GOLDEN TOGETHER

Policy Paper #1 - FEBRUARY 2024

Reducing California's Carbon Emissions Through Modern Forest Management

Foreword

I'm thrilled to publish this, our first Golden Together policy paper. Our aim is to produce a monthly series of reports that will offer substantive analysis of California's most serious challenges, along with positive and practical, common sense ideas that will help solve them.

The focus of this first paper is climate change: but we approach this issue from a more pragmatic perspective than the increasingly ideological tenor of current debates. An analysis of California's carbon emissions over the past few decades reveals that one of the largest sources of carbon pollution in our state is wildfire. In fact, emissions from just one recent wildfire year were greater than all the emission reductions achieved by climate policy in the preceding twenty years.

The good news is that with the right policies in place, we can drastically reduce these emissions by restoring California's forests to health, simultaneously reviving an industry that will create significant economic opportunity - both in rural communities directly, and across the state. One of the most exciting opportunities lies in the emerging market for "mass timber" - a construction technique that could replace concrete as a prime construction material. This would not only reduce housing and other costs but produce significant ongoing reductions in carbon emissions too. We can and should be at the forefront of this revolution in California - and this report lays out a plan for putting us there.

I am hugely grateful to everyone who helped prepare this policy paper, especially Golden Together Advisory Board members David Tangipa and Tom Crosby who generously provided insight and ideas. We are also indebted to the many forestry industry experts and wildlife biologists who shared their research expertise, including Mike Baker, Andrew Ball, Danny Haber, Stephen Byrd, Steven Brink, Lisa Perry, Andrea Howell, John Mount, Eric Carleson, and George Gentry.

Special thanks to California Policy Center senior fellow Edward Ring who is the lead author on this and all our policy papers. I cannot overstate my appreciation for Ed's policy expertise, and his ability to produce clear and compelling writing that tells the story of what has gone wrong in California and how we can put it right together. I would not be able to do any of this without him.

Steve Hilton
Founder, Golden Together
California, February 2024

Modern Forest Management – Key Points:

- Wildfires are California's second highest source of carbon emissions, behind transportation but ahead of the industrial sector and ahead of all power plants combined.
- California's 30,000 square miles of forest and chaparral are overgrown tinder boxes. Wildfires in the summer and fall of 2020 released an estimated 106 million tons of CO2
- into the atmosphere, more than double the amount of greenhouse gas emissions than all the reductions made in California between 2003 and 2019 combined.
- New management practices to restore the health of California's forests would dramatically curb California's carbon emissions, while making compelling economic and environmental sense whether or not the policy priority is to address climate change.
- Most of the reforms we propose will not cost taxpayers anything. Private sector investment can fund the transition to Modern Forest Management in California, and in so doing create thousands of jobs and billions of dollars of revenue through products serving California's construction and energy sectors.
- In the 1980s (in 2020 dollars) CalFire spent on average $187 million per year on fire suppression, and the average annual timber harvest was 6 billion board feet per year. By 2020 CalFire spent $1.7 billion on fire suppression, while the annual timber harvest had declined to 1.5 billion board feet.
- Fire suppression and reduced logging have consequences. The density of California's mixed conifer forests has risen from 60 trees per acre to 170 trees per acre. This has not only created the conditions for 'mega' wildfires, with their associated CO2 impact, but exacerbated drought and water shortages, with knock-on negative effects for communities and ecosystems.
- A revived timber industry could put California at the forefront of a revolution in construction materials: "mass timber" which has the opportunity to replace concrete in many applications. This would also contribute to lowering carbon emissions whilst helping to reduce the cost of housing.

Golden Together Policy Recommendations

- **Enhance community safety with forest thinning**, prioritizing along evacuation routes. Widen roads enough to ensure cars can evacuate one way as firefighting vehicles advance from the other direction. Harden homes against embers, with brush cleared away from structures.
- **Revive sustainable logging;** turn forest management back into a revenue generating activity. Expand new techniques of total ecosystem management, to protect wildlife and important groves.
- **Revive California's sawmills.** In 2020 California's forestry and logging industries produced over $400 million in economic output and employed over 5,700 workers. If capacity were restored to the volumes achieved in the 1980s, this direct economic output would triple.
- **Specific recommendations include:** extending time periods for active forest management and controlled burns; streamlining the application process for timber harvesting; grant long term logging rights to harvest trees on state owned land; loan funds to help finance new sawmills and biomass plants; revise building codes to accelerate uptake of mass timber in construction; invest in workforce development to attract and train people for careers in forestry.

Wildfires are California's second highest source of carbon emissions, greater than all our power plants combined. A new plan to do better - together.

Introduction

Since the year 2000, according to the California Air Resources Board, wildfires have destroyed over 19 million acres, mostly forest and chaparral, over 30,000 square miles. At the same time, these wildfires exposed millions of Californians to smoke so thick and toxic that people were advised to stay indoors for weeks. Utility companies, attempting to prevent fires from starting, cut power during hot and windy summer days to millions more Californians, sometimes for several days in a row. During one of the worst fire seasons in recent years, in the summer and fall of 2020, it is estimated that wildfire smoke released 127 million tons of CO2 into the atmosphere, more than California's entire electricity, commercial, and residential sectors combined.

A recent study by University of California researchers revealed that in 2020, wildfires produced more than double the amount of greenhouse gas emissions than all the reductions made in California between 2003 and 2019, combined. In fact, emissions from wildfires were the second highest source - behind transportation but ahead of the industrial sector, and ahead of all power plants put together.

The conventional explanation for these catastrophic wildfires is that climate change has led to longer, hotter, drier summers in California, creating conditions where small fires can more easily turn into 'megafires'. In response, California's politicians and government agencies have enacted a series of measures designed to achieve "net-zero.", such that all economic activity in the state will either generate zero CO2 emissions, or whatever emissions are generated will be offset by activities that sequester an equal quantity of CO2.

