Healthy Forests and Fire Prevention Programs:

Funding Report

Outcomes of CAL FIRE's $200 Million Annual Greenhouse Gas Reduction Fund Appropriation
Fiscal Years 2019-20 through 2023-24

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Executive Summary

In 2018, Senate Bill (SB) 901 (Dodd, Ch. 626, Stats. 2018) was signed to address the impacts of increasing threats from catastrophic fires. It intended to appropriate $200 million annually to CAL FIRE through the 2023-24 Fiscal Year from the Greenhouse Gas Reduction Fund, accumulating to $1,030,000,000 from Fiscal Year 2019-20 to 2023-24. CAL FIRE utilized these funds for forest health, fire prevention, and wildfire resilience activities.

SB 63 (Stern, Ch. 382, Stats. 2021) required CAL FIRE to report to the Legislature the outcomes of the projects implemented with this appropriation, a description of the projected carbon sequestration impacts, recommendations for improving the Forest Health and Wildfire Prevention Grants programs, and an assessment of the potential benefits, including unmet need, for continuing the commitment to these programs.

As of December 2024, CAL FIRE awarded $781 million to 668 grants and contracts. Additionally, the Fuels Reduction Crews and California Conservation Corps completed a combined 316 fuels reduction projects over five years. Although many projects are ongoing, modeling and recent initiatives like the Fuel Treatment Effectiveness Reporting Dashboard and Forest Health monitoring program provide insights into the effectiveness of these efforts. Key expected outcomes include increased forest resilience, improved fire dynamics, carbon sequestration, more fire-adapted communities, economic benefits, improvements in social and cultural well being, biodiversity conservation, improved water security and air quality, and strengthening wetland integrity.

The work funded by SB 901 is anticipated to yield significant benefits in forest health and wildfire prevention, as detailed in the expected outcomes. These initiatives represent substantial commitments to improving California's forest and community resilience against wildfires. That being said, several changes could improve outcomes for the Forest Health and Wildfire Prevention programs. These include:

- Modifying grant programs to support resilience in non-forested areas vulnerable to wildfire;
- Additional funding dedicated for maintenance treatments;
- Streamlining grant program administration, including making funds available more quickly each fiscal year and keeping reporting requirements more consistent;
- Maintaining or expanding existing statutory exemptions from the California Environmental Quality Act for restoration projects, projects on tribal lands, and projects on federal lands;
- Supporting refinements in benefit assessment methodologies to more accurately predict project outcomes and optimize benefits.

Demand for grant funding remains high—the Forest Health and Wildfire Prevention grant programs received requests for nearly three times the funding available through their solicitations over the five years covered by this report, and the Forest Health Research grant program received requests for nearly five times the available funding during that same timeframe. Maintaining funding for these grant programs, plus supporting private investment in wildfire resilience work, will be necessary for the State to reach its long-term goals.

Introduction

Fire has been an important process in many California ecosystems for thousands of years. Fires intentionally set by Indigenous people or sparked by lightning have played a key role in fostering habitat diversity, removing competition, and promoting desirable plants for food and materials. Many forest systems, particularly the mixed-conifer forests of the Sierra Nevada, evolved in the presence of frequent, generally lower-severity fires that reduced understory competition from shrubs and younger, shade-tolerant tree species, coming to be dominated by large, widely spaced trees resilient to disturbance (Stephens et al., 2007).

The State's forests today look very different than they historically did (Figure 1). Past logging practices that began in the 1800s harvested many of the largest trees that were most resistant to wildfire.

Figure 1: A Lassen County Ponderosa pine stand, circa 1925. The openness of the stand suggests a frequent fire regime (Albert Everett Wieslander).

The attempted destruction of Indigenous communities and forced removal from the land, as well as the implementation of strict fire suppression policies in the early 1900s, almost entirely eliminated fire from the landscape. As a result, many of the State's forests are now choked with densely packed shrubs and small, flammable trees that have the potential to carry fire into the tree canopy, leading to stand-replacing fires (Hagmann et al., 2021). The size and frequency of fires, particularly those that burn a greater proportion of land at high severity, have significantly increased since the 1990s (Safford & Stevens, 2017). Fire-stimulated shrubs outcompete young tree seedlings in these post-fire landscapes, suppressing the growth of the seedlings that manage to get established and potentially leading to wholesale conversion of forests to shrublands (Coop et al., 2020). This combination of increased high-severity fire and post-fire regeneration failure could result in the loss of almost half of California's forested area by 2070 (DeLyser et al., 2025).

Most of the investments highlighted in this report have been targeted toward forests, so these systems are the focus of the report. However, it should be noted that the State's chaparral and shrubland systems face different challenges. Many of these lands historically burned infrequently, but at high severity. Many of the State's shrublands, particularly in southern California, now

experience more frequent ignitions, making them susceptible to conversion to non-native grasslands and putting nearby communities at risk (Grupenhoff & Safford, 2024).

Climate change is further stressing the State's natural systems. Hotter and drier conditions have left forests even more vulnerable to fire and other disturbances such as insects and pathogens. And as the State's population grows, more people than ever are living in the wildland-urban interface (WUI) where homes and infrastructure are particularly vulnerable to wildfire threats. As of 2020, nearly 14 million people, one-third of California's population, are estimated to live in the WUI (Kimelman, 2025).

Californians are seeing the catastrophic results of past land use, management decisions, and a warming climate. The nine largest fires in recorded State history have all occurred since 2017, and 14 of the 18 most destructive fires have occurred over the same period (*California Wildfire Statistics*, 2025). These massive and destructive fires have occurred even with the dramatically increased investments California has made in its firefighting forces. The wildfires that escape suppression efforts have been the ones burning under the most extreme conditions and at the highest intensities. In fact, while the average acreage burned each year still remains below estimates of fire activity prior to widespread Euro American settlement, the percentage of acreage burned at high severity was estimated to be four times higher from 1984-2020 than in pre-Euro American times (Williams et al., 2023).

These catastrophic wildfires have widespread impacts. Beyond the tragic loss of life and property, high-severity fires can degrade air and water quality, destroy habitat, cause a variety of economic losses, and affect social and cultural well-being (Feo, 2020). Under the status quo, wildfires will continue to be ever more destructive, particularly as the climate continues to become warmer and drier.

Scientists, fire officials, and land managers have reached consensus that addressing this crisis will require an active management approach to restore forests' resilience to fire. This must involve reducing the density of trees and woody debris, promoting growth of larger, fire-resistant trees, and ultimately restoring the role of healthy fire to the landscape (Prichard et al., 2021). Efforts to prepare homes and communities for wildfire will also be necessary, including establishing defensible space around infrastructure, hardening homes to resist fire, and planning and educational efforts (*Fire Adapted Communities*, 2024).

Recognizing this, the State of California has released a series of strategies and plans with ambitious goals for wildfire resilience, including:

- The Forest Carbon Plan (2018), which outlined strategies to improve forest resilience and carbon sequestration;
- The Wildfire & Forest Resilience Action Plan (2021), which included a suite of actions to meet a goal of scaling up wildfire resilience treatments to 1 million acres annually by 2025;
- The California Climate Adaptation Strategy (2021), which detailed steps to prepare for the impacts of a changing climate at the State, regional, and local levels;
- The Natural and Working Lands Climate Smart Strategy (2022), which set near-term priorities for climate action and nature-based solutions, including proactive forest management;
- The AB 32 Climate Change Scoping Plan (2022), which highlighted the need for at least 2.3 million acres per year of treatments in forests, shrublands, and grasslands to minimize carbon losses from natural and working lands; and

- California Nature Based Solutions Climate Targets (2024), established under AB 1757 (C. Garcia, Ch. 341, Stats. 2022), which set a goal of 2.5 million acres of beneficial fire and other fuels reduction treatments annually by 2045, plus additional goals for post-fire reforestation, forest, shrubland, and grassland conservation, and urban greening.

Senate Bill 901

The State policies listed above have been accompanied by a historic level of investment. In 2018, Governor Newsom signed SB 901 (Dodd, Ch. 626, Stats. 2018) to address the wildfire crisis. The law included a provision stating the Legislature's intent to appropriate $200 million per year to CAL FIRE through the 2023-24 fiscal year from the Greenhouse Gas Reduction Fund (GGRF). Specifically, $165 million was to be "for healthy forest and fire prevention programs and projects that improve forest health and reduce greenhouse gas emissions caused by uncontrolled wildfires," while $35 million was "to complete prescribed fire and other fuel reduction projects through proven forestry practices consistent with the recommendations of the Forest Carbon Plan, including the operation of year-round prescribed fire crews and implementation of a research and monitoring program for climate change adaptation."

The Legislature and the Governor followed up on this commitment, appropriating approximately $200 million each year until 2021, when Senate Bill 155 continuously appropriated the same amount annually through the 2028-29 fiscal year.

CAL FIRE has used this $200 million annual appropriation to fund a variety of forest health and wildfire resilience activities through the grant programs listed below (summarized in Table 1). All figures represent the SB 901 appropriation only, as most of these programs have additional funding sources, and represent commitments through December 2024. For more information on these programs, see Appendix A.

Program	Awards	Amount Awarded
Forest Health	86	$418,867,633
Wildfire Prevention	424	$272,470,911
Business & Workforce Development	32	$29,938,503
Forest Health Research	70	$24,534,882
Forest Legacy	6	$12,994,964
Urban & Community Forestry	10	$10,226,668
Wildfire Resilience	3	$8,732,918
California Forest Improvement Program	37	$3,207,961
Total	**668**	**$780,974,441**

Table 1: CAL FIRE Grants Awarded from the SB 901 Appropriation. Number of awards and amount awarded are as of 12/31/2024. Numbers may differ from the 2025 California Climate Investments Annual Report, which includes cumulative appropriations, some of which pre-date SB 901.

- Forest Health. This program provides grants to regionally based partners and collaboratives for landscape-scale fuels reduction, prescribed fire, reforestation, pest management, and forest biomass utilization. $418.9 million has been awarded to 86 landscape-scale projects,

which will result in the treatment of more than 233,000 unique, or footprint, acres[1] by the time these projects are completed.

- Wildfire Prevention. These grants fund hazardous fuels removal around communities or infrastructure, wildfire prevention planning, and wildfire prevention education with an emphasis on improving public health and safety.
  CAL FIRE has awarded nearly $272.5 million to 424 grants around the state: 325 hazardous fuels reduction projects, 62 planning grants, and 37 education grants.
- Business and Workforce Development. These grants promote healthy, resilient forests throughout the State through 1) supporting wood products and bioenergy projects and operators, and 2) workforce development projects within the forestry and wildfire sector. CAL FIRE has awarded $29.9 million in GGRF dollars to 32 grants. 14 of these grants have been for business development projects, 10 have been for business research and development projects, and eight have been for workforce development projects.
- Forest Health Research. The research program supports scientific studies that provide critical information and tools to forest landowners, resource agencies, fire management organizations, and policy makers across California on a variety of topics related to forest health and management (see box at right). CAL FIRE has awarded $24.5 million via 61 research grants and nine research and monitoring contracts.
- Forest Legacy. This program achieves protection of environmentally important forestland threatened with conversion to non-forest uses, through CAL FIRE's purchasing of conservation easements or fee title of productive forestlands from willing sellers. The SB 901 appropriation has contributed nearly $13 million to the purchase of six conservation easements, which have conserved more than 9,300 acres. These lands will promote sustainable forest practices that provide economic value from the land and encourage long-term land stewardship.
- Urban and Community Forestry. These grants fund tree planting, monitoring and management, and utilization of urban tree waste for wood products and bioenergy. $10.2 million has supported three urban wood utilization grants and seven urban forest expansion grants, funding the planting of more than 14,000 trees in primarily disadvantaged neighborhoods.
- Wildfire Resilience. These block grants provide funding to regional applicants who serve as aggregators, providing technical and financial assistance to groups of nonindustrial forestland owners ranging in size from 3 to 5,000 acres in a specific region. $8.7 million of

Project Spotlight: California Fire Science Consortium

Research around wildland fire and forest management is developing rapidly. The California Fire Science Consortium (CFSC) is a network of scientists and managers facilitating the flow of this information to governmental and non-governmental stakeholders. A Forest Health Research grant allowed CFSC to diversify their methods of disseminating the latest science to maximize understanding and use of key findings. From June 2022 through December 2024, with the support of the CAL FIRE grant, CFSC conducted more than 1,100 outreach activities, including webinars, conferences, workshops, trainings, and field tours, reaching an estimated 160,000 people. Read more.

[1] Unique/footprint acres represent the geographic area treated by one or more projects. An acre treated multiple times (e.g., by thinning, biomass removal, and prescribed burning) would still only be counted as one unique acre.

the SB 901 appropriation has funded three Wildfire Resilience block grants to the Sonoma, Shasta Valley, and Feather River Resource Conservation Districts, supporting fuels reduction and post-fire reforestation treatments on 2,800 acres and planning assistance for additional lands.

- California Forest Improvement Program (CFIP). This program provides cost-share assistance for improved management of California's private, nonindustrial forestlands and resources to ensure adequate high-quality timber supplies, related employment and other economic benefits, and the protection, maintenance, and enhancement of productive and stable forests for the benefit of present and future generations. $3.2 million has been awarded to 37 small landowners, supporting forest management activities on more than 1,500 acres.

Additionally, funding has been allocated to the following other departments:

- The California Conservation Corps receives an annual $5 million appropriation, amounting to $25 million for the period covered by this report. With this funding, Corpsmembers implement forest fuel reduction, habitat restoration, and other projects that reduce greenhouse gas emissions.
- The California National Guard received one-time funding of just over $9 million to assist with implementing high-priority fuels reduction projects in response to Executive Order N-05-19.

Figure 2: The approximately 877 projects funded or implemented by CAL FIRE with the SB 901 appropriation, including both grants and projects supported by CAL FIRE Fuels Reduction Crews.

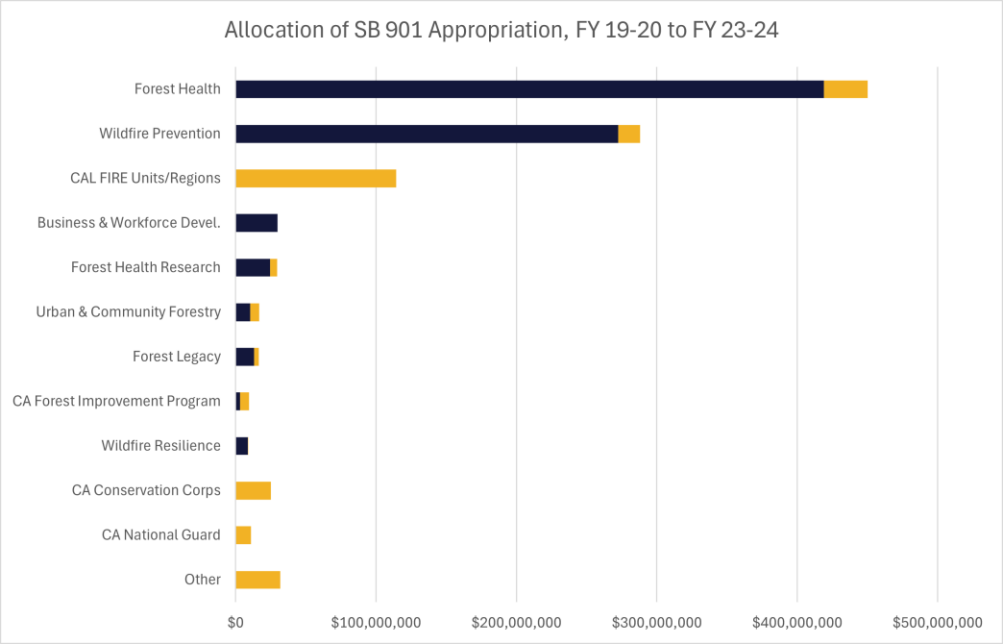

Figure 3: Allocation of the SB 901 appropriation to CAL FIRE programs and partner departments. The blue portions of the bars represent grants awarded as of December 2024, with the yellow remainder representing program administration costs, grant funds not yet awarded as of December 2024, and other personnel/operating expenses. The CAL FIRE Units/Regions allocation includes funding for the Fuels Reduction Crews, plus additional personnel and operating expenses. Note: With a few exceptions, these amounts do not reflect instances in which funding was shifted between programs after it was initially allocated.

Finally, funding has supported CAL FIRE's own personnel and operations. Most prominently, this includes crews of wildland fire professionals who implement fuels reduction treatments around the State to protect communities and ecosystems from wildfire. These Fuels Reduction Crews are stationed at CAL FIRE Units and, working with other resources from CAL FIRE and partners, have played a key role in implementing 209 projects around the State over the period of the SB 901 appropriation. While crews often play a supporting role on projects, such as establishing containment lines for a prescribed burn, their work has contributed to more than 22,000 acres of work, i.e., "activity acres[2]." These projects, which include fuels reduction, prescribed fire, right-of-way clearance, and fuel break construction, are typically in support of CAL FIRE's Vegetation Management program or Unit Fire Plans.

CAL FIRE staff and operational expenses have also funded personnel who administer the grant programs described above, various service contracts in support of the programs described above and other related activities, and additional programs and projects related to fuels reduction and general CAL FIRE operations (including the Demonstration State Forests, Vegetation Management, and Mobile Equipment Management programs). See Figure 3 for a summary of funding allocations by program.

