SIERRA PACIFIC INDUSTRIES

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April 6, 2017

Pedro Nava, Chairman
Milton Marks Commission on California State Government Organization and Economy
925 L Street, Suite 805
Sacramento, CA 95814

RE: California Forest Management in Response to Tree Mortality Crisis.

Dear Pedro Nava:

Sierra Pacific Industries is pleased to provide its comments on California Forest Management in response to the tree mortality crisis.

An introduction to Sierra Pacific Industries' Operations in California.

Sierra Pacific Industries (SPI) is a family owned, vertically integrated forest products company. In California, SPI owns over 1.6 million acres and operates 10 sawmills, 5 cogeneration power plants, millwork and window manufacturing facilities and other support facilities. SPI is the third largest U.S. lumber producer, producing everything from timbers and framing lumber to fencing and specialty products. The company's mills utilize state-of-the-art computer technology, sensors and scanners to individually analyze each log and guide experienced equipment operators to maintain high production levels and product quality. SPI employs about 3,400 people in California.

Overview of how the Tree Mortality Incident Impacts SPI and how we're responding.

California's drought and associated beetle attacks have affected SPI business in several ways. First, the epidemic has killed many trees in SPI forests. Due to past management practices, SPI forests are generally healthy, however beetles can overwhelm previously non-susceptible trees when their population density becomes high (Bone et al. 2013). On SPI lands the hardest hit areas are in Tuolumne, Calaveras and Amador counties. In Fall 2016 outbreaks were also beginning to occur in El Dorado County. The company has responded aggressively to these outbreaks by having its foresters closely monitor its lands for signs of beetle attacks (e.g., bore holes and pitch tubes) on trees. When areas of beetle outbreaks are discovered, company foresters identify the "epicenter" of the affected

area. An extensive buffer zone is then delineated around the affected trees. Within the buffer zone, all trees are harvested. These steps are designed to prevent the beetles from spreading to nearby healthy trees (Fettig and Hilszczannski, 2015). Despite our efforts to contain and insulate our forests from further infestation, keeping our forests free of beetles is difficult. As beetle populations increase they shift from finding the most susceptible host tree to forests where beetle populations are lower and less intraspecific competition is occurring, thus increasing the potential for reproductive success (Bone et al. 2013). Because of this tendency, beetles from neighboring forests with very high beetle populations continue to migrate into our forests and kill trees, which means SPI must frequently revisit areas as new populations of beetles infest additional trees.

Fortunately, there is a streamlined regulatory permitting process the Board of Forestry has authorized and CAL FIRE administers. Beetle salvage is permitted using a Drought Mortality Exemption 14 CCR 1038(k) or Emergency Notice 14 CCR 1052. Harvesting activities under these permits require full compliance with the California Forest Practice Rules and requirements of the Water Quality Control Board.

The beetle outbreak in the southern extent of our ownership has required SPI to curtail its green harvest of trees in other portions of its ownership and shift harvesting activities to the beetle affected areas. Shifting timber harvesting activities accomplishes two important objectives. First, it provides enough logging infrastructure to quickly and effectively capture the dying trees value. Second, it maintains the overall live tree inventory across SPI's California ownership, which we rely on to maintain a sustainable rate of harvest over time.

The tree mortality epidemic has also affected SPI's sawmills and biomass plants. Specifically, 100% of the wood processed at the Sonora Sawmill is derived from drought/beetle killed wood. This translates into an estimated annual log consumption of 90 million board feet annually (Scribner log scale). The Chinese Camp Sawmill is processing 95% drought/beetle killed wood, which translates into an estimated annual log consumption of 27.5 million board feet of logs annually (Scribner log scale). The Lincoln Sawmill is also processing some drought/beetle killed wood, along with significant volumes of fire-killed wood. The Lincoln sawmill consumes an estimated 195 million board feet of logs annually (Scribner log scale). All sawmills are operating at full two-shift capacity given constraints in the amount of downtime needed for mill maintenance, kiln drying capacity, and the ability of the market to absorb heavy volumes of blue-stained lumber. Statewide, the estimated tree volume killed by the drought/beetle event is between 20 and 40 billion board feet, so these SPI sawmills were only capable of processing approximately 3% to less than 1% of the dead material in 2016. As the trees degrade the proportion that is merchantable as lumber diminishes rapidly. These beetle killed trees are usually unmerchantable as sawlogs after just four to five months, due to bore holes, fungus, severe checking and cracking.

SPI has also completed a bilateral negotiation of the terms of its power sales contract with Pacific Gas & Electric. These negotiations have allowed for greater consumption of biomass generated from

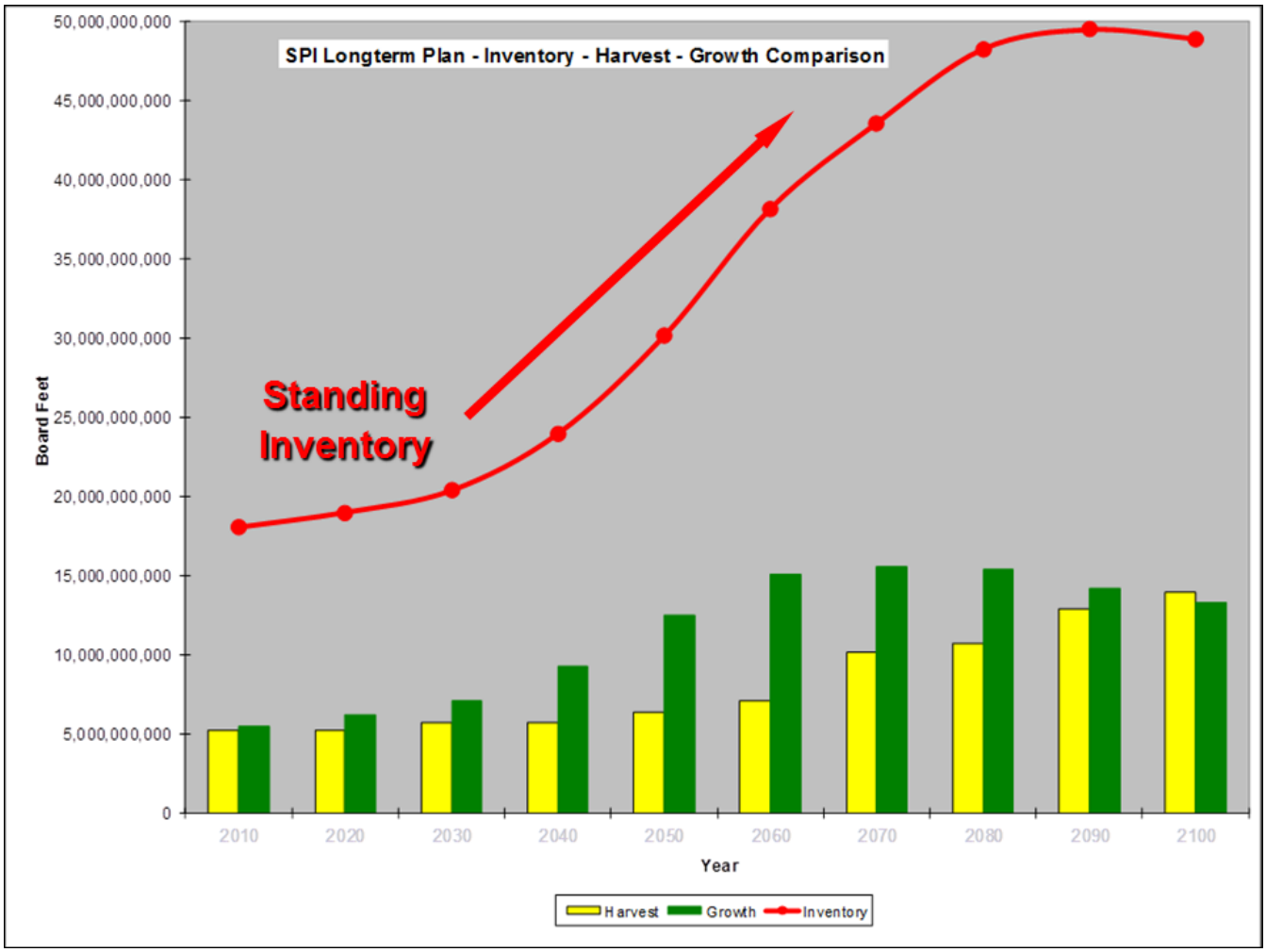
drought/beetle killed trees. The key change in the renegotiation is that the company can operate its biomass power plants more hours (i.e., sell more power to PG&E) than specified in its original power sales contract, so long as a certain portion of the fuel used to fire those plants is drought/beetle killed salvage material from California forests. Due to the size of the biomass disposal problem from the tree mortality crisis, this contribution only helps incrementally.

