizen-based council.

The BLM also collaborated with staff at Sequoia and Kings Canyon National Parks (SEKI) in an effort to provide updated and accurate data of the Case Mountain giant sequoia grove boundaries. Sixteen SEKI staff members visited Case Mountain for a day to remap the boundaries of three of the six groves on the mountain. The team provided great data: Some groves were smaller than the historical grove boundaries, but several areas of young-to-midsize giant sequoias weren't captured within the historical grove boundaries. Some of these giants are estimated to be 50 years old and 30 to 50 feet tall. Over the winter, CAL FIRE will take a second look at the grove boundaries based on the data collected and aerial photography. In the spring, the team will reconvene to complete the boundary mapping of the Case Mountain groves.

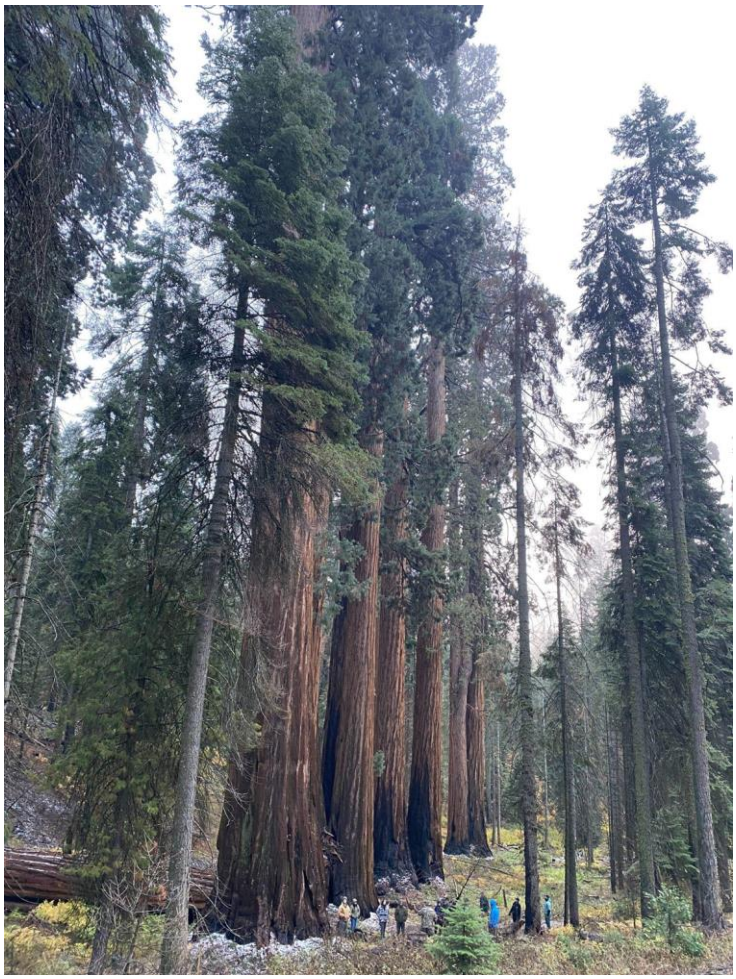
Tahoe National Forest reduces fuels in the Placer County Big Trees Grove in November 2023. Photo by USDA Forest Service.

USDA Forest Service

USDA Forest Service manages Sequoia National Forest and Giant Sequoia National Monument, Sierra National Forest, and Tahoe National Forest. Sequoia National Forest contains 33 giant sequoia groves, Sierra National Forest contains two and Tahoe National Forest contains one. Twenty-three giant sequoia groves suffered high-severity fire within the last five years. The Forest Service has increased its focus and active management in all its groves.

Sequoia National Forest

In July 2022, the chief of the Forest Service signed an emergency declaration for 12 unburned groves and portions of groves at high risk of wildfire. Two weeks later, the Forest Service began reducing fuels in groves in Sequoia National Forest.



Bearskin Grove in Sequoia National Forest was among the groves in which the USDA Forest Service reduced fuels in 2023. Photo by USDA Forest Service.

