Comments on the Draft Forest Carbon Plan Concept Paper

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Summary: Public Workshop on the

Draft Forest Carbon Plan Concept Paper

Forest Carbon Action Team

March 23, 2016

CalEPA Building, 1001 I Street, Sacramento, 9:00 a.m. – 12:00 p.m

Note: Written comments on the Draft Forest Carbon Plan Concept Paper will be accepted until April 8th. Email comments to fcat.calfire@fire.ca.gov

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Executive Summary and Key Themes

This Workshop provided an opportunity for the Forest Carbon Action Team (FCAT) to present a draft Concept Paper for the Forest Carbon Plan (Plan) and to solicit public feedback on their efforts. The Plan, anticipated to be completed by the end of 2016, will provide forest carbon targets and an array of strategies to promote healthy wildland and urban forests. The Concept Paper provides an overview of the proposed goals and strategies of the Plan. It is intended to serve as a discussion document to foster interaction with and feedback from the public as the FCAT continues to develop the Plan.

Public comments expressed during the Workshop reflected a diversity of perspectives on the Plan and included comments on: terms and definitions, carbon accounting methods, carbon and industrial forestry, support for forest protection, financing strategies, and the role of stakeholders and communities. A detailed summary of individual attendee comments and questions is included in the following pages. Key themes are summarized here:

The importance of precise and accurate use of terms. Commenters suggested the FCAT consider more carefully how it uses terms in the Plan, including sustained yield, sustainable, ecosystem services, fragmentation, reforestation, and “black” carbon.

Desire for specificity and transparency in carbon accounting methods. Commenters had several questions and suggestions about carbon accounting methods. Critiques included: overly optimistic assumptions about long-term carbon storage in wood products; failure to account for carbon emissions from harvest methods, especially clear-cutting; and a need for more robust methods to address emissions from prescribed and extreme fires. There were also calls for greater transparency and specificity in carbon accounting methods, including analyses by region and forest type.

Support for protecting and enhancing urban and wildland forests. Many commenters expressed support for protecting private forestlands from conversion and parcelization, while offering different perspectives on how to achieve this. Some focused on support for conservation easements, while others focused on the need to address high regulatory costs of timber production that can potentially increase land conversion and parcelization. There was general support for elements of the plan that would protect urban forests and increase funding for tree planting. Some expressed a desire for clearer recognition of forest co-benefits, and the need to optimize not just carbon benefits but also other co-benefits that forests provide.

Carbon policy is an overlay to harvesting methods, restoration and other management questions. Some viewed the Forest Carbon Plan effort as an opportunity to pursue greater regulation of methods like clear-cutting, while others noted the net positive benefits of forestry ownership to carbon sequestration. Some viewed reforestation as an opportunity to increase carbon sequestration in some areas, while some expressed concern that current, high-density reforestation methods increase fire risks.

Financing. Commenters noted the importance of economically feasible solutions and of working with landowners to ensure they have the ability and incentives to pursue forest management practices that sequester carbon. Ideas included supporting more financing for conservation easements and urban trees, communicating the benefits of public investments in healthy forests, and public benefits charges on downstream water beneficiaries to support forest and watershed health.

Desire for additional conversation, discourse, and collaboration with stakeholders and communities. There were many requests for meaningful engagement of stakeholders and rural communities, including opportunities for two-way dialog. Several expressed concern about exclusion of rural community perspectives. Urban forestry efforts were additionally noted as an opportunity to engage with environmental justice and active transportation efforts.

Detailed Meeting Notes

Introduction and Agenda Review

Facilitator Caelan McGee of the Center for Collaborative Policy, Sacramento State University, introduced the workshop presenters and goals.

Presenters:

- **Edie Chang**, California Air Resources Board, Deputy Executive Officer
- **Liz Berger**, USDA Forest Service, Regional Forester's Liaison in Sacramento
- **Claire Jahns**, California Natural Resources Agency, Assistant Secretary for Climate Issues
- **Helge Eng**, CAL FIRE, Deputy Director for Resource Management
- **Ashley Conrad-Saydah**, California Environmental Protection Agency, Deputy Secretary for Climate Policy
- **Russ Henly**, California Natural Resources Agency, Assistant Secretary of Forest Resources Management
- **Klaus Scott**, California Air Resources Board, Greenhouse Gas Inventory Branch

Workshop goals:

- Review status of work on the Forest Carbon Plan.
- Discuss intent and contents of the draft Forest Carbon Plan Concept Paper.
- Collect comments and address questions and on the Forest Carbon Plan Concept Paper, Particularly on Goals and Strategies.
- Provide updates for next steps in planning process.

Opening Remarks on the Forest Carbon Plan and Process

Opening remarks described the context for Forest Carbon Plan development.

Mr. Eng: The Forest Carbon Action Team (FCAT) was convened in August 2014 to address the role of forests in achieving the goals of Assembly Bill 32, the California Global Warming Solutions Act of 2006. The FCAT includes state and federal agencies, academia, non-governmental organizations, working forest land owners, and others working together to develop a Forest Carbon Plan (Plan). The Plan will provide forest carbon targets and an array of strategies to promote healthy wildland and urban forests. The FCAT aims to complete the Plan by the end of 2016. Goals for the Plan include:

- Develop quantitative targets.
- Identify actions necessary to meet these targets.
- Develop recommendations for funding actions to ensure net long term carbon storage by California's forests.