SPI Forest Management

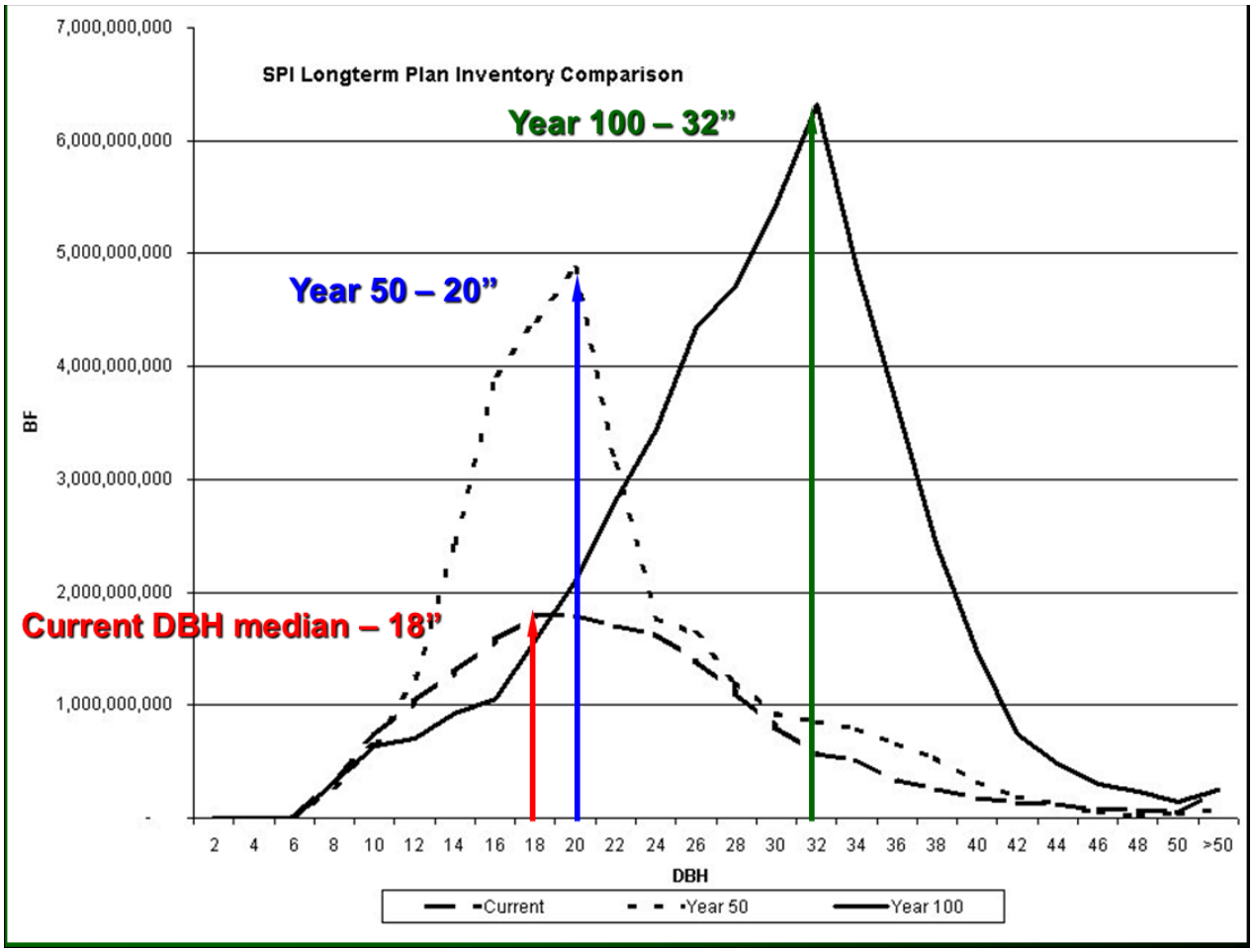
The SPI forest management plan (SPI Option A) is designed to meet the intent of the California Forest Practices Act (CFPA). The intent of the CFPA is to assure the "maximum sustained production of high-quality timber products is achieved while giving consideration to values relating to sequestration of carbon dioxide, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment." (California Public Resources Code §4513). The California Forest Practice Rules (CFPRs) require timberland owners to demonstrate they are meeting their management objectives while achieving "Maximum Sustained Production of High Quality Timber Products" (14 California Code of Regulations §933.11) (MSP). SPI demonstrates its MSP using criteria set forth in §933.11(a). The SPI Option A is reviewed annually by CAL FIRE and continues to be found to be in compliance with 14 CCR § 913.11(a).

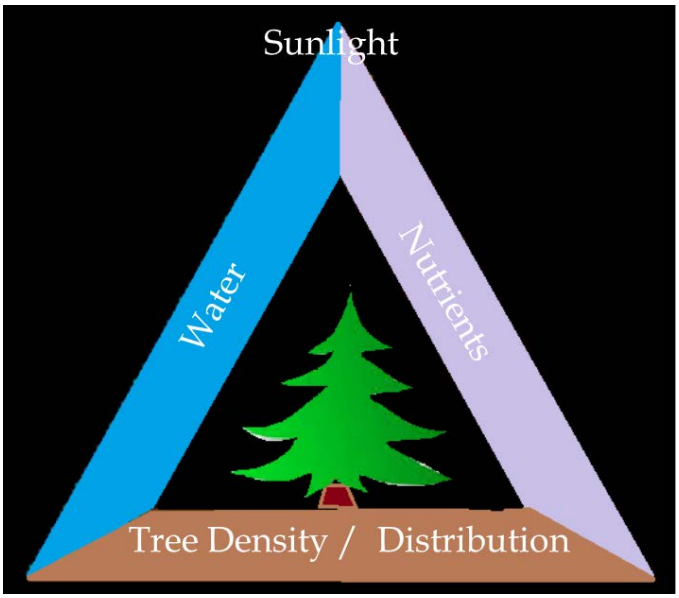
The SPI Option A is a long-term plan (100-year term) for managing the balance of timber growth and harvest from its ownership. The plan is also compatible with and responsive to the warming of the climate in California along with many other important environmental considerations. SPI's average harvest rotation age is 80 years. The SPI Option A is considered a key component of its overall business plan to provide a sustainable, stable to increasing, predictable, and cost-effective supply of raw materials for manufacturing a variety of forest products.

SPI used the following guiding principles to aid in our land management decisions: 1) SPI's overall management objective of providing for a sustainable, stable to increasing, predictable, and cost-effective supply of raw materials, will primarily determine future landscape conditions, 2) SPI believes that through planning and research the achievement of this overall management objective will result in healthy, fire resilient, and productive forests capable of providing moderate- to high-levels of other forest values, 3) Disturbance is an inherent and required component to sustain California's forest stands and landscapes, 4) Forest management activities can be conducted in a manner that takes current forest conditions and trends them toward the stand density conditions of pre-European forest disturbance regimes, 5) Forests prior to European management influences were not subject to modern demands for wood products, 6) Landscapes and stands that are capable of supporting a wide range of vertebrate wildlife species, including species thought to be "at risk" and species thought "to benefit" from forest management activities, are key elements of a healthy forest, and 7) A management program that combines research and monitoring with effective management adaptation can create the stand and landscape conditions of healthy and productive forests, over the short- and long-term.

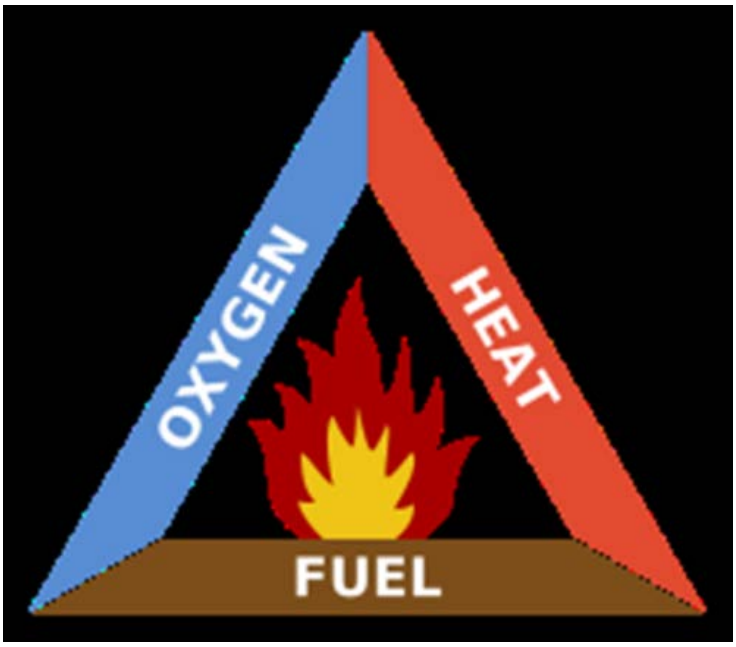


By implementing SPI's sustainable forestry practices it is expected that its timberlands will grow trees at three times the rate over the next 100 years as compared to a custodial forest management approach. This substantial increase in carbon sequestration rates requires significant monetary investments in establishing and managing tree densities. SPI's sustainable forestry practices will increase the current modal diameter of volume by diameter class from 18 inches to 32 inches (see graph on the following page). Because these larger trees will be widely spaced and populate stands that exhibit a relatively even structure their distribution on the landscape will increase the fire resilience of the forest.





