PACIFIC FOREST TRUST
Private Forests. Public Treasures.

August 5, 2013

Shelby Livingston
California Air Resources Board

Dear Ms. Livingston,

Please find below the comments of the Pacific Forest Trust (PFT) regarding the initial work the Air Resources Board (ARB) is conducted to revise the state's Scoping Plan for greenhouse gas (GHG) reduction activities. We hope you find this information helpful.

Summary

California's forests should play a significant role in meeting the state's 2050 goal of reducing GHG emissions by 80% compared to 1990 levels. Indeed, as it becomes increasingly difficult and expensive to make emission reductions in other sectors such as transportation and energy, the ability of forests to remove carbon from the atmosphere is an indispensible and essential tool to achieve tens of millions of tons of CO2 emissions reductions.

Additionally, actions in the forest sector bring other economic, social, and environmental benefits that are increasingly important under climate change. These include improved water security for agriculture and drinking water, improved adaptation for fish, wildlife and plants, as well as new and sustained employment in rural areas hard hit by the recent economic recession. Achieving these synergistic benefits helps achieve other important state goals in addition to greenhouse gas reductions.

California's forests are amongst the most effective carbons sinks globally. It also has the most diverse suite of forest types nationwide, and the most diverse conifer forests globally. Though millions of acres of its original forests have been converted, the state remains one third forested and at well below its natural carbon carrying capacity, providing a significant opportunity to enhance its carbon stocks.

This document outlines the opportunities that California's forested landscapes offer the state to help it meet its GHG reduction goals, with a focus on private forestlands.[1] They fall into three general categories:

[1] As AB 32 is a state law, these recommendations focus on forestlands within the state's jurisdiction. Furthermore, some of the greatest opportunities to increase carbon storage and reduce emissions exist on non-federal lands.

- Increase secure forest carbon stocks in resilient forest ecosystems through restoration and conservation management.
- Mitigate forest emissions and decrease forest loss as a source of CO2 emissions.
- Promote reforestation and urban forestry to augment forest carbon stocks as well as enhance forest connectivity and link habitat types.

The state should set a target of increasing net private forest carbon stocks in key areas by 25- 50% by 2050, with a tiered strategy ranking the water security benefits, adaptation for fish wildlife and plants, and economic vitalization accompanying the greatest net carbon sequestration gains. The Scoping Plan should establish periodic five-year targets for increasing cumulative sequestration, strategically prioritizing those actions to achieve gains to 2050.

Working forest conservation easements (WFCEs) are an economically effective tool for this. In a WFCE, the public effectively shares the holding costs of the land with landowners, while bearing none of the operations and maintenance cost. Targeting investments to achieve highest total carbon increases across the landscape combined with greatest water security benefits gains multiple climate benefits. Further supplementing this ranking with economic and adaptation benefits strengthens that strategic impact.

Background on California's forests

California's forests are not static. They are living landscapes that respond to a combination of ecological conditions, public policy and market forces. Over the last 200 years, some 15 million of acres of California forestland were deforested to serve a rapidly expanding population or converted to agricultural lands.[2] While some of these acres have been reforested over time, many forestlands have been permanently converted to other types of landscapes. For example, in 2003 CalFIRE estimated that 95% of California's historic riparian forests and woodlands have been permanently converted to other uses.

Forests in California cover approximately one-third of the state (31,620,000 acres). Of this forestland[3], approximately 55% is publically owned and the remainder is privately held.[4] Over 75% of the publically owned forestland is held by the US Forest Service (USFS), meaning that the USFS manages 42% of California's forests and 13% of