Overall, in 2023, the Forest Service reduced fuels in 12 groves and planted trees in four groves on more than 3,500 acres. Work was conducted in Bearskin, Abbot, Grant, Landslide, Indian Basin, Black Mountain, Belknap complex, Freeman Creek, Long Meadow, Starvation Creek, Nelder, Big Stump (Big Stump Redwood Fuels Restoration Project), Converse Basin (Rough Plantation Maintenance and Restoration Project), and McKinley. Each grove, except for Nelder and McKinley, is in the Giant Sequoia National Monument of Sequoia National Forest. The Nelder and McKinley groves are in Sierra National Forest.

Fuels reduction was completed in six giant sequoia groves encompassing 2,100 acres, removing more than 100,000 tons of biomass from the groves. As described in the Save the Redwoods League section below, the League partnered to complete fuels removal in Long Meadow Grove. Across Sequoia National Forest, crews created over 30,000 piles, and more than 15,000 have been burned.

The USDA Forest Service and partners reduced fuels in Long Meadow Grove in Sequoia National Forest. Photo by USDA Forest Service.

Approximately 590 Forest Service acres in the Big Stump Grove were broadcast burned in October. It was a joint effort in Big Stump Grove between Great Basin Institute, Sierra Nature Conservancy, PG&E, Sequoia and Kings Canyon National Parks and Sequoia National Forest.

Since 2021, more than 297,000 trees have been planted on more than 1,430 acres in Sequoia National Forest with the support of American Forests, Save the Redwoods League, and numerous other partners. More than 650 acres were reforested in Converse Basin, Long Meadow, Freeman Creek, Cunningham and Starvation Creek groves in 2023, with approximately 130,000 native trees, including 18,494 giant sequoia seedlings.

Five public information officers facilitated public meetings and media events in the Western Divide Ranger District and the Hume Ranger District. In addition, they created social media outreach, news releases, and flyers, and engaged with the public about the emergency work.

The Forest Service has spent more than $12 million and engaged a workforce of more than 200 people in the Giant Sequoia Emergency Response.

Sequoia National Forest will continue working on fuels treatments in giant sequoia groves. In June, Save the Redwoods League and the Forest Service signed an updated project agreement, which estimates spending $18.5 million in the first five years to accelerate the restoration of Long Meadow, Freeman Creek, Alder Creek and Packsaddle groves. American Forests is continuing to assist with identifying reforestation needs and cone collection, and Great Basin Institute continues doing restoration work around Converse Basin and will start near Evans Grove Complex. There are still plans to burn Wishon, Silver Creek and Burro Creek groves on the Western Divide, finish Big Stump on Hume Lake and burn more than 10,000 piles. Sequoia National Forest is also working on plans for an Evans Grove prescribed fire.

Sequoia National Forest and the Tule River Indian Tribe recently signed a memorandum of understanding focused on the co-stewardship opportunities in the forest. Sequoia National Forest also has initiated a contract, and the Tule River Indian Tribe plans to assist Sequoia National Forest with pile burning in Black Mountain Grove. Sequoia National Forest plans to collaborate on managing several sequoia groves in the near future.

Sierra National Forest

In Sierra National Forest, 70 acres of thinning and piling were completed within the McKinley Grove through a contract. In September and October 2023, three fuels-reduction contracts were awarded for Nelder Grove, one for helicopter-based treatments, one for mechanical ground-based treatments, and one with specific requirements within a developed recreation site and major archaeological site. The footprint covered by these contracts includes 730 acres, and they contain 1,478 acres of fuels-reduction activities (sum of acreage of all distinct activities). Work began in October 2023 for the aerial- and ground-based fuels-reduction contracts and good progress was made until late December. Overall, each of these contracts is about 50% or more complete, although it is difficult to report completed acres due to overlapping treatment activities.

Tahoe National Forest

Tahoe National Forest (TNF) maintains a 160-acre Special Botanical Area for the Placer County Big Trees, the northernmost and smallest grove of giant sequoias in the Sierra Nevada. The 2022 Mosquito Fire threatened the Placer County Big Trees Grove. Fire operations were conducted to protect the grove from adverse fire impacts and, fortunately, the fire stopped just before reaching the grove. In fall 2023, the TNF completed 5 acres of prescribed pile burning

within the Placer County Big Trees Grove to consume downed fuels created during Mosquito Fire protection efforts. To further protect this grove from future catastrophic wildfire, the TNF completed 304 acres of prescribed burns in units adjacent to the grove to reduce fuels and increase fire resiliency throughout the surrounding landscape. An additional 200 acres remain to be burned in the vicinity of the grove.