Ms. Conrad Saydah: The FCAT has wrestled with large challenges facing our forests and different views on how to address them, but has come to an overwhelming conviction that we need to change how we manage forests for the future. The Concept Paper lays out an approach. The FCAT needs to hear from managers, landowners, and partners about their responses to the paper and how we can achieve these goals together.

Mr. Henly reiterated the importance of public participation and input. California has 33 million acres of forestlands, plus urban forests, and addressing these challenges requires broad scale collaborative solutions. Public input is crucial to ensure that the FCAT is appropriately identifying problems and issues and identifying strategies to accomplish carbon and forest health goals.

Presentations: Status of Work on the Forest Carbon Plan and Overview of the Forest Carbon Plan Concept Paper

Ms. Chang discussed the Forest Carbon Plan in the context of other climate change efforts work in California.

- California is developing a new Scoping Plan, the state's blueprint for how to meet its climate change goals. The first Scoping Plan was released in 2008, it was updated in 2014, and now there is another update process to respond to the Governor's new goal, set in 2015, for a 40% reduction in 1990 greenhouse gas (GHG) emissions by 2030. The Governor also set goals for working and forest lands to achieve zero net balance of carbon sequestration and emission.
- Because the FCAT and Scoping Plan were moving in the same direction, now we are merging these two processes, building on the work that the FCAT has done to develop targets and evaluate and select metrics.
- Timeline for the updated Scoping Plan:
    - Discussion draft – will be completed in May and heard by the Air Resources Board in June.
    - Draft Scoping Plan – will be completed in August, heard by board in Fall.
    - Final Scoping Plan – Fall 2016

Mr. Eng provided an overview of the current California Forest Carbon Concept Paper.

- The Concept Paper is a skeleton of the Plan, with much analysis to be done. This was purposeful so that the analysis can be responsive to public input at this stage.
- Mr. Eng reviewed the introduction and vision statement of the Concept Paper.
- One item the FCAT would like public input on is the definition of forest health in the Concept Paper. The Concept Paper focuses on resilience, biodiversity, and economic and ecological sustainability as cornerstones of forest health.
- The FCAT would also like public input on the analytical approach in the Concept Paper.

Mr. Henly reviewed the process and overarching vision for the Forest Carbon Plan.

- Public input will enable the FCAT to further develop the goals and strategies, which will also be incorporated into the 2016 Scoping Plan that ARB is developing.
- The Concept Paper lays the groundwork for a Plan to be focused on increasing sequestration and reducing emissions. It addresses a wide range of forest co-benefits – ecosystem, social, economic – in both urban and rural forests.
- A UC Berkeley team is beginning a study to help quantify values and costs in the Plan.
- The Concept Paper views achieving healthy, resilient forests – expected to have larger, more widely spaced trees than current forests – as a key to achieving carbon and other goals.
- The Concept Paper recognizes the need to work collaboratively at landscape scales. Implementation of goals and strategies will require significant collaboration and investment
- The Concept Paper provides information on current carbon inventories, sequestration rates, and needs for future carbon accounting.
- There will need to be adequate monitoring, reporting, and evaluation, and ability to adapt as we learn what works or does not work.
- The Concept Paper organizes Goals and Strategies along three broad themes: protect, enhance, and innovate.

Mr. Scott reviewed highlights of the methodologies used to calculate carbon storage.

- Mr. Scott reviewed the section "The Carbon Storage Potential of California's Forest Landscapes and Urban Forests."
- The Concept Paper combined classical methods with new, innovative methods to evaluate how carbon is currently stored in urban and wildland forests.
- The carbon quantification effort takes a portfolio approach, as different methods suit different purposes. The methods include analysis of ground-based data and biometric data and other methods.

Ms. Jahns discussed the goals and strategies for implementation in the Concept Paper.

- Strategies for forest carbon sequestration and GHG emission reduction goals are organized around the concepts of protection of existing forested lands, enhancement of carbon storage through active management and restoration, and cross-sector innovation to promote emissions reductions in other sectors that support forest health.
- Strategies address both urban and wildland forests.

Ms. Berger reviewed the section of the report on implementation and investment mechanisms at federal, state, and local levels.

- Collaboration is essential, as an "all lands" approach is necessary to implement these strategies at a landscape scale. The Concept Paper identifies a range of collaborative approaches that the Forest Service, other agencies, and stakeholders are using to implement restoration efforts.
- The Concept Paper identifies potential investment mechanisms at federal, state, local, private levels that can provide resources for meeting climate change targets.

Mr. Eng reviewed the timeline and next steps for this process.

- The FCAT plans to complete the Forest Carbon Plan in 2016.
- The FCAT is accepting public input on this draft through April 8th.
- The next draft of the Plan is to be released in August, followed by a 2nd public workshop in October. Public comments will be incorporated in November.
- Another public workshop may be held before finalizing the plan in December.

Attendee Comments and Questions

John Amodio, Yosemite-Stanislaus solutions

- Mr. Amodio offered a commendation for the draft as a strong step forward in recognizing the relevance of forest health to AB 32 goals.
- He suggests the plan development process needs more opportunity for dialog, not just written comment, with stakeholders, who have vast experience in these forests.