But current climate policy, and public debate, has an enormous, gaping hole. It fails to take into account that one of the biggest sources of California's carbon emissions - not cars, not electricity generation, but 'mega' wildfires - results from outdated, ideologically-driven forest management practices.

This is an enormous missed opportunity to develop positive, practical policies to combat climate change in a way that brings people together around common sense solutions, moving beyond polarized and divisive ideological extremes.

There are modern ways to manage California's forests that would restore them to health, prevent recurring 'megarfires', and introduce practices that guarantee California's forests are not only carbon neutral, but substantially carbon negative.

This report will outline the reasons California's forests have become so unhealthy, survey their current status, and then propose a new approach to managing them. There are important lessons to be learned from how California has historically managed forests, and this report will lay out a number of policy recommendations that combine CO2 reduction goals with opportunities to revive rural economies, and fast-track innovative business models that bring widespread benefits across our state in a number of crucial industries.

One of the most exciting things about incorporating new management practices to restore the health of California's forests is that it makes compelling economic and environmental sense whether or not the policy priority is to reduce CO2 emissions. Moreover, by establishing a new regulatory framework that helps revive a timber industry in California, evolved and enlightened, most of the reforms we propose will not cost taxpayers anything. On the contrary, private sector investment can fund the transition to Modern Forest Management in California, and in so doing create thousands of jobs and billions of dollars of revenue through products serving California's construction and energy sectors.

The Decline of California's Forests

Over the past 20 million years, California's forests endured countless droughts, some lasting over a century. Natural fires, started by lightning (very frequent in the Sierras), were essential to keep forest ecosystems healthy. In Yosemite, for example, meadows used to cover most of the valley floor, because while forests constantly encroached, fires would periodically wipe them out, allowing the meadows to return. Across millennia, fire-driven cycles of devastation followed by recovery and growth played out throughout California's ecosystems.

Over the same period, climate change has been the norm. To put this century's warming into some sort of context, giant sequoias once grew on the shores of Mono Lake. For at least the past few centuries, forest ecosystems have been marching into higher latitudes because of gradual warming. In the Sierra Foothills, oaks have invaded pine habitat, and pine, in turn, have invaded the higher elevation stands of fir.

More recently, fire suppression, and the failure to remove all the undergrowth that results when natural fires aren't allowed to burn, have dramatically altered the natural condition of our forests.

A century ago, in the 1920s, tactics to suppress forest fires were still in their infancy. But techniques and technologies steadily improved, along with firefighting budgets. By the second half of the 20th century, an army of firefighters could cope effectively with California's wildfires. For a while, a combination of timber harvesting and natural fires prevented excess fuel buildup in the forests. But regulatory restrictions on logging that started in the 1990s, and increasingly aggressive fire suppression, laid the foundation for the problems we see today.

During the 1980s (in 2020 dollars), CalFire spent an average of $28 million per year ($66 million in inflation-adjusted 2020 dollars) on fire suppression, and the average annual timber harvest in the state was 6 billion board feet. In 2020, CalFire spent an astonishing $1.7 billion on fire suppression, nearly 10 times more than in the 1980s after adjusting for inflation, while the annual timber harvest had declined to just 1.5 billion board feet.

These two trends are of course directly related. The 'megafires' of recent years are the result of excessive undergrowth, which not only creates fuel for fires that are vastly more difficult and costly to control, but competes with mature trees for the sunlight, water, and soil nutrients needed for healthy growth.

This is why California's forests are not only tinderboxes but are also filled with dying trees. Now Californians confront nearly 20 million acres of overgrown forests.

In a speech before Congress in September 2021, Representative Tom McClintock (R-Calif.) summarized the series of policy mistakes that are destroying California's forests. McClintock's sprawling 4th congressional district covers 12,800 square miles, and encompasses most of the Northern Sierra Nevada mountain range. His constituency bears a disproportionate share of the consequences of forest policies emanating from Washington, D.C. and Sacramento.

> *"Excess timber comes out of the forest in only two ways," McClintock said. "It is either carried out or it burns out. For most of the 20th Century, we carried it out. It's called 'logging.' Every year, U.S. Forest Service foresters would mark off excess timber and then we auctioned it off to lumber companies who paid us to remove it, funding both local communities and the forest service. We auctioned grazing contracts on our grasslands. The result: healthy forests, fewer fires, and a thriving economy. But…we began imposing environmental laws that have made the management of our lands all but impossible. Draconian restrictions on logging, grazing, prescribed burns, and herbicide use on public lands have made modern land management endlessly time-consuming and ultimately cost prohibitive. A single tree thinning plan typically takes four years and more than 800 pages of analysis. The costs of this process exceed the value of timber—turning land maintenance from a revenue-generating activity to a revenue-consuming one."*

When it comes to carrying out timber, California used to do a pretty good job. From the 1950s to the 1980s, as noted, the average timber harvest in California was around 6.0 billion board feet per year. The precipitous drop in harvest volume began in the 1990s. The industry started that decade taking out not quite 5 billion board feet. By 2000 the annual harvest had dropped to just over 2 billion board feet. Today, only about 1.5 billion board feet per year come out of California's forests as harvested timber.

> *Wildlife biologists and forest ecologists who spend their lives studying and managing these timberlands now agree that tree density in California's forests has increased thanks to "non-climatic factors such as the prohibition of controlled burning, and legacies of fire suppression."*

The increase is *not* subtle. Without controlled and naturally occurring fires that clear underbrush and small trees, and without responsible logging, forests become overgrown. According to a study conducted in 2020 by UC Davis and USDA, California's mid-elevation Ponderosa pine and mixed conifer forests used to average 60 trees per acre, but now average 170 trees per acre.