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[2] *See generally* McArthur ED and Ott JE, 1996. "Potential Natural Vegetation in the 17 Conterminous Western United States." Citing Kuchler, 1964 "Manual to accompany the map, potential natural vegetation of the coterminous United States." Spec. Publ. No. 36. New York: American Geographical Society, p. 116.
[3] For the purpose of this document, we refer to "forestland" as those lands that are defined by CalFIRE in the 2010 Forest and Rangeland Assessment as conifer forest, conifer woodland, hardwood forest and hardwood woodland.
[4] California Department of Forestry and Fire Protection: Forest and Resource Assessment Program, 2010. "California's Forests and Rangelands: 2010 Assessment." Note that in a 2008 assessment of California's forestlands, the USFS came up with a figure of 60% public ownership of California forestland. We use the FRAP figures throughout this brief to ensure consistency. If you wish to consult the alternative USFS assessment, the title of their report is "California's Forest Resources, 2001 – 2005: Five-Year Forest Inventory and Analysis Report."

California's total surface area. With respect to the extent of certain forest types in California: 19% of California's surface area is conifer forest (19,335,000 acres), 2% is conifer woodland (2,399,000 acres), 5% is hardwood forest (4,594,000 acres) and 5% is hardwood woodland (5,292,000 acres).[5]

The Scoping Plan should Acknowledge Synergy Across Sectors

There are many climate benefits provided by forests that go beyond their ability to sequester CO2. These include water filtration and storage, habitat for valuable fish, plants and wildlife, potential for renewable energy, reduced transportation emissions, recreational opportunities and good paying jobs in rural communities.

Actions and investments that protect and improve forests will therefore benefit other sectors covered by the Scoping Plan – particularly water and energy. The water filtration and storage services provided by California's forests are literally awesome. Nearly 85% of California's average annual runoff comes from forested watersheds.[6] Forests are the first filters for the state's water, ensuring that it is of high quality for surface storage reservoirs that supply our agricultural fields and urban households. Forest meadows play a critical role in the state's water system, acting as sponges that collect water during wet periods and release it slowly during dry periods of the year. Restoring forest structure can significantly increase water yields as well, through capturing and retaining more snowfall.

On the energy front, California's forests can play a crucial role in meeting the state's renewable energy goals. Forest bioenergy is increasingly recognized as an important contributor to the RPS, and the fuels used for bioenergy can come from management activities that improve forest health and resiliency. Additionally, the protection of forests and open space, as part of a larger integrated land use plan, can also support more compact development and help reduce transportation-related emissions.

Promote Forests as a "carbon sink" –
To remove CO2 and restore carbon in forests

The conservation and management of California's landscapes and natural resources have a direct impact on climate change and present significant GHG reduction opportunities for the state. Forests are carbon sinks. They remove vast amounts of carbon dioxide from the atmosphere and store it as carbon for decades, centuries and thousands of years in woody tissue and soils.

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[5] California Department of Forestry and Fire Protection: Forest and Resource Assessment Program, 2003. "The Changing California: Forest and Range 2003 Assessment," page 46. ("Typical Conifer Forest habitats include Sierran and Klamath Mixed Conifer, while Juniper is a common habitat in Conifer Woodland. Typical Hardwood Forest and Hardwood Woodland habitats include Montane Hardwood and Blue Oak Woodland, respectively").

[6] *Supra* note 3 at 138.

California's private forests currently store approximately 5.1 billion tons of CO2e.[7] While current sequestration benefits are significant, these forests have the potential to provide far greater climate benefits. Properly managed, this stock could increase by some 50%[8], and serve as stable, resilient carbon sinks for hundreds and thousands of years. Depending on the forests type, these forests may store anywhere from 30-80 tons CO2e/acre for hardwood forests to over 200 tons CO2e/acre in conifer forests such as mixed conifer and redwood types.[9]

Encourage greater carbon storage through changes in forest management

It is widely acknowledged that California's forests could be substantially enhanced as a carbon sink if certain management and restoration policies were pursued. For example, Hudiburg, et al estimate that the biological potential for total landscape stocks of forestland carbon in Northern California could be almost doubled.[10] Disaggregating that landscape number between the public and private forests shows the large majority of gain would be on private lands, with the older federal forests already well-stocked. Despite having far greater productivity, private forests sequester, on average, half of what public forests sequester, due to their young age.[11] Furthermore, federal forests are not subject to state laws and policies, emphasizing the greater opportunity to effect change on private and non-federal lands.