Fire resilient landscapes are desired by a broad suite of stakeholders. Reducing tree densities is a requirement of maintaining resilient forests because as a forest reaches carrying capacity, tree growth slows and the forest becomes at risk to natural disturbance such as insects and fire. Tree vigor can be represented in simple terms using a triangular diagram (shown here). In the diagram tree vigor is dependent on enough water, nutrients and sunlight being available, which is contingent on tree density and distribution. Sustainable forestry practices reduce the tree density and distribute retained trees so each tree has enough growing space. As a rule, larger trees need more growing space than smaller trees to remain vigorous, because larger trees have higher respiration demand, which requires



more energy from photosynthesis, which is dependent on adequate sunlight, water and nutrients made available from growing space.

Fire can also be represented in simple terms using a triangular diagram (shown below). In the diagram fire is dependent on three factors; fuel, heat and oxygen. Land managers cannot control the amount of oxygen and heat available to a fire, but they can reduce the amount of fuel available. Holding other fire variables constant (slope, relative humidity, and wind speed), except under extreme fire conditions, fire intensity will be reduced proportionally to the amount of fuels removed. Providing growing space for trees reduces the threat of fire because tree removals reduce the amount of fuel available, which improves tree vigor and fire resilience.

Over time SPI intends on controlling the tree density in the majority its forests to approximately 60 trees per acre, which is approaching the average tree count per acre of 10-30 large trees per acre that Collins et al. (2015) estimated being present in the fire resilient pre-European forest stands.

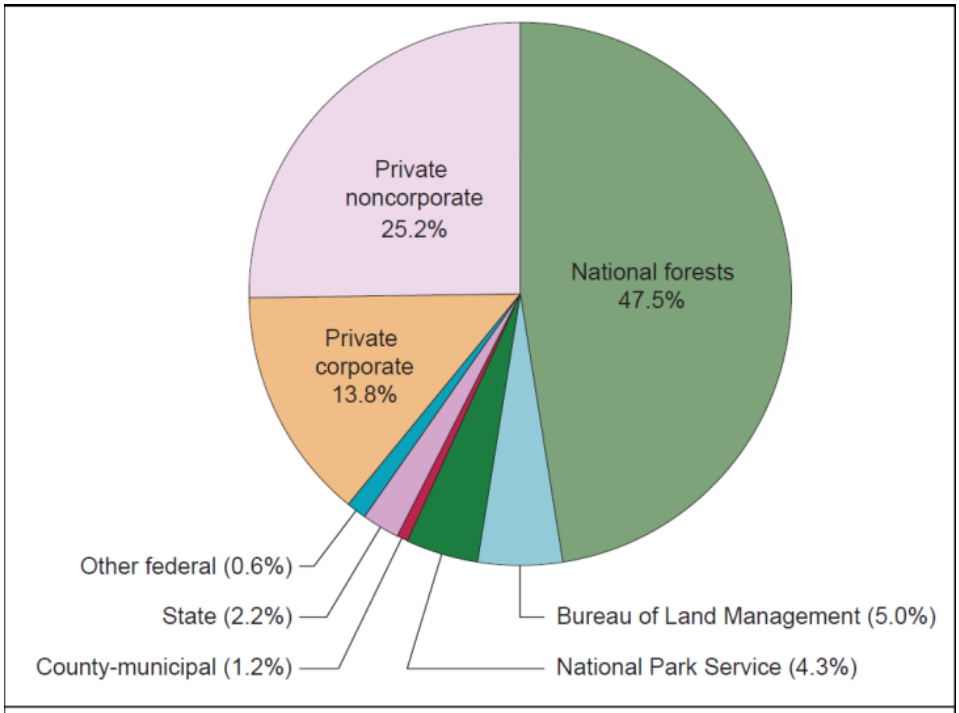
SPI uses mechanical harvesting to implement sustainable forestry practices that reduce tree density. Mechanical harvesting is the physical removal of trees using purpose built machinery to fall and cut trees into logs (felling), bring logs from the woods to a central location accessible by road (yarding), load logs, chip or masticate logging slash, and haul logs or chips to a manufacturing facility.

The best method for reducing tree density is through mechanical forest harvesting because it provides the most certainty regarding outcomes. Mechanical forest harvesting allows foresters to plan for and control post-project stand conditions including tree species, spacing, composition, size, frequency, distribution and fuel loading. Mechanical treatment of fuels as part of sustainable forestry practices should improve the outcomes of future planned or natural fire events. Mechanical forest harvesting allows the planning of future expected growth and available wood products. Wood products derived from harvesting reduce the costs of forest resiliency projects. Long-term plans that utilize sustainable forestry practices and mechanical forest harvesting can provide confidence in the expected volume of wood products over time, which is essential for business investments in manufacturing infrastructure. Some mechanical harvesting projects will not be economically feasible due to the distance to market and the low expected value of the wood products from the project. Mechanical thinning treatments are generally effective at increasing forest resilience to moderate and high-severity wildfire, and evidence suggests there are few unintended consequences to the vegetation, soil, and wildlife from these treatments (Stephens et al. 2012).

Our foresters, biologists, and botanists conduct inventories of forest growth, wildlife populations and habitat, native plants, and other forest attributes each year. In California, we survey about 10% of the current 400,000 inventory plots annually. Our in-house research department continually monitors water quality and other environmental impacts from our forest management activities, ensuring superior land stewardship. These data collection processes provide important feedback to SPI's forest management team for adaptively managing these forests effectively and responsibly.

California's Forestland Ownership.

The distribution of ownership in California's forests is provided in the graphic below. These ownerships are being affected differently by the drought and subsequent bark beetle infestation. Impact differential is affected by the drought severity, with the southern forests impacted more severely than more northerly forests, along with the contributing factor of the vigor of the individual trees in those forests.



Forest Ownership in California (Christensen et al. 2016)

Trees that are vigorous will exhibit higher growth rates. Tree vigor can be improved through active forest management by controlling growing space and thus the available sunlight, water and soil nutrients, which in turn makes those trees less susceptible to bark beetle attack (Fettig et al. 2013). In Christensen et al. (2016) shown on the next page, corporate and noncorporate forests have been experiencing less mortality and are exhibiting faster growth rates than federally-owned forests.