Tahoe National Forest burns piles of fuels in the Placer County Big Trees Grove, November 2023. Photo by USDA Forest Service.

Affiliate Member Organization Reports

A crew prepares to plant giant sequoia seedlings as part of American Forests' reforestation work. Photo by American Forests.

American Forests

As part of a multiyear, cross-boundary project to improve forest health through reforestation, American Forests worked closely with Sequoia National Forest personnel implement their reforestation projects in spring 2023–including planting more giant sequoia seedlings across 1,380 acres in and around giant sequoia groves. High-severity burn areas targeted for reforestation included Converse Basin, Freeman Creek, Long Meadow and Starvation Creek groves, which were deforested by the 2015 Rough, 2020 Castle, and 2021 Windy wildfires. Biochar and shade shelters were strategically utilized in the hottest and driest sites, and the effectiveness of these tools will be monitored by American Forests and USDA Forest Service.

American Forests worked with contractors to plant locally sourced, native tree species, including giant sequoias, to help the groves recover. Although spring storms brought many challenges such as washed-out roads and deep snow, seedlings were successfully planted while soil moisture and temperatures were ideal for the trees' survival. Through this partnership, another 1,600 acres or more will be planted in spring 2024.

A 2023 Cone Camp attendee cuts a giant sequoia cone to assess the health of a tree's seeds. Photo by American Forests.

Recognizing that adequate seed supply and genetic diversity is paramount to future reforestation efforts, American Forests also held three inaugural Cone Camp trainings across California, the first of which took place at Mountain Home Demonstration State Forest. With the goal of cultivating a larger pool of cone collection experts, this two-day, hands-on training brought together a mix of seasoned and early career foresters to help them prepare for successful cone harvests and to ensure best practices are not lost. More than 150 foresters learned from experts about cone surveying and collection management.

Ancient Forest Society

As part of an ongoing study examining where different giant sequoia trees get their water and how tree water use is affected by fire, scientists from the Ancient Forest Society collected sapwood samples from 45 trees in Giant Forest in June 2023 for stable isotope analysis, completing one full year of post-fire sampling. The society also collected sapwood samples from 32 trees in Mariposa Grove and from eight trees in Merced Grove. Soil samples were collected from 41 cores, as well as stream, groundwater, and precipitation samples in the three study groves for stable isotope analysis. A duplicate set of soil samples was collected for measurement of soil water content and other chemical and physical properties by Dr. Courtney Creamer at USGS Menlo Park. The society continued to maintain and collect data from treetop sap flow and weather monitoring systems installed in 10 trees in Mariposa Grove, two trees in

Merced Grove, and eight trees in Giant Forest. Sap flow and stable isotope sample processing and data analysis are ongoing, with plans to complete the study at the end of 2024.

In 2023, Ancient Forest Society launched a giant sequoia seed collection program in Yosemite National Park, Sequoia National Park and Calaveras Big Trees State Park. The organization collected an estimated 7.6 million seeds from 59 trees in 10 different groves for genetic conservation and to support reforestation efforts in severely burned groves.

Ancient Forest Society scientists collect giant sequoia seed cones in Merced Grove in Yosemite National Park. Photo by Ancient Forest Society.

While climbing the study- and cone-collection trees, the team also made observations of cone dynamics and bark beetle attacks in 104 giant sequoia trees across 11 groves in Yosemite National Park, Sequoia National Park and Calaveras Big Trees State Park. These beetle observations provide the foundation for a new project examining bark beetle attacks in giant sequoias in collaboration with Dr. Seth Davis at Colorado State University.

The society also worked with Drs. George Koch and Drew Peltier at Northern Arizona University to collect tree-ring radiocarbon isotope samples from five of our giant sequoia study trees and install a phenocam in the top of a tree in Mariposa Grove. To advocate for giant sequoias and discuss the society's research, the team climbed and filmed in Giant Forest with two

international media productions: CNN International's "Call to Earth" program and a French TV documentary, to be released in 2025, on the legacy of John Muir.