[2] Activity acres represent the total amount of work done on an area. This figure may be larger than the geographic area if that area received multiple treatments. For example, one acre treated by thinning, biomass removal, and prescribed burning would be counted as three activity acres.

Senate Bill 63

SB 63 (Stern, Ch. 382, Stats. 2021) requires CAL FIRE to report to the Legislature on the funds spent pursuant to SB 901—the approximately $200 million annual appropriation CAL FIRE received from GGRF from the 2019-20 fiscal year through the 2023-24 fiscal year. Due to a larger appropriation one year, this amounts to $1,030,000,000 (see Appendix B for a full breakdown of this appropriation).

The law requires this report to include the following:

1. The outcomes of the projects implemented, including, but not limited to, a description of the benefits for public safety, fire prevention, habitat, climate resiliency, and protection of important natural resources, including water quality and water supply.
2. A description of the projected greenhouse gas emission and carbon sequestration impacts for the year of implementation of a project and for administering programs based on the State Air Resources Board's forest health quantification methodology.
3. Recommendations for modifying the forest health grant program and the local assistance grant program to improve outcomes, benefits, durability of benefits, and Statewide benefits.
4. An assessment of the potential benefits, including unmet need.

Report Overview

The remainder of this report addresses the four provisions of the law listed above. The forest resilience and wildfire prevention work undertaken with the SB 901 funding is expected to produce numerous positive outcomes, from ecological benefits to community protection. These outcomes, including those specifically called out in the legislation, are organized around the Pillars of Resilience, a framework first developed for the Tahoe Central Sierra Initiative and adopted by California's Wildfire and Forest Resilience Task Force (Figure 3). The Pillars represent shared social and ecological values necessary for landscape resilience, and are as follows:

- Forest Resilience
- Fire Dynamics
- Carbon Sequestration
- Fire Adapted Communities
- Economic Diversity
- Social and Cultural Well-being
- Biodiversity Conservation
- Water Security
- Air Quality
- Wetland Integrity

Figure 3: The Pillars of Resilience (Wildfire and Forest Resilience Task Force)

A section on each Pillar describes how funded activities are expected to achieve beneficial outcomes for that value. These outcomes are quantified when reliable methods exist to do so and otherwise are described qualitatively.

Because many of the projects funded by the SB 901 appropriation have not been completed as of the writing of this report, the outcomes described here are primarily forward-looking estimates based on modeling of expected future conditions. Some of the outcomes may be more immediate, such as employment, while others, such as carbon sequestration from a reforestation project, may take decades to be fully realized. Many expected outcomes spur from changes in fire dynamics brought about by forest resilience work—reductions in fuel loading and density to levels more consistent with pre-Euro-American intervention will facilitate fires burning at lower severity, which will in turn benefit water security, air quality, biodiversity, and other outcomes. The realization of these benefits will depend on when, and under what conditions, these lands burn.

Additionally, because many of the projects funded by the SB 901 appropriation have not yet been completed, the expected outcomes presented in this report are primarily based on project plans at the time of award. Projects often change during implementation based on site conditions, labor costs, disruptions from wildfire, and other factors. The outcomes and acreages presented in this report are based on the information available at the time of writing and are subject to change.

While the forward-looking outcomes presented in this report represent reasonable estimates based on the best science available, CAL FIRE is also launching a Forest Health monitoring program to empirically study the on-the-ground impacts of work funded through the Forest Health grant program. Field data collection began in Summer 2025. Additionally, CAL FIRE's Fuel Treatment Effectiveness Reporting Program evaluates the real-world impacts of vegetation management treatments on fire behavior, ingress or egress, and fire suppression when they interact with wildfire.

As investments in forest resilience and wildfire mitigation have increased, efforts to measure the impact of these investments and summarize their cumulative impact have also grown. In parallel with CAL FIRE's efforts as part of this report, the Wildfire and Forest Resilience Task Force and its executive committee members, including the California Natural Resources Agency and the US Forest Service, are also advancing methods to detect landscape changes resulting from forest treatments and to quantify the resulting benefits. CAL FIRE will continue to collaborate with these partners and others to align efforts to measure outcomes.

To meet the requirements of SB 63, this report also provides recommendations for modifying the Forest Health and Wildfire Prevention grant programs, as well as an assessment of the need for continuing the SB 901 appropriation into the future.

Outcomes of SB 901 Projects

Forest Resilience

A resilient forest is one that maintains desired forest conditions, including structure, composition, and wildlife habitat, in the face of disturbance and is well adapted to climate change (North et al., 2022). Due to fire suppression and exclusion policies, selective logging of large-diameter, fire-resistant trees, and other management practices over the last century, forest structure and composition have been altered to the point where they are no longer resilient to contemporary disturbances, particularly in the face of hotter, drier climatic conditions. Modern forests are often characterized by exceptionally high fuel loads, dense ladder fuels caused by infilling shade-tolerant trees like white fir and incense-cedar, and a lack of large-diameter, fire-resistant pines that may act as a seed source in the post-disturbance environment (Gray et al., 2005), (Cocking et al., 2012). These factors have combined to create a crisis for California's forests in the face of increasingly severe wildfires and climate-driven droughts. Estimates of the scale of density reduction needed in California's forests range from 2.6 million to 7.1 million acres (*California's Forests and Rangelands: 2025 Assessment*, Forthcoming).

Resistance to disturbance is conferred by reducing stand density while also increasing the average diameter of the trees (Knapp et al., 2021), (Stephens et al., 2024). By removing ladder fuels and small-diameter trees, forest treatments reduce the probability of a fire spreading into the canopy of

Figure 4: Before (left) and after (right) a thinning treatment in San Mateo County in which small-diameter trees and shrubs were removed to reduce ladder fuels and improve forest resilience (San Mateo Resource Conservation District)

the trees, becoming a crown fire from which mortality is all but guaranteed (Brodie et al., 2024). Larger trees have thicker bark, enabling them to better survive a wildfire if there are not excessive fuel loads around the base of the tree. Decreasing stand density also reduces water competition and water stress in the late summer season, when trees compete for limited water deep in the ground (Sankey & Tatum, 2022).

While historical evidence suggests that California's fires have always burned with a mosaic of fire severities creating heterogeneous patches of low-, moderate-, and high-severity fire (Stephens et

al., 2007), the relative proportion of severely burned areas has increased significantly over the past two decades (Miller & Safford, 2012). This has resulted in large contiguous patches of severely burned areas without seed sources. Replanting seedlings is costly, logistically challenging, and may not be successful in all circumstances, but can still be a critical strategy for restoring forest resilience in areas that are out of reach of natural regeneration and in danger of conversion to shrublands (North et al., 2019). Reforestation outcomes are discussed in more depth in the Carbon Sequestration section.

The primary vehicle for improving forest resilience with the SB 901 appropriation has been CAL FIRE's Forest Health program. Many Forest Health projects alter forest structure and composition by removing small trees, reducing density and basal area to restore conditions more in line with those that existed 150 years ago (Figure 4). If effective, these treatments will reduce the need for reforestation in the aftermath of high-severity wildfire.

Wildfire is not the only disturbance threatening California forests. Overly dense forests are also susceptible to various native and non-native insects and diseases, with severe mortality observed in the aftermath of the 2012-2015 drought (Fettig et al., 2019). The Forest Health program has funded the removal of dead and diseased trees to prevent the spread of bark beetles, Goldspotted Oak Borers, and invasive shothole borers.

Forest resilience work to reduce density and replant following high-severity wildfire has also been funded through the Wildfire Resilience and California Forest Improvement programs. Additionally, the Business and Workforce Development program is facilitating forest resilience by increasing the critical capacity and infrastructure necessary to implement projects.

Finally, Forest Health Research grants have funded work to improve scientific understanding of resilient forests, including studies on the effectiveness of various fuels treatments in different ecosystems.

A description of the "Climate Resiliency" outcome required by SB 63 is covered in this section. Many of the subsequent outcomes in this report are secondary effects that are the result of improved forest resilience.

Methods

In accordance with California Climate Investments requirements, CAL FIRE applies the California Air Resources Board's Forest Restoration and Management Quantification Methodology to estimate the impacts of reforestation, forest pest management, fuels reduction, forest conservation, and biomass utilization activities (*Quantification Methodology: Forest Restoration & Management*, 2021). This involves using a forest growth simulation model called the Forest Vegetation Simulator to model the effects of treatments and get outputs such as changes in tree density, basal area, and aboveground and belowground carbon, which are well-established indicators of forest resilience (Knapp et al., 2021). The Forest Vegetation Simulator is the dominant growth-and-yield model used by the US Forest Service across the country, and it is tailored to California with four regions that are calibrated to the forested areas of the State.

Stand Density Index (SDI) is a commonly used forest metric to describe how many trees are in an area of forest, adjusted for the average tree size. It is standardized to a reference diameter of 10 inches so that forest stands can be meaningfully compared to each other across forest types and geographies. SDI is independent of both stand age and site quality and is helpful for understanding how competition affects tree growth and in turn, carbon sequestration. SDI is a unitless index that allows practitioners to make comparisons between stands and better understand the true density of the forest. For example, a fully stocked ponderosa pine forest in California has an SDI value of 315 to a max of 483, indicating high competition and high fire risk due to fuel continuity. In this forest type, competition begins around 265 and intensifies as SDI increases, while a moderately stocked and more fire resilient forest has an SDI of 170-265 (Long & Shaw, 2005). Forest treatments that reduce SDI values lead to less dense stands, thereby conferring greater resiliency to fire, drought, and pest-driven and disease-driven mortality (Furniss et al. 2022).

Reducing density alone does not maximize forest resilience; the Quadratic Mean Diameter (QMD) is another key indicator. This metric describes the average tree size in a stand but is weighted to capture the influence of larger trees. Thinning treatments increase the QMD of a forest stand by retaining larger-diameter trees and removing small-diameter trees to reduce overcrowding and allow the larger-diameter trees to thrive in the less competitive environment. In practice, forest managers use both outputs from the Forest Vegetation Simulator, SDI, and QMD to inform thinning treatments and promote more resilient forests.

The 74 Forest Health projects with a fuels reduction component were modeled with the Forest Vegetation Simulator, comparing a Baseline scenario where the forest stand is left unmanaged to a Treatment scenario where the relevant management actions were applied. Common forest treatments include thinning from below, mastication, prescribed fire, thin and pile burning, and biomass removal for use in wood products or energy production. Program-level changes in SDI and QMD were derived from acreage-weighted averages of project-level changes between the Baseline and Treatment scenarios.

Outcomes

The comparison of Baseline and Treatment scenarios reveals insights into the effectiveness of the treatments in promoting a more resilient forest structure. The effects of treatments can vary by treatment type, biophysical settings, and climate; however, simulations show consistent treatment effects across the suite of projects. This may be due in part to the local adaptations of project goals and treatments that were tailored to the local forest conditions.

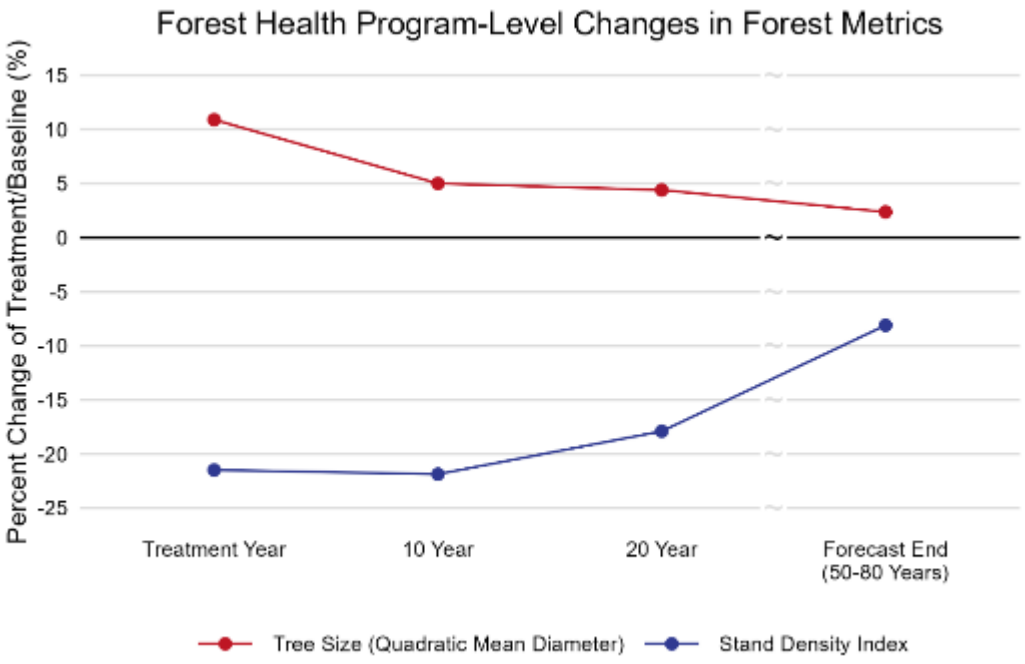

Figure 5: This graph shows program-level percentage changes between Baseline and Treatment scenarios for both Stand Density Index and Quadratic Mean Diameter. Differences are projected to be greatest immediately post-treatment. Source data is from fuels reduction activities on 151,527 acres, across 74 projects.

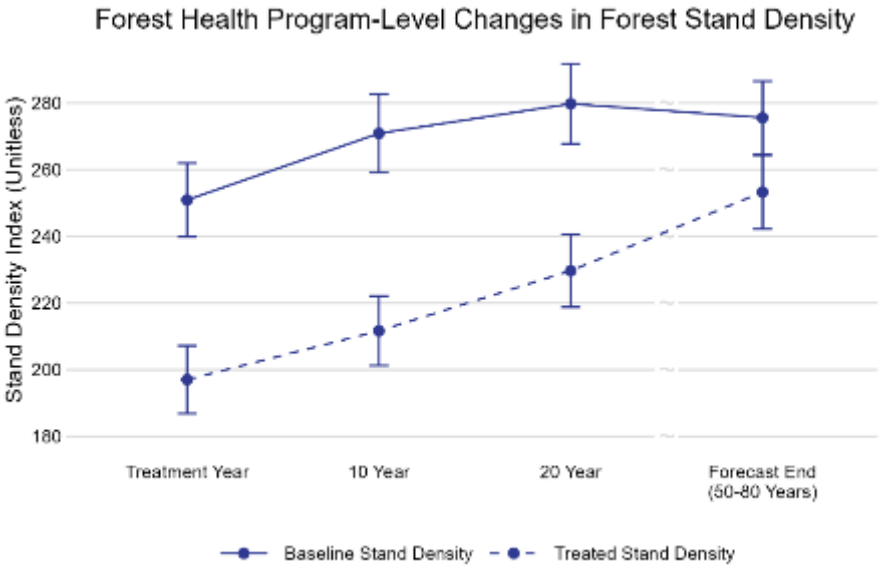

Figure 6: This graph shows program-level changes between Baseline and Treatment scenarios for Stand Density Index only. Differences are projected to be greatest immediately post-treatment. Source data is from fuels reduction activities on 151,527 acres, across 74 projects.

Fuels reduction treatments cover a total of 151,527 acres across 74 Forest Health projects. As shown in Figures 5 and 6, in the first year of project implementation, Forest Health projects are on average projected to reduce the Stand Density Index by 22%, from 245 to 185, while also increasing the Quadratic Mean Diameter from 11.0 inches to 14.1 inches, an 11% increase in diameter size. Metrics from individual projects can be found in Appendix C. These trends are expected to persist through the first 10 years after project implementation before diminishing, although future-year estimates are less reliable since the Quantification Methodology does not currently account for natural vegetation regeneration. Forest treatments will likely need to be reapplied every 10-15 years to maintain high levels of resilience to future disturbances (Collins et al., 2013).

Project Spotlight: Yurok Community Forest and Salmon Sanctuary

A Forest Health grant to the Humboldt County Resource Conservation District funded fuels treatments on more than 1,300 acres of second growth timberland in the Blue Creek Watershed. Blue Creek is the most important cold-water tributary to the Klamath River. Project goals included reducing fuel loads while retaining the healthiest and largest trees, facilitating the return of cultural burning practices, improving wildlife habitat, and creating employment opportunities for Yurok Tribe members. CAL FIRE modeling found that fuels treatments reduced Stand Density Index by 267 and increased Quadratic Mean Diameter by 11.6 inches, building resilience in this critical landscape. Read more.

Photo credit: CAL FIRE

Pest management activities conducted as part of seven Forest Health projects will result in treating 3,263 acres when all treatments are completed. These treatments involve removing dead and diseased trees and reducing stand density to prevent the further spread of pests and pathogens. Pest management activities are estimated to reduce the risk of infestations on average by 12.1%.

Sufficient data was not available to calculate changes in resilience metrics for projects funded by the Wildfire Resilience and California Forest Improvement programs, but these programs would be expected to have similar outcomes on a smaller scale. Projects oriented more toward community protection, such as those implemented by the Wildfire Prevention program, CAL FIRE Fuels Reduction Crews, and California Conservation Corps, would not be expected to result in significant improvements in forest resilience because these projects often focus more on clearing brush from roadways and infrastructure, creating and maintaining fuel breaks, and other treatments that protect communities but do not result in landscape-scale changes to forest structure.