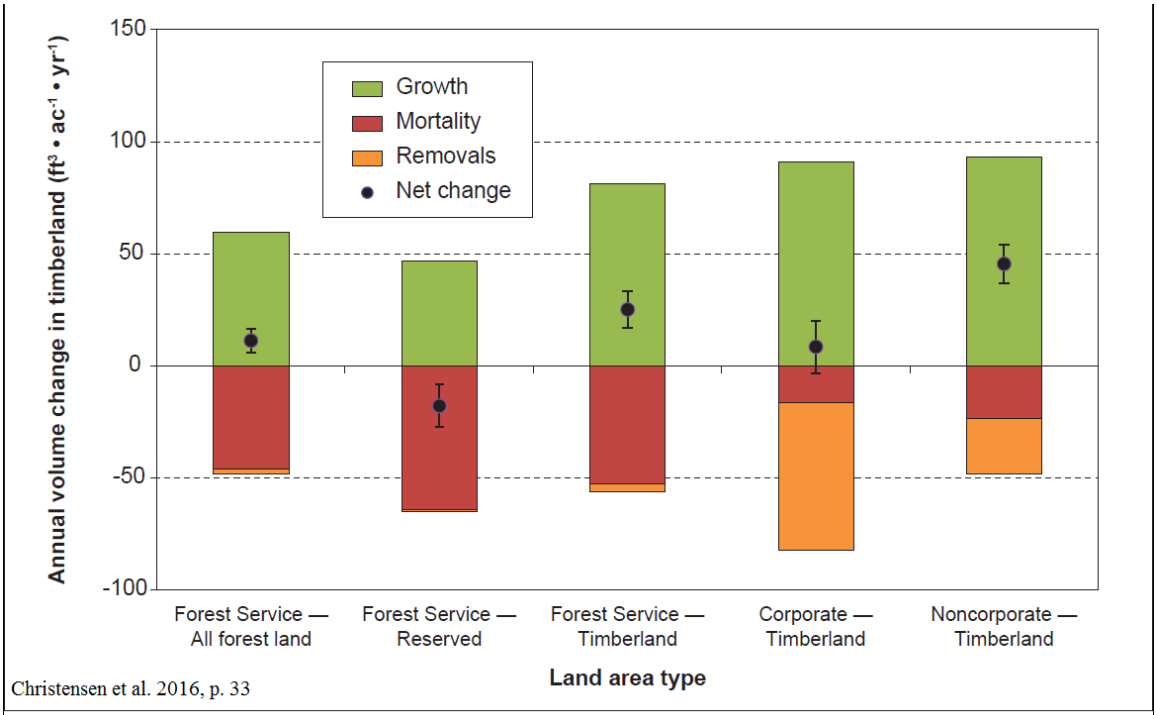
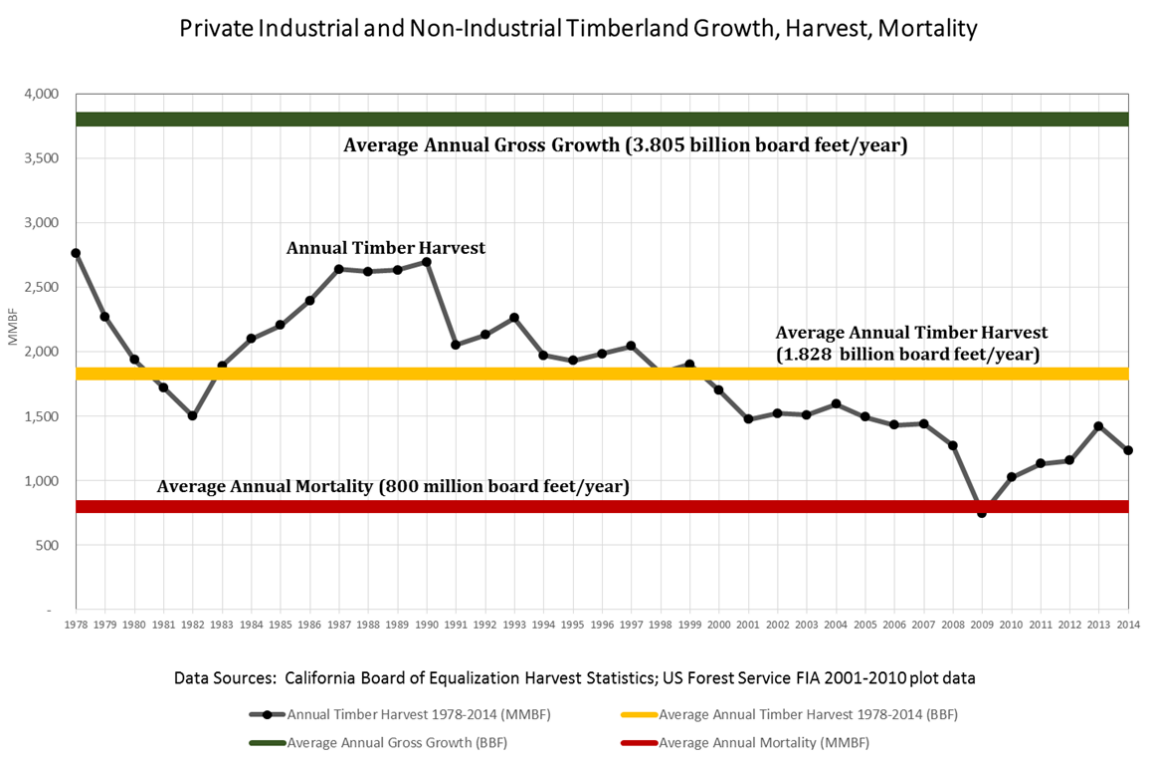


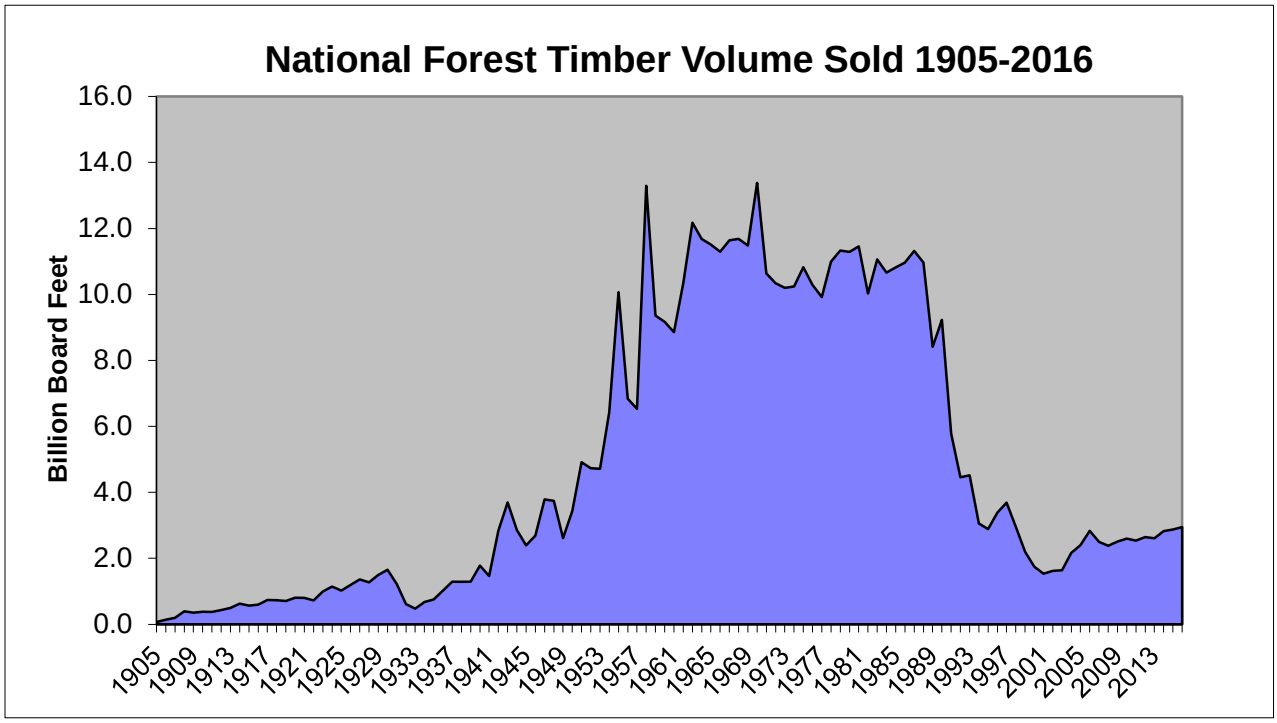
Figure 34—Combined average annual change in volume (cubic feet) growth, removals, and mortality per acre per year on national forest land between 2001–2006 and 2006–2010 by land status compared to privately owned timberland between 1991–1994 and 2007–2010 in California (error bars represent sampling error). Although volume changes are on an annual per-acre basis, it is important to note that Forest Service estimates of change cover a different timeframe than private timberland.

The corporate and noncorporate ownerships also are harvesting at annual rates well below the total estimated annual growth rate, but rapidly enough to capture most of the tree mortality that naturally occurs (graph below).



A Brief History of California Timber Management.

To understand the appropriate solutions for today's crisis it is important to understand what has occurred during the past 70 years. Shortly after World War II, the forests managed by the United States Forest Service (USFS) began experiencing increased levels of timber harvesting to satisfy the growing demand for wood products. With U.S. population expansion following World War II this increase in harvesting to satisfy the wood demand continued until the late 1980s. During the early 1970s there was an increasing concern about man-made impacts on the natural environment due to industrial activities, including forest management and harvest activities. As a result, there were numerous environmental laws enacted in the 1970s including the Clean Water Act, Federal Endangered Species Act, National Environmental Policy Act (NEPA), the California Forest Practice Rules, and the Porter Cologne Water Quality Control Act. During the late 1980s the environmental focus relating to forestry was the preservation of old-growth Western forests, driven by concerns about the rate of harvest on National Forest lands and culminating with the 1990 listing of the Northern Spotted Owl as an endangered species and the signing of the Northwest Forest Plan in 1994.