When considering the policies to enhance forests as a carbon sink, it is important to focus on those forests that are currently sequestering carbon well below their optimal annual yield or amount. Increasing the average age of forests vastly increases the carbon stocks while still yielding timber. This is true across all conifer types forests from coastal Douglas fir/redwood to mixed conifer inland types. In a study of ponderosa pine in central Oregon, a stand of trees between 50 and 250 years old sequestered greater amounts of carbon per unit of land area than a stand roughly 15 years of age that had been clearcut in 1978.[12] This means that climate policies for private forestland owners should focus on management for older, more diverse forests.

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[7] Robards TA, 2010. "Current Forest and Woodland Carbon Storage and Flux in California: An Estimate for the 2010 Statewide Assessment."

[8] Hudiburg T, Law B, Turner DP, Campbell J, Donato D and Duane M, 2009. "Carbon dynamics of Oregon and Northern California forests and potential land-based carbon storage." Ecological Applications, 19(1): 163 – 180, 178 ("If forests were managed for maximum carbon sequestration total carbon stocks could theoretically double in the Coast Range, West Cascades, Sierra Nevada, and East Cascades and triple in the Klamath Mountains. Our results indicate that Oregon and California forests are at 54% of theoretical maximum levels… given the absence of stand replacing disturbance").

[9] Stewart W, Powers RF, McGown K, Chiono L, et al, 2011. "Potential Positive and Negative Environmental Impacts of Increased Woody Biomass Use for California." P. 35. PIER Publication # CEC-500-2011-036. Cites the following figures for tonnes per hectare of live tree biomass carbon: redwood = 258.4 (383 tonnes CO2e/acre), canyon live oak = 81.1 (120 tonnes CO2e/acre), and blue oak = 32.6 (48.5 tonnes CO2e/acre). Apply the following formula to convert metric tons of carbon biomass per hectare to metric tons of CO2e per acre: X metric tons per hectare * 3.7 = Y metric tons CO2e per hectare. Y / 2.47105 = Z metric tons CO2e per acre.

[10] *Supra* note 7.

[11] *Supra* note 7.

[12] Anthoni PM, Unsworth MH, Law BE, et al, 2002. "Seasonal differences in carbon and water vapor exchange in young and old-growth ponderosa pine ecosystems." *Agricultural and Forest Meteorology*, 111: 203 – 222.

For example, an increase in the average age gained through a reduction in harvest rates for a period of time could increase both carbon and timber yields, as it would allow for an increase in base inventory. Implementing this strategy within the mixed conifer forests of northern California could increase average carbon stocks by an estimated 70-100 tons CO2e/acre in the next 40 years.[13] With over two million acres of forest on which this could be carried out, the carbon gains in this region alone exceed 140 million tons CO2e at the lower end of the range.

A Key Strategy to Store More Carbon: maintain intact and ecologically functional forest landscapes

Carbon sequestration occurs with a forest system, not just at the individual tree or stand level. The more stable and connective the forest, the more effectively it functions as a watershed, as wildlife habitat, as well as to sequester and hold carbon. The more fragmented and disturbed the forest—as by conversion, roads, intensive harvest or uncharacteristic fires—the less stable and effective it is.

Therefore, a key strategy in the Scoping Plan should be to secure and protect the overall forest that provides the carbon sequestration. This can be done across millions of acres by conserving forests owned by private landowners that are interwoven with public forests. Public forests exist within a matrix of private lands, and, with ongoing, continued and cumulative impacts of fragmentation, development and degradation, the overall stability and security of all these carbon stocks is at risk as forest function declines.