Paul Mason, Pacific Forest Trust

- In terms of the "enhancement" goals and strategies, it seems like there is good consensus with where we want to go with forest structure, including stand treatments in the near term to deal with the overstocked condition.
- Mr. Mason noted a lack of discussion of how to change the cycle of logging we are in right now, which is based on profitability of trees, and rotations of 40, 60, 80 years.
- Mr. Mason suggested we need a more robust discussion around mechanisms to change behavior and approaches, recognizing there is a cost to landowners for these changes.

  <u>Panelist responses</u>:
  - Ms. Conrad-Sayda noted that FCAT is very interested in hearing ideas about tax incentivies and about the role that government can play in adjusting incentives for forestry approaches.
  - Ms. Jahns noted that biomass strategies focus on non-merchantable timber, and that FCAT is interested to know more about opportunities to grow higher value lumber including specialty products and finer-grained wood products.

Arthur Boone, Sierra Club, Oakland Tree Team

- First, Mr. Boone stressed the importance of continuing funding to support urban tree planting, like CAL FIRE support that enabled his organization to plant 1500 trees in Oakland. He noted that more urban trees could be planted.
- Second, Mr. Boone noted that we have 40% fewer trees in the world now compared than at the start of human civilization. He asked whether increasing tree numbers back to their pre-human civilization level would increase the earth's ability to absorb carbon dioxide and therefore make the Keeling curve go down. (The Keeling curve plots the concentration of carbon dioxide in the atmosphere over time since 1958).

- Mr. Boone suggested we should look at trees as endangered and work to protect them, including by addressing population growth and tree policy and protecting and planting more urban trees.

Karen Mackey, Bay Area resident

- Ms. Mackey was heartened that the Concept Paper encourages larger trees and biodiversity.
- She suggested a need to identify the specific forest treatments and incentives that will result in larger trees and biodiversity.

Forests Unlimited, Sonoma County

- In Sonoma County we see industry using very destructive clear-cutting methods. Some burn all the slash and apply herbicide after clear-cutting.
- First, a question: have you analyzed the impacts of these treatments including not just the impacts of removing the trees, but also the impacts from these other treatments that follow clear-cutting. We would like to see some more analysis of those treatments.
- Second, in terms of fire, recent peer-reviewed research by Hanson et al. shows the beneficial impacts of fire and the destructive impacts of salvage logging. We would like to see analysis of salvage logging impacts in the Plan.

Spencer Eldred, Mountains Recreation & Conservation Authority

- Mr. Eldred suggested exploring how urban forestry incentives can be used to improve active transportation in urban areas. This relates to encouraging higher density housing.
- Urban tree planting should recognize environmental justice and geographic equity. There is great potential for tree planting in non-traditional areas.
- The Authority is concerned about the impacts on wildlife corridors and megafuna of climate changes that force species to migrate up and down hillsides.

<u>Panelist responses</u>:

- Ms. Jahns noted FCAT's desire to integrate plans that focus on forest co-benefits like wildlife and water. This includes the State Wildlife Action Plan, which views corridors as important for facilitating migration of species impacted by climate change.
- Ms. Chang would like to hear more about the first comment on using forestry incentives to promote active transport and urban density.
- Another panelist noted that California is spending significant funds on urban forestry, and there is a need to ensure that it stays in the Governor's proposed budget moving forward.

Craig Thomas, Sierra Forest Legacy

- First, Mr. Thomas noted some definitions in the report that need refinement.

  - Conflation of *sustained yield forestry* with *ecological sustainability*. Sustained yield forestry is about rotation forestry, not ecological sustainability. We may need to accept declining timber harvests to produce larger trees.
  - Conflation of *ecological fragmentation* and *land cover fragmentation* measured using satellite imagery. You can have forest cover that is highly ecological fragmented in terms of connectivity and forest type.
  - *Black Carbon*. Large landscape megafires are not a good thing, but getting back to a more natural fire regime, which can be a good thing, will mean more black carbon emitted from these landscapes. The Forest Service wants to promote restoration to more fire-resilient forests by using fire.
- Second, Mr. Thomas urged caution on assumptions about carbon storage in wood products. For example, wood storage in building products may promote a housing industry that paves over farmland and has other carbon implications. Shipping trees across the ocean has a large carbon burden.

  <u>Panelist responses</u>:
  - Ms. Chang noted that the comment about black carbon shows the challenge of dealing with highly variable and complex natural lands sector. Although we come to this from the perspective of carbon sequestration and management, we recognize that there are other values we are managing for. The challenge is finding the balance. CARB recognizes it's not helpful for us to say there should be no more fires.
  - Ms. Jahns expressed agreement with Mr. Thomas, noting that the FCAT wants to focus on innovation opportunities, including in housing and building programs, such in-fill development and density.
    - Those kinds of synergies can be built into into the Scoping Plan.

Kimberly, Sonoma County
- Treatments should prioritize activities with immediate best impact.
- There should be lower reliance on fire and a greater priority placed on restoration.
- If guidelines and plans are enforceable, they should be communicated to CAL FIRE. Effort is wasted if we can't bring these concepts to bear.

Susan Robinson, Ebbots Pass Forest Watch (Comments submitted online)
- Ms. Robinson commented that California must have transparency in estimated emissions from timber harvest and lost carbon sequestration due to industrial timber management panel.
- The date ranges of data in Table 4 leave out years with some of the highest industrial clear-cutting and drought years, which may invalidate conclusions.
- In the short term it is imperative that we get fewer forest emissions and sequester as much forest carbon as possible. Science shows that clear-cutting and even-aged management produces more emissions than other forms of logging.