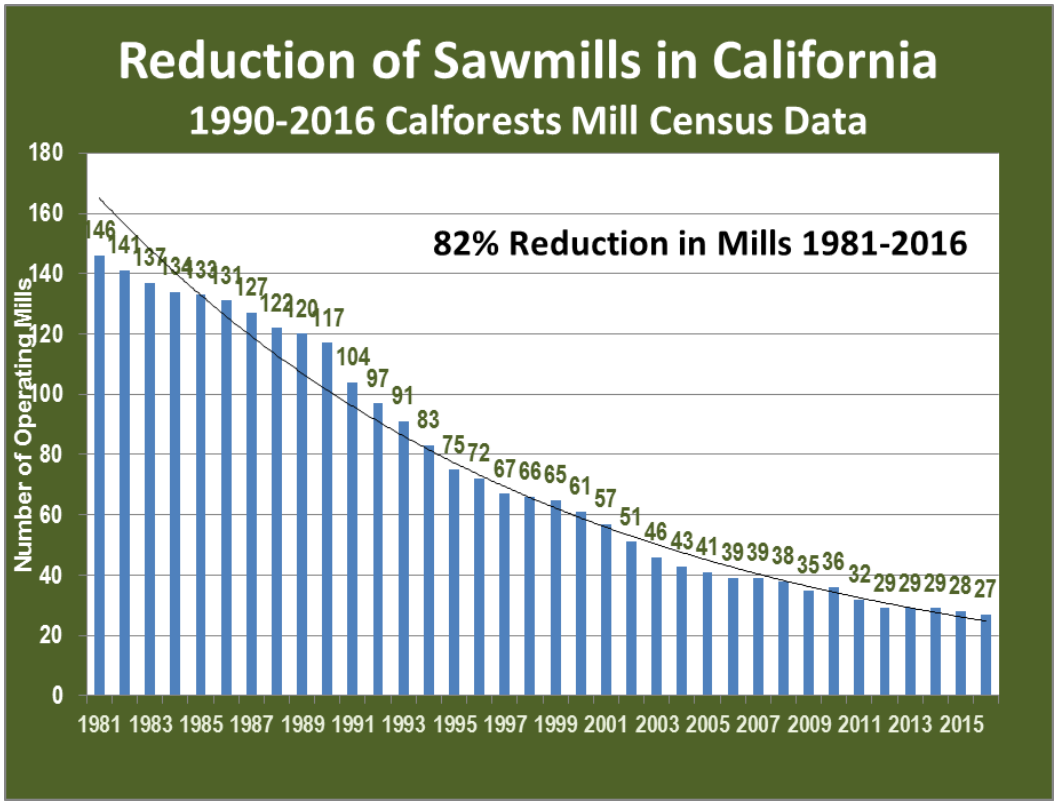


The previously described events are reflected in the amount of timber volume sold from the National Forests in the above graph. One of the outcomes of this reduced volume from National Forests is that other countries are now helping to meet the U.S. demand for wood products. Today, the U.S. imports approximately 24% of the coniferous sawnwood it consumes annually (Prestemon 2015).

California's Vanishing Lumber Manufacturing Infrastructure

Because the federal government owns about 57% of California's forests, its contribution to the raw material supply has a tremendous influence on California's wood products manufacturing

infrastructure. With the reduction in timber volume from the National Forest lands came a fairly rapid reduction in sawmill infrastructure in California. The graph below shows the business response to the reduction of raw material supplies following the 1990 listing of the Northern Spotted Owl.



Answering Difficult Environmental Questions.

The Northern Spotted Owl was only one species of wildlife that raised concerns over the rate of timber harvesting on California's National Forests. Other species include the California Spotted Owl, Pacific Fisher, Northern Goshawk, Marten as well as several anadromous salmonids. Because of the lack of definitive science on the myriad of species and other environmental resources, the complex NEPA process required to be used by the USFS has resulted in very significant delays as forest projects wind their way through the court system. Until recently, those advocating for no forest harvest or other active forest management on USFS lands have been successful in stopping many projects that would have reduced tree density. This has made National Forests more vulnerable to fire and insect mortality.

Over time, a great deal of research has been completed by industrial forest owners, universities, the USFS's Pacific Southwest Research Station, the National Council for Air and Stream Improvement and others that help inform forest management decisions. Using the developing compendium of forest science, forest managers are able to develop a fairly sophisticated response to issues raised during forest-wide management planning and individual project planning. As the crises in our forests has grown and the public, legislators, land managers and the courts have seen the consequences of non-management, the USFS is being provided more deference from the courts so long as the USFS follows

the necessary procedural requirements. Unfortunately, it is too little too late for resolving the current situation.

The lack of a complete understanding of exactly how each management action may affect a particular resource is well recognized. In order to address the varying degrees of uncertainty inherent in managing natural resources for particular outcomes, the use of "adaptive management" strategies has been developed. An adaptive management strategy can vary for differing projects to reflect the natural variation of the landscape. This strategy can acknowledge the uncertainty of a project's outcomes, by establishing a pathway for implementing the project while addressing the areas of uncertainty through monitoring in a manner that quantifies the environmental response to the planned activities. Data from the monitoring is then used to inform future project planning. An adaptive management strategy is an incremental approach to taking actions to solve a problem when uncertainty exists. An adaptive management strategy should consider the pace and scale of individual projects locally and their impact in the context of the larger landscape. The monitoring and reporting should function to inform successive management actions before a significant environmental threshold is exceeded. To further ecological understanding of forest systems, some projects should be implemented to test environmental thresholds incrementally, especially when there is uncertainty regarding whether the thresholds are accurate.

Collaboration, Adaptive Management and Results 25 Years Later.

Over the past 25 years, collaboration and the utilization of an adaptive management approach have been utilized sparingly on private ownerships and more frequently on USFS projects. Adaptive actions on private forests have generally been in response to additional regulations or the threat of regulations with little collaboration except with responsible agencies. Adaptive management on private forests has allowed forestry projects to proceed at a regular pace and higher costs.

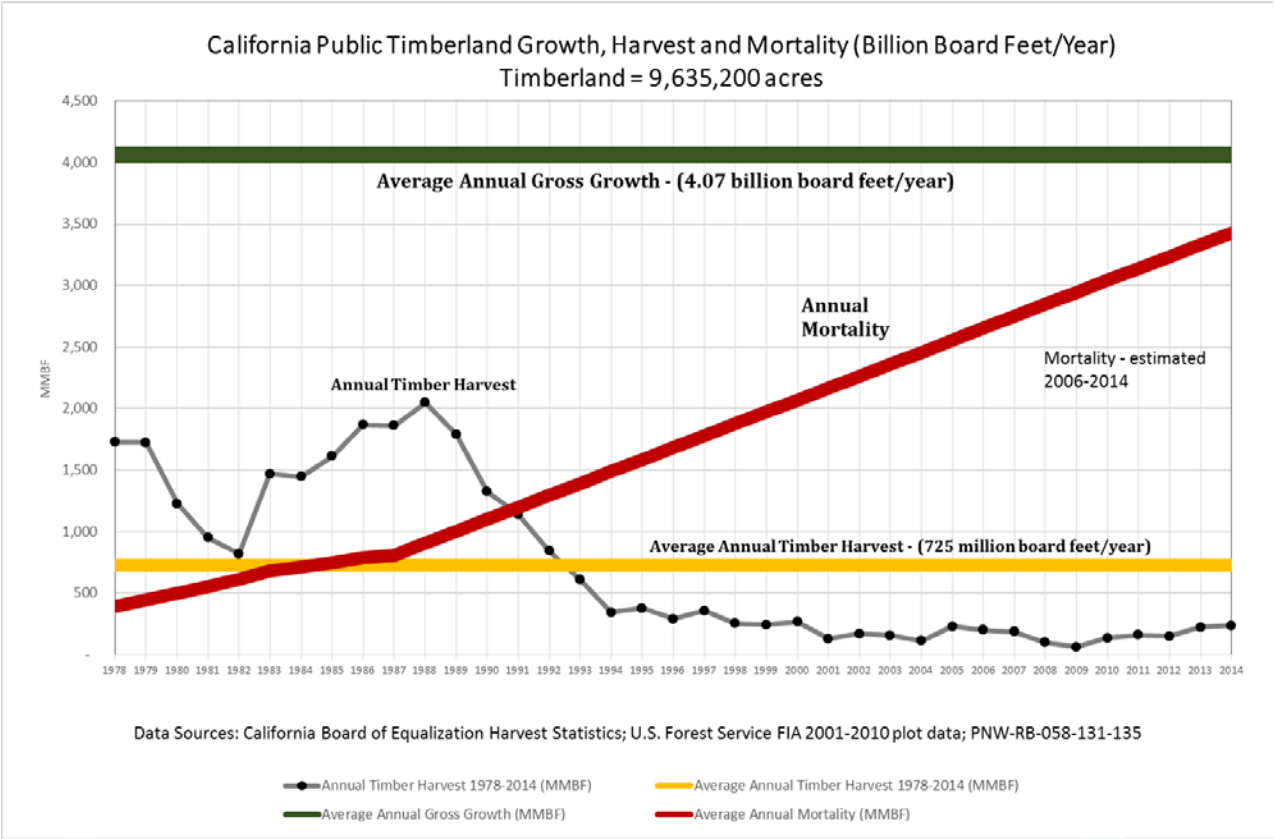
USFS collaboration and adaptive management has been institutionalized, but has not led to the full implementation of the National Forests' management plans. USFS projects do not proceed at a timely pace because a handful of advocacy groups generally oppose those plans. Speculation as to the specific aims of these groups is not productive, but pointing out their tactics is important for identifying why the USFS has been unable to manage the National Forests effectively during the previous 25 years. It is important to understand their management difficulties because the majority of beetle-killed trees are on Federal Land (USDA 2016 Aerial Detection Monitoring).