We suggest that the initial target of the Scoping Plan be to identify where the greatest total volume of carbon can be secured within forest types, and focus initial efforts there. Subsequent investment can then be made to complement this core set of gains. Using conservation easements that not only protect the forest base but also require increased stocking over time is the key tool that can achieve this. Targeting this conservation in forested areas where precipitation is projected to be stable or increase over the next decades is makes sense as a way to strategic strategically achieve another key goal—securing water supplies as climate change continues to decrease water yields elsewhere in the state.

Policy Recommendations to encourage increased, resilient carbon storage on forestlands include:

- Acquire conservation easements on working forestlands and other forestlands to restore and maintain older, more diverse forests with increased carbon storage.
    - Identify areas of the state that present substantial opportunities to protect and increase carbon sequestration and also provide important co-benefits including securing the state's water supply, and enhancing adaptation opportunities. Focus and aggregate investments to achieve a landscape-

[13] The Pacific Forest Trust performed an analysis of the potential carbon stocking for a substantial acreage of representative commercially managed private forestland in northern California, and the results were in line with this range.

scale impact on watersheds in the region and to maintain large functional ecosystems.
    - Funding for conservation easements should come from auction proceeds and any future bond funding
- Forest restoration/reforestation through the CA Forest Improvement Program
    - Prioritize investments based on significance of carbon sequestration opportunities, as well as impacts to climate adaptation readiness and other co-benefits.
    - Develop a mechanism to ensure that investments lead to enduring public benefits.

Minimize forests as a source of emissions – Reduce degradation and conversion; mitigate emissions

While forests sequester carbon as they grow, forests release CO2 when they are disturbed through events like harvest and conversion to non-forest cover. Large-scale human activity over the past several hundred years has led to major forest loss, changes in land use, and consequent CO2 emissions. When forests and other natural landscapes are disturbed, degraded or eliminated, not only is much of the carbon they stored directly released into the atmosphere as carbon dioxide, ongoing carbon sequestration benefits are impaired.

Reduce forest loss to reduce GHG emissions from forests

Projections for future conversion of California forestlands to other uses indicate the potential for additional emissions and lost sequestration from California's forests, unless actions are taken to protect these landscapes. Barbour and Kueppers estimated that during the 1990s and early 2000s, forestland in California was being converted at a rate of at least 15,000 acres per year.[14] Spero et al estimated that over 30,000 acres/year were converted in the 1980s and 1990s. These annual rates will vary due to economic factors. This rate of conversion of forestland is expected to continue through 2020.[15]

Similarly, a 2003 CalFIRE study estimated that conversion would occur on 4 – 6% of conifer forest types and 12% of hardwood forests and woodlands between 2000 and 2040.[16] Pearson, et al estimated that as much as 15,904 acres per year were deforested statewide due to development from 2002 to 2009.[17] A study by The Nature Conservancy (Cameron, et al, in review) of rangeland conversion (primarily hardwood woodlands, shrubs and grasslands) from 1984 to 2008 estimates that 20,130 acres per year were converted to other uses across 33 California counties.

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[14] Barbour E and Kueppers LM, 2011. "Conservation and management of ecological systems in a changing California." *Climactic Change*, 111: 135-163.
[15] *Ibid* at 137.
[16] *Supra* note 5 at 90.
[17] Pearson T, Grimland S, Goslee K and Brown S, 2011. "Spatial Analysis: Deforestation in California - a poorly understood GHG emission source and emission reduction opportunity." California Energy Commission. Report to PIER under #PIR-08-008.

Reducing and mitigating for this conversion would help California meet its GHG goals by 1) avoiding the direct GHG emissions caused by conversion of forestland and 2) retaining the capacity of the state's forests to sequester carbon in the future.

Since the last Scoping Plan, the state amended its CEQA Guidelines to assist project developers account for GHG emissions and test for the significance of GHG impacts. Helpfully, the Guidelines now include a recommendation to explicitly consider the GHG impacts of converting forestland.[18] However, the Guidelines could be improved if they explicitly considered the lost sequestration capacity of converted forestland as a GHG impact. They could also help project developers mitigate the GHG emissions of their projects by reflecting clear mitigation priorities and rigorous GHG accounting standards for any offsets pursued as a part of mitigation. Further, given the current trends in atmospheric carbon dioxide concentrations, permanent loss of forestland should be considered significant and require mitigation.