- Industrial timber companies should not be able to take credit for carbon sequestration on not for profit or public lands.
- FCAT should look at Pennsylvania Forest climate report analysis of projected forest species change by region and elevation.
- FCAT should examine two recent reports on deforestation rates in Oregon and Clearcutting of Climate Stores by the Center for Sustainable Economy.
- Replanting practices after clear-cutting are producing overly dense, even aged, non-biodiverse tree plantations, that increase fire risk near rural communities and are contrary to California's climate goals. Board of Forestry could change the regulation requiring 300 trees per acre to be replanted.

  Panelist responses:
  - Mr. Scott Klaus responded that the trends in Table 4 are based on Forest Inventory and Analysis (FIA) plot re-measurement data, and reflect just a subset of plots and years for which we had data.

Kerri Timmer – Sierra Business Council (Comments submitted online)

- What policy outcomes or changes do you expect to see from the Plan, such as changes to requirements for how utilities contract for purchase of bioenergy, such as the California Public Utilities Commission recent resolution E-4770?
- Do you anticipate proposing any changes in the Disadvantaged Communities definition – as part of the CalEnviroScreen update – to accommodate the concept paper's call for assisting rural forested communities, which are not generally identified in the top 25% of CalEnviroscreen-defined DACs?
- How do you intend to develop specific quantification methodologies, especially for co-benefits of forest health activities? In other words, how will you involve stakeholder and interest groups – will there be anything, such as working groups or advisory groups that will provide discussion opportunities beyond just public comment periods? And if so, how does one get involved in that process?
- How long before these methodologies get incorporated into AB 32 scoping planning, agency guidelines, and competitive funding program guidelines?

  Panelist responses:
  - Ms. Chang: We have been thinking and evolving about this in the Scoping Plan process. We did macro-economic analysis in 2008 which didn't really consider forest impacts. This year we've been discussing with agency patterns how we can start to quantify land use benefits and other co-benefits. We would like to ask you for assistance on how we do this. Our model allows inputs that show different kinds of benefits. Our staff are working to figure out what information is out there in terms of land use change and other co-benefits that could be used for the modeling effort.
    - As part of the Scoping Plan, have had one workshop on how to do economic modeling. The UC Berkeley study is another effort.

        - We'd like to hear from you in your written comments.
    - Ms. Jahns noted that measuring co-benefits is hard to do in a standardized way. ARB has revolutionized the use of carbon dioxide equivalents to look at greenhouse gas emissions across sectors.
        - Within California Natural Resources Agency, we are taking small steps toward funding for co-benefits. We'll ask applicants to show how their programs produce co-benefits. For the GHG reduction fund, the primary benefit must be GHG reductions, but there are many other co-benefits.

Rondall Snodgrass, North Coast

- The Plan does not acknowledge the benefits of public investment in wildlife and conservation achieved through bond measures including Propositions 70 and 84. Public investment has made our forests healthier.
- Mr. Snodgrass is encouraged by the analysis of what we get when we invest money for cap and trade. Forest health is one of the best investments.
- How much money is available for this panel to put to use in moving forward?
- Region-specific analysis could help answer questions on a finer scale – for example, is the North Coast carbon positive or negative?
- We need investment to stop privately owned forests from being divided and sold, which is happening in the North Coast for marijuana production, in response to low market value for timber.
- Mr. Snodgrass would like to see recommendations on how cap and trade money will be spent. We need innovative instruments for landowners, who want to be involved but can't afford certification under AB 32, to enter into carbon sequestration.
- Mr. Snodgrass encourages a plan for reinvesting in programs that have worked.

Kathryn Phillips, Director, Sierra Club California

- Ms. Phillips commented that the report's use of the term "ecosystem services" refers primarily to what the forest provides to humans, as opposed to what it supplies to the planet, ecology, wildlife, etc. This term generally refers to services to humans by the ecosystem. This usage could diminish other values.
- For harvested wood products, the analysis of carbon sequestration needs to look at the whole lifecycle. What kind of methods and related emissions are used to extract the wood, and what are the emissions from milling, transport, and use of the product. Looking at the whole cycle may show lower emissions benefits.
- In terms of emissions from biomass, there is a need to consider the alternatives that biomass would be substituting for, including less polluting kinds of energy such as solar, renewable, battery storage, conservation, and energy efficiency.
- Innovative strategies can include abandoning clear-cutting and even-aged management on private lands.
- In terms of incentives, regulation can be a good incentive. We regulate lots of things to benefit society. Many people recognize that clearcutting is not beneficial to society.

There is a lot of evidence that it's not good for GHG emissions. Let's use this opportunity to regulate this practice.

- There needs to be some way to encourage private landowners to enhance and protect wildlife corridors and habitat.

  Panelist responses:
  - Edie – "ecosystem services" does include a broader range, including both the intrinsic value of healthy ecosystems, and values for humans. We are using it that way in the paper, consistent with how scientists have been using it since 1997.