This is not an isolated finding. Observations of excessive tree density are corroborated by numerous studies, testimony, and journalistic investigations. Roughly tripling the density of trees across millions of acres of forest leaves them stressed and starved for soil nutrients, sunlight, and water.

California's excessive forest density not only results in overgrown, dried out and fire prone trees and brush. It also impacts California's water supply and aquatic ecosystems.

That's because excessive forest density also causes excessive evapotranspiration, the process by which plants emit water through tiny pores in their leaves. And in this case, what goes up does not come down. Water lost to evapotranspiration is water that does not percolate into the ground to recharge springs and feed streams. Scientists affiliated with the National Science Foundation's Southern Sierra Critical Zone Observatory have concluded that "forest thinning could increase water flow from Sierra Nevada watersheds by as much as 10 percent."

No reasonable person doubts the sincerity and good intentions of the environmentalists and activists, nor the experts and legislative staff, or the judges and legislators who have unwittingly turned California's forests into tinderboxes. But in search of perfection we engineered a catastrophe. How to unwind and reverse this predicament constitutes the remainder of this report.

Restoring Forest Health and Robust Forestry Economics

Bringing California's forests back from the brink does not have to require more government spending. The right legislative and regulatory reforms can create incentives for the private sector to make the requisite investments, as the logging, milling, grazing, and biomass industries are revived. This in turn would create tens of thousands of jobs and new revenue for the state while reducing carbon emissions and enhancing the safety of people living within California's forests.

Enhancing Community Safety

There are three layers of protection against fires for people living in forest-surrounded communities, more formally referred to as the urban-wildland interface. The first, forest thinning, needs to involve multiple agencies cooperating based on community needs and land topography, rather than stopping at arbitrary jurisdictional boundaries. The second layer of protection requires removing combustible material along access roads, ensuring safe evacuation routes. Roads need to be wide enough to allow cars to evacuate one way at the same time as oncoming firefighting vehicles pass in the other direction. Third, homes themselves need to be hardened against embers, with brush and other combustible materials cleared away from the structures. With these conditions met, insurance against fires can remain affordable, because the risk of fire harming people and property in the forests is minimized. All three of these goals can be achieved by reviving California's timber industry.

Revive Sustainable Logging

Turning land maintenance from what it has become - a revenue *consuming* activity - back into a revenue *generating* activity, starts with bringing annual timber harvests up to a level that matches the natural rate of forest regeneration. To accomplish this, California's logging industry would need to roughly quadruple in size. The good news is that with decades of accumulated experience, logging using today's best practices can significantly improve forest ecosystems. [1]In forests owned and managed by some of the logging companies and public utilities in California, for example, owl counts are higher than in California's federally managed forests.

An important element is a technique known as "clear cutting." This is where a logging company removes all the trees in a designated area, ideally not more than 40 acres. Because it is done on a 60- to 100-year cycle, 'clear cuts' can benefit forests. By converting one or two percent of the forest back into meadow each year, areas are opened up where it is easier for owls and other predators to hunt, helping to maintain naturally balanced ecosystems. In addition, during a clear cut, needles and branches are stripped off trees and left to rejuvenate the soil. Water runoff is managed as well, through 'contour tilling' which creates furrows that follow the topography of hillsides. Rain percolates into the

[1] Mount, John (Forester, Southern California Edison) Interview. Conducted by Ed Ring. 22, February, 2024.

furrows instead of running off causing erosion - and these furrows are where replacement trees are planted.

But clear-cutting can only sustainably be performed on one to two percent of the land in any given year. There are other types of large scale, sustainable logging that can be used in areas deemed more ecologically sensitive. Southern California Edison (SCE) owns 20,000 acres of forest around Shaver Lake in Southern California where they practice what is known as “total ecosystem management.”

California’s worst fire season of this century was the summer and fall of 2020, when 4.1 million acres – over 6,000 square miles – burned. The Creek Fire was the largest, burning over 550 square miles in Southern California. But the 30 square mile island of SCE-managed forest around Shaver Lake was unscathed. This is because for decades, SCE has been engaged in timber operations they define as “uneven age management, single-tree selection,” whereby trees to be harvested are individually designated in advance, in what remains a profitable logging enterprise. Controlled burns are also an essential part of SCE’s total ecosystem management, but these burns are only safe when the selected areas are already well-managed through logging and thinning.

The practice of uneven age management can be used in any sensitive areas, such as along rivers and streams, or in areas where valuable stands of old-growth trees merit preservation.

The alternative, a policy of hands-off preservation, has been disastrous. Overall tree density in the Sierra Nevada is currently estimated to average 170 per acre, much higher in some areas. Historically, a healthy forest would only have had around 60 trees per acre. Clearly, this number varies depending on forest type, altitude, and other factors, but overall, California’s forests, especially on federal lands, contain in some cases up to five times the normal tree density. The results are disastrous: trees that cannot compete for adequate moisture and nutrients, far less rain percolating into springs and aquifers, disease and infestation of the weakened trees, and fire.

This choice—manage the forest or suffer fires that destroy the forest entirely—cannot be emphasized enough. In the Feather River Canyon, along with many other canyons along the Sierra Nevada, the east-west topography turned them into wind tunnels that drove fires rapidly up and down the watershed. Yet these groves of trees along California’s streams and rivers have been among the most fiercely defended against any logging, which made those fires all the worse. The choice going forward should not be difficult. Logging and forest thinning cannot possibly harm a watershed as much as parched forests burning down to the soil, wiping out everything.

Revive California's Sawmills

While California's logging sector is small relative to California's $2.4 trillion economy, logging is an important regional industry.