Forestry projects on National Forests which are intended to be a surrogate for fire or that attempt to salvage fire-killed trees, are regularly litigated to slow or halt forest management projects. These lawsuits drive up the costs of those projects. Because there is no financial risk to the plaintiff, lawsuits are used as a tool to circumvent the democratic planning process in order to impose plaintiffs' values on the USFS without concern of the consequences. The Equal Access to Justice Act facilitates a culture used by some environmental groups to sue the USFS, then forcing the agency to reimburse the plaintiffs for their legal costs if the plaintiff prevails, even if the USFS later wins on appeal. These

groups know that if they can delay harvest of fire- or insect-killed trees for at least a year, the value of the timber declines to a point that the project is no longer economically feasible. Despite these challenges, the USFS continues to propose responsible forest management programs. However, the pace and scale of successfully implemented projects cannot keep up with forest growth, with tree densities continuing to increase up to and beyond the carrying capacity of the land.

The Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG) is an example of the indifference and counter productivity these advocacy lawsuits represent. The HFQLG was an "agreement by a coalition of representatives of fisheries, timber, environmental, county government, citizen groups, and local communities that formed in northern California to develop a resource management program that promotes ecologic and economic health for certain Federal lands and communities in the Sierra Nevada area." Using the terminology of our youth today, the HFQLG was the "OC" (Original Collaboration), the "granddaddy" of collaborative efforts. The HFQLG passed through Congress in 1998 on a vote of 429-1. The HFQLG used an adaptive management strategy that was to be implemented incrementally over 20 years, however due to lower value projects, combined with nearly every project being litigated (90%) in 2008, the total costs of implementing the QLG through 2011 reached $293.3 million while the cumulative revenues were only $23.8 million (Pinchot Institute 2013). The return of revenue from the original Environmental Impact Statement for the HFQLG project estimated $3 of revenue to the United States Treasury for every $1 expended on the Pilot Project. In actuality the cost of implementation realized only $1 dollar of revenue for every $12.3 spent. Litigation caused the HFQLG project to underperform by more than 50% for treated acres in 11 of the 13 years of the project (Pinchot Institute 2013). The delays and limited implementation caused many of the questions posed by the implementation and monitoring studies; relating to the ecological integrity of the landscape, California Spotted Owls and watershed effects, to go unanswered.

Overall, the outcome of these kinds of lawsuits has resulted in a highly-constrained level of timber harvest occurring on public timberland in California, causing the USFS to fall far behind their goals (North et al. 2009). The lack of harvest activities as a surrogate to fire has not kept up with annual growth and the tree density on public land has increased from an average of 10-30 trees per acre during pre-European times (Collins et al. 2015) to approximately 320 trees per acre today (Christensen et al. 2016). The increasing tree density exacerbates the effect of drought and makes trees more vulnerable to bark beetle attack (Fettig et al. 2013).



<u>Current Scale of California Timber Manufacturing Infrastructure.</u>

There is a perception that because there is not enough manufacturing infrastructure necessary to utilize all the killed trees from the bark beetle epidemic that the amount of manufacturing infrastructure in California is lacking. While it is true that the existing manufacturing infrastructure is not available to immediately utilize the dead trees standing in the southern Sierra Nevada, it is not true for the "business as usual" supply of raw materials available in an "average" year. For a typical year the existing infrastructure capacity is not limiting, because the existing operations (sawmills and biomass power) are scaled to match the sustainable harvest from private timberlands and the currently available logs from the USFS. While there has been a recent spike in available dead trees from both large fires and this beetle infestation this does not reflect a long-term reliable source of material that would support investing in manufacturing technologies that are currently available at scale. Efforts at new business development will be dependent on the USFS and other public landowners committing to a long-term increase in the amount of timber harvested annually.

<u>Keeping our existing infrastructure healthy.</u>

SPI is concerned that an unwarranted amount time and money will be placed on utilizing the unmerchantable dead trees killed in the past several years, which will distract policymakers from the

core issues that were the precursor to the tree mortality crisis, as well as reduce resources available to focus on maintaining the health of their green trees.

The core issues are extremely high tree densities and drought. Forest managers cannot control the weather, but they can reduce the tree density so that the next drought doesn't kill vast areas of the forest again. For example, there was a significant bark beetle epidemic in 2003 and 2004 in the southern Sierra Nevada around Lake Arrowhead that was caused by a regionally significant drought and elevated tree densities. The causes of the 2013-2016 tree mortality crisis are the same, except the forests have grown for an additional 10 years and the latest drought has been more widespread and severe. During the 2003-2004 crisis policymakers had the same conversations we have today regarding tree utilization and the costs for removals and/or treatments. At that time, meaningful preemptive actions were not taken to avoid the next tree mortality crisis. If the forests that are alive now are not thinned in preparation for the next severe drought it will only be a matter of time before further significant forest losses occur and the watershed, wildlife, recreation and wood resources critical for society's well-being are jeopardized. If the USFS expends its resources attempting to treat dead trees, SPI is concerned those efforts will be to the detriment of the remaining live forests and the existing manufacturing infrastructure that relies on those forests remaining vital and productive.

SPI believes treatment of the trees in the Tier 1 high hazard areas is critical and should be the first task to accomplish. Governor Brown's Tree Mortality Taskforce defines Tier 1 High Hazard Zones as "areas where tree mortality directly coincides with critical infrastructure such as communities, roads, utility lines, water conveyances, and other critical infrastructure. They represent a direct threat to public safety." The next priority should be putting in place an effective program to avoid yet another beetle attack, which means thinning green forests inside and outside of Tier 2 areas to a density that will prevent them succumbing to the next drought. We believe the last priority is to treat the remaining dead trees in the Tier 2 areas. Governor Brown's Tree Mortality Taskforce defines Tier 2 areas as "high hazard zones defined by watersheds (Hydrologic Unit Code 12, average 24,000 acres) that have significant tree mortality as well as significant community and natural resource assets". However, the Tier 2 work should focus on the immediate threat of falling trees and broader forest health issues, while limiting the treatment of dead trees to areas that support strategic landscape level fire planning. This prioritization recognizes that in today's budget environment, with all the competing demands for services, education, and health care the solution to the crisis needs to be strategic, realistic, and fiscally responsible.

After treating the Tier 1 areas, the impetus for action should be on preventive measures in live forests to avoid further tree mortality. Reducing forest densities proactively will yield the best results for watersheds, wildlife, recreation, and wood resources because it helps increase resiliency in those live forests by reducing stressors from drought, temperature, air pollution, and wildfire (Gillette et al. 2014). Treating live forests also has the additional benefit of producing higher value products, which will help fund these important forest stewardship activities.

The strategy of protecting the live forests ahead of treating dead trees in Tier 2 areas also factors in the reality that the manufacturing infrastructure will not be available to utilize the dead materials from the Tier 2 areas in any significant way because of the sheer volume of dead trees, their perishable nature, the costs of removal and their reduced market value. For example, on the Sierra National Forest it is estimated trees equaling 10 billion board feet are dead across 525,000 acres (Pile et al. 2016). That doesn't include the Sequoia, Stanislaus, Eldorado and Tahoe National Forests, - the other most impacted National Forests. The estimated total dead trees on California's Forests is approximately 20-40 billion board feet and the USFS continues to refine that number, but it is likely to go up (L. Swan, 2017 Pers. Comm.). Most of this volume will be uneconomical to recover because these beetle-killed trees lose their value as sawlogs after four to five months due to bore holes, fungus, severe checking and cracking.

Other lower value uses of the dead trees will not cover their cost of harvesting and transportation to market. Realistically, the only large scale product these dead trees can provide is fuel for biomass energy or possibly mulch to remediate challenges like heavy metal deposits around the Salton Sea. Both of these alternatives would be prohibitively expensive (e.g., Salton Sea) or require either State or ratepayer subsidies (e.g., biomass energy). The California Forestry Association estimated the average cost of tree removals delivered to a biomass energy plant, which includes cutting, skidding, chipping, and transportation by truck is $80 per bone dry ton (Steve Brink, 2017 Pers. Comm.). Using this rough delivered cost estimate, a conversion rate of 3 bone dry tons per thousand board feet, and the 10 billion board feet volume estimated by Pile, a cost estimate for treating the dead fuels is calculated at $2.4 billion. A bone dry ton can generate approximately 1 MW of power. Using a short run avoided cost of electricity value of $30/MWh ($0.03/kWH) the electrical revenue would equal approximately $900 million. If a value was placed on the CO_2 emissions offset from those trees being used as fuel at a biomass energy plant instead of natural gas at a conventional power plant, and using an offset market price of $10/tonne CO_{2e}, the offset emissions value would be approximately $631 million. There are also reduced fire suppression costs, along with watershed and health effect benefits that may be realized from the disposal of the dead trees as biomass energy. However, due to the myriad of uncertainties associated with a fire event, estimating a value for that benefit is too speculative to calculate. Therefore, the estimated total cost of treating the fuels on just the Sierra National Forest is approximately $869 million.