Fire Dynamics

Fire is an integral part of most forest ecosystems in California, which are evolutionarily adapted to it. Fire serves a vital ecological function in many forest ecosystems by shaping and maintaining landscape structure, recycling nutrients, regulating biodiversity, and both consuming and generating forest fuels. Many plant species in California forests have evolved adaptations that enable them to survive under diverse fire regimes, such as fire-resistant bark, self-pruning branches, and the ability to regenerate through seeds and/or resprouting (Pausas et al., 2004). However, increasing wildfire size and severity across much of California may be shifting how trees and woody shrubs respond to fire. Ideally, in most California forests, wildfires would burn primarily at low to moderate severity in a mosaic pattern across the landscape, with limited high-severity patches. Such fires have substantial ecological benefits and, compared to high-severity wildfire, pose less of a threat to communities, infrastructure, water security, carbon stability, and air quality (Perry et al., 2011). The ecological role of fire is most relevant to landscapes outside of the wildland urban interface (WUI). Within the WUI, protection of life and property takes priority over the role of fire as a process. As a result, this Fire Dynamics Pillar focuses on areas outside of the WUI while the Fire-Adapted Communities Pillar pertains to areas inside the WUI.

As with the Forest Resilience Pillar, Forest Health grants are the main portion of the SB 901 appropriation benefitting fire dynamics. A primary goal of Forest Health treatments is to modify fire behavior by reducing fuel loads and overcrowded live vegetation. In fire models, flame lengths that exceed 8 feet are considered a proxy for high-severity fire (*Quantification Methodology: Forest Restoration & Management*, 2021). In the event of a wildfire, treatments implemented through many Forest Health grants influence fire dynamics by reducing expected flame lengths, therefore reducing the amount of high-severity wildfire. Forest Health projects also reduce the likelihood that the treated forest will burn if a fire occurs in the area. These reductions in the likelihood and extent of high severity fire are an integral way that forest managers hope to mitigate the effects of catastrophic fire and are achieved by increasing a forest's resilience to disturbance, as described in the Forest Resilience section above.

The Wildfire Resilience and California Forest Improvement programs also aim to reduce the likelihood of severely burned areas through similar methods, although on a smaller scale than the Forest Health program. Other programs implemented through the SB 901 appropriation, including Wildfire Prevention, Fuels Reduction Crews, California Conservation Corps, and National Guard projects may also influence fire dynamics by reducing the likelihood of unplanned ignitions.

A description of the outcomes for "Fire Prevention" requested in SB 63, is partially covered in this section, as well as under the Fire Adapted Communities Pillar below.

Methods

As described in the Forest Resilience section above, CAL FIRE models how Forest Health treatments change forest structure through the Forest Vegetation Simulator. A second component of the Forest Restoration and Management Quantification Methodology involves running the outputs from the Forest Vegetation Simulator through a fire behavior model called the Interagency

Fuels Treatment Decision Support System (IFTDDS) to simulate the effects of wildfire in an area with and without treatments. The IFTDDS platform uses the FlamMap engine as the core fire model that simulates potential fire behavior characteristics across the landscape, including fire spread rate and growth under fixed weather conditions, in the absence of fire suppression activities. Fire behavior is simulated under extreme weather conditions, with 97th percentile historical weather variables extracted from the closest Remote Automated Weather Station (RAWS) recorded from the mid-1980s to 2016.

Model outputs such as conditional flame length and conditional burn probability provide insights into how treatments are expected to change fire dynamics. These metrics are conditional in that they depend on a fire occurring in a forested area; once a fire has arrived at a site, the expected outcomes are captured in the model. Conditional flame length is an estimate of the mean flame length for all the fires that burn a given point on the landscape during a simulation. Conditional burn probability is an estimate of the likelihood that a specific location will burn, given a fire in the area. A treatment that lowers the conditional burn probability in the forest stand makes the stand less likely to burn once a fire starts nearby.

To assess expected changes in fire dynamics, CAL FIRE analyzed differences in the likelihood and extent of high severity fire by comparing the conditional flame lengths and conditional burn probabilities in the Baseline and Treatment scenarios of 68 Forest Health projects with fuels reduction treatments.[3] The conditional flame lengths and conditional burn probabilities were calculated for each treatment activity, plus the impact area, which is the area surrounding the treatment area that has not been directly treated but which benefits from the modification of fire behavior within the treatment.

Outcomes

Modeling results indicate that the 68 Forest Health fuels reduction projects of all treatment types funded by SB 901 will reduce the two key fire dynamics metrics, conditional flame length and conditional burn probability, across 147,841 acres (Figures 7 and 8).

[3] Several Forest Health projects that were part of the Forest Resilience analysis in the previous section were excluded from this analysis, either because the treatments were too small and sparse for the models to capture reductions in high severity fire and burn probability in the impact area, or because the model results showed that they did not have any high severity fire in the Baseline scenario.

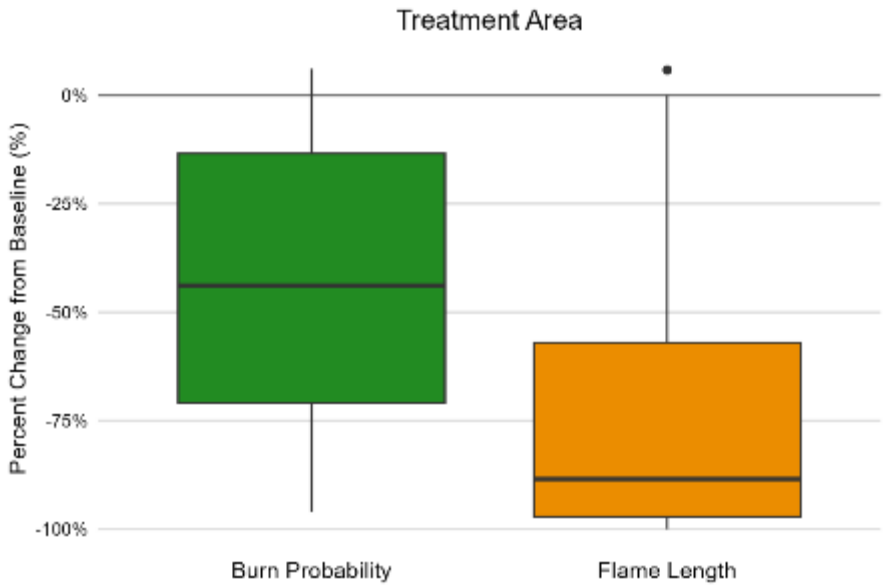

Figure 7: This graph shows Forest Health percentage changes between Baseline and Treatment scenarios in the Treatment Area for both Conditional Burn Probability and Conditional Flame Length, with the bold line representing the median change and the boxes representing the 1st and 3rd quartiles. Differences are projected to be greatest immediately post-treatment. Source data is from fuels reduction activities on 148,768 acres, across 68 Forest Health projects.

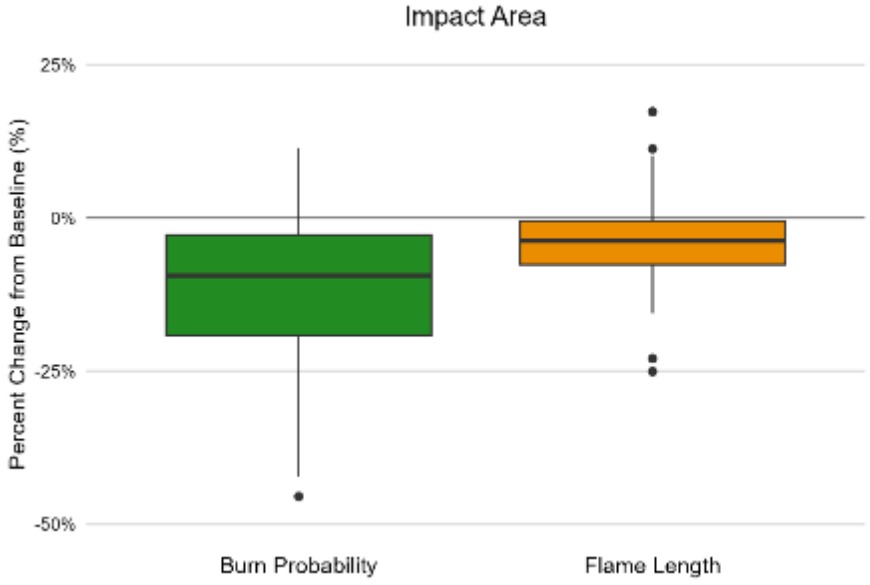

Figure 8: This graph shows Forest Health percentage changes between Baseline and Treatment scenarios in the Impact Area for both Conditional Burn Probability and Conditional Flame Length, with the bold line representing the median change and the boxes representing the 1st and 3rd quartiles. Differences are projected to be greatest immediately post-treatment. Source data is from fuels reduction activities on 148,768 acres, across 68 Forest Health projects.

Program wide, the median reduction in high-severity fire across these 68 projects is expected to be 88% in the treatment area, with a quarter of the projects resulting in a greater than 97% reduction in high severity fire. Similarly, the modeling found a 44% reduction in the median conditional burn probability within the treatment area, with a quarter of the projects resulting in at least a 70% reduction in conditional burn probability.

Smaller effects are expected in the impact areas, since these areas are not directly treated but still benefit from fire behavior modifications within the treatments. Impact areas range from 200 meters to over 2,500 meters wide, buffered around the outside of the treatment area. The 68 Forest Health fuels reduction projects are expected to reduce the likelihood of high severity fire by nearly 4% in the impact area, with a quarter of the projects resulting in at least a 9% reduction in high severity fire. The treatments are also expected to reduce the median conditional burn probability by more than 9% in the impact area, with a quarter of the projects resulting in greater than a 19% reduction in conditional burn probability. While these reductions are significantly smaller than those expected in the treated areas, they show that even untreated areas surrounding fuels reduction treatments are expected to benefit from those treatments. Fuels reduction projects funded by other programs that are oriented around communities and infrastructure can also influence fire dynamics, particularly by reducing the likelihood that unplanned ignitions grow into high-severity wildfires. For example, the San Luis Obispo Fuels Reduction Crew cleared 300 feet on either side of a road in the Santa Lucia Range, treating a total of 1,563 acres. IFTDSS model simulations suggest that these efforts will reduce conditional burn probability by nearly 20%. Projects implemented through the Wildfire Prevention program and by the California Conservation Corps are expected to have similar effects. Observations have confirmed that these projects can help prevent ignitions from becoming large wildfires (see box at left). All told, the SB 901 appropriation has funded 325 fuels reduction projects through the Wildfire Prevention program, 209 projects implemented at least in part by CAL FIRE Fuels Reduction Crews, and 32 fuels reduction projects implemented by the California Conservation Corps.

Project Spotlight: Highway 44 Fuel Break

Sometimes fuels reduction work can prevent a large wildfire before it starts. CAL FIRE Shasta-Trinity Unit's Fuels Reduction Crew, working with California Military Department crews in 2019 and 2020, treated more than 1,000 acres along Highway 44 in Shasta County with manual thinning, chipping, pile burning, and other means. Roadways are frequent wildfire ignition sites. In June 2024, a small fire was reported along the highway in an area that had been treated and subsequently maintained. Thanks to the minimal fuel on the ground, and a quick firefighter response, the blaze was contained to a 10'x10' area. Read more.

Photo credit: CAL FIRE

Carbon Sequestration

Carbon sequestration is the process by which carbon dioxide is taken from the atmosphere by trees, grasses, and other plants and stored as carbon in biomass and soils. Resilient forests can be net sinks of carbon and can play an important role in reducing greenhouse gas emissions into the atmosphere, thereby mitigating climate change (Buotte et al., 2020). Forest products also play a role in storing carbon for decades in building materials, thereby delaying emissions (Cabiyo et al., 2021). However, forests are at risk of losing carbon because of increasing rates of decay and disturbance, especially from high-severity wildfires (Jerrett et al., 2022). Increasing forest resilience and improving forest conditions to promote more low- and moderate-intensity wildfire can reduce long-term carbon loss from wildfire and ensure that carbon stored in forests is stable (Wiechmann et al., 2015), (Low et al., 2021).

When large, high-severity fires occur, reforestation projects can be critical for maintaining forested systems and increasing the rate of carbon sequestration. Seed availability is the primary factor that determines potential regeneration in a postfire environment (Bonnet et al., 2005), (Donato et al., 2009). Large wildfires kill the trees that might otherwise supply a seed source, thereby preventing seeds from arriving to the interior of high severity patches. Reforestation projects overcome this limitation by supplying the seedlings and preparing the ground for planting by removing excess dead fuels and in some cases, applying herbicide to reduce the competition from shrubs (Young et al., 2019), (North et al., 2019).

Carbon sequestration rates are relatively low in the first decade after planting as small seedlings develop their photosynthetic capabilities. When a tree matures, its ability to sequester carbon increases and the sequestration rate eventually decreases, usually after 50-60 years in mixed conifer forests and 80 years on drier, less productive sites. Reforestation projects also present an opportunity to plant for future climate conditions. The Climate Adapted Seed Tool (CAST) is being used by CFIP and Forest Health grantees to match planting sites with seed zones in lower elevations in anticipation of future climate conditions.

Several programs funded by the SB 901 appropriation are expected to produce carbon sequestration benefits. The Forest Health, Wildfire Resilience, and California Forest Improvement programs fund both fuels reduction to increase carbon stability and post-fire reforestation. Many Forest Health projects aiming to improve resilience also include a biomass utilization component, in which materials removed from the forest are converted into durable wood products or used for energy generation as a replacement for fossil fuels. Business and Workforce Development grants facilitate this biomass utilization through increased mill capacity and other necessary infrastructure. This helps reduce the immediate carbon impact of fuels reduction projects, expand the net benefits over the project lifetimes, and support jobs and rural economies.

Forest Health Research grants have supported this forest resilience and post-fire reforestation work through funding studies on climate-adapted seeds for reforestation and how treatments and wildfire interact to affect carbon stocks.

Forest Legacy projects prevent conversion of forests to developed lands, maintaining their ability to sequester carbon. These avoided-conversion projects protect the forest in perpetuity and may include an element of forest management to maintain resilience and revenue from wood products.

Urban tree planting funded by the Urban and Community Forestry program also sequesters carbon and can reduce energy consumption for cooling by providing shade.

Finally, projects oriented toward community protection, such as those implemented by the California Conservation Corps, CAL FIRE Fuels Reduction Crews, and the Wildfire Prevention program, are not expected to increase carbon sequestration on the landscape. However, these projects may also have carbon benefits if they reduce the likelihood of wildfire occurring.

A description of the projected greenhouse gas emission and carbon sequestration impacts requested in SB 63 is covered under this Pillar.

Methods

As described above, CAL FIRE applies the California Air Resources Board's Forest Restoration and Management Quantification Methodology to estimate the greenhouse gas impacts of reforestation, forest pest management, fuels reduction, forest conservation, and biomass utilization activities. Through factoring in changes in vegetation brought about by treatments and the expected outcomes of wildfire on the landscape with and without those treatments, it is possible to calculate the projected greenhouse gas impact of these activities. CAL FIRE applied this methodology to the Forest Health, California Forest Improvement program, Wildfire Resilience, Forest Legacy, and Fuels Reduction Crew projects for which sufficient data was available.

Reforestation activities have significant greenhouse gas benefits. Fuels reduction activities may have a positive or negative greenhouse gas impact. These treatments typically result in an initial reduction in carbon stored on the landscape, as small trees and brush are removed to improve the health of the remaining vegetation. Whether these activities ultimately result in a net greenhouse gas benefit depends on the assumed probability that the landscape will be affected by a wildfire occurrence during the period of treatment effectiveness (Figure 9 and 10).

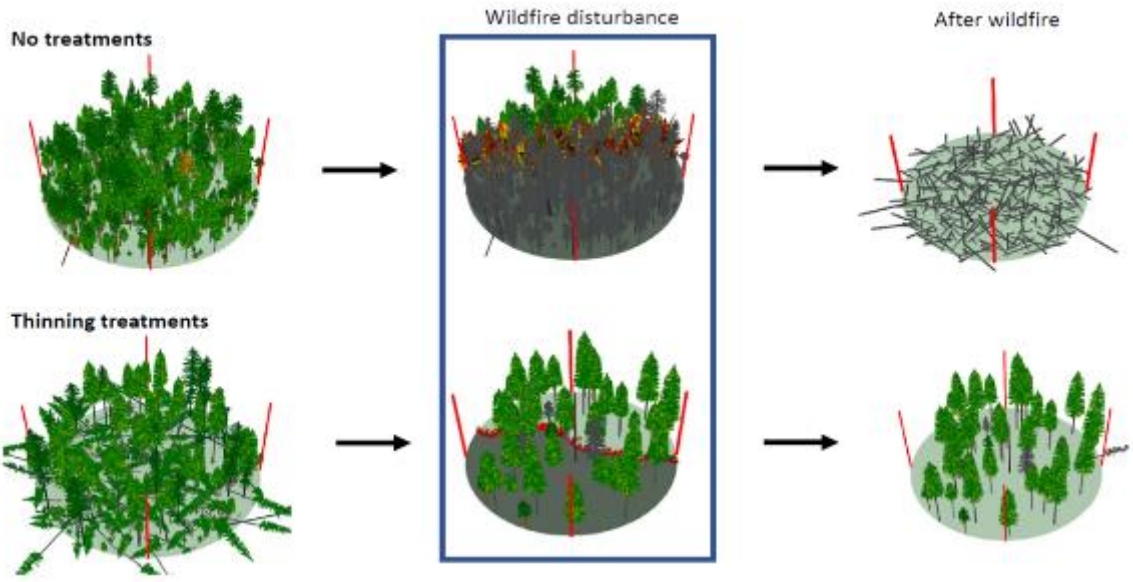

Figure 9: A representation of the Quantification Methodology for Forest Restoration and Management, in which carbon values are estimated based on the probability of a wildfire impacting an area under treatment and no-treatment scenarios.