According to a 2020 study by the University of California, in 2020 California's forestry and logging industries produced approximately $437 million in economic output and employed just over 5,700 workers. If California's timber harvesting and sawmill capacity were restored to the volumes achieved in the 1980s, this direct economic output would triple. When taking into account the indirect economic benefits of California's forestry and logging industries, restoring the industry to its former capacity imparts significant benefit to the entire state economy.

According to the UC study, the economic activity induced *indirectly* by California's logging industry adds "another $500 million in additional output and over 3,600 jobs in agriculture, real estate, manufacturing, and wholesale trade." The study concludes by estimating forest products to be a vital part of a "value chain with a total economic contribution accounting for a $39 billion industry, generating over $16 billion in value-added or gross sale products and employing nearly 177,000 people." *Imagine tripling those numbers.*

Just 40 years ago, there were over one hundred sawmills operating in California. Today only 29 remain, along with eight that are still standing but inactive. There are currently 112 vacant sites in California where sawmills once operated - and in most cases, these sites of former mills are located in ideal areas to rebuild and resume operations.

Reinforcing the compelling economics of reviving California's timber is the fact that the in-state market for timber is far in excess of our potential capacity, even if the industry were fully restored to its former size. While today California *harvests* less than 2 billion board feet per year, the state *consumes* 9 billion board feet. The rest is imported, most of it from Oregon, Washington, and British Columbia. If California's timber industry were to be restored to the level it was in the 1980s, just the in-state market would be big enough to consume 100 percent of its output - and then some.

To establish a modern sawmill with a capacity of 100 million board feet per year requires an investment of around $100 million. Operating at a profit, each sawmill would create an estimated 640 full time jobs. Constructing just 30 new sawmills would create roughly 20,000 jobs in direct employment of loggers, haulers and mill workers, along with thousands of additional jobs in the communities where they are located.

The state's biggest single timber harvester is Sierra Pacific, which owns 1.7 million acres of timberland in California and operates seven company owned mills in California. But Sierra Pacific, the third largest lumber producer in the U.S., is expanding in Oregon, not California, doubling the capacity of their mill in

Eugene to 650,000 board feet per year. Expanding in California would have made more sense; plenty of timber, closer access to markets. But the current regulatory climate in California made that impossible.

Building more sawmills in California would enable smaller private timberland owners to sell their timber. As it stands today, even if these small landowners manage to obtain timber harvest permits, the mills that still exist have no room for timber from small landowners. They are almost always operating at full capacity. A vital part of making investments in more sawmills feasible is to unlock the vast reserves of harvestable timber in California's federally managed national forests. The industry's potential growth depends on the accessibility of timber from the U.S. Forest Service, since the federal government owns two-thirds of the timberland in California. Again, it is the regulatory climate, not the practical potential, that prevents Californians from building more sawmills.

Embrace the Mass Timber Revolution

Every so often a product comes along that presents itself as a "sustainable" innovation, yet has compelling appeal even if sustainability isn't the top priority. One of the most significant examples in recent years is what is known in the industry as "mass timber."

First commercialized in Austria in the 1990s, mass timber is set to revolutionize the construction industry by replacing reinforced concrete as a building material. Mass timber is not only economically competitive with, and functionally superior to, concrete - it is transformationally better for the environment.

The production and use of concrete is one of the planet's largest sources of carbon emissions. In 2022, the concrete industry was responsible for at least 8 percent of global emissions. Mass timber, by contrast, helps reduce carbon emissions. It is perhaps the most profound innovation in building materials since the invention of reinforced concrete over 150 years ago – and it has the power to transform urban development.

Laminated veneer, commonly known as plywood, has been around for decades. But mass timber (also referred to by the more descriptive term "cross laminated timber") is where strips of wood are pressed together into large beams and panels, with each layer of grain running perpendicular to the layer above and below it. By every measure of sustainability, mass timber beats concrete. As a forest product, it is genuinely renewable and serves as an excellent way to permanently sequester carbon. Manufacturing concrete, by contrast, is a far more energy intensive process, and each year uses millions of tons of sand which is – surprisingly – a dwindling and non-renewable resource.

In addition, since smaller trees can be used for mass timber than for conventional lumber, more precise and comprehensive forest thinning and fire prevention operations become commercially viable, and larger trees can remain untouched.

The mass timber products available today are amazing: structural pillars with cross sections 60 inches on a side; lateral beams; floor panels eight inches thick, 10 feet wide, and 40 feet long.

The specifications defining cross-laminated timber should silence the skeptics. They weigh about one-fifth as much as similar sized structural materials made of reinforced concrete, while offering the same strength. They are not combustible. In hot structure fires, only the outer skin of the beams are charred. They are aesthetically pleasing and, unlike concrete, do not require surface treatments to soften their appearance.

This characteristic allows, for example, the floor panel in a high-rise unit to also constitute the ceiling panel for the unit underneath. Mass timber products have better thermal characteristics than concrete, meaning less additional insulation is required. And they can be manufactured to precise sizes and delivered ready for assembly, a tremendous time and cost saver.

The construction industry changes slowly, but after a slow start, the use of mass timber is taking off around the world. Last July, what is currently the tallest mass-timber tower in the world opened in Milwaukee, Wisconsin. Technically speaking, this is a "hybrid" building, with reinforced concrete used for the first six floors, plus for the staircases and elevator shafts. But at 25 stories, most of the superstructure of this building makes exclusive use of wood.

Here in California, a startup is constructing some of the tallest buildings using mass timber in the world. oWOW, based in Oakland, has nearly finished building a 19 story residential tower that will provide 236

one and two bedroom units. Even at this early stage in the adoption of mass timber in the United States, construction costs were competitive with construction using conventional materials.