A conservative reforestation cost is approximately $500 per acre. Expenditures to regrow these impacted forests is a better use of taxpayer money than treating the dead trees because the growth of the new forest will help sequester the carbon that will be emitted as these dead trees rot. Also, regrowing the forest could potentially support wood products manufacturing jobs. On the Sierra National Forest the cost of reforestation would be approximately $263 million if all 525,000 acres were replanted. These reforestation efforts would be largely wasted unless the USFS also committed to using herbicide to restrict competing vegetation until the conifers were established and able to compete on their own.

SPI Perspective on Prescribed Fire.

California has 40 million acres of forestland, and the median pre-European fire return interval has been estimated at 13 years (Scholl and Taylor 2010) to 19 years (Taylor and Skinner 2003). Using a fire return interval of 20 years would mean that approximately 2 million acres burned annually, which would create huge quantities of untreated emissions. The pre-European tree densities have been estimated at approximately 19 trees per acre on average (Collins et al. 2015). Collins et al. (2011) describes the average tree densities as an oversimplification of historical forest conditions, however the USFS's ecologist Malcolm North concurs that the current tree densities are far too high and should be reduced by approximately 50% or more, using the strategies described in General Technical Reports 237 and 220 (Pers. Comm. M. North, March 2017).

The historic fire regime has been altered significantly during the last 100 years. Fire suppression became the rule in the 1950s and combined with a lack of forest thinning projects during the last 30 years, has led to forests having more than 300 trees per acre. CAL FIRE (2003) estimates there are approximately 11.3 million people living in the Wildland Urban Interface, which means there is significant risk to life and property using prescribed fire. Even when considering the untreated emissions from open burning and the substantial risks to property, there is still a keen interest in using prescribed fire as a management tool for treating overly dense forests.

SPI believes prescribed fire has its place in sustainable forestry practices, however on commercial timberland -the tradeoffs between mechanical harvesting and prescribed fire have not been analyzed thoroughly enough for policymakers to make informed decisions regarding its use. SPI recommends that a cost/benefit analysis comparing prescribed fire to mechanical harvesting (tractor and cable) be completed. The analysis for ground-based tractor logging should include biomass removals or mastication and the cable logging analysis should include "whole tree logging" with tops and limbs chipped at the landing. The analysis should be restricted to "commercial timberland" and not include woodlands, chaparral, or non-commercial forests because those areas have significantly different commercial values, productivity, and management options. Results of the analysis could be used as a tool to understand the trade-offs between those two management techniques. Variables that should be compared include: air quality/health effects, effectiveness at reaching a desired stand density and fuel load, economic costs, certainty of acres treated/risks to property, certainty in protecting watershed and wildlife resources, bi-product values/jobs derived from the project, cumulative product sequestration, and energy offsets. The results of this analysis should provide policy makers an opportunity to evaluate the different outcomes from these two different management approaches. It is our expectation that the analysis would show that for each variable listed previously, mechanical treatments would create better overall outcomes than prescribed fire on commercial timberland. Prescribed fire could be applied following a mechanical treatment to meet a particular ecological

objective, but SPI believes its usefulness will be limited by numerous risk factors. Prescribed fire should otherwise be restricted to non-commercial forests, parks and wilderness areas.

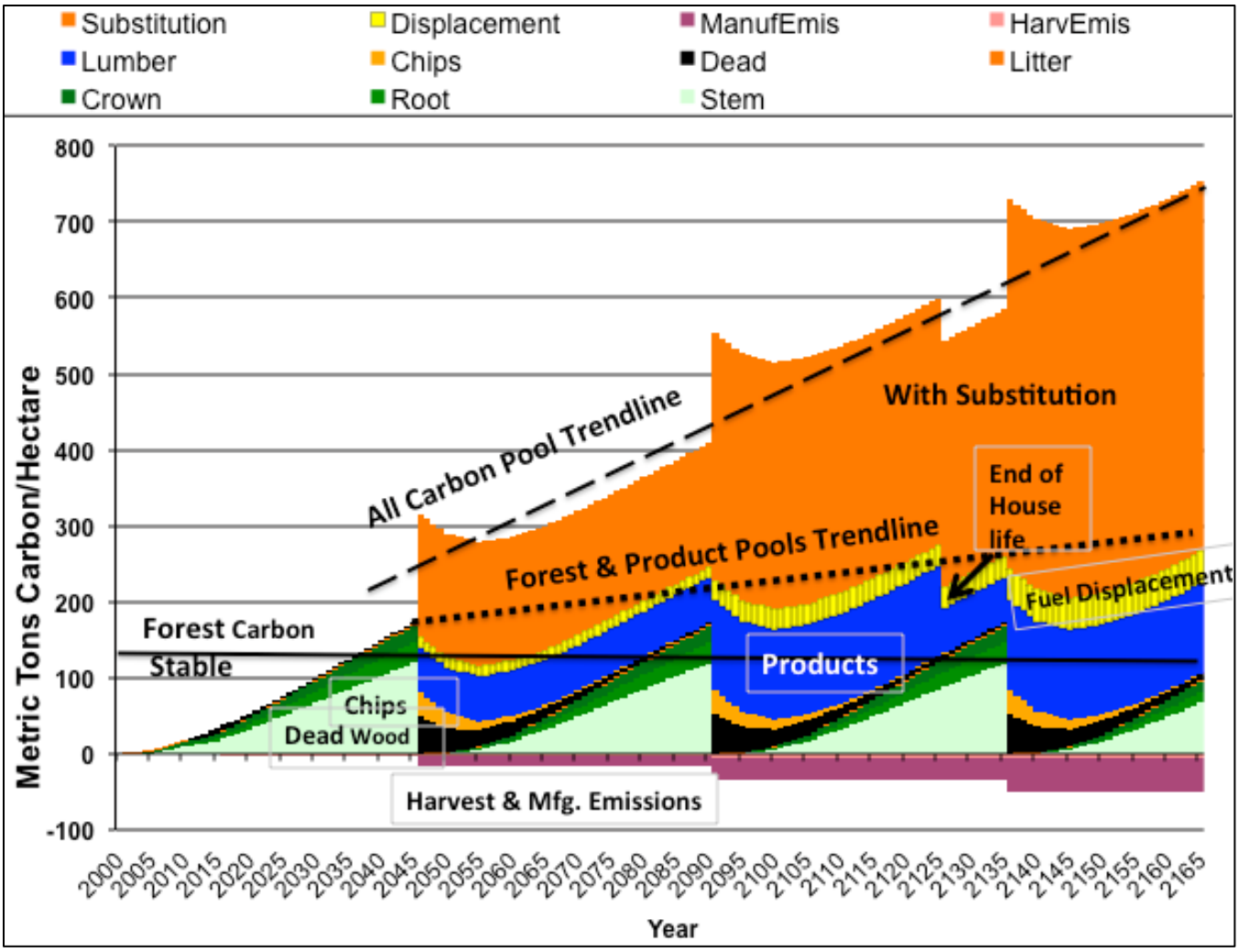
Any other information that could aid the commission's analysis of the forest management response to the tree mortality crisis?

Increasing the Demand for Wood Products

Currently there is a need to increase the demand for wood products as a mechanism to increase the value of wood products and thus the feasibility of implementing sustainable forestry practices. One area where policy could increase wood demand and CO_2 sequestration would be to recognize the emissions savings that occurs when mass timber wood products, such as cross laminated timber (CLT), are used in substitution for more highly energy embodied materials such as cement and steel. There are currently impediments in the California Building Code that prevent the widespread use of mass timber construction of multi-story buildings, even though individual projects have demonstrated their safety and price competitiveness. The following are informational videos and resources relating to applications for CLT construction: 1) Introducing Cross-laminated Timber (CLT) to North America, 2) Time lapse construction of University of British Columbia's 18 story dorm completed in 2016: https://youtu.be/GHtdnY_gnmE, 3) The History and Future of Tall Wood Buildings, https://www.youtube.com/watch?v=phPeFXLwA4g and 4) http://www.naturallywood.com/.