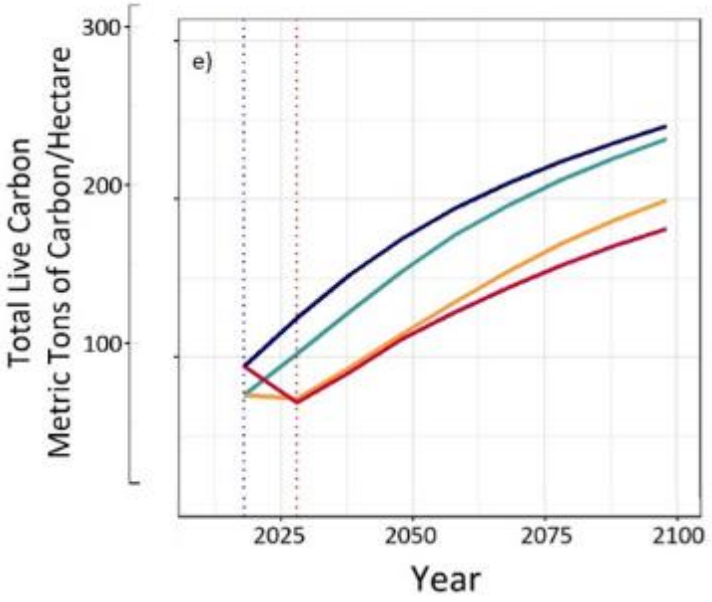

Figure 10: The formula to calculate the carbon benefit of a fuels reduction project considers four scenarios to find the carbon impact of a fire burning through a treated vs. untreated stand: Baseline with no wildfire (blue line); Treatment with no wildfire (teal line); Treatment with wildfire (orange line); and No Treatment with wildfire (red line). The net GHG benefit is derived from the difference in live carbon stocks (above and belowground) in the treatment and impact boundary as a result of reduced mortality from wildfire, minus the carbon removed from the treatment boundary and the mobile emissions from mechanical treatments. The difference in carbon stocks is multiplied by the likelihood of a wildfire occurring within the effective period of the fuels treatment.

Initial carbon losses are recovered through the increased growth of the remaining trees that respond to the reduction in density and competition (Clyatt et al., 2017), as well as by the carbon savings from decreasing the proportion of severely burned forest. With the impact of subsequent wildfire, research indicates that the initial losses of stored carbon in a stand due to treatment may be regained and exceeded in 10-20 years (Dore et al., 2012). However, even the activities for which the quantification methodology shows a reduction in sequestered carbon are expected to improve the stability of carbon on the landscape. By reducing competition and restoring stand health, the remaining carbon in treated forests will be less likely to be lost due to a catastrophic wildfire or other disturbance.

The Department also uses the California Air Resources Board's Urban and Community Forestry Quantification Methodology to estimate the greenhouse gas impacts from tree planting and biomass utilization in urban areas. This methodology estimates the carbon sequestered by urban trees and the greenhouse gas emissions impacts from changes in building energy use.

Outcomes

The Forest Health program funded 44 projects with a reforestation component from the SB 901 appropriation, which are anticipated to plant 9,944,042 seedlings, predominantly conifers. These projects will reforest 63,596 acres and result in the sequestration of 11,468,445 metric tons of carbon dioxide equivalent[4] (CO_2e) over the project lifetimes, recouping some of the carbon lost from wildfire (see box above). Though fuels reduction treatments funded by Forest Health grants are estimated to lose 1,657,478 metric tons of CO_2e over the life of the projects, these treatments are still critical for forest resilience and carbon stability. Together with benefits from biomass utilization and pest management activities, all Forest Health grants will result in emissions benefits equivalent to sequestering 11,129,060 metric tons of CO_2e. Given the total amount awarded to Forest Health grants from the SB 901 appropriation, $418.9 million, this translates to a

Project Spotlight: Sequoia Wildfire Reforestation and Recovery Project

Over the past decade, nearly 20% of the world's mature giant sequoias have been killed by severe wildfires raging through their narrow range in the southern Sierra Nevada. American Forests received a $4.9 million Forest Health grant from CAL FIRE in 2021 and is leading an effort to restore more than 2,600 acres of forests burned by six wildfires in the southern Sierra. The work involves replanting giant sequoias and other native conifers in areas that were severely burned. CAL FIRE estimates that the project will sequester more than 400,000 metric tons of CO_2e over its lifetime. Read more.

Photo credit: Mark Janzen, American Forests

[4] Carbon dioxide equivalent is a metric used to compare the emissions from various greenhouse gases based upon their global warming potential. CO_2e converts the impact of all GHGs into the amount of CO_2 that would have the same warming effect. This allows for comparisons among different greenhouse gases that have different global warming potential.

marginal cost of $37.64 per metric ton of CO_2e, within the range of California's carbon market allowance prices since the beginning of 2024.

The California Forest Improvement program funded 14 reforestation projects from the SB 901 appropriation, which reforested 674 acres and planted 88,100 trees for a net benefit of 41,776 metric tons of CO_2e. SB 901 funds also contributed to the conservation of 9,344 acres of forest that were at risk of conversion through the Forest Legacy program. Three of the six easements had sufficient data to be modeled, resulting in a net gain of 554,828 metric tons of CO_2e over the life of those projects.

The Wildfire Resilience program has spearheaded reforestation projects after the large-scale fires, like the Dixie Fire that burned nearly one million acres in 2021. In collaboration with the Feather River Resource Conservation District, the Wildfire Resilience program funded the planting of 383,700 trees on 1,585 acres in the footprint of the Dixie Fire that will sequester 423,191 metric tons of CO_2e over the life of the project (see box at right).

The Urban and Community Forestry program funded 10 grants resulting in 14,265 trees planted, resulting in a net greenhouse gas benefit of 51,727 metric tons of CO_2e.

The 209 projects supported by the Fuels Reduction Crews during the SB 901 appropriation years were estimated to result in a net loss of 451,458 MT CO_2e. As noted above, these and other community protection projects prioritize public safety, although they may have some carbon benefits not captured by the Quantification Methodology if they prevent catastrophic wildfire from occurring.

Project Spotlight: Plumas Emergency Forest Restoration Team

The Plumas Emergency Forest Restoration Team was established in October 2021 as a response to multiple wildfires in 2020 and 2021 that collectively impacted approximately 64% of the land in Plumas County. The team, led by the Feather River Resource Conservation District, was organized to provide restoration services to non-industrial private landowners, including tree clearing, replanting of native conifer species, and herbicide application. The effort has targeted small landholdings that are at risk of conversion to shrublands due to lack of natural tree regeneration. CAL FIRE's Wildfire Resilience program is one of several partners contributing funds to the effort, which has reached nearly 200 landowners to date. Read more.

All told, CAL FIRE estimates that all of the SB 901-funded projects with quantifiable GHG impacts will achieve a net benefit of 11,749,124 metric tons of CO_2e over the projects' lifetimes. For comparison, the median annual emissions from wildland fires in California over the past ten years were 18.2 million metric tons of CO_2, per California Air Resources Board estimates (*Wildfire Emission Estimates for 2023*, 2024). Additional emissions reductions would be expected from activities that prevent wildfires from occurring, but no methodologies exist to quantify these impacts.

Fire-Adapted Communities

Wildfires increasingly threaten homes and communities, especially in the wildland-urban interface. As described above, fire is a natural process and will continue to occur on the landscape. However, fire-adapted communities can accept fire as part of the surrounding landscape, take action to reduce their vulnerability to fire, and adapt to live safely with fire.

The Fire Adapted Communities Learning Network developed a framework of actions communities can take to live better with fire, including planning for wildfire, activities to prevent accidental ignitions, landscape treatments, household mitigation actions, and evacuation preparation. These actions are all generally geared toward 1) reducing hazards to communities by reducing the likelihood of high-severity wildfire, and 2) increasing the preparedness of those communities for when a wildfire does occur. Examples of the former include fuels reduction projects that alter fire dynamics, fuel breaks that support fire suppression activities, and roadside brush clearing projects that reduce the likelihood of unplanned ignitions. Examples of the latter include defensible space and home hardening programs, as well as planning, public education, and training. All of these approaches have been shown to be effective in reducing risk (Syphard et al., 2014), (Kolden & Henson, 2019), (Jakes & Sturtevant, 2013), (Prestemon et al., 2010).

Multiple programs funded by the SB 901 appropriation focus on reducing the likelihood of high-severity fire impacting communities. Wildfire Prevention grants provide funds for projects in or near fire-threatened communities such as brush clearing and other fuels reduction, creation or maintenance of fuel breaks, and community chipping programs. Projects implemented by CAL FIRE Fuels Reduction Crews, the California Conservation Corps, and the National Guard have often focused on fuel breaks, roadside clearing, and fuels reduction in wildland-urban interface areas to support fire suppression and reduce unplanned ignitions). Other programs, such as Forest Health, CFIP, and Wildfire Resilience, also fund work to reduce the likelihood of high-severity fire, although their focus tends to be outside the wildland-urban interface.

Wildfire Prevention grants also fund efforts to increase community preparedness, including wildfire risk mapping, development of Community Wildfire Protection Plans or Local Hazard Mitigation Plans, and implementation of public education and outreach programs.

A description of the outcomes for “Public Safety” and “Fire Prevention” requested in SB 63 are covered in this section.

Methods

Certain aspects of improving communities’ resilience to wildfire can be quantified by applying the California Air Resources Board’s Forest Restoration and Management Quantification Methodology described above to applicable fuels reduction projects. This method can produce expected reductions in flame length, which is a proxy for fire severity, as well as expected changes in burn probability.

Real world outcomes of these projects have also been observed by fire suppression personnel. CAL FIRE’s Fuels Treatment Effectiveness Dashboard displays examples of various projects, including those funded by the SB 901 appropriation through the aforementioned programs, with narratives of how those projects affected fire behavior.

Outcomes

The Wildfire Prevention program has funded 424 projects from the SB 901 appropriation. These grants have been awarded in 51 counties across the State, including within all 21 CAL FIRE Units and six Contract Counties. 62 of these have been *planning grants*. These grants have funded a variety of efforts around the State to improve wildfire preparedness, including wildfire risk mapping, General Plan Safety Element updates, evacuation planning, community risk assessments, and development or updating of Community Wildfire Protection Plans. One grant supported the development of a Community Wildfire Protection Plan Toolkit as a resource for communities seeking to prepare and implement these important plans.

Another 37 Wildfire Prevention grants funded *education and outreach* efforts. These projects included homeowner education, defensible space trainings, building awareness around prescribed and beneficial fire, and visitor outreach to reduce unplanned ignitions. Outreach was targeted to the population centers of Los Angeles and San Diego, rural Sierra Nevada and northern California communities, Statewide campaigns, and everything in between.

A key element of fire-adapted communities is *hazardous fuels reduction*, and 325 Wildfire Prevention grants funded various fuels reduction projects. The majority (238) of these have been fuel break or understory thinning projects in and around communities that are designed to prevent or slow the spread of wildfire. Other grants have funded chipping, prescribed fire, prescribed grazing, and roadside clearance projects to reduce hazardous fuels. These projects, typically implemented in areas of high wildfire risk, have already proved valuable in saving homes and lives (see box above).

Turtle Rock Park Biomass Collection Site

A $120,810 Wildfire Prevention grant to Alpine County is supporting the operation of the Turtle Rock Park Biomass Collection site, which provides property owners in eastern Alpine County with a place to send green waste removed while creating defensible space around their properties. The collection site supports the treatment of an estimated 190 acres per year, allowing for the collection and composting of 4,000 to 7,000 yards of biomass. The success of these efforts was demonstrated during the July 2021 Tamarack Fire, when the defensible space clearance made possible by the biomass collection facility saved homes from the fire and helped prevent it from spreading to additional communities. Read more.

The SB 901 appropriation has funded hazardous fuels reduction through other programs as well, particularly through the efforts of CAL FIRE's GGRF-funded Fuels Reduction Crews. The crews are typically deployed to work in concert with other CAL FIRE personnel or partner organizations on projects prioritized in Unit Fire Plans or through the Vegetation Management program.

Figure 11: Projects completed with support from CAL FIRE Fuels Reduction Crews from July 2019 to June 2024.

The crews contributed to 209 separate projects over the five-year period covered by the SB 901 appropriation[5] that resulted in the treatment of just over 22,000 activity acres (with some of these acres representing re-treatments areas that had already seen treatments) (Figure 11). Similar to the work funded by Wildfire Prevention grants, these projects involve prescribed fire, fuel break construction/maintenance and understory clearing, right-of-way clearance, and other hazardous fuels reduction work, and often occur in the wildland-urban interface. These projects can provide firefighters with footholds from which to slow or halt large wildfires and protect surrounding communities, as well as prevent ignitions from growing into large wildfires in the first place.

The California Conservation Corps (CCC) has also implemented hazardous fuels reduction projects with its annual $5 million allocation. CCC crews have completed 32 fuels reduction projects around the State with this funding, treating about 865 acres via roadside brushing, ladder fuel removal, fuel break construction, and other means to reduce wildfire risk. Similarly, more than $9 million of the SB 901 appropriation went to the five California National Guard-supported fuels crews stationed in Fresno, Auburn, Redding, and Monterey. These crews contributed to implementation of priority projects identified under the Governor's Executive Order N-05-19.

The Forest Health and Wildfire Resilience programs have a primary focus on forest resilience rather than community protection. However, projects funded by these programs often do have elements

[5] Due to time lags between the appropriation and liquidation of funds, there is not perfect alignment between the SB 901 appropriation and the Fuels Reduction Crew projects presented here (i.e., some of these projects could have been funded by prior-year GGRF funds). The figures presented here are a reasonable approximation of what was achieved by the crews from this appropriation.

Project Spotlight: Butte County Fire Safe Council

When the Park Fire ignited in July 2024 and burned through the northern part of Butte County, eventually growing to become the fourth-largest wildfire in California history, fuels reduction work funded by the Forest Health program around the community of Cohasset was directly in the path of the blaze. The treatments, implemented by Butte County Fire Safe Council, didn't stop the fire, which was burning under extreme conditions at the time. However, firefighters observed that fire behavior decreased significantly in areas where the forest had been thinned, resulting in slower progression of the blaze. The reduced fire severity allowed mature trees in the treated area to survive. Read more.

Photo credit: CAL FIRE

that enhance fire-adapted communities. Forest Health grants, for example, have funded nearly 7,000 acres of fuel break and roadside clearing work. As described in the Fire Dynamics section above, many other thinning treatments near communities or roadways serve similar purposes by lessening fire behavior (see box at left).

Since CAL FIRE launched its Fuels Treatment Effectiveness Dashboard in 2024, 12 projects funded by the SB 901 appropriation have been observed to interact with a wildfire. Eleven of those projects were found to have a positive impact on the fire, through assisting with fire containment or ingress/egress, reducing property damage, or changing fire behavior.

A final outcome under this Pillar is the new insights that will improve fire adaptiveness of California's communities into the future. Forest Health Research grants have funded researchers studying structural ignition risk, wildfire spread in the wildland-urban interface, and other topics that can inform how we design homes and urban landscapes to reduce wildfire risk.

Economics

California's forests are an important economic driver for the State. Resilient forests provide ecosystem services and forest products that in turn provide a foundation for many local and regional economic activities and employment opportunities, including recreation, tourism, and natural resource management industries, particularly in rural communities (Standiford, 2020). Forest management activities undertaken to improve resilience can support these various uses as well as directly provide employment and generate wood products that support local industries (BenDor et al., 2015).

Nearly all of the grant programs funded by the SB 901 appropriation directly support jobs. Additionally, several programs have an explicit focus on developing the forest sector workforce, such as the Business and Workforce Development grant program and the California Conservation Corps. This is especially important because the forestry sector is smaller than it has been historically and its current need for qualified personnel is growing faster than the available talent pool (*Forest Sector Workforce Study Report*, 2021). Without a more robust forestry workforce, the State will not be able to meet its wildfire and forest resilience goals.

Finally, the devastating economic consequences of catastrophic wildfire are well known in California (Bayham et al., 2022). The forest resilience work described throughout this report aims to reduce the risk of catastrophic wildfire and its associated economic impacts. Activities that reduce the risk of high-severity wildfire can have multiple economic benefits, including avoided damages to communities and infrastructure, avoided wildfire suppression costs, reduced human health impacts from wildfire smoke, and preserved ecosystem function (Hjerpe et al., 2024). Recent estimates suggest that every dollar invested in forest restoration treatments can provide up to seven dollars of benefits (Hjerpe et al., 2024). While CAL FIRE does not have reliable methods of quantifying these outcomes, it should be noted that the various outcomes presented in this report, including forest resilience, carbon sequestration, air quality, and fire adapted communities, also have associated economic benefits.

Methods

This section primarily relies on qualitative descriptions of the economic outcomes of the SB 901 appropriation. Certain data, such as grant awards and jobs/training numbers, are included where applicable.