Gary Graham Hughes, Friends of the Earth

- We are operating on a carbon debt in California – forests are severely depleted in terms of carbon reservoirs due to deforestation.
- The Plan should look at old growth characteristics for forest health baseline, for example include standing dead trees as part of forest health.
- Mixed forests are being converted to conifer-exclusive forests through forestry practices, hack and squirt.
- Mr. Hughes expressed support for increasing urban forests, but noted that urban forests don't have soil. So there should be a decoupling of urban forests from measuring of carbon in rural forests.
- The suggestion that carbon sequestration in wood products is forest carbon sequestration is not right – once the trees leave the forests they are an anthropogenic carbon reservoir.
- Forest carbon offsets are scientifically indefensible because the carbon debt in forests just reflects past deforestation.
- Using carbon harvested from clearcuts for offsets is inconsistent with international carbon accounting approaches.

Peter Miller, NRDC.

- Will the Plan address imported wood products? The majority of our forest sector emissions come from imported wood products.
- (Ms. Jahns asked Mr. Miller how he would propose doing this.)
- There is a parallel with the energy sector, where if we buy electricity from a coal plant in Utah, we make an effort to account for and address the emissions associated with that. We could do same for the wood products sector.

  Panelist responses:
  - Ms. Chang: Virtually all consumer products have associated emissions, but we don't account for them. We address electricity because AB 32 calls it out.
  - Mr. Eng: It's true that California imports the vast majority of its wood products consumption, and that's something we should look at.

Gary Rynearson, Green Diamond Resource Company

- Mr. Rynearson expressed appreciation for this effort.
- He would encourage this process to not become embattled in the discussions about silvicultural methods.
- That debate occurred in the conversation about AB 32 offset protocols. There is a net benefit of maintaining forestry ownership of land in terms of sequestering carbon.
- We support the use of conservation easements to protect land, but also there should be treatments for fuel hazard reduction.
- Low timber value, in part due to high regulatory costs, increases forest fragmentation.
- We need to come up with systems that reduce regulatory costs but don't reduce environmental protection standards.
- In terms of biomass, the solution needs to be economically feasible or it won't work.
- The report does not address the need to look at underperforming acres, i.e., acres that should be restocked to benefit carbon storage.

Michelle Passero, The Nature Conservancy

- It would be helpful up front if the Plan as clear as possible on framing what is a GHG reduction. How we are defining it, what trend are we aiming for, how we will approach it, what are the interventions we will do.
- More specificity and definition in the carbon accounting protocols will clarify and reduce confusion.

John Bernstein, Trust for Public Land

- The Concept Paper relies a lot on the Stewart and Sharma paper for analyzing carbon sequestration in wood products. This is a weak basis for this major section of the paper. The analysis is not applicable to long-lived forest types. The paper needs more discussion on that.
- There has always been a shortage of money for conservation easements that would provide carbon benefits. There are many, many willing landowners who would enter conservation agreements.

Jim Cramer, Volunteer, Sierra Club

- In terms of sequestering carbon in wood products, some wood products are short-lived, while others are long-lived. It's not clear how your methods account for that.

Carlin Starrs – UC Berkeley Center for Fire Research (Submitted online and in person)

- Ms. Starrs submitted written comments as well to the record.
- Ms. Starrs suggests using a consistent approach to accounting for climate benefits and impacts related to forests and forest products, including clarifying how harvested wood products can fit into climate mitigation strategies.
- Ms. Starrs comments that developing a shared understanding of the relative importance of different benefits and co-benefits for major forest types is important.

John Amodio, Yosemite Stanislaus Solutions

- California's GHG reduction targets can't be achieved without addressing the trend of megafires. CARB's current GHG accounting is incomplete because it doesn't factor in wildfire emissions. Will you be updating that?
- Funding: engaging partners and beneficiaries beyond the Sierra Nevada region is essential. Downstream beneficiaries should pay a public benefits charge as a revenue stream for enhancing forest and watershed health. Is this being considered/evaluating moving forward?
- A public benefits charge could also address wood and biomass utilization, making it more economically feasible. Restoring forest health requires far-reaching advances in utilization of biomass. I urge full consideration of public benefit charge.
- I didn't hear a response to an earlier question about updating of socioeconomic criteria that is prejudiced against rural areas (DAC definition).

<u>Panelist response:</u>

- Ms. Chang:
  - The white paper lays out series of potential actions that we are thinking of. It would be great to hear more, in written comments, about the public benefits charge and how it could be done.
  - How DAC communities are defined is described in statute. There is a recognition that some communities are not covered under CalEnviroScreen. We recognize the need for broader geographic diversity.

Amy Granat

- We represent people with a ground level perspective of forests. The Concept Paper is very theoretical and shows very few attempts to incorporate practical considerations.
- The Plan needs to have practical solutions for people who live in the communities and work in the forests. A lot of these communities are economically disadvantaged, for example with schools running out of money that depending on logging.
- Actions should be derived collaboratively with these stakeholders and communities.

Chuck Mills, CA Re-Leaf

- Thank you for the robust discussion of urban forestry in the Plan and recognition of threats.
- The strategies section should address reinvigorating efforts to maintain existing canopy.
- The proposed green infrastructure program at Cal Natural Resources Agency can be another key element for implementing this overall effort, in addition to CAL FIRE's lead role.

Gary Burnheim, Sonoma

- Mr. Burnheim echoed others' skepticism about relying on sequestration in wood products for carbon accounting.