Comparing the direct GHG emissions and lost sequestration capacity of converted forestlands with the estimated GHG benefits of California's high speed rail (HSR) project leads to striking results. The California HSR Authority recently advised the state that they believe HSR will reduce CO_2e emissions by 27.1 million to 44.9 million tons, cumulatively, by 2050.[19] Avoiding the conversion of 540,000 acres of forestland (assume 15,000 converted acres x 36 years) will lead to avoided emissions of nearly 70 million tons of CO_2e, cumulatively, by 2050.[20] And this can be done for a tiny fraction of the cost of HSR. The lost annual sequestration capacity of these 540,000 acres by 2050 would be over 400,000 tons CO_2e.[21]

Policy recommendations to reduce emissions from forest loss and degradation:

- Implement mitigation requirements for the climate impact of forest conversion as identified under CEQA.
- Update the state's CEQA Guidelines to:
    - Add language specific to forest and other natural land conversion as a source of GHGs and lost sequestration in Section 15064.4.
    - Revise Section 15126.4 subdivision (c) to reflect clear mitigation priorities and rigorous GHG accounting standards for any offsets.
    - Include a question in Appendix G section VII regarding loss of sequestration capacity that may occur as a result of a project.

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[18] CEQA Guidelines, Appendix G. "Environmental Checklist Form." Sample question #2, c – e.

[19] California High Speed Rail Authority, 2013. "Contribution of the High-Speed Rail Program to Reducing California's Greenhouse Gas Emission Levels." Available at: http://www.hsr.ca.gov/docs/about/legislative_affairs/HSR_Reducing_CA_GHG_Emissions_2013.pdf.

[20] Calculated using the EPA factor for forestland conversion to cropland: 129.51 metric tons of CO2e per acre.

[21] Using the net annual average sequestration capacity from FRAP 2010 assessment of CO_2e for all forestlands. http://frap.fire.ca.gov/assessment/assessment2010/assessment2010.html

- Evaluate the pressures and threats of conversion of forest and other resource lands statewide to prioritize the acquisition of conservation easements.
    - Consider existing policies – such as zoning, limitations on the expansion of physical infrastructure, and tax and other financial incentives – that would restrict such conversions.

- Improve land use policies to prevent and mitigate conversion and fragmentation.
    - Ensure that SB 375 Sustainable Communities Strategies include protection of lands threatened with development.
    - Support incentives for local land use policies, like SB 375 and others, that encourage better land use to reduce GHG emissions not only from transportation but also other interrelated issues such as development and open space.

Building climate resiliency in forests – A key to meeting GHG goals

Another source of high emissions and ecological disruption is uncharacteristically intense fires driven by the high fuel loads in California. California has a Mediterranean climate, but current fire regimes are higher and more frequent than some historical analyses suggest. More frequent droughts, excessive fuel buildup from past fire suppression, larger and more intense wildfires, rising temperatures, reduced snowpack and lower overall precipitation in some parts of the state will almost certainly diminish the range and health of California's forestlands – notably in more central and southern California.

Climate change is projected to lead to the loss of forest cover due to these factors[22], especially in the more southerly, drier forest types. It will also expose forests to greater risk of wildfire; a risk exacerbated by ongoing rural sprawl.

Building a climate resilient forest essentially means giving it the capacity to adapt to rapidly changing climatic conditions as a living ecosystem. At a local scale, this means promoting forest stands that have more natural structure, species composition, and age distribution (i.e. older), with gap areas intermixed with clumps of multi-aged trees of different species. This forest structure reflects historic fire regimes in place throughout California's forestlands. It can be structurally recreated by management practices with the focus on ecological and climate outcomes, rather than short-term timber production.