Outcomes

The Business and Workforce Development program's primary focus is to promote economic development in forestry. Grants funded by the SB 901 appropriation are achieving this in multiple ways, one of which is through investment in the forest sector workforce. Eight Workforce Development grants have gone to community colleges, school districts, and other organizations to support training and certification of forestry and wildland fire professionals. Expected outcomes include expansion of Shasta College's Heavy Equipment Logging Operations certificate program, creation of a prescribed fire apprenticeship program, piloting of a Forestry Field School at Hoopa Valley High School, and creation of a Forestry Master's Degree program at Cal Poly Humboldt. More than 900 individuals are expected to be trained with funding from these eight grants, adding badly needed capacity to achieve the State's wildfire and forest resilience goals.

Another 13 Business Development grants are expanding the State's forestry and wood products infrastructure. These grants support equipment purchases to increase fuels reduction capabilities, in some cases doubling an operator's capacity; sawmill upgrades to increase wood processing, particularly for small trees and chips; and other business growth, such as the first cross-laminated timber operation in California.

An additional ten Business Research and Development grants are supporting the deployment of new wood utilization and biomass processing technologies, including dowel laminated timber and mobile gasification of woody biomass. These innovations are intended to help build a robust wood products market and increase the value of the woody biomass that must be removed from overly dense forests, thus attracting private investment and providing more opportunities for long-term carbon storage in durable wood products.

Through the Training and Workforce Development program, the California Conservation Corps enrolls young adults for a year of service resulting in job skills and work experience to launch meaningful careers. Through 2024, the California Conservation Corps implemented 107 projects using funds from the SB 901 appropriation. 57 of these projects were trainings for corpsmembers, typically covering first aid/CPR, use of chainsaws and other tools, and other foundational skills to prepare them for careers in wildland firefighting, forestry, and fuels management. The remaining projects involved fuels reduction, restoration, and planting, providing on-the-job skills to participating corpsmembers (see box at right).

Project Spotlight: California Conservation Corps

In 2023, Corpsmembers from the California Conservation Corps Chico Center treated 20 acres of hazardous fuels on Paradise Recreation and Park District lands in an area that had been devastated by the 2018 Camp Fire. The work served to protect residents living in the wildland urban interface, educate Corpsmembers on the importance of reducing fire fuels in their communities, and prepare young adults for their future careers. The Paradise project was particularly meaningful for corpsmembers, some of whom grew up in the area and were in school at the time of the wildfire. Read more.

Other programs funded by the SB 901 appropriation also contribute to economic outcomes, even without a central focus on workforce development. Grant funds support jobs for grantee organizations, as well as their partner organizations and contractors. As described in the Social and Cultural Wellbeing section below, many of these grants fund work in parts of the State defined as disadvantaged or low income. It is difficult to reliably estimate the number of jobs supported by grant funds. The California Air Resources Board developed a project-specific job co-benefit modeling tool that CAL FIRE applied to earlier grants, but that tool has been discontinued. Using this tool, 64 Forest Health grants awarded before 2024 were estimated to support 2,667 direct jobs.

Finally, CAL FIRE's own Fuels Reduction Crews provide workforce development benefits. The ten crews stationed around the State typically support 130 positions. 90 of these positions are targeted to attract entry-level employees, who are given opportunities to build skills in vegetation management, wildland fire, and incident response that set them up to advance their careers at CAL FIRE or other departments.

Social and Cultural Well-being

Forests allow people to build and maintain active cultural and social connections to a place (Kanowski & Williams, 2009). This has been true since time immemorial for Native Americans, the original stewards of these lands. However, Euro-American colonization of California brought about the forcible removal of indigenous people from the land and the criminalization of indigenous stewardship practices such as cultural burning (Hankins, 2024).

Efforts to build landscape resilience offer opportunities to restore traditional stewardship practices, and for all people to connect with the natural environment through culturally valued resources, recreational experiences, and engagement in natural resource management and conservation (Maclean et al., 2023), (Laband, 2013). Funded activities through the Forest Health, CFIP, Wildfire Resilience, and other programs will have a variety of beneficial outcomes for social and cultural resources, values, and practices. This will be achieved through support for tribes in reintroducing fire and other traditional stewardship practices to their ancestral homelands, and through reducing the likelihood of high severity wildfire among forests and landscapes that Californians care deeply about.

Activities that reduce the likelihood of high-severity wildfire or protect communities from wildfire can help to reduce the stress and trauma associated with evacuations, property loss, and threats to personal safety (To et al., 2021). Reforestation of areas burned by wildfires is a specific element of these programs with benefits to social and cultural well-being. Beyond its ecological and economic cost, high-severity fire can take an emotional toll on those with a connection to an affected landscape. Research suggests that replanting burned forests can promote emotional healing among people who have lost their forest to wildfire (Waks et al., 2018).

The Forest Legacy program maintains the social and cultural benefits of forests in another way: by protecting forest values from conversion to other uses.

Finally, urban and community forestry also provides social and cultural benefits. Urban green spaces have been associated with improved mental and physical health, increased physical activity, and reduced crime (Tsai et al., 2018) (Wolf et al., 2020) (Connolly et al., 2023).

The California Climate Investments program as a whole is focused on providing benefits to the State's most disadvantaged communities and low-income communities and households.

Methods

Measuring improvements to social and cultural well-being is particularly challenging. For the purposes of this report, proxy metrics have been compiled to provide a sense of the breadth of these outcomes without attempting to quantify changes in well-being.

Outcomes

The Forest Health program has invested directly in stewardship activities on tribally-owned lands, with more than 13,500 activity acres planned or completed on lands under tribal ownership.

Project Spotlight: Hoopa Valley East Project

The eastern side of the Hoopa Valley, in present-day Humboldt County, was historically home to extensive oak woodlands. The Hupa people frequently burned the hillsides to maintain the oaks and other culturally important plants, but Euro-American colonists halted this practice. The absence of fire slowly altered the ecosystem, allowing Douglas-fir trees to encroach into the oak woodlands. But in 2021, a $1.4 million Forest Health grant supported the Hoopa Valley Tribe in re-introducing fire to the landscape. The project reduced competing vegetation, improved conditions for mature oaks, and promoted the growth of important plants for basketmaking. Read more.

Photo credit: Jeff Lindsey

Treatments include re-introduction of cultural fire, tree planting and other restoration work, and conventional fuels reduction. More than a dozen grants involve tribal partnerships, relying on Traditional Ecological Knowledge, providing workforce development opportunities to tribal members, and conducting restoration on ancestral homelands (see box at left). The Wildfire Prevention program has also provided more than ten grants to tribes for hazardous fuels reduction, planning, and outreach on tribal lands.

General forest resilience work funded by the SB 901 appropriation is occurring widely across the State. Forest Health, CFIP, and Wildfire Resilience awards have been made in 41 counties. As described above, forest resilience metrics are expected to improve over nearly 150,000 acres, reducing the likelihood that catastrophic wildfire will destroy the many social and cultural values Californians attach to these forests (see box at right).

The devastating wildfires California has experienced in recent years have taken a toll on the mental and emotional health of those who experienced them (Rosenthal et al., 2021). Forest Health grants have funded more than 63,000 acres of tree planting under the SB 901appropriation (note: this does not include another 50,000 acres of planting funded through Forest Health Post-Fire Reforestation and Regeneration grants, which came out of the General Fund). CFIP awards from this appropriation funded more than 600 acres of reforestation for small landowners, and the Plumas Emergency Forest Restoration Team, funded in part by a Wildfire Resilience grant, has reforested about 1,500 acres in the aftermath of multiple wildfires.

Project Spotlight: Southern Sierra All Lands Restoration and Recovery Project

Forest resilience treatments funded by a Forest Health grant helped to save some of the world's most iconic trees in Yosemite National Park. Protecting the ancient, majestic giant sequoias was an immediate concern for land managers when the Washburn Fire broke out near Mariposa Grove on July 7, 2022. Fortunately, a partnership that includes the Mariposa County Resource Conservation District, the National Park Service, and local tribal forest crews had completed the important fuels reduction work that reduced the fire's severity and helped firefighters protect the invaluable trees, as well as the nearby community of Wawona. Read more.

Photo credit: National Park Service

Many of the investments made from the SB 901 appropriation have been in census tracts designated as disadvantaged or low income. About half of the grants made from each of the two largest programs, Forest Health and Wildfire Prevention, have been located in disadvantaged or low-income communities, targeting community protection, workforce development, and other benefits of these projects to the State's most vulnerable populations. Urban and Community Forestry grants have funded the planting of 14,000 trees. Nearly all of these grants have been awarded within disadvantaged and/or low-income communities, promoting a more equitable distribution of urban trees and the social benefits they provide across the State. The California Conservation Corps also employs the majority of its workforce from disadvantaged and/or low-income communities, increasing job readiness and career opportunities.

Biodiversity Conservation

Healthy forests provide important habitat for a wide variety of species in California. Fire is an integral part of many forest ecosystems, playing an important role in fostering biodiversity (Stephens et al., 2021). Low- to moderate-intensity burns with small patches of high severity tend to increase biodiversity, creating habitat diversity and stimulating plant growth. However, wildfires that burn large areas at high severity can negatively impact species diversity generally (Steel et al., 2022), (Ayars et al., 2023) and habitat for special status species specifically (Jones et al., 2016), (Stephens et al., 2016) due to vegetation type conversion, degradation of aquatic habitat, and direct wildlife mortality. High-severity wildfire has emerged as a significant threat for several threatened wildlife species (USFWS, 2023), (USFWS, 2018). The megafires of 2020 and 2021 affected a significant portion of the range of more than 100 vertebrate species (Ayars et al., 2023).

Treatments that improve forest resilience, such as those implemented through the Forest Health, California Forest Improvement, and Wildfire Resilience programs, can protect biodiversity by reducing the likelihood of catastrophic wildfire and the subsequent destruction of wildlife habitat (Wright et al., 2023). These treatments can also help restore historical fire regimes and promote forest structures more in line with old-growth conditions that existed pre-Euro-American settlement (Kramer et al., 2021), (Jones et al., 2022). More recent evidence suggests that certain treatments can even directly improve habitat for some special-status species (Wright et al., 2023). Projects funded by the Forest Health, CFIP, and Wildfire Resilience programs all support these outcomes. Reforestation projects funded by these same programs prevent conversion from forests to shrublands and accelerate the return to a healthy forest ecosystem (Coop et al., 2020).

Forest conservation easements funded through the Forest Legacy program also conserve biodiversity, as the lands put under easement had been threatened by conversion to non-forest uses. Even Urban and Community Forestry grants can contribute to promoting biodiversity, as street trees have been shown to support urban wildlife populations (Wood & Esaian, 2020).

Finally, certain funded activities have a primary focus on reducing unplanned ignitions, such as some Wildfire Prevention grants and projects implemented by CAL FIRE Fuels Reduction Crews, the California Conservation Corps, and the National Guard. While these activities aren't necessarily aimed at restoring ecological function, the resulting reduced likelihood of catastrophic wildfire may provide some benefits for biodiversity.

Not every funded treatment will provide a biodiversity benefit. Indeed, some activities have the potential to cause adverse impacts to certain species. However, CAL FIRE ensures compliance with legal requirements such as the California Environmental Quality Act, California Endangered Species Act, and Forest Practice Act, along with industry best practices, to minimize or fully avoid such impacts.

A description of the outcomes for "habitat" requested in SB 63 is covered in this section.

Methods

Viable methods are not available to assess individual Forest Health projects' impacts to biodiversity at a program level, and more research is needed to understand how different fuels reduction treatments may have different impacts on biodiversity. However, as described above, Forest Health projects are expected to significantly improve forest resilience and reduce the likelihood of high-severity fire over approximately 150,000 acres. More resilient forests will provide more resilient habitat for wildlife, particularly for special-status species or those vulnerable to climate change.

The California Department of Fish and Wildlife maintains Areas of Conservation Emphasis (ACE), a synthesis of the best available Statewide data on California's biological richness and biodiversity. ACE relies on mapped data products from the Department of Fish and Wildlife and other vetted sources to summarize various biological values across the entire State. Two of these datasets are Species Biodiversity, a summation of native species richness, rare species richness, and species endemism; and Climate Resilience, which reflects the probability that a given location within California will serve as refugia under climate change. Both are summed up as a 1-5 ranking, in which hexagons receiving a 5 represent the 20% of areas with the highest values within a given ecoregion.

To produce a coarse assessment of the extent to which forest resilience improvements might benefit biodiversity, spatial data for Forest Health fuels reduction treatments were overlain with ACE data. The overlap provides insight into where improvements in forest resilience would coincide with high biodiversity values across the State.

Project Spotlight: Saving San Diego's Last Mixed Conifer Forest

A Forest Health grant to the Resource Conservation District of Greater San Diego County funded a landscape-scale restoration project to improve forest health on Palomar Mountain. Project partners implemented more than 1,600 acres of treatments to ensure Palomar Mountain's regionally unique forests are resilient to future wildfires. CAL FIRE modeling found that these treatments reduced Stand Density Index by 32 and increased Quadratic Mean Diameter by 3 inches in an area that primarily received the highest Statewide terrestrial biodiversity rank from the Department of Fish and Wildlife. Project treatments were specifically intended to benefit the California spotted owl, a species of special concern. Read more.

Photo credit: Resource Conservation District of Greater San Diego County

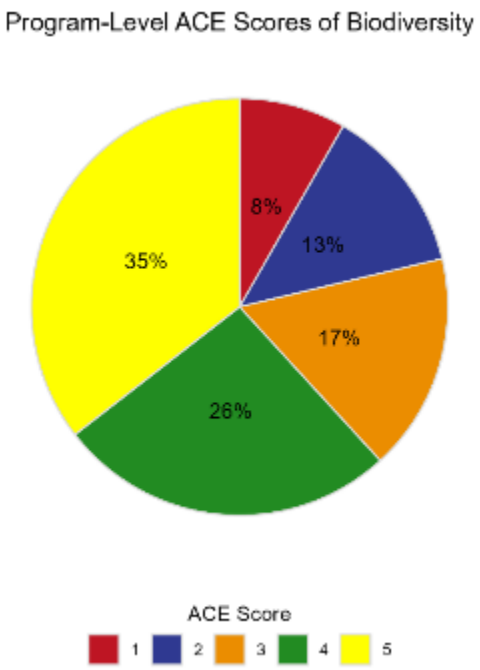

Figure 12: The percentage of Forest Health fuels reduction treatments that overlap with each Species Biodiversity rank from the California Department of Fish and Wildlife's Areas of Conservation Emphasis dataset. 1 represents areas with lowest relative biodiversity and 5 represents areas with highest relative biodiversity.

Outcomes

The analysis of ACE data found that 61% of the fuels reduction treatment acres funded by the Forest Health program occurred in areas with the high-or-highest values of Species Biodiversity (Figure 12). This indicates that the Forest Health program has focused its work to improve forest resilience and reduce susceptibility to catastrophic wildfire in areas with the most native and/or rare species richness—in other words, the areas with the most at stake from a biodiversity standpoint. Only 42% of Forest Health fuels reduction acres are within the high-or-highest-ranked areas for Climate Resilience, suggesting that treatments are more proportionally distributed across lands based on this metric. Treatments funded by the Wildfire Resilience and California Forest Improvement programs are also expected to confer biodiversity benefits through improved resilience, but the data is not available to quantify these outcomes.

Additionally, the conservation easements funded with this appropriation through the Forest Legacy program have conserved more than 9,300 acres of habitat, including critical watersheds for imperiled salmon species and old-growth forests that support more than a dozen threatened and endangered species.

Water Security

Resilient forested watersheds are key for regional and Statewide water security (Brown et al., 2008). Water flows from forests into rivers that provide critical aquatic and wetland habitat and supply agricultural and drinking water for tens of millions of people. In fact, while forests account for only 32% of lands within California, these watersheds produce about 70% of the State's water supply (Liu et al., 2021). Forests serve as natural water collection, storage, filtration, and delivery systems. These functions will become more important as climate change intensifies (Chang & Bonnette, 2016).

Projects that improve forest resilience, such as those funded by the Forest Health, California Forest Improvement, and Wildfire Resilience programs, are expected to provide water quality benefits (Bryant et al., 2023), (Guo et al., 2023). Those that aim to reduce unplanned ignitions, such as some

Wildfire Prevention grants and projects implemented by CAL FIRE Fuels Reduction Crews, the California Conservation Corps, and the National Guard, may also provide benefits. A reduced likelihood of high-severity wildfire means reduced erosion and debris resulting from these fires that can disrupt natural and human-made water delivery systems and threaten public safety (Hohner et al., 2019). Fuels reduction projects that thin overly dense forests may also increase water availability by reducing competition for water, although the limited evidence available suggests that such an effect may be site-specific (Saksa et al., 2017), (Goeking & Tarboton, 2020). Reforestation projects facilitate a return to healthy forest conditions that provide the water security benefits described above. Additionally, some projects funded by the Forest Health and Wildfire Prevention programs have been specifically designed to protect water infrastructure.

Urban tree planting can also improve water outcomes. Trees can intercept rainwater to reduce stormwater runoff, and can also remove nutrient pollutants from stormwater to provide water quality benefits (Livesley et al., 2016). Conservation easements that prevent the development of forested lands can also play a key role in maintaining watershed function.

A description of the outcomes for "protection of important natural resources, including water quality and water supply" requested in SB 63 is covered in this section.