- He suggested attributing carbon emissions for imported wood products to the entity that has authority to authorize imports.
- It's important to think about the average length of time that wood products stick around versus how long they would have stuck around as trees in the forests.
- CAL FIRE functions mainly as an agent for logging companies. There will need to be regulation to incorporate something that's going to work on the ground.
- Mr. Burnheim suggests looking more closely at the idea that forest growth exceeds harvest, and using this idea to justify industrial forestry.

Craig Thomas

- Mr. Thomas shared a map of the Rim Fire area with panelists.
- Mr. Thomas noted concerns about "reforestation" as a concept, and the use of public resources toward efforts that may prove counterproductive or ineffective.
- In the Rim Fire area, it's risky to reforest with confers. Homogenous stand structure with linked crowns is very risky in terms of fire. So reforestation is going toward a model that's vulnerable to fire and will burn over and over again.
- Forest plantations are getting hit hard by drought and bug kill.
- There is more need to think about how to reforest those areas.

Nazar Visav, Water, Sound, Air and Light Quality

- We want to restrict hunting.
- We are striving to uplift our consciousness.
- Yesterday two healthy pine trees were cut down by Flood Control. Why are we cutting trees? Who gives the order and decides what tree need to be cut?
- We strive to have a healthy garden and preserve healthy trees.

<u>Panelist response:</u>

- In response to the concern about the trees being cut down, Mr. Henly replied noted the "right tree in the right place" concept. Sometimes trees are inappropriately located in terms of flood control or are causing infrastructure damage, or other problems. The idea is to plant trees in the right places so you won't have to remove large healthy trees later.

Rondall Snodgrass

- Will this panel suggest a budget to the Governor?

<u>Panelist response:</u>

- No, the budget process starts in November when we solicit info from agencies about what funding they need to implement these plans.
- We may suggest that there is a large need for funding in this paper, but we won't suggest the source from which funding should originate.

Closing Comments

Panelists thanked participants for their comments, passion, and interest. They invited participants to submit additional, detailed comments, and noted the desire for comments that will help make the plan implementable and adaptable.

April 8th, 2016

Mr. Russ Henly
Assistant Secretary of Forest Resources Management
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

RE: California Forest Carbon Plan Concept Paper

Dear Mr. Henly:

On behalf of California's urban forestry non-profits and practitioners who are committed to greening our golden state and reducing greenhouse gas emissions, we are writing to provide comments on the California Forest Carbon Plan Concept Paper released earlier this year.

The recommendations provided in this document will guide California forest planning efforts and forest infrastructure investments needed to meet the ambitious 2030 GHG reduction targets set forth in Executive Order B-30-15. While it is important to recognize that the Executive Order proclaims "Natural infrastructure solutions should be prioritized," we must acknowledge that the primary source of carbon sequestration and carbon sinks will come from the State's forest and urban forests.

With respect to how the Concept Paper approaches the role of urban forests in the overall process of contributing to GHG reductions and climate resilience, there are significant strengths and a few missing links as follows:

Section I. PROTECT

As one of the very few state-level reports to explicitly highlight the need to protect our existing greenspace and tree canopy, we wholeheartedly applaud this goal and its inclusion in the Concept Paper. As noted in the document, it is our existing urban forest that is sequestering up to 7.2 million metric tons/year, with another 1.3 million metric tons through avoidance. Mature trees are the number one carbon sequestration mechanism in our disadvantaged communities, and they are vital to California for contributing to our 2030 GHG reduction targets.

Consequently, there must be a set of strategies in place to address how we protect these resources that are currently missing from the Paper. The six strategies suggested under the "Protect" section speak primarily to supporting new urban forests or connecting people to existing green space. We strongly recommend that the Forest Carbon Plan include specific recommendations about how we protect and maintain our existing urban forests. Such strategies should include sufficient fiscal resources to water, mulch, prune and otherwise properly manage these trees; and exploration of local tree ordinances and urban forest management plans that incentivize local governments to commit to the protection of these resources.

Section II. ENHANCE

We support the ambitious goal of increasing urban tree canopy by 5% over the next 14 years, which equates to roughly 10 million trees. Studies prepared by Dr. Greg McPherson and the U.S. Forest Service estimate that in addition to the 200 million existing urban trees, there are over 50 million viable

tree-planting locations currently available in California, so this goal is achievable with appropriate fiscal support.

We also strongly support utilizing CAL FIRE's Urban and Community Forestry Strategic Plan as a guiding mechanism to achieve this goal, and the recognition of CAL FIRE as the appropriate lead entity to guide our urban forest growth, health, and well-being. Currently, the state is investing significant revenues generated from Cap-and-Trade to support 29 projects through CAL FIRE's Urban and Community Forestry Program that are planting 38,000 trees over the next four years.

Our primary suggestion relates to the rest of the stated goal in this section, which includes "incentivizing urban tree canopy maintenance and preservation programs to help projects achieve long-range climate, health and economic benefits." We would encourage this is an appropriate strategy under the aforementioned "Protect" section, as it complements other recommendations identified there.

Section III. INNOVATE

The stated goal to "Support innovative urban forestry and greening projects that reduce GHG emissions, increase carbon sequestration, and provide other environmental, health, social, and economic co-benefits" is laudable, if perhaps a bit vague. But before that goal can move past simply tree planting and inventory activities, the state must work with stakeholders across multiple sectors to develop meaningful tools and templates to quantifiably measure GHG reductions that will come from these innovative urban forestry and greening projects.