A benefit of mass timber products are that smaller dimension lumber can be used, which would result in improved prices and increased utilization of small trees (http://www.rethinkwood.com/tall-wood-mass-timber/products/cross-laminated-timber-clt). Modern small log sawmills can economically mill a 10' 6" long log that is 5 inches in diameter on the small end. The sheer quantity of wood necessary for multi-story mass timber constructed buildings would increase wood demand. Economic principles suggest that an increase in the demand for wood products will lead to higher prices for wood. Higher prices for wood should motivate non-industrial owners to take a more active approach to forest management because there would be a higher likelihood of profiting. Higher prices for wood should also improve the economics of sustainable forestry projects generally, including federal forests projects.

Below is a graphical representation of the flux of forest carbon over time on a fixed area of forest. The graph is from the Consortium for Research on Renewable Industrial Materials (CORRIM) (http://www.corrim.org/pubs/factsheets/fs_10.pdf, pg 3). There is a steady accrual of carbon stocks in wood products and the carbon displaced with bioenergy, with the largest gains occurring when wood products are substituted for highly energy intensive cement and steel.



The Importance of Forest Residuals

Providing wood residual biomass disposal opportunities should be a key part of the infrastructure in California. In order to manage fire hazards and suppression costs, fuel loads in our forests must be managed. In order to dispose of forest fuel with the most beneficial air quality outcomes, incentivizing the disposal of tree vegetation that is too small to make lumber needs to be addressed. Currently the technology for generating high value products at scale from very small diameter wood (<5"diameter) is limited. The technology currently available at scale for very small diameter wood is biomass energy plants. However, due to the abundance of natural gas the current market price of electricity is too low to support stand-alone biomass energy plants. Biomass energy plants do not receive subsidies that are provided to other renewable energy generators such as wind and solar even though Morris (1999) documents the (ancillary) benefits of burning biomass under controlled conditions in a biomass energy plant are 11.4 cents/ kWh compared to open burning. Because the forest density problem is so wide spread and there are huge quantities of very small diameter wood (<5"diameter) that needs to be removed from the forests, a reliable disposal mechanism needs to be available. Biomass energy currently meets that need, while also providing the certainty for outcomes relating to the number of

acres treated, the residual fuel load, the risk and amount of emissions from open burning, and the post project stand structure including wildlife element retention.

Providing wood biomass disposal opportunities is crucial for reducing harmful emissions while offsetting fossil fuel use. According to the California Air Pollution Control Officers Association (CAPCOA), "Biomass power plants are a primary alternative to the open burning of agricultural and forest waste and the emissions associated with open pile burning including criteria air pollutants (fine particulate matter (PM), carbon monoxide (CO), volatile organic compounds (VOC), and nitrogen oxides (NOx)), greenhouse gases (carbon dioxide (CO2) and short lived climate pollutants of methane and black carbon), and organic air toxics. Comprehensive life cycle assessments show reductions of greater than 99% for PM and black carbon, from 95-99% for CO and VOCs, 70% for NOx, and up to 30% for CO2 (Springsteen et al. 2015, Springsteen et al. 2011). In the near term, the lack of biomass plants will undo much of the progress that has been made in reducing open burning and the levels of harmful air pollutants in the air we breathe". In California it can cause a multitude of health issues, including increased hospital and emergency room visits, an increased risk of having a heart attack, and premature deaths. According to Hall et al. (2008) the estimated annual cost associated with air pollution health effects in the South Coast Air Basin and San Joaquin Valley were $22 billion and $6 billion respectively. Open burning and catastrophic wildfires exacerbate those health effects associated with poor air quality.

A study by the National Renewable Energy Laboratory (G. Morris 1999) indicated that the uncompensated (ancillary) benefits of biomass energy production are 11.4 cents/ kWh; the price of energy paid to biomass power plants does not reflect those benefits. A mechanism to support the cost of transporting biomass waste to a biomass power plant for its safe disposal should be developed. SPI believes that using the Greenhouse Gas Reduction Fund (GGRF) is a possible mechanism to support biomass power since its use benefits all Californians generally and the GGRF funds are accumulated equitably.

The state's renewable energy portfolio should also create a mechanism that enables biomass energy to work synergistically to support other renewable sources of energy by reducing the variability and uncertainty of power output and increase grid stability (Nelson and Wisland 2015). Such a strategy would elevate the use of biomass energy as the primary source for baseload power to support the expansion of intermittent renewable sources of power such as wind and solar, instead of using natural gas. Where such biomass capacity can be supplied, its substitution for natural gas would help California reach a higher percentage of renewable energy use in support of Senate Bill 350: Clean Energy and Pollution Reduction Act. SB 350 increases California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030.

<u>Minimize the Regulatory Cost of Implementing Sustainable Forestry</u>

The California Forest Practice Rules (CFPR) requires that a Timber Harvest Plan (THP) be prepared by a Registered Professional Forester (RPF) for any commercial timber operations. A THP will contain all of

the environmental review and supporting documentation for the proposed project. A THP must be consistent with other laws, including but not limited to, the Timberland Productivity Act, the California Environmental Quality Act (CEQA), the Porter Cologne Water Quality Act, and the Federal and California Endangered Species Acts. The THP should use practices and procedures that "avoid or substantially lessen significant adverse effects on the environment". There are several activities that are exempt from the THP requirement, but most timber harvested is done using a THP. The average cost of preparing a THP is approximately $30,000 - $60,000, depending on the size of the project. These costs are incurred from forestry staff preparing, administering, and monitoring the THP. While approximately 40% of the forestry time is important field work, the other 60% of the time is spent on paperwork. SPI estimates that it costs approximate $60 per thousand board feet to prepare and administer a THP in California. In Washington State the cost is approximately $6 per thousand board feet, which puts California at a distinct competitive disadvantage.

Innovative methods for reducing the cost of plan preparation will help landowners implement sustainable forestry that improves tree vigor and reduces the risk of catastrophic fire and insect outbreaks.

There have been improvements to the California Forest Practice Rules that allow exemptions from the paperwork involved in a Timber Harvest Plan, but not the operational limitations of the Forest Practice Rules. The Fire Safe Clearance Exemption (1038 c) allows landowners to expedite the necessary vegetation clearances around structures. The Drought Mortality Exemption (1038 k) allows the harvest of dying trees more widely than allowed by the original dead and dying exemption (1038 b). The Forest Fire Prevention and Forest Fire Prevention Pilot Project (1038 i, 1038 j) allows for larger areas (300 acres) to be thinned to reduce tree density, increase average tree diameter and fire hazards by modifying fuel loads.

The Drought Mortality Exemption (1038 k) has been useful during this tree mortality crisis. SPI and other landowners have used this exemption with positive results. Even though the most recent drought will not be our last, this exemption sunset date is December 31, 2018.

While not widely-used, the Forest Fire Prevention Exemption has also been used successfully. The intent of the Forest Fire Prevention Exemption is to reduce the risk of catastrophic fire that threatens many communities in the Sierra Nevada while improving the economic use of this exemption for landowners. While it hasn't been utilized widely by landowners, the legislature has modified the original bill slightly and is contemplating further modifications to allow it to function more effectively for landowners. SPI believes that the Forest Fire Prevention Exemption is the kind of program that will help further sustainable forestry practices in the state and improve forest health. The legislature's willingness to adaptively change this exemption is a positive approach to finding a "goldilocks" solution. We encourage the legislature to continue with these efforts.

Conclusion

In order to change the fire and insect crisis paradigm of reacting to these natural events after the fact, we need to treat the tree density issue using sustainable forestry practices at scale, in a systematic and continuous fashion. Such a strategy would rely on harvesting green trees on lands classified as commercial timberland in a manner that improves tree vigor and fire resilience. Harvesting trees when they are green will provide much better environmental and economic outcomes than waiting until they burn or succumb to insects or disease. On non-commercial forests, such as parks and wilderness areas, prescribed fire or managed wildfire should be encouraged to improve forest vigor and fire resilience.

When forests are not destroyed by fire or insects they have a tremendous value to society for water, wildlife, and recreation. Because the growth of forests is unrelenting, the density of trees must be managed programmatically and at scale. While the problem can seem daunting the solution holds tremendous opportunity. We have the opportunity to secure our watershed, wildlife, recreation, and wood resources while using sustainable forestry practices that sequesters additional CO_2, supports additional renewable energy developments, and creates family living wage jobs. Sustainable forestry does not need to be a burden on the taxpayer.

We have the technologies and science available to plan for and manage the forests responsibly. Where uncertainties in the science exist we can develop innovative adaptive management schemes to incrementally understand the ecological processes where our knowledge base is lacking, without impeding the pace necessary to effectively implement forest restoration work. We need innovative regulations for both private and public lands that facilitate the implementation of sustainable forestry practices at scale and avoid being held hostage by spurious litigation. Improving the markets for solid wood products by emphasizing mass timber building construction will help drive demand for wood, improve sequestration through product substitution and consequently improve the economics of sustainable forestry practices. If we work together respectfully and intelligently we can secure our natural resources with the best possible outcomes for all of us.

Sincerely,

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