Methods

Various methods are under development to quantify the water supply benefits of forest resilience work. However, data is not available to reliably estimate these outcomes for SB 901-funded projects. To provide a sense of the scope of benefits expected, CAL FIRE conducted a spatial analysis to compare the boundaries of Forest Health grant fuels reduction activities to watershed boundaries. This analysis was done at the sub-watershed level, using the national watershed boundary dataset (Watershed Boundary Dataset (WBD) Data Model (v2.3.1)) . This approach was used to identify the number of watersheds across which treatments are expected to improve water security.

In terms of water quality, California Geological Survey researchers have developed a post-fire debris flow hazard prediction model for the State (Rossi et al., 2025). Based on rainfall intensity, slope, burn severity, and soil properties, the model identifies lands as low-, moderate-, or high-hazard areas. These predictions can inform treatment priorities. CAL FIRE overlayed the boundaries of Forest Health fuels reduction activities with these predictions to assess how these treatments might affect the likelihood of post-fire debris flows.

Finally, this section highlights specific examples of SB 901-funded projects that are directly benefitting water security.

Outcomes

72 Forest Health grants with fuels reduction treatments covering an area of 149,668 acres were included in the analysis. These treatments have been or will be implemented in 294 sub-watersheds. While the overlap with some of these sub-watersheds was less than an acre, some sub-watersheds will see thousands of acres of treatments funded by the SB 901 appropriation. As described in the sections above, these treatments are expected to improve forest resilience and reduce the likelihood of high severity fire across these 294 sub-watersheds, which constitute just under 7% of the sub-watersheds of the entire State.

The same treatments were assessed against predicted debris flow hazards, with 77.1% of fuels reduction treatment acres overlapping with moderate-hazard areas and 0.8% overlapping with high-hazard areas. For comparison, 50% of the lands mapped Statewide were identified as moderate hazard and 1.9% as high hazard. These results suggest that Forest Health fuels reduction projects have generally been targeted toward lands with significant post-fire debris flow risks. Given that these treatments are expected to reduce the likelihood of high-severity wildfire, it would also be expected that they would reduce post-fire debris flow hazards. The proportion of treatments in high-hazard areas is likely lower than the overall proportion of these areas because the steep slopes that increase debris flow hazards also increase the cost and complexity of fuels treatments.

Project Spotlight: Weger Ranch

The Forest Legacy program contributed funding to Save the Redwoods League to secure a conservation easement on Weger Ranch, a 3,000-acre forest in Mendocino County. The easement allows for sustainable forest management to continue, but will ensure that the property can never been subdivided or developed. Weger Ranch contains seven stream headwaters, all of which drain into the Big River, a critical coastal watershed for imperiled salmon species. The ranch is also contiguous to other protected areas, creating a landscape of 11,500 acres that will promote watershed health and maintain water quality. Read more.

Some of these Forest Health projects were specifically designed to protect critical water infrastructure. Grants to the Santa Clara County Fire Safe Council, in partnership with San Jose Water, have sought to reduce wildfire risk in a watershed that serves more than two million Santa Clara County residents, while another grant to the Yuba Water Agency has supported forest resilience treatments around New Bullards Bar Reservoir.

Similar forest resilience activities funded by the Wildfire Resilience and California Forest Improvement programs are expected to improve water security outcomes across additional watersheds, but the data is not available to quantify these outcomes.

Additionally, the more than 9,300 acres protected under conservation easements funded through the Forest Legacy program will also improve water security by maintaining forests in critical watersheds. Several of these easements include the headwaters of important streams (see box above).

Air Quality

Healthy forests improve air quality by reducing the overall amount of air pollutants in the atmosphere. On the other hand, catastrophic wildfires degrade air quality and cause respiratory and cardiovascular illnesses that affect millions of people, especially children and people who work outdoors, and are responsible for thousands of premature deaths in California (Chen et al., 2023), (Connolly et al., 2024). These health burdens disproportionately affect elderly and low-income populations (Masri et al., 2021). Furthermore, smoke from wildfires discourages recreation and disrupts businesses and local economies (Bayham et al., 2022).

Forest resilience projects funded through the Forest Health, Wildfire Resilience, and California Forest Improvement programs aim to limit emissions from fires by reducing the severity of fires in wildland ecosystems, as low- and moderate-severity wildfires tend to produce fewer emissions (Xu et al., 2022). Projects meant to reduce the likelihood of unplanned ignitions, such as those implemented by Fuels Reduction Crews or through the Wildfire Prevention program, can also reduce emissions from wildfires.

While certain activities funded by these programs, such as prescribed fire, generate emissions of their own, these projects can decrease the chances that smoke from wildfires create long-duration, intense smoke episodes like those caused by large wildfires in the past decade. A recent study estimated that prescribed burns implemented prior to the extreme 2020 fire season led to a 14% net reduction in particulate matter smaller than 2.5 microns in diameter (PM2.5) from those wildfires, and that scaling up treatments to one million acres annually could reduce smoke emissions by 655,000 tons over the next five years (Kelp et al., 2025).

Though some trees naturally emit volatile organic compounds that contribute to smog, tree planting, particularly in urban landscapes, contributes to air quality improvements by filtering air pollutants, including ozone and particulates (Nowak et al., 2006).

Methods

Methods are still being developed to estimate reductions in particulate matter and other criteria pollutants that might result from fuels reduction treatments. Such impacts would be dependent on the likelihood of wildfire interacting with a treated area, the severity of that wildfire with and without treatment, the types of forest fuels consumed, and other factors. However, Climate Action Reserve has published a new methodology to estimate anticipated emission reductions from the implementation of fuel treatments in forests of California that are at risk for high severity wildfire (*Reduced Emissions from Megafires Forecast Methodology Version 1.0*, 2023). This Reduced Emissions from Megafires (REM) Forecast Methodology, which involves feeding project outputs from the Forest Vegetation Simulator growth simulation model into the First Order Fire Effects Model (FOFEM), was developed with funding support from the Forest Health program.

FOFEM produces quantitative estimates of the immediate consequences of fire, including smoke and fuel consumption. A wide range of pollutants are tracked by FOFEM including carbon dioxide, carbon monoxide, methane, PM2.5, and PM10 (FOFEM 6.7, 2020). The combination of the Forest Vegetation Simulator and FOFEM can produce an estimated difference in smoke emissions for an area burning under treated and untreated conditions. The REM methodology was released in 2023

and is still in the early phases of adoption. Given the novel nature of this method, CAL FIRE applied it to one Forest Health project as a case study to test its utility.

The California Air Resources Board's Urban and Community Forestry Quantification Methodology does allow users to calculate outputs for select criteria and toxic air pollutants, so this methodology was applied to projects funded by the Urban and Community Forestry program.

Outcomes

CAL FIRE applied the REM methodology described above to the Trapper Forest Health and Fuels Reduction Project, a Forest Health grant led by the National Forest Foundation in Sierra and Yuba counties involving thinning and biomass removal across more than 2,500 acres.

The REM methodology, like CARB's Quantification Methodology, assumes that a wildfire occurs five years after the treatments are implemented. The Trapper Forest Health project's treatments will be completed by 2030, so a wildfire was simulated in 2035. Comparing the emissions from the wildfire burning under baseline (no treatment) and treatment scenarios gives a snapshot of potential emissions reductions during that time. The reduced severity and extent of the wildfire brought about by the treatments leads to an expected emissions reduction by the following factors in 2035: 6,315 metric tons of carbon dioxide, 53 metric tons of methane, 1,140 metric tons of carbon monoxide, and 98 metric tons of PM2.5. A 10% risk discount is applied upfront to all projects to ensure conservative accounting and to address the uncertainties in estimating climate benefits from fuel treatments, as well as the probabilistic occurrence of future wildfires in the project vicinity (*Reduced Emissions from Megafires Forecast Methodology Version 1.0*, 2023).

This was a preliminary test of a new methodology, and the results should be interpreted accordingly. However, the results from this one project do provide a sense of the scale of potential air quality outcomes that might be achieved by implementing forest resilience treatments. Other funded projects with a community protection focus, such as those implemented by Wildfire

Project Spotlight: Studying the Public Health Effects of Increased Prescribed Burns

The Forest Health Research program awarded a grant to the Sequoia Foundation to investigate the impacts of increasing prescribed fire on air quality and public health outcomes. Although prescribed fire plans are designed to limit air quality impacts to communities, they still produce some level of smoke. The question is, how will that smoke compare to what is expected from wildfires? And what are the differences in health impacts from prescribed burn and wildfire smoke exposure? The researchers are collecting information that can help minimize the impacts of prescribed fire smoke through a combination of smoke modeling, exposure assessment, health analysis, and community engagement. Read more.

Photo credit: Lenya Quinn-Davidson

Prevention grants, CAL FIRE Fuels Reduction Crews, and the California Conservation Corps, would also likely provide air quality benefits if they prevent large wildfires from occurring, but the scale of these impacts is even more difficult to quantify.

Given the lack of certainty around air quality impacts from future wildfires and how they may be impacted by future forest resilience treatments, the Forest Health Research program has funded research on how increased use of prescribed fire could affect public health (see box above).

The ten Urban and Community Forestry grants funded by the SB 901 appropriation are expected to reduce nitrogen oxide emissions by 23.3 metric tons, reduce PM2.5 by 2.3 metric tons, and reduce reactive organic gases by 0.63 metric tons. These outcomes were calculated based on estimates of air pollutants removed from the atmosphere by trees, air pollutant emission reductions from energy savings, and air pollution avoided by diverting wood products from landfill (see box below).

Project Spotlight: North Sacramento NeighborWoods Initiative

The Sacramento Tree Foundation used a grant from the Urban and Community Forestry program to plant 2,750 trees in North Sacramento disadvantaged communities. The communities were directly involved with the project, which included job training for local youth. The project's many expected benefits include pollutant reduction—the new trees are estimated to remove 3,781 pounds of nitrogen oxides, 803 pounds of PM2.5, and 186 pounds of reactive organic gases over a 40-year lifetime. The project is also expected to reduce greenhouse gas emissions by 9,315 metric tons of CO2e over the same period. Read more.

Wetland Integrity

Wetlands provide critical habitat, filter and retain nutrient pollution, store carbon, enhance water quality, control erosion, and provide spaces for recreation. They are local and regional centers of biodiversity, and support species found nowhere else across western landscapes (Lee et al., 2015). Functional wetland ecosystems will serve increasingly important roles in buffering impacts from extreme climate events, and upland disturbances such as flooding and erosion (Thorslund et al., 2017).

Forest health and wildfire resilience projects funded by the SB 901 appropriation have not typically had an explicit focus on enhancing wetland integrity. However, certain projects have included work in meadow and riparian ecosystems to improve the functioning of these systems. Mountain meadows are also reliant on frequent, low-severity fire to maintain function. In the absence of fire, conifers can encroach into meadow systems, further reducing the extent of this limited habitat type (Halpern & Antos, 2021). Some Forest Health projects include treatments to remove encroaching trees and/or re-introduce fire to restore mountain meadows.

Methods

There is not sufficient data to quantify improvements to wetland integrity as a result of projects funded by the SB 901 appropriation. At a coarse level though, it is possible to identify areas where funded fuels reduction activities overlap with mapped wetlands or meadows. The UC Davis Center for Watershed Sciences maintains a spatial database of more than 278,000 acres of Sierra Nevada mountain meadows (*Sierra Nevada Multi-Source Meadow Polygons Compilation (v 2.0)*, 2017). This

dataset was used to calculate a rough estimate of the acreage receiving restoration treatments in mountain meadow systems through the Forest Health program. Additionally, this section presents a handful of examples of funded projects that are contributing to these outcomes.

Outcomes

Fuels reduction treatments from 22 Forest Health grants were found to have at least some overlap with Sierra Nevada mountain meadows identified in the UC Davis dataset. These projects account for 704 acres of meadows receiving treatments. Some of these projects have less than an acre of overlap with meadows, while the project with the largest total meadow treatments is 355 acres. The acreage of treatments within meadows is an underestimation, as it does not account for wetlands and meadows outside the Sierra Nevada region.

These projects are using various approaches to improve ecosystem resilience in and around Sierra Meadows. The Climate and Wildfire Institute is using grant funds to implement a prescribed burn of more than 3,000 acres in the Teakettle Experimental Forest in Fresno County. The burn will improve resilience in a unique old-growth forest that is dotted with wet and dry meadows. As part of another grant, the Nature Conservancy worked with partners to implement manual and mechanical thinning in the French Meadows area. The treatments have helped to protect a key water supply and restore meadows facing encroachment from conifers (see box at right).

Project Spotlight: French Meadows Forest Restoration Project

Multiple Forest Health grants have funded elements of the French Meadows Forest Restoration Project. This ambitious effort, led by multiple governmental and non-governmental partners, aims to implement a comprehensive restoration strategy for the headwaters of the Middle Fork of the American River. Fuels reduction treatments will improve forest health and promote healthy meadows and riparian areas that are critical for wildlife and water storage. Researchers have found that the treatments are likely to result in increased water availability and hydropower generation. Read more.

Grant Program Recommendations

The Forest Health grant program is governed by Public Resources Code (PRC) section 4799.05 and the Wildfire Prevention grant program is governed by PRC section 4124.5. Additionally, the SB 901 appropriation is subject to the California Climate Investments provisions in Health and Safety Code section 39710-23. CAL FIRE's recommendations for improving outcomes for these grant programs fall into several categories:

General Program Design

By statute, the Forest Health grant program focuses on improving resilience and ecosystem health in forest systems. Wildfire Prevention grants can be awarded more broadly across the State but have an explicit focus on community protection. This creates a gap in State funding available for restoring ecosystem resilience in other fire-dependent landscapes, such as shrublands and grasslands. Several potential grantees proposing work in non-forested landscapes have been turned away from the Forest Health program because they did not meet the eligibility requirement of being focused on forests. Additionally, the California Natural Resource Agency's nature-based solutions climate targets established under AB 1757 (C. Garcia, Ch. 341, Stats. 2022) include chaparral/shrubland and grassland restoration targets to address threats from wildfire and other disturbance (*California's Nature-Based Solutions Climate Targets*, 2024). The Legislature may wish to consider modifying the current suite of grant programs to support wildfire resilience in non-forested lands to meet this need.

Thinning and other fuels reduction treatments lose effectiveness as vegetation re-grows, and re-treatment is typically needed every 10-15 years. To maintain the outcomes achieved by the SB 901 appropriation, future maintenance treatments will be necessary at regular intervals. The Forest Health grant program already provides funds for multiple phases of certain projects, but a supplemental funding stream for these maintenance treatments, either through the Forest Health program or separately, could help ensure that initial SB 901 investments continue to provide benefits.

Grant Administration

A predictable, simple grant administration process can make it easier for grantee organizations to achieve project goals. CAL FIRE has several recommendations to improve administration:

- Advance payments: The ability to receive advance payments, rather than pay for grant expenses and be reimbursed later, is important for organizations with fewer resources. However, grantees receiving advances are required to submit advance accountability reports every four months under PRC section 4799.05, subdivision (a)(2)(B)(ii). These reporting requirements help ensure proper use of funds, but the intervals do not align with those of other reporting requirements such as quarterly progress reporting. Allowing grantees to align advance reporting with other required reporting would support grantee organizations in achieving project outcomes, while continuing to ensure fund accountability.
- Funding availability: Timely availability of funding is important to ensure projects are implemented as soon as possible. Funds with extended encumbrance dates, like CAL FIRE's GGRF appropriation, must be "rolled over" from one fiscal year to the next if any

funds have not been spent at the end of a fiscal year. Funds are not available to be spent during the rollover period. In recent years, this rollover period has lengthened to several months, such that grants cannot be awarded for the first quarter of the fiscal year. This delay has prevented grants from being executed in a timely manner, causing grantees to miss the fall field season. Providing the resources necessary to shorten the budget rollover period would be an easy way to streamline wildfire resilience work.

- Reporting: CAL FIRE frequently hears from its grantees that reporting requirements are perceived to be a burden. Grantees must provide regular updates on funding spent, work completed, and outcomes achieved. Regular reporting is important for ensuring appropriate use of State funds, accurately tracking work completed to inform planning and emergency response, and communicating the value of these investments. However, reporting requirements have increased over time. Departments and grantee organizations can better plan to meet reporting requirements if they are consistent. CAL FIRE recommends that potential burdens to grantees should be considered before any new requirements, including those applied to California Climate Investments programs, are implemented, and that any new requirements not be applied retroactively to grants already underway.

Environmental Compliance

California laws written to protect endangered species, air and water, and overall environmental quality have tremendous value. However, procedures associated with these laws can sometimes inhibit projects meant to protect and restore these very values. The California Natural Resources Agency has prioritized the Cutting Green Tape initiative, and the Legislature and Administration have created several exemptions from the California Environmental Quality Act (CEQA) and other laws for wildfire resilience work in recent years that have been effective. CAL FIRE recommends maintaining or expanding the following exemptions:

- PRC section 21080.56 created the Statutory Exemption for Restoration Projects (SERP), which exempts certain habitat restoration projects from CEQA requirements, so long as the California Department of Fish and Wildlife (CDFW) provides concurrence. CAL FIRE has successfully used this tool a handful of times, and it has proven to be effective in streamlining approval of forest restoration projects. However, the Legislature may wish to consider two changes in this program. First, this exemption currently sunsets on January 1, 2030. A prompt extension or removal of the sunset date would facilitate efficient long-term planning of projects expecting to use this exemption. Second, an adjustment to this exemption to align project eligibility requirements with those of the CDFW's Restoration Management Permit (RMP) program, defined in Fish and Game Code Section 1671, subdivision (d), could make it more useful for facilitating forest resilience work. Statute currently limits the eligibility for the exemption to projects that are "exclusively" for fish and wildlife habitat restoration and have other benefits that are only "incidental." Alignment of SERP eligibility with the broader RMP eligibility would create greater consistency between these two Cutting Green Tape programs and allow more Forest Health projects that are designed to provide intended secondary benefits to watershed and wildfire resilience, in addition to habitat benefits, to utilize the SERP.