To reduce costs, oWOW not only took advantage of the lower cost for mass timber compared to steel and concrete. The company's holistic approach to construction meant they "digitally choreographed" the entire building process in advance. This was so precise that they were then able to construct 15 stories in 61 days; both the mass timber superstructure and the prefab exterior walls. A typical build at this scale generally takes about twice as long. With several other construction projects active in California, oWOW is proving that mass timber is already a cost-effective option for developers.

Mass timber is experiencing rapid growth mainly because it offers an economic advantage to builders. While the renewable nature of mass timber gives it additional appeal, skeptics have questioned whether it is renewable at scale. Could it actually replace reinforced concrete? The short answer is yes.

In the United States in 2020, about 370 million cubic yards of concrete were produced. Around 40 percent of it was used for commercial real estate construction. If half of that concrete was replaced by mass timber, we would need to harvest from our forests the mass timber equivalent to 74 million cubic yards of concrete. That equates to an additional 24 billion board feet of timber. In the context of the annual timber harvest in the United States, that is a clearly achievable level of production.

According to the U.S. Forest Service, the total volume of timber in the U.S. is 12 trillion board feet, and about 186 billion board feet were harvested in 2018. In other words, the U.S. timber harvest each year represents about 2 percent of total U.S. timber by volume. In the United States, forest growth has outpaced harvesting for many decades. For mass timber to replace half the concrete used in commercial construction, the nation's forest harvest would only have to increase by just over 10 percent.

Despite some official resistance to increasing the harvest and manufacture of mass timber in-state, these products are catching on as a building material. Last month, California building codes were updated to allow for construction of mass timber buildings up to 18 stories tall. Mid-rise buildings using mass timber are opening or under construction in Los Angeles, San Jose, San Francisco, Sacramento and elsewhere across California.

The mass timber revolution offers the prospect of simultaneously delivering multiple benefits: reducing construction costs, curbing carbon emissions and creating new jobs. And given its potential to also transform forest management, California should be leading the way in championing this exciting new product.

Expand the Biomass Power Industry

Removing trees using expanded timber operations is one essential step in returning California's forests to a sustainable, lower density of trees per acre. But to restore the health of California's forests and reduce the danger of cataclysmic fires, the mechanical removal of shrub and undergrowth is an essential corollary.

> *Fortunately, California has already begun to develop the infrastructure to do this - and to make use of the output for renewable power generation in the form of biomass electricity.*

Biomass power is straightforward technology. Biomass fuel is wood that has no higher-valued use as timber, including the tops and branches of trees harvested for timber, mature trees that have died or are diseased, and small trees and undergrowth with no value as timber.

A 2019 study conducted for the California Energy Commission and PG&E in 2019 estimated "potentially 248 million bone dry tons of biomass on 13.1 million acres suitable for management in high hazard zones" (for wildfires) in California. Along with accumulated biomass that needs to be removed from overgrown forests, the natural regeneration of biomass is substantial. A 2012 "Bioenergy Action Plan" prepared by a consortium of state agencies including CalFire and the California Natural Resources Agency estimates the annual biomass growth in California's forests at 18 million bone dry tons per year.

Calculating how much electricity these quantities of biomass fuel can generate is fairly straightforward. A modern biomass power plant requires 8,000 dry tonnage of biomass fuel per year to generate one megawatt of constant electricity production. This means that if the 248 million tons of accumulated biomass in California's overgrown forests were cleared out over a 20 year period, it would power 1.55 gigawatts of electricity generation for 20 years. As for the 18 million tons of ongoing natural biomass growth in California's forests, if all of it were harvested each year from California's forests, it would generate 2.25 gigawatts of electricity in perpetuity.

It's not quite that simple, unfortunately. Today there are 23 active biomass power plants in California, generating just over a half-gigawatt of continuous electric power. That's one percent of California's electricity supply at peak demand; not a lot, but enough to matter. Increasing California's biomass power generating capacity requires building biomass power plants that are close enough to the forests being harvested to make it economical to transport the fuel. The 2019 study determined an economically viable haul distance at 50 miles or less, finding that only 3.6 million acres of high fire hazard forest are that close to existing biomass power plants.

Critics of biomass energy claim that burning biomass releases more CO2 per megawatt-hour than coal. But biomass, unlike coal, is carbon neutral, which is why biomass power is included in California's

Renewables Portfolio Standard. As for particulate matter, critics correctly point out that small on-site biomass power units cannot afford to install adequate filtration technology. But modern biomass power plants generating megawatts of power can be required to install cyclone separators that use centrifugal force to remove particulates, and electrostatic precipitators that use an electric field to remove even microscopic particulate matter.

More to the point, failure to remove biomass from California's forests invites catastrophic wildfires, as evidenced in the horrific fires of 2018 and 2020. The only alternatives to using biomass as fuel for power generation are wildfires, controlled burns, and leaving in place the 'slash' after forest thinning and timber harvesting. In all three cases, CO2 is still released, even if the cuttings are just allowed to decompose. And according to the California Biomass Energy Alliance, burning biomass at industrial facilities results in CO2, methane, and particulate emissions up to 60 percent less than the rate from wildfires and controlled burns.

In the future, advanced renewable forest biofuel processing may permit commercial extraction of clean fuel using, for example, biochemical conversion of forest biomass into ethanol, or into various other clean burning liquid and gaseous fuels using gasification or pyrolysis. None of these advanced conversion technologies involve combustion or emissions.

In an optimally managed forest, not all biomass should be removed. Controlled burns and natural decomposition of biomass return essential nutrients to the soil and support wildlife. But expanding California's capacity to generate power from forest biomass can play a vital part in forest management while simultaneously creating jobs and generating renewable electricity. With so much accumulated biomass in California's overgrown forests that must be removed, developing biomass power offers an attractive solution.