Save the Redwoods League

Save the Redwoods League owns and manages a portion of Alder Creek Grove in Giant Sequoia National Monument. The League also partners with the Sequoia National Forest on fuels reduction, forest health and post-fire restoration treatments in the national monument through a Master Stewardship Agreement signed in September 2022. This agreement currently covers four groves in the national monument to be treated over five years: Alder Creek, Freeman Creek, Long Meadow and Packsaddle. The League also supports stewardship activities at Calaveras Big Trees State Park.

In 2023, the League focused on Alder Creek and Long Meadow groves. Like much of the giant sequoia range, both groves were affected by recent wildfires, and portions of both groves burned at high severity.

In 2023 and in collaboration with coalition partners, the League treated 267 acres in and around giant sequoia groves on its Alder Creek property. This work included the final phase of a three-year post-fire restoration and reforestation project on 220 acres of the Alder Creek property, which cost more than $2 million and was completed by about 70 people. In 2021 and 2022, the League used manual and mechanical treatments to clear heavy fuel loads in portions of the property that burned at high severity, removing standing dead trees and conducting pile burns.

Save the Redwoods League and partners planted more than 50,000 native conifer trees in areas of Alder Creek Grove where the 2020 Castle Fire killed the large seed trees and the seed bank was lost. Photo by Smith Robinson Multimedia, courtesy of Save the Redwoods League.

The League in spring and fall 2023 planted more than 50,000 native conifer seedlings (including more than 33,000 giant sequoias) on portions of the property that burned at high severity. In this wider restoration project, the League's Dr. Joanna Nelson is leading conservation-genetics research in a smaller unit. Each of two sites contains three plots planted with seedlings from three arid-adapted groves and three plots planted with regional, high-genetic-diversity seedlings from three groves. A monitoring station was installed at each site to track conditions affecting the planted seedlings such as air temperature and relative humidity, soil moisture and temperature, and the spectrum of light that fuels photosynthesis. Seedlings were planted in May and monitored throughout the growing season. Data collection on the seedlings and growing conditions will continue in future seasons. A second experiment, led by Dr. Rob York of University of California, Berkeley, and supported by the League, investigates the impacts of two factors, giant sequoia seedling density and prescribed fire, on sequoia survival and vigor.

Also on the Alder Creek property, the League began implementation of a $2.7 million project funded by a Sierra Nevada Conservancy grant. The project focuses on the unburned or lightly burned portions of the property to improve grove health, reduce fuel loads and implement prescribed burning. In 2023, the League completed initial fuels-reduction work on 47 acres of a 275-acre project footprint. To implement this work, the League is focusing on advancing

workforce development while striving to maintain equitable workforce hiring. To dispose of some of the material generated, the League brought an air curtain burner (a low-emissions fuels incinerator), to the property, which operated for over two months.

In 2023 under the League's Master Stewardship Agreement, the League partnered with Sequoia National Forest to complete a 520 acres of fuels reduction, forest health and post-fire restoration work in and around Long Meadow Grove. An additional 80 acres within this project area was treated in fall 2022. The goal of the project was to protect remaining ancient giant sequoia trees from future high-severity wildfires and to prepare the groves for a warmer, drier climate and the reintroduction of prescribed burning.

Paul Ringgold (right), Save the Redwoods League chief program officer, discusses the operation of an air curtain burner with contractors in Alder Creek Grove. The burner is a low-emissions fuels incinerator. Photo by Save the Redwoods League.

League staff members and other coalition partners continue to conduct scientific surveys and research across the giant sequoia range. Science underpins restoration and stewardship work.

The League also continues to raise public awareness of the significant losses of giant sequoias due to high-severity wildfires and the work in progress to protect the groves. Staff members have hosted numerous media events and completed public outreach campaigns. They also have been in direct communication with neighbors of the groves.

Sequoia Parks Conservancy

Sequoia Parks Conservancy is the educational and philanthropic partner of Sequoia and Kings Canyon National Parks. For over 80 years, Sequoia Parks Conservancy has prioritized resource stewardship and public engagement with critical issues facing the two national parks. Sequoia Parks Conservancy joined the Giant Sequoia Lands Coalition in 2022 as a founding affiliate member.