- PRC section 4799.05, subdivision (e) exempts tribal wildfire resilience projects on lands within tribal jurisdiction or ownership and funded by a specific appropriation from CEQA. Because of the limited applicability of this statutory exemption, it has not been used for Forest Health or Wildfire Prevention grants. However, it has proven to be a successful tool for facilitating eligible projects funded by CAL FIRE's Tribal Wildfire Resilience grant program. CAL FIRE recommends removing the funding source limitation so this exemption can be used by tribes implementing cultural burning or wildfire resilience projects on their lands regardless of how those projects are funded.
- PRC section 4799.05, subdivision (d)(1) exempts various fuels reduction, restoration, and reforestation projects on federal lands from CEQA if they were reviewed under the National Environmental Policy Act (NEPA). CAL FIRE has frequently used this tool, using 26 statutory exemptions tied to NEPA documents in 2024 for the Forest Health program. This has avoided duplicative work for projects that have already been analyzed under federal requirements. This exemption currently sunsets on January 1, 2028. CAL FIRE recommends extending or removing the sunset date to maintain this important CEQA streamlining tool into the future.

Benefits Quantification

As investments in forest health and wildfire resilience grow, so does the value of having methods to estimate and validate the outcomes of these investments. The ability to clearly articulate project benefits can provide transparency, build public confidence, and potentially attract investments from new sources. This report has presented outcomes derived from established methodologies as well as the experimental application of new methods. Through this process, CAL FIRE and the California Air Resources Board have identified several methodological improvements that could be used to more accurately estimate project outcomes, and CAL FIRE recommends continued support for methodological refinements. CAL FIRE is committed to continued collaboration with partners, including the Wildfire and Forest Resilience Task Force, to develop new methods where needed, and is already working with the California Air Resources Board to update the Board's methodologies with the following improvements:

- Development of a Rangeland Vegetation Simulator (RVS). The Forest Vegetation Simulator, which is used to model changes in forest structure in response to treatments, does not capture the shrub component of forests and has limited accuracy in non-forested landscapes. This is particularly true in the southern part of the State at lower elevations, where tree cover is often sparse and the landscape is dominated by shrubs, chaparral, and grasses. The RVS is a vegetation model specific to shrublands and grasslands and will allow for assessment of carbon sequestration and other outcomes of treatments in these areas. Originally developed in 2011, RVS was recently revitalized through a contract with the California Air Resources Board to modernize its input data, incorporate new allometric equations, and develop Statewide carbon maps for shrublands and chaparral. The goal is to integrate RVS with the FVS workflow so that the outcomes of treatments in the non-forested landscapes are more accurately modeled.
- Wildfire probability maps. The expected long-term benefits of fuel treatments depend heavily on the probability of a wildfire occurring within the treatment effectiveness window. The California Air Resources Board's Quantification Methodology has been relying on a

wildfire probability map based on empirical wildfire occurrence between 1980-2019, extrapolated to future climate conditions. However, due to complex changes in wildfire patterns and the nonlinear effects of climate on wildfire, this map likely underestimates wildfire probability in some areas of California. Thanks to a new mechanistic modeling effort by the US Forest Service called FSim, an updated wildfire probability map is now available for incorporation into the Quantification Methodology.

- Incorporation of natural regeneration. Current modeling tools do not account for the natural forest regeneration that occurs following disturbance, as no accepted rates of regeneration exist for the California variants of the Forest Vegetation Simulator. This likely results in an underestimate of the carbon sequestration benefits over the life of fuels reduction, pest management, and reforestation projects, as no new seedlings are added to the growth and yield model. Assuming even a conservative rate of natural tree regeneration and vegetation regrowth would result in higher estimates of carbon sequestration. Testing of a new method for establishing natural regeneration rates for California forests is currently underway.
- High-severity fire. The Quantification Methodology uses industry-standard wildfire behavior models to estimate the impacts of projects on future wildfire severity. These models were developed to mimic fire patterns under 20th century climate and forest conditions and do not reflect modern fire behavior due to the unprecedented weather patterns, fuel dryness, and fuel loads seen today. As a result, the Quantification Methodology predicts far less high-severity fire than occurs empirically. The California Air Resources Board is exploring model calibration to better reflect the benefits of fuel treatments on high-severity fire patterns.
- Delayed forest reestablishment. The current Quantification Methodology for forest restoration accounts for fuel treatment effects on carbon stocks via biomass removal, stimulated forest growth, and reduced wildfire severity. However, severely burned forests often do not regenerate on their own due to lack of seed sources and post-fire competition with shrubs. This can affect the carbon accounting over the course of the project life. A new contract has been initiated to better understand the carbon impacts of delayed forest reestablishment. The findings from this project will be integrated into the Quantification Methodology by 2030. When combined with improved methods for natural regeneration and high-severity fire, these improvements to the Quantification Methodology will better reflect the long-term benefits of fuel treatments to ecosystem carbon.

Assessment of Unmet Need

There are multiple ways of assessing the need for investment in forest health and wildfire resilience work. At a macro scale, California has tremendous unmet need for forest restoration work to reduce the risk of catastrophic wildfire. California's first Wildfire and Forest Resilience Action Plan set a goal of treating one million acres a year by 2025. Thanks to the efforts of CAL FIRE and many partner agencies, tribes, and organizations, the State is closing in on this goal. However, even this level of treatment will be inadequate to restore California's 30 million acres of forests to more resilient conditions. More recently, the California Natural Resources Agency established targets of 2.5 million acres a year, including 1.5 million acres of beneficial fire, by 2045, pursuant to AB 1757 (C. Garcia, Ch. 341, Stats. 2022) and consistent with the California Air Resources Board's Climate Change Scoping Plan. The California Natural Resources Agency has also established targets for post-fire reforestation of 322,000 acres annually by 2030, growing to 462,000 acres annually by 2038 (*California's Nature-Based Solutions Climate Targets*, 2024).

Grant programs funded in full or in part by the SB 901 appropriation have played an important role to date in accelerating on-the-ground treatments and building the necessary capacity to sustain this work. These grant programs are almost always oversubscribed. Demand for the Forest Health and Wildfire Prevention grant programs has been close to three times higher than the funding available in competitive solicitations over the five years covered by this report. Demand for Business and Workforce Development grants has been more than three times higher than funding available, and demand for the Forest Health Research program has been close to five times higher than funding available. Unmet demand was even higher in FY 2024-25. This demonstrates the need for ongoing funding for these programs to maintain progress toward State goals, as well as adequate program staffing levels. Staffing has not kept pace with the growth of CAL FIRE grant programs, particularly Forest Health, making it difficult for grant administrators to visit each project regularly for field verification of treatments, conduct invoice and progress report review, and provide technical assistance. Likewise, the California Natural Resources Agency has established targets for urban greening, including increasing canopy cover in cities and communities by more than 34,000 acres per year (*California's Nature-Based Solutions Climate Targets*, 2024). Funding for urban and community forestry has been unpredictable from year to year and these programs would also benefit from ongoing funding in order to achieve State goals.

State grants on their own cannot fully achieve wildfire resilience goals. The Forest Health program's FY 2023-24 solicitation, for example, funded about 50,000 acres in resilience treatments, a meaningful but small portion of the State's overall goals. Private investment, through development of robust markets for wood products or new conservation finance mechanisms, will ultimately be essential to scaling up this work. State investments in support of new wood products technologies, expanded wood products infrastructure, and workforce development will be complementary to direct public investments in resilience treatments and will increase the likelihood of California achieving its long-term goals.

Appendix A: SB 901-Funded CAL FIRE Programs

This appendix provides more detail on the CAL FIRE programs that have received California Climate Investments funding through the SB 901 appropriation. More information can be found on the California Climate Investments webpage.

Business and Workforce Development

What it funds: Grants to promote healthy, resilient forests throughout the State through 1) supporting wood products and bioenergy projects and operators; and 2) workforce development projects within the forestry and wildfire sector.

Eligibility: Local, State, and federal agencies, universities, special districts, Native American tribes, non-profit organizations, and private entities including businesses and foundations.

Program Website: https://www.fire.ca.gov/what-we-do/natural-resource-management/climate-and-energy-program/wood-products-and-bioenergy

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California Forest Improvement Program

What it funds: Cost-share assistance for improved management of California's private, nonindustrial forestlands and resources to ensure adequate high-quality timber supplies, related employment and other economic benefits, and the protection, maintenance, and enhancement of productive and stable forests for the benefit of present and future generations. Funding is also used to directly support California Forest Improvement Program staff. Staff regularly meet with private landowners to help them find financial support, understand the full suite of options available to them as forestland owners, and move through the process of setting up a cost-share agreement.

Eligibility: Landowners owning between 20 and 5,000 acres of forestland.

Program Website: https://www.fire.ca.gov/what-we-do/grants/california-forest-improvement

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Forest Health

What it funds: Grants to regionally based partners and collaboratives for landscape-scale reforestation, fuels reduction, pest management, prescribed fire, and forest biomass utilization. Grants are aimed at providing for more resilient and sustained forests to ensure future existence of forests in California while also mitigating climate change, protecting communities from fire risk, strengthening rural economies, and improving California's water and air.

Eligibility: Local, State, and federal agencies, universities, special districts, Native American tribes, private forest landowners, and non-profit organizations.

Program Website: https://www.fire.ca.gov/what-we-do/grants/forest-health

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Forest Health Research and Monitoring

What it funds: Research on priority topics in support of California Forest Carbon Plan implementation, as well as Prescribed Fire Monitoring.

Eligibility: Local, State, and federal agencies, universities and academic institutions, Tribal Governments, private forest landowners, and nonprofits including fire safe councils and land trusts are all eligible for Forest Health Research grants.

Program Website: https://www.fire.ca.gov/Home/What-We-Do/Grants/Forest-health-research-program

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Forest Legacy

What it funds: Protection of environmentally important forestland threatened with conversion to non-forest uses, through CAL FIRE's purchasing of conservation easements or fee title of productive forestlands from willing sellers. This funding is also used to support the program staff who work directly with grantees before, during, and after a grant is made, including helping grantees to prepare for a solicitation, complete the necessary due diligence work to finalize an easement purchase, and perform annual project monitoring.

Eligibility: Private forestland. Eligible properties include those with working forests and rangelands where the property is managed for the production of forest products and traditional forest uses are maintained.

Program Website: https://www.fire.ca.gov/what-we-do/grants/forest-legacy

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Fuels Reduction Crews

What it funds: CAL FIRE crews of wildland fuels reduction professionals dedicated to increasing the pace and scale of fuel reduction treatments in support of the California Forest Carbon Plan, as well as costs of additional resources (e.g., hand crews, engine companies, etc.) for work on CAL FIRE Units' fuel reduction projects. Crews are located around the State and conduct prescribed burns and other fuel reduction treatments to help protect communities from wildfires, create healthier and more climate-resilient ecosystems and watersheds, and stabilize carbon stored in natural lands. Crews provide key capacity, jointly with other CAL FIRE teams and resources, to assist with implementation of CAL FIRE Fire Plan and Vegetation Management Program projects.

Urban and Community Forestry Program

What it funds: Urban forest expansion, management, and improvement, and utilization of urban tree waste for wood products and bioenergy.

Eligibility: Local agencies and nonprofits.

Program Website: https://www.fire.ca.gov/what-we-do/grants/urban-and-community-forestry-grants

Wildfire Prevention Grants

What it funds: Hazardous fuels removal, wildfire prevention planning, wildfire prevention education, and wildfire prevention research with an emphasis on improving public health and safety.

Eligibility: Joint Powers Authority if the entities involved are eligible applicants, federal, State, and local public agencies, tribal governments, certified local conservation corps, Fire Safe Councils with a 501(c)(3) designation, nonprofits.

Program Website: https://www.fire.ca.gov/what-we-do/grants/wildfire-prevention-grants

Appendix B: The Senate Bill 901 Appropriation

Section 45 of Senate Bill SB 901 (Dodd, Ch. 626, Stats. 2018) stated the Legislature's intent to appropriate $200 million annually to the Department of Forestry and Fire Protection (CAL FIRE) through the 2023-24 fiscal year from the Greenhouse Gas Reduction Fund. $165 million was to be "for healthy forest and fire prevention programs and projects that improve forest health and reduce greenhouse gas emissions caused by uncontrolled wildfires," while $35 million was "to complete prescribed fire and other fuel reduction projects through proven forestry practices consistent with the recommendations of the Forest Carbon Plan, including the operation of year-round prescribed fire crews and implementation of a research and monitoring program for climate change adaptation."

The Legislature and the Governor followed up on this commitment, appropriating approximately $200 million each year until 2021, when SB 155 (Committee on Budget and Fiscal Review, Ch. 258, Stats. 2021) continuously appropriated the same amount annually through the 2028-29 fiscal year. Due to a larger appropriation one year, CAL FIRE was appropriated $1,030,000,000 pursuant to Section 45 of SB 901 from the 2019-20 fiscal year through the 2023-24 fiscal year (the period to be included in this report per SB 63). A detailed accounting of these appropriations is as follows:

- The Budget Act of 2019, AB 74 (Ting, Ch. 23, Stats. 2019) for the 2019-2020 fiscal year was signed June 27, 2019, appropriating $165,000,000 to be "used consistent with subdivision (a) of Section 45 of Chapter 626 of the Statutes of SB 901" (including $5 million to be made available to the California Conservation Corps) and $35,000,000 to be "used consistent with subdivision (b) of Section 45 of Chapter 626 of the Statutes of 2018."
- The Budget Act of 2020 SB 74 (Mitchell, Ch. 6, Stats. 2020) for the 2020-2021 fiscal year was signed June 29, 2020, appropriating $39,613,000 to be "used consistent with subdivision (a) of Section 45 of Chapter 626 of the Statutes of 2018 (SB 901)" (including $5 million to be made available to the California Conservation Corps) and $35,000,000 to be "used consistent with subdivision (b) of Section 45 of Chapter 626 of the Statutes of 2018 (SB 901)."
    - SB 85 (Committee on Budget and Fiscal Review, Ch. 14, Stats. 2021) was subsequently signed on April 13, 2021, amending the Budget Act and appropriating an additional $125,387,000 for purposes consistent with subdivision (a), bringing the total for the fiscal year for subdivision (a) to $165,000,000.
- The Budget Act of 2021 AB 128 (Ting, Ch. 21, Stats. 2021) for the 2021-2022 fiscal year did not include this appropriation, but SB 129 (Skinner, Ch. 69, Stats. 2021) was subsequently signed on July 12, 2021 amending the Budget Act and appropriating $39,613,000 to be "used consistent with subdivision (a) of Section 45 of Chapter 626 of the Statutes of 2018 (Senate Bill 901)" (including $5 million to be made available to the California Conservation Corps) and $35,000,000 to be "used consistent with subdivision (b) of Section 45 of Chapter 626 of the Statutes of 2018 (Senate Bill 901)."
    - SB 170 (Skinner, Ch. 240, Stats. 2021) was subsequently signed on September 23, 2021, amending the Budget Act again and appropriating an additional $155,387,000 for

purposes consistent with subdivision (a), bringing the total for the fiscal year for subdivision (a) to $195,000,000.

- SB 155 (Committee on Budget and Fiscal Review, Ch. 258, Stats. 2021), the public resources trailer bill, was signed on September 23, 2021. The law continuously appropriates $200 million annually from Fiscal Years 2022-2023 through 2028-2029 to CAL FIRE, to be allocated as follows:
    - $165,000,000 for healthy forest and fire prevention programs and projects that improve forest health and reduce emissions of greenhouse gases caused by uncontrolled wildfires.
    - $35,000,000 for the completion of prescribed fire and other fuel reduction projects through proven forestry practices consistent with the recommendations of the California Forest Carbon Plan, including the operation of year-round prescribed fire crews and implementation of a research and monitoring program for climate adaptation.

Note that General Fund investments have been made in many of these same programs and separate GGRF investments have been made in CAL FIRE programs over the same time period, but this report only covers the SB 901 funding described above.

Appendix C: Forest Health Modeling Outputs

The table which follows summarizes the outputs derived from modeling each SB 901-funded Forest Health grant for which sufficient data was available. Outputs were derived using the California Air Resources Board's Forest Restoration and Management Quantification Methodology. The outputs include Stand Density Index (SDI), Quadratic Mean Diameter (QMD), Conditional Burn Probability (CBP), Conditional Flame Length (CFL), and greenhouse gas (GHG) benefits. Total acres may not match those reported elsewhere, as not all project acres could be modeled.