Obstacles to Modern Forest Management in California

The last two decades in California have included fire seasons of terrifying scope and ferocity, with four of the most recent years delivering the most area burned: 1.3 million acres in 2017, 1.6 million acres in 2018, 4.1 million acres in 2020, and 2.4 million acres in 2021. But experts (and, sadly, politicians) saw this coming - and more to the point, knew what had to be done.

In 1999, the Associated Press reported that forestry experts had long agreed that "clearing undergrowth would save trees," and that "years of aggressive firefighting have allowed brush to flourish that would have been cleared away by wildfires." But very little was done. And now fires of unprecedented size are raging across the Western United States.

"Sen. Feinstein blames Sierra Club for blocking wildfire bill," reads the provocative headline on a 2002 story in California's *Napa Valley Register*. Feinstein had brokered a congressional consensus on legislation to thin "overstocked" forests close to homes and communities, but could not overcome the environmental lobby's disagreement with expediting the permit process to thin forests everywhere else.

Year after year environmentalist organizations including the Sierra Club and the Center for Biological Diversity sued to stop efforts to clear forests through timber harvesting, underbrush removal and controlled burns, in the misguided belief that these efforts would protect ecosystems. In fact they made them weaker and more vulnerable. As natural fires were suppressed and the forests became more and more overgrown, the excessive biomass competed for the same water, soil, and light that a healthier forest would have used, rendering all the trees and underbrush unhealthy.

One specific manifestation of this was the rapid advance of the bark beetle, a mortal threat to California's forests. In a healthy forest, with a more natural density of trees, each tree gets enough water to produce the sap that is part of its defense against threats like bark beetles. With more trees, there is less water to go round, each tree produces less sap, and therefore cannot repel the beetles - which end up killing the tree. As a result, visitors to California's forests in the Sierra Nevada often see not only the blackened trees and hillsides devastated by 'megafires' - but vast areas of dead trees that are the victims of disease and infestation. In the decades when the ideology of fire suppression dominated policy-making, it wasn't just excess biomass that accumulated, but *dried out and dead* biomass. And what happened among California's tall stands of Redwood and Ponderosa Pine also happened in its extensive chaparral.

> *Fire suppression, along with too many ideologically-driven bureaucratic barriers to controlled burns and undergrowth removal, turned the hillsides and canyons of Southern California into tinderboxes.*

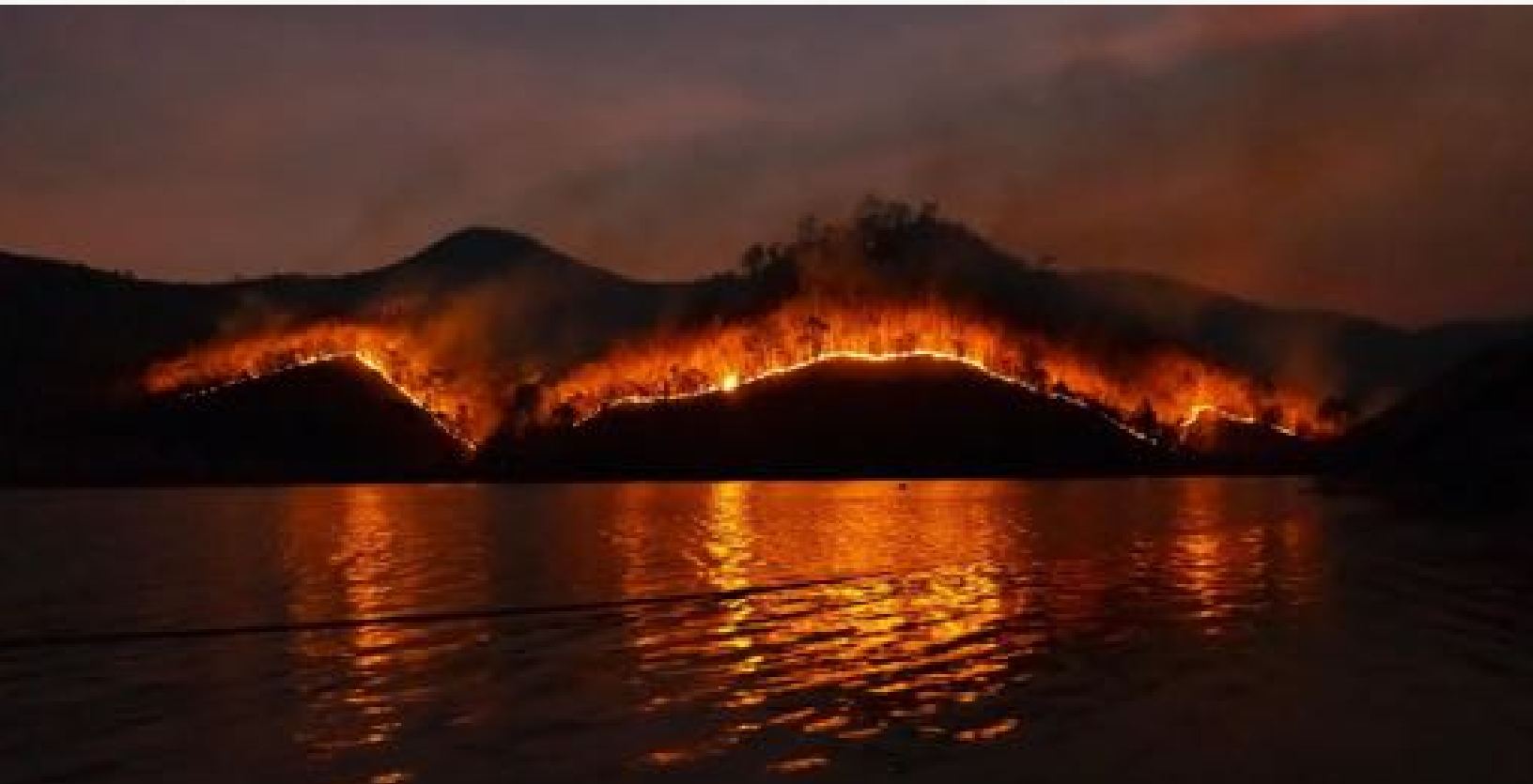
In 2009, after huge blazes wiped out homes and forced thousands to evacuate, Los Angeles County Supervisor Mike Antonovich observed: “The environmentalists have gone to the extreme to prevent controlled burns, and as a result we have this catastrophe today.”