Often referred to as forest restoration, this kind of management is increasingly recognized by both the state and federal government as an essential tool to improve forest health and reduce wildfire intensity. The products of this restoration can supply fuel for renewable energy facilities.

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[22] Lenihan JM, Drapek R, Bachelet D and Neilson RP, 2003. "Climate Change Effects on Vegetation Distribution, Carbon and Fire in California." *Ecological Applications*, 13: 1667-1681. Shaw MR, Pendleton L, Cameron DR, Morris B, Bachelet D, et al, 2011. "The impact of climate change on California's ecosystem services." *Climatic Change*, 109: 465-484.

A vitally important climate benefit of well-managed and conserved forests is adaptation for fish, wildlife and plants. Conserving key private forests that connect to federal forests will weave together a landscape with safe habitat corridors for plants and animals to adapt to climate change. Plants and animals will seek to migrate as temperatures and precipitation levels rapidly change, and they will not recognize private/public lines separating different forest properties.[23] Strategically targeted and protected landscapes give them the best chance for survival.

Policy recommendations to build resiliency in forests and maintain climate benefits:

- Support state policies, including regulatory changes, insurance requirements and incentives, to encourage private landowners to manage for the desired resilient forest stands.
- Fund the Vegetation Management Program to help landowners restore natural fire regimes.

- Encourage the federal government to invest in public land management to restore millions of acres of unnaturally dense forest to a more ecologically appropriate condition.
- Reduce the social and economic conflict between humans and fire by encouraging state policies that reduce the risk of loss of life or property from fires:
  - Support programs that subsidize or otherwise encourage retrofitting of existing homes in fire prone areas to meet current wildland fire resistant best practices.

Setting a goal and monitoring progress

Focusing on eliminating threats and seizing opportunities in California's highly productive private forests, the Scoping Plan should set an initial target of increasing resilient carbon stocks on these holdings by 25-50% by 2050, with the state undertaking a process to refine this target over the next three years.[24] Comparable, indeed greater gains have been achieved on public forests in less time. This target should also focus on protecting the security of the state's key forested watersheds, achieving a synergistic climate benefit. Initial periodic targets should focus on gaining the greatest

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[23] Loarie SR, Carter BE, Hayhoe K, McMahon S, Moe R, et al, 2008. "Climate Change and the Future of California's Endemic Flora." *PLoS ONE*, 3: e2502.

[24] To refine the statewide target for forests, ARB in conjunction with the resources agency, should build off the GHG inventory update and conduct a spatial analysis to identify emissions threats and sequestration opportunities across the California landscape. Such an analysis would provide the basis for developing a more refined target for the forest sector as well as a strategic vision for targeting policies and monitoring progress over time.

forest base for sequestration, while later years may yield greater annual amounts of carbon sequestration.

The soon to be completed update to the inventory system for California's forest and rangelands provides a foundation to develop an effective mechanism to spatially track and monitor the change in carbon sequestration across the landscape. This tool would be more useful if it further identified geographic areas that represent a high risk of emissions from forest loss or degradation, as well as helping to identify opportunities for increasing sequestration. As the inventory is periodically updated it will provide an opportunity to assess how much forest sequestration capacity has been lost to conversion, whether investments in Working Forest Conservation Easements, reforestation or other actions continue to result in increased carbon storage, and to what extent natural disturbances such as fire have reduced carbon stocks.

Conclusion

Mitigating and reducing emissions from, and increasing sequestration in, the forest sector will be an indispensible aspect of meeting California's 2050 goals. Reducing greenhouse gas emissions from California to that degree will extremely difficult – fortunately increasing the carbon storage and resilience of our forests has the same atmospheric effect, while also achieving myriad valuable co-benefits.

The benefits of forest carbon sequestration increase over time. To maximize the benefits for 2050, we should invest in reforestation, conservation, and improved management as soon as possible, with ongoing investments in improving forest resilience.

Sincerely,

Paul Mason
Vice President, Policy & Incentives
Pacific Forest Trust