APPENDIX C: FOREST HEALTH MODELING DATA

GRANT ID	PROJECT NAME	GHG PROJECT BENEFIT* (MT CO2E)	FUELS REDUCTION ACRES	PEST MANAGE-MENT ACRES	REFOREST-ATION ACRES	TOTAL ACRES TREATED	FUEL TREATMENTS				IMPACT AREA		REFORESTATION		BIOMASS UTILIZATION	
							▲ SDI %	▲ QMD %	▲ CFL %	▲ CBP %	▲ CFL %	▲ CBP %	▲ CARBON* (MT CO2E)	NUMBER OF TREES PLANTED	ENERGY GENERATED (KWH)	GHG BENEFIT BIOMASS (MT CO2E)
8GG19604	Forest Health in Santa Cruz County - A Collaborative Approach	29,153	132		251	383	-32.63	59.94	N/A	N/A	N/A	N/A	30,350	31,375		
8GG19605	Forest Health in San Mateo County – A Collaborative Approach	15,734	459			459	-26.72	53.67	N/A	N/A	N/A	N/A				
8GG19606	Jose Basin Fuels Reduction	57,843	3,751		1,439	5,190	-42.51	54.71	N/A	-61.28	0.00	-14.35	198,529	287,800		
8GG19607	Improving Forest Health in the Yurok Community Forest and Salmon Sanctuary	57,625	2,472			2,472	-66.50	144.06	-99.30	-88.36	-7.03	-20.11				21,539
8GG19609	Upper Little Stony Post Ranch Fire Restoration Project	104,445	845		780	1,625	-50.69	62.13	-15.94	-8.47	-4.39	-2.84	96,399	234,000		
8GG19610	Saving San Diego's Last Mixed Conifer Forest	60,895	1,059	85	237	1,381	-27.12	37.59	-3.45	5.22	-12.21	11.44	14,918	41,475		
8GG19611	Yuba Foothills Healthy Forest Project	37,648	5,257		118	5,375	-35.10	65.16	-97.11	-89.23	-12.65	-26.03	12,066	17,700	37,333,800	9,298
8GG19612	Climate Adaptive Forest Management	8,030	617	108	217	942	-19.52	27.39	-98.32	-70.73	-22.97	-27.37	10,886	16,160		
8GG19613	Trinity Community Protection and Landscape Resilience Project - Phase 2	131,304	5,362		300	5,662	-64.94	107.53	-65.01	-7.43	-1.53	-2.60	118,356	90,000	9,720,000	1,944
8GG19615	East Fork Scott	41,498	3,457			3,457	-22.02	17.94	-58.49	-13.26	-2.46	-5.61				11,793
8GG19616	Mendocino National Forest Fuel Reduction Partnership: Smokey Project	7,055	702			702	-10.91	43.58	N/A	N/A	N/A	N/A				
8GG19617	Case Mountain Forest Health Project	64,451	822	320		1,142	-15.87	53.56	-64.24	-21.99	-5.66	0.48				1,934
8GG19619	Fire Adapted 50 Phase IB - Wildland Fire Protection Program	-12,653	1,121			1,121	-30.04	42.49	-31.35	-39.01	-0.24	-2.29				
8GG19620	2020 CAL FIRE Forest Resilience Project – Tahoe Central Sierra Initiative	-177,229	3,765			3,765	-32.21	40.19	-98.45	-56.46	-2.97	-13.05			6,150,600	7,513
8GG20600	Burney Hat Creek Forest Health Project, Phase 2	219,780	1,810		910	2,720	-5.73	7.19	-100.0	-88.99	-3.73	-5.57	181,082	273,000	6,150,600	30,168
8GG20602	Upper Pit River Forest Health Project, Phase 2	-61,893	7,348			7,348	-13.11	10.00	-96.82	-56.91	-5.00	-14.55			66,132,000	6,235
8GG20604	Los Gatos Creek Watershed Collaborative Forest Health Grant	11,579	692			692	-11.61	24.50	-70.13	-13.47	-2.38	-5.94			6,847,200	10,711
8GG20611	Whitmore Forest and Watershed Restoration Project	-51,974	7,412			7,412	-45.16	15.50	-98.67	-31.80	-0.47	-4.97				17,781
8GG20612	Increasing Forest Resilience and Restoring Forest Health at Two Critical Outreach Forests	115,983	615		272	887	-1.53	2.44	-92.69	-50.49	-1.69	-4.42	117,486	54,400	88,906,500	
8GG20618	Sequoia Wildfire Reforestation and Recovery Project	414,150	40		2,565	2,605	-10.82	13.80	-98.14	-45.99	0.52	-6.27	396,770	729,500	-	16,957
8GG20619	Hog and Sheep Fire Forest Restoration	2,002,988	-		13,295	13,295	N/A	N/A	N/A	N/A	N/A	N/A	1,992,967	111,933		10,021
8GG20620	Landscape Scale Management to Combat Goldspotted Oak Borer in Southern California	-44,856	1,106	505	324	1,935	-47.83	-34.29	N/A	N/A	N/A	N/A	-495	1,940	100,500	10,711
8GG20625	Goat Mountain Forest Infrastructure Improvements for Fire Resilience	20,731	332	594	100	1,026	-17.86	13.12	-89.76	-8.83	-0.14	-3.62	23,180	15,000	3,244,101	2,988
8GG20627	Forest Health and Upper Watershed Resilience, Butte County	24,595	1,442		189	1,631	-10.24	15.61	-84.73	-55.05	-0.91	-14.19	33,038	48,700		3,817
8GG20630	Hoopa Valley East Viewshed Cultural Treatment and Prescribed Burn	11,326	544			544	-14.29	47.35	-97.47	-84.73	-7.27	-35.47				
8GG20631	South Lassen Forest Health and Workforce Development	27,437	1,421			1,421	-46.09	49.46	-84.88	-67.53	-8.30	-9.25				
8GG20632	Northern Mendocino County Forest Health Collaborative	567	1,021		45	1,066	-27.68	22.86	-9.50	-0.74	-0.87	-0.19	8,243	9,000		
8GG20634	Ruth Lakes/Mad River Reforestation Project	1,182,508	-		2,981	2,981	N/A	N/A	N/A	N/A	N/A	N/A	1,182,508	300,750		
8GG20635	Southern Sierra All Lands Restoration and Recovery – Mariposa County, Phase II	48,429	1,870		82	1,952	-9.36	10.58	-88.44	-44.03	-11.11	-17.05	11,115	41,000	25,188,300	38,795
8GG21601	Indian Valley Wildfire Recovery Project	768,677	-		4,343	4,343	N/A	N/A	N/A	N/A	N/A	N/A	768,677	577,890		
8GG21602	Implementing Landscape-Scale Restoration and Reforestation in Klamath National Forest	51,198	2,994		450	3,444	-23.58	-7.44	5.85	0.63	1.60	-0.02	63,216	95,850	324,000	
8GG21603	Consumes Ladder Fuel Reduction Project	-4,117	1,152		5	1,157	-26.39	5.29	0.00	0.00	-15.35	0.00	-76	400		
8GG21604	Travis Ranch Fire Recovery and Forest Health Improvement Project	65,614	1,084		798	1,882	-21.68	39.34	-97.10	-24.27	-3.17	-10.09	209,585	99,750		
8GG21605	Collins Almanor Forest Dixie Fire Restoration Project	2,715,597	-		15,000	15,000	N/A	N/A	N/A	N/A	N/A	N/A	2,552,601	3,000,000		162,996
8GG21606	Headwaters Basin forest Resilience Project	313	714			714	-19.15	25.61	-0.94	0.17	-0.46	-0.45				

GRANT ID	PROJECT NAME	GHG PROJECT BENEFIT* (MT CO2E)	FUELS REDUCTION ACRES	PEST MANAGE-MENT ACRES	REFOREST-ATION ACRES	TOTAL ACRES TREATED	FUEL TREATMENTS				IMPACT AREA		REFORESTATION		BIOMASS UTILIZATION	
							▲ SDI %	▲ QMD %	▲ CFL %	▲ CBP %	▲ CFL %	▲ CBP %	▲ CARBON* (MT CO2E)	NUMBER OF TREES PLANTED	ENERGY GENERATED (KWH)	GHG BENEFIT BIOMASS (MT CO2E)
8GG21608	Mattole and Salmon Creek Forest Health and Wildfire Resilience Project	11,300	912		22	934	-23.64	35.83	-97.19	-48.70	11.29	-8.80	8,253	11,000		1,870
8GG21609	Bear/North Complex reforestation	166,715	280		1,057	1,337	-33.65	13.25	N/A	N/A	N/A	N/A	168,955	317,100		
8GG21610	Scott Valley/Callahan Fuels Reduction and Forest Resiliency Project	8,905	2,342		123	2,465	-25.97	15.51	-41.44	-2.61	-0.03	-1.57	31,796	36,900	3,132,000	1,132
8GG21611	Napa's Howell Mountain Corridor: Forest Ecotone and Fire Resiliency Restoration Project	-7,635	854		119	973	-32.32	37.24	-94.08	-54.28	-9.55	-25.72	7,331	8,925		
8GG21612	Forest Health and Feather River Watershed Resilience, Butte County	44,969	974		339	1,313	-13.64	27.72	-77.36	-41.67	-5.49	-25.86	47,167	53,850		
8GG21613	Shelterwood Forest Restoration	50,120	657		160	817	-24.56	48.80	-99.28	-77.43	-6.61	-13.78	48,433	24,000		
8GG21614	Low Gap Road Forest Resilience Project	-20,926	958			958	-46.00	56.39	-96.93	-41.68	-4.53	-14.66			5,908,500	3,532
8GG21615	Leoni Meadows Forest Restoration Project	123,565	39		843	882	11.38	43.05	N/A	N/A	N/A	N/A	118,709	194,463		5,076
8GG21616	French Meadows Ecological Restoration-Project Completion (FMP)	21,020	1,435			1,435	-18.31	29.68	-96.05	-82.53	-7.97	-26.02				4,171
8GG21617	Mariposa County SSARR, Phase III: Protecting the Mariposa Grove	64,438	4,150		265	4,415	-5.15	6.44	-99.86	-96.04	-7.22	-28.64	76,386	132,500		
8GG22600	Tenmile Creek Watershed Forest Health Project	-20,633	1,319			1,319	-22.30	29.68	-52.66	-9.06	-1.82	-2.18				
8GG22601	Southern Trinity Fire Resiliency Project	-51,986	1,830			1,830	-20.11	20.48	-6.62	-3.34	-0.21	-0.44				
8GG22603	USFS I-5 Corridor Forest Health Project Phase I	-46,480	2,924			2,924	-3.21	2.60	-48.88	-2.05	0.59	0.66				
8GG22604	Warner Mountains Forest Health Implementation and Planning	-7,965	965			965	-23.21	28.22	-11.00	-0.01	-0.60	0.00			21,879,000	
8GG22606	Restoring fire resilience and stabilizing carbon storage in an old-growth, headwater forest	-43,799	3,836			3,836	-3.25	-1.19	-97.70	-82.91	-1.19	-2.56				
8GG22607	New Bullards Bar 2023 Forest Health Project	-3,299	3,407			3,407	-21.95	26.05	-71.87	-32.95	-1.79	-7.37			27,000,000	5,400
8GG22608	Mosquito Fire Recovery and Reforestation	198,549	-		997	997	N/A	N/A	N/A	N/A	N/A	N/A	198,549	219,340		
8GG22609	WUI Wide Forest and Watershed Restoration Project	-39,054	2,007			2,007	-20.28	13.74	-78.32	-29.67	2.57	-2.97			-	1,105
8GG22611	Los Gatos Creek Watershed Collaborative Forest Health Project (Phase 2)	-2,061	725			725	-14.89	33.20	-2.61	-2.68	-1.23	-1.57			5,524,200	
8GG22613	Dixie Fire Restoration Project	1,195,602	-		6,625	6,625	N/A	N/A	N/A	N/A	N/A	N/A	1,183,452	1,325,000		12,150
8GG22614	Forest Projects Plan – Arbor (Phase 1A)	-65,202	3,092			3,092	-25.17	37.52	-44.30	-10.47	-4.46	-9.05			-	
8GG22615	Eshom-Rough-Castle Ecological Restoration Phase 2	33,017	2,038		452	2,490	-19.57	17.30	-92.59	-23.79	-0.42	-3.40	84,435	90,400	60,750,000	8,648
8GG22616	Napa Veterans Home Lighthouse for the Blind – Wildfire Resiliency Project	-18,314	906		16	922	-39.29	35.19	-83.16	-79.77	-6.03	-45.47	3,968	3,200		
8GG22617	North Shore Restoration Fuels Reduction	314,242	-		1,064	1,064	N/A	N/A	N/A	N/A	N/A	N/A	314,242	232,633		
8GG22619	Giant Sequoia National Monument Restoration and Stewardship Project	5,627	1,303			1,303	-40.67	70.11	-99.27	-82.47	-8.98	-12.43			2,785,500	2,245
8GG22620	ARC SOFAR Restoration Project	-67,562	868			868	-53.13	35.81	-54.34	0.15	1.75	1.54				103
8GG22624	Western Klamath Fire Resilience and Forest Health Project	-52,586	4,122			4,122	-5.71	10.47	-19.32	6.07	2.05	5.88				
8GG22626	Tehama East Forest Health Program	15,646	831			831	-16.55	14.93	-87.97	-37.68	-15.26	-20.09			959,400	192
8GG22627	Dixie Fire West Reforestation Project	500,832	1,551		3,303	4,854	-34.64	24.49	-93.65	-21.41	-5.83	-10.28	519,373	578,025	78,818,940	15,764
8GG23600	Crystal Basin Ecological Restoration Project	-43,810	3,003		196	3,199	-26.41	1.00	-95.03	-43.69	-8.52	-15.45	15,474	39,200		
8GG23602	Upper Chowchilla River Watershed Forest Health and Fire Recovery Project	95,390	730		772	1,502	-28.57	35.53	-95.05	-66.43	-15.57	-34.83	109,005	163,660	1,707,118	2,492
8GG23604	One Tam Regional Forest Health Project -- Phase II	-6,982	965			965	-22.39	26.16	-87.37	-54.01	-2.59	-15.46				
8GG23605	Nevada & Placer County Cooperative Landscape Resilience Project	32,210	2,617		64	2,681	-15.46	17.41	-97.63	-70.82	-14.44	-24.18	9,621	12,800	3,206,700	9,385
8GG23607	Butte County Forest Resilience and Restoration Project	-105,730	2,391			2,391	-43.89	41.33	-83.03	-26.13	-4.03	-9.70				
8GG23608	Trapper Forest Health and Fuels Reduction Project	4,705	2,480			2,480	-20.49	13.56	-96.77	-72.32	-4.07	-26.78			9,069,017	1,814
8GG23609	Leonard Lake Reserve and Montgomery Woods State Reserve Forest Health Collaborative	-18,917	1,625			1,625	-37.14	26.68	-98.78	-88.42	0.92	-21.98				
8GG23610	Mariposa County SSARR, Phase IV: Large Scale Fuels Reduction	-235,645	19,190			19,190	-0.68	1.08	-99.70	-92.43	-14.24	-28.94			5,626,575	42,083
8GG23613	Eastern Sierra Climate & Communities Resilience Project (ESCCRP): Phase I Priority Acres	79,514	1,492	473		1,965	-20.66	26.06	-75.75	-84.44	-12.34	-18.87			17,238,198	6,816
8GG23614	Larabee Valley Forest Health & Resiliency Project	412,817	-	790	93	883	N/A	N/A	N/A	N/A	N/A	N/A	8,515	1,023		1,410
8GG23615	Skey-wok kee' we Mech (It Needs Fire) Phase 1	2,394	1,010			1,010	-33.51	40.23	-98.11	-87.66	-3.13	-7.53				

GRANT ID	PROJECT NAME	GHG PROJECT BENEFIT* (MT CO2E)	FUELS REDUCTION ACRES	PEST MANAGE-MENT ACRES	REFOREST-ATION ACRES	TOTAL ACRES TREATED	FUEL TREATMENTS				IMPACT AREA		REFORESTATION		BIOMASS UTILIZATION	
							▲ SDI %	▲ QMD %	▲ CFL %	▲ CBP %	▲ CFL %	▲ CBP %	▲ CARBON* (MT CO2E)	NUMBER OF TREES PLANTED	ENERGY GENERATED (KWH)	GHG BENEFIT BIOMASS (MT CO2E)
8GG23617	SLO Monterey Pine Restoration	5,306	837		31	868	-3.65	8.51	-57.01	-39.98	-4.30	-5.34	5,304	2,700		
8GG23618	Linking Landscape Scale Forest Resilience Efforts in San Mateo County	3,845	773			773	-14.15	28.31	N/A	-30.38	N/A	-2.20				4,175
8GG23619	Weed Community Forest Restoration and Enhancement Project	209,584	827		1,012	1,839	-23.08	8.83	-33.25	-35.09	10.19	-13.86	218,779	227,700		
8GG23620	West Mt. Shasta Forest Resilience Phase II	356,423	323	430	330	1,083	-40.84	40.27	-95.05	-66.43	-15.57	-34.83	126,622	99,000	3,150,000	630
8GG23622	Northern Trinity County Forest Resilience Partnership Phase II	1,880	1,462			1,462	-30.57	47.89	-58.30	-71.28	-25.07	-42.24				-
8GG23625	Sustainable Land Stewardship: Tribal Integrated Fuels Management and Targeted Grazing	-55,373	5,024			5,024	-31.50	44.21	-39.81	-7.29	-1.70	-4.66				
8GG23626	Collective Recovery: Strategic partnerships for landscape-scale sequoia grove management	139,973	1,035		1,012	2,047	-29.11	40.00	N/A	-62.75	17.34	3.25	142,675	93,000	12,058,200	15,087
	Measured over the life of the project, usually 50-60 years.															

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