In 2014, Republican members of Congress tried again to reduce the bureaucracy associated with “hazardous fuel projects” that thin out overgrown forests. The bill got nowhere thanks to environmental lobbyists who worried it would undermine the 1969 National Environmental Policy Act (NEPA), the law that requires thorough impact assessments ahead of government decisions affecting public lands. And despite almost universal awareness that more thinning is the only way California’s forests will ever recover their health and resiliency, extreme environmentalists continue to throw up obstacles.

In June 2022, a group that calls itself the John Muir Project, joined by a small number of other state and local like-minded organizations, sued the U.S. Forest Service. The transgression? A proposal to thin 13,000 acres of forest near Big Bear Lake, in the heart of California’s San Bernardino Mountains.

We must overcome these barriers. The next section of this report will examine specific policy solutions that would save California’s forests, reduce carbon emissions, and create economic, social and environmental opportunity.

Structural reform that takes away the ability of anyone, anywhere to file lawsuits will be a critical element, because even when consensus is reached with reasonable environmentalists, it only takes one group or individual to file a blocking lawsuit to cripple progress.



Modern Forest Management: Reform Proposals

Around two-thirds of California's forests lie on federal land. Does that mean nothing can be done? Far from it. California is by a long way the most significant state in the Union. We are the world's fifth largest economy. We have the largest Congressional delegation. We have the opportunity, and the responsibility, to demand federal policy changes that are necessary for the public good in our state. There are close working relationships between the federal, state and local agencies that jointly have jurisdiction over the entirety of California's forests. It is simply unacceptable for California's leaders to abdicate responsibility for such a vital issue.

And if co-operation is not forthcoming, if reasonable demands are not met - then California must pursue legal and constitutional remedies against any federal entities that block progress.

Actions to be taken by the U.S. Congress, the President, and Federal Agencies

1. Revise the EPA's "no action" restrictions, usually based on the "single-species management" practice, which have led to more than half of California's national forests being off-limits to tree thinning, brush removal, or any other sort of active management.

2. Change the U.S. Forest Service guidelines which only permit active forest management, even in the areas that are not off-limits, for as little as six weeks per year. Restrictions on when and where forests can be thinned are making it impossible to adequately thin the forests and manage them responsibly. To be effective, thinning operations need to be allowed to run for several months each year, instead of several weeks each year.

3. Streamline the NEPA (National Environmental Policy Act) application process so it is less expensive and time-consuming for qualified companies to get permits to extract timber from federal lands. Grant waivers to allow thinning projects to bypass NEPA, or at the least, broaden the allowable exemptions.

4. Establish a revolving loan fund for investors to build sawmills, as well as biomass energy facilities, chippers and other equipment that would allow the industry to quickly expand operations and capacity.

5. Fill vacancies in the forest service. In the ten national forests within California, the U.S. Forest Service has over 100 vacancies. This staffing shortage is slowing the process for qualified licensed timber operators to get permits to extract wood products. The vacant positions must be filled, whether through transfers from other states, offering better compensation packages to attract more applicants, or hiring private contractors. Priority should be given to hiring qualified foresters who will actually spend time in the forests.

6. Fast-track the granting of long-term stewardship contracts whereby qualified companies acquire a minimum 20-year right to extract wood products from federal lands. This would guarantee a steady supply of wood products which, in turn, would make new investment viable in logging equipment, mills, and biomass energy facilities.

7. Revise rules and conditions governing timber exports. The export of raw logs from federal lands in the Western United States is currently prohibited. Lifting this prohibition is vital for restoring the health of our forests, especially while sawmill capacity remains below the level needed to process the necessary increase in volume of harvested timber.

Actions to be taken by California's Governor, State Legislature, and State Agencies

1. Grant long-term logging rights. The California Board of Forestry should grant long-term rights for timber companies to harvest trees on state owned land. This will attract private investment in timber company expansion.

2. Eliminate counterproductive bureaucracy. Logging companies currently have to submit timber harvest plans every five years. Each of these plans is costly, consuming thousands of pages and requiring significant forestry staff and outside consultant time to prepare. Requirements for plans should be consolidated to encompass an entire parcel or an entire watershed within a large parcel. And instead of expiring every five years, timber harvest plans should be granted in perpetuity, with monitoring. Major revisions should only be required if there is "significant new information" affecting the plan area.

3. Streamline the process for small-holders of forest land to harvest their timber. Most timber harvested in California comes from large industrial holdings which account for around one-sixth of the total acreage in the state that contains marketable timber. But a further one-sixth is in the hands of private, non-industrial owners. Many of these owners are deterred from participating in a modern system of forest management and timber harvesting because of the bureaucracy involved. The expense of repeatedly submitting plans, instead of being able to have a long-term plan approved, makes it economically impossible for small parcel owners to engage in logging. If this process were streamlined for non-industrial owners of timberland, the quantity of harvestable timber in California could potentially double.

4. Establish state government revolving loan funds for investors to build sawmills, as well as biomass energy facilities, chippers and other equipment that would allow the industry to quickly expand operations and capacity. This could be in partnership with a similar federal program as outlined in #4 above.