In 2023, Sequoia Parks Conservancy's coalition-related activities focused on publications and mailings, giant sequoia public interpretive walks and talks, funding a giant sequoia film, building the Giant Sequoia Lands Coalition website, and fundraising. Sequoia Parks Conservancy awarded Sequoia and Kings Canyon National Parks $234,449 in grants for research, giant sequoia restoration and climate resilience science and management work.

Yosemite Conservancy

Yosemite Conservancy is the official philanthropic partner and cooperating association of Yosemite National Park. For more than 100 years, Yosemite Conservancy has worked closely with the park to fund high-priority projects that preserve park resources and provide an enriching experience for all visitors.

In 2023, Yosemite Conservancy provided a grant of $420,000 to support scientific research on the health and long-term persistence of giant sequoia groves across the coalition land base. Research activities carried out by park service scientists and partners from Colorado State University and the Ancient Forest Society focused on how giant sequoias acquire water and sustain life processes during sustained drought. More than 20 scientists and many volunteers were involved in collecting water samples from soil and vegetation to better understand how trees acquire, store and use water, and how these processes change in response to stress.

The grant also supported research on cedar bark beetles and their impact on short- and long-term giant sequoia health. Until recently, giant sequoias were thought to be resistant to pests and disease. Research is shedding new light on the presence and persistence of bark beetles, and how they adversely affect otherwise healthy trees.

What's Next in 2024

Giant Sequoia Lands Coalition continues to make great strides toward improving the health of the larger giant sequoia ecosystem, and there is still much work to do. As shown in this report, we can accomplish more together than individually. Members and affiliates are poised to strengthen and grow the coalition's impact in 2024, including developing a strategic roadmap for achieving collective goals; seeking funding to support shared research and project needs; and increasing the coalition's coordination capacity to deepen relationships and advance shared goals.

We know that to find scalable stewardship solutions that meet today's environmental, social and economic challenges, we must work together.

Thanks, Giant Sequoia Lands Coalition Supporters!

The Giant Sequoia Lands Coalition is grateful for the support of agencies and organizations who recognize the importance of the work to restore giant sequoia groves. Many of the 2023 accomplishments were possible thanks to generous contributions from Sierra Nevada Conservancy, Save the Redwoods League and many other donors and supporters.

Cover photo: Mariposa Grove of Giant Sequoias in Yosemite National Park. Photo by Wendy Baxter, Ancient Forest Society.

Glossary

Air curtain burner: an incinerator designed to aid in combustion and reduce emissions by directing a flow of air (air curtain) across a contained fire of vegetative debris.

Broadcast burning: controlled applications of fire to fuels under specified environmental conditions that allow fire to be confined to a predetermined area, producing fire behavior and fire characteristics required to meet forest health objectives identified in a burn plan.

Fuel load: the total amount of combustible material in a defined space.

Fuels: combustible plant material such as grasses, shrubs, trees, and dead leaves.

Hazard tree: a tree with a structural defect from age, fire or disease that makes it likely to fall in whole or in part, causing injury or death to people or damage to property.

Manual treatment: vegetation management relying on hand pulling or breaking to either remove plants from the soil or break the top from woody plants

Mechanical treatment: vegetation management using cutting tools ranging from chainsaws to mechanized forestry equipment such as feller-bunchers.

Overstory: the top foliage from multiple trees that combine to create an overhang or canopy.

Pile burning: prescribed fire used to ignite piles of cut vegetation resulting from vegetation or fuels management activities.

Prescribed fire (aka prescribed burn or prescribed burning): the planned and controlled application of fire to the land under specified predicted weather conditions to accomplish the desired goals such as reducing fuel loads to prevent severe wildfires.

Prescription: a planned treatment of a forest site designed to change current stand structure or condition to one that meets management goals.

Reforestation: the process of replanting an area with trees.

Sap flow: the movement of fluid in the roots, stems and branches of plants. Sap flow is essential in maintaining the hydraulic connection between the soil and the atmosphere.

Slash: coarse and fine woody debris generated during logging operations or through wind, snow or other natural forest disturbances.

Snag: a standing dead tree.

Stand: a contiguous community of trees sufficiently uniform in composition, structure, age, size, class, distribution, spatial arrangement, site quality, condition, or location to distinguish it from adjacent communities.

Thinning: removal of some trees from a stand to give others more room and other resources to grow.

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