5. The California Air Resources Board should modify the application process and time allowed for controlled burns to thin overgrown forests.

6. The state should develop an accreditation, incentive and awareness campaign for in-state sourcing of timber for construction projects. Such action would help stimulate greater recognition of how California has to import lumber because its own timber industry has been unduly stifled. This would also raise awareness of California logging practices that are more environmentally responsible than those in effect in the out-of-state areas where timber is currently sourced.

7. California's building codes were updated in 2023 to allow the wider application of mass timber construction by allowing timber towers to be built up to 18 stories high. But California's building codes still incorporate fire safety standards that are outdated with respect to mass timber. Current codes require layers of encapsulation around mass timber structural beams that are already sufficiently fire resistant to be fire safe with fewer layers. It would reduce costs and accelerate adoption of mass timber if these codes were revised. Regulatory agencies should use the most relevant and up to date testing data to adopt modern and appropriate codes for mass timber.

8. In 2022 California's Assembly Bill 2446 directed the California Air Resources Board to develop a framework for "measuring and reducing embodied carbon in buildings." As the final rules to enforce AB 2446 are adopted and revised, they should provide for a streamlined compliance process if mass timber is used in construction, since it so clearly conforms to the intention of the law, which is to encourage use of construction materials with low carbon intensity. Mass timber produces minimal carbon emissions in its sourcing and manufacture, while sequestering a tremendous amount of carbon in its structure.

9. End the private right of action under CEQA. The California Environmental Quality Act (CEQA), was enacted by the state legislature in 1970. Its original intent was to "inform government decision makers and the public about the potential environmental effects of proposed activities and to prevent significant, avoidable environmental damage." Over the past half-century, however, CEQA has acquired layers of legislative updates and precedent-setting court rulings, warping it into a distortion of its original intent that denies clarity to developers and derails projects. When projects do make it through the CEQA gauntlet, the price of passage adds punitive costs in time and money. Reforming CEQA by restricting the right to file lawsuits to District Attorneys in California's counties and the State Attorney General would deter what are now countless lawsuits that constitute a significant impediment to Modern Forest Management. This reform would also go a long way towards streamlining the construction of housing in California, solving a chronic housing shortage and creating in-state markets for California's timber products.

10. The state should invest in workforce development that will enhance the management of our forests. This requires a political commitment to expand the logging industry instead of shrinking it, which will help attract people to enter the workforce and commit to a career in the forests and sawmills.

11. California's State Dept. of Forestry, the California Air Resources Board, Cal EPA, CalFire, and every other state agency involved in managing California's forests should hire more foresters, and make sure they spend a significant amount of time actually in the forests. California's colleges and universities that offer degrees in forestry should revisit their curricula to ensure sufficient coursework emphasizes Modern Forest Management.

Changing Public Perception

To build political consensus for these pragmatic and common sense reforms, the conventional wisdom surrounding forestry needs to evolve. Political leaders at every level in California, along with those who run and operate relevant state agencies, now have an opportunity to bring about a shift in public attitudes that will enable the actions necessary to combat California's second largest source of carbon emissions.

To that end, these arguments need to be made prominently and consistently:

1. Policies and public spending on wildfire prevention is as important as wildfire response.

2. The logging industry can be a responsible partner in a shared goal of doubling or even tripling the annual timber harvest in California. The state's timber harvest has been reduced to 25 percent of what it was even as recently as the 1990s.

3. Success stories such as "uneven-aged" forest management and "total ecosystem management" that saved Shaver Lake's forests in 2020, and the forests around South Lake Tahoe in 2021, can be the basis of a statewide standard for Modern Forest Management.

4. So-called 'environmentalist' litigators and lobbyists that work to prevent responsible forest management have helped turn California's forests into tinder boxes and are in fact the enemies of a sustainable forest environment and action on climate change.

5. High profile measures ostensibly aimed at combating wildfires, like Electric Vehicle mandates, divert attention and resources from positive, practical policies - like Modern Forest Management - that can actually help reduce emissions on a much larger scale, more quickly.

6. Sequestering carbon in forest products and producing energy from carbon neutral forest biomass moves California closer to achieving its climate goals.

A New Approach to Forestry and Forest Products

We hear a lot from California's political leaders about their commitment to fighting what they often call the "existential threat" of climate change. A better way of demonstrating that commitment than current approaches would be to sit down with representatives from California's timber, biomass energy, and cattle industries, along with federal regulators, to develop a plan to comprehensively modernize forest management policy in California.

If we applied to this effort the same scope and urgency observed in current attempts to transform our entire energy and transportation sectors, California would experience vastly more immediate and practical benefits, both to people and ecosystems. The recommendations in this report may serve as a partial roadmap.

Reimagining forest management in California for the 21st century would produce dividends that benefit multiple sectors. It would rest on a single, simple premise: Match the rate of forest extraction to the rate of growth, and use what is extracted to produce carbon sequestering lumber for housing, carbon neutral biomass for electricity generation, fodder for grazing livestock, and restored forest health. This in turn would improve water quality, retention and percolation, improve wildlife habitat, and greatly reduce the risk of catastrophic wildfires.

Modern Forest Management, achieved by implementing the reforms set out in this report, would not only benefit the climate and our ecosystems. It would create tens of thousands of jobs in the timber, milling, energy, livestock, and construction industries. It would bring down the cost of lumber, helping to lower the cost of housing. The economic dividends of Modern Forest Management in California are as profound as the ecological dividends.

It is time for Californians to come together and implement a reform program that simultaneously addresses these many challenges and transforms the state's forests from an economic and environmental problem into a tremendous and perpetual source of wealth and ecological vitality.