The third strategy in this section alludes to this need, but does not explicitly dive deep into quantification. While we fully support "the design and implementation of innovative, multi-function urban greening projects that provide a wide range of carbon, climate, environmental, social, and economics benefits," they have little chance of producing measurable reductions without the tools to quantify beyond sequestration. This would include mechanisms for measuring reduced vehicle miles travelled (VMTs), avoided conversion of green space, and water-energy savings from capturing stormwater runoff and supporting local groundwater recharge. Much like urban forestry project research could yield recommended anti-displacement strategies (which we fully support), so could it yield critical methodologies for measuring additional GHG reductions.

As the Administration noted almost a year ago, the 2030 GHG reduction targets established under the Executive Order are "the most aggressive benchmark enacted by any government in North America to reduce dangerous carbon emissions over the next decade and a half." The Forest Carbon Plan can serve as the roadmap to success for maximizing the GHG reduction values of our rural and urban forests.

Thank you for the opportunity to provide written comments and for your leadership in reflecting the vital role urban forestry plays in safeguarding California.

Sincerely,

Chuck Mills
Director of Public Policy and Grants
California ReLeaf

Nancy Hughes
Executive Director
California Urban Forests Council

Calforests
California Forestry Association

1215 K Street, Suite 1830
Sacramento, CA 95814
916.444.6592

April 8, 2016

To: Forest Climate Action Team (FCAT)
Subject: California Draft Forest Carbon Plan Concept Paper:
Managing our Forest Landscapes in a Changing Climate (March 9, 2016)

These comments were emailed to: fcat.calfire@fire.ca.gov

CFA Commends FCAT:

Calforests would like to commend the FCAT for its work on the Forest Carbon Plan Concept Plan. We see a forward looking document that supports forest management in the state.

General Comments:

1) The March 23 Workshop

During the workshop of March 23, several commenters made statements that diminished the contributions of forest managers toward the goal of increased carbon sequestration. These comments questioned various forest practices such as even-aged management, the use of durable wood products, growth/harvest ratios, and biomass. We address these comments below.

The Intergovernmental Panel on Climate Change (IPCC) is the leading international body for the assessment of climate change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and its potential environmental and socio-economic impacts. In the same year, the UN General Assembly endorsed the action by WMO and UNEP in jointly establishing the IPCC.

The IPCC reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. Thousands of scientists from all over the world contribute to the work of the IPCC. Review is an essential part of the IPCC process, to ensure an objective and complete assessment of current information.

Because of its scientific and intergovernmental nature, the IPCC embodies a unique

opportunity to provide rigorous and balanced scientific information to decision makers. By endorsing the IPCC reports, governments acknowledge the authority of their scientific content. The work of the organization is therefore policy-relevant and yet policy-neutral, never policy-prescriptive.

The Intergovernmental Panel on Climate Change (IPCC) has emphasized that assessments of the mitigation potential in the forest sector should be based on estimates of carbon stock changes and the resulting GHG emissions in forest ecosystems, in the harvested wood product (HWP) sector and of the avoided emissions that result from the substitution of emissions-intensive products such as steel and concrete with HWPs.

IPCC AR4 WG III

The IPCC Working Group III report states as one of its objectives:

> *"Increase efforts to replace high energy input materials with wood, and encourage further recycling of forest products in order to provide for long-term storage of carbon".*

It goes on to state:

> *"Wood products derived from sustainably managed forests address the issue of saturation of forest carbon stocks. The annual harvest can be set equal to or below the annual forest increment, thus allowing forest carbon stocks to be maintained or to increase while providing an annual carbon flow to meet society's needs of fibre, timber and energy. The duration of carbon storage in wood products ranges from days (biofuels) to centuries (e.g., houses and furniture). Large accumulations of wood products have occurred in landfills (Micales and Skog, 1997). When used to displace fossil fuels, woodfuels can provide sustained carbon benefits, and constitute a large mitigation option (see Box 9.2).*
>
> *Wood products can displace more fossil-fuel intensive construction materials such as concrete, steel, aluminum, and plastics, which can result in significant emission reductions (Petersen and Solberg, 2002). Research from Sweden and Finland suggests that constructing apartment buildings with wooden frames instead of concrete frames reduces lifecycle net carbon emissions by 110 to 470 kg CO2 per square metre of floor area (Gustavsson and Sathre, 2006). The mitigation benefit is greater if wood is first used to replace concrete building material and then after disposal, as biofuel."*

In terms of the over role of forest management in sequestering carbon, in C. E. Smyth et al.: Quantifying the biophysical climate change mitigation potential of Canada's forest sector the following is stated:

> *The better utilization strategy was found to provide the greatest climate change mitigation for most locations. The strategy of maximizing the C in forests through the harvest less strategy generally ranked lower than the better utilization strategy, which supports the conclusion of IPCC AR4 WG III that, according to Nabuurs et al. (2007), "[i]n the long term, [a] sustainable forest management strategy aimed at maintaining or increasing forest C stocks, while producing an annual yield of timber, fibre, or energy from the forest, will generate the largest sustained mitigation benefit."*

In the study, *documenting the Full climate benefits of Harvested Wood Products in Northern California: Linking Harvests to the Us Greenhouse Gas Inventory. Stewart and Nakamura* the following conclusion is reached:

> *When current utilization practices throughout the full wood products use cycle are considered, the total estimated climate benefits per unit of harvest volume are two times larger than estimates based on historical wood utilization coefficients.*

In regards to current practices, the Forest Practice Act and Rules were thoroughly vetted by the Air Resources Board for consideration under adoption of the Forest Protocols. The Forest Protocol provides requirements and methods for quantifying the net climate benefits of activities that sequester carbon on forestland. The protocol provides offset project eligibility rules; methods to calculate an offset project's net effects on greenhouse gas (GHG) emissions and removals of CO_2 from the atmosphere (removals); procedures for assessing the risk that carbon sequestered by a project may be reversed (i.e. released back to the atmosphere); and approaches for long-term project monitoring and reporting. The protocol is designed to ensure that the net GHG reductions and GHG removal enhancements caused by an offset project are accounted for in a complete, consistent, transparent, accurate, and conservative manner and may therefore be reported as the basis for issuing ARB or registry offset credits.

These practices were accepted for use in the Protocols. It is fundamental that the Carbon Plan be consistent with these standards.

2) Biomass is a critical component to the Forest Carbon Calculator:

Biomass is a critical component of an overall strategy to address carbon sequestration. In a recent analysis for the California Energy Commission, Fried, etal. (Fried, Jeremy, Sara Loreno, Benktesh Sharma, Carlin Starrs, William Stewart. (University of California, Berkeley). 2016. ***Inventory Based Landscape-Scale Simulation to Assess Effectiveness and Feasibility of Reducing Fire Hazards and Improving Forest Sustainability in California With Biosum.*** CEC-600-11-006) concluded that the optimal scenario for carbon sequestration would:

> *Assuming a 0.8% annual probability of a severe wildfire, the optimal scenario would generate 46% more net carbon benefits than a no action, Grow-only scenario. The level of benefits goes up substantially if the FVS net growth rate is discounted by 25% to account for the apparent overestimate compared to empirically measured growth rates.*
>
> *In addition to the carbon sequestration benefits from reducing fire hazards to prepare for a future with an equal or greater incidence of wildfire, the optimal scenario is projected to reduce fire hazards on about 400,000 acres per year while producing 9 million bone dry tons of bioenergy feedstock and 11 million bone dry tons of merchantable logs.*

In order to accomplish both hazard reduction and sequestration, a biomass industry is crucial.

3) Use of Wood Waste in a Biomass Boiler Reduces Pollutants by 98% Compared to Open Pile Burning

Two studies by Placer County have sown the net environmental benefits of chip, haul, and consumption of wood waste at a biomass powerplant versus open pile burning (Sept. 2015. Springsteen etal, "Forest biomass diversion in the Sierra Nevada: Energy, economics and emissions" and Oct. 18, 2013. Springsteen etal, "Emission Reductions from Woody Biomass Waste for Energy as an Alternative to Open Burning").

A 98% reduction in pollutants from burning wood waste in a biomass boiler compared to open pile burning has been known since 1979 (Attachment #1).

4) Actionable Items Integral in the Forest Carbon Plan

CFA believes the Goals and Strategies listed on pages 21-27 of the Draft Plan are well done. However, for the Plan to be successful, we believe that each Strategy needs a list of specific **"ACTION ITEMS"** if there is to be a positive outcome to the Plan.

The Forest Service as a Full Partner in the Carbon Plan

To have a successful Forest Carbon Plan that leads to improved forest health and resilience, the Forest Service has to be a partner. We believe the Forest Service is a full partner in this endeavor in writing but we're not sure so we're bringing it to your attention.

Importance of Known Information 2011-2015

The Forest Carbon Plan has to incorporate not just the 2001-2010 FIA data, but also what's known since 2010. There's good data available on wildfire burn intensity and emissions, the impact of the insect and disease epidemic, and forest health and fuels reduction accomplishment.

Page-Specific Comments:

Pages 1-3

It is unclear if the "Vision" and the "Purpose and Scope" includes federal forest lands? Is this Carbon Plan going to "deliver forest-based policy" (p. 2) for federal land?

Page 5 – Table 1 and 1st Paragraph

Table 1 and the first paragraph should be expanded to fully display Table A2-2 from the 2001-2010 FIA data that was released early March 2016 so that the reader can see unreserved versus reserved forest land by ownership and can see "timberland", "other forest" , and "non-forest" for both reserved and unreserved by ownership. By reproducing the FIA Table A2-2 in the Carbon Plan, then you and the reader know it's consistent with 2010 FIA.

Page 5 – 2nd paragraph

More detail should be provided explicitly displaying in graphs growth, mortality and harvest from each ownership group.

The text should be more explicit about FIA data up to 2010 on growth (3.8 billion board feet (bbf)/year on private industrial and non-industrial; 4.0 bbf on Forest Service; Mortality (0.8 bbf/year on private; 2.6 bbf/year on Forest Service) and a graph of harvest private, Forest Service, and Total since 1980 (from the Board of Equalization (B.O.E.) statistics). Then adding some text about what percent removal expressed as a percent of growth by ownership would be helpful (see Attachments #2 and #3). For example, from 1978 through 2014, private harvest is at about 48% of annual growth while the Forest Service is at about 9% of growth. In 2014, harvest from private ownership was at 32% of growth while the Forest Service was at 6% of growth.

Page 5, Forest Health, Paragraph 1

The text suggests there's been climate change that has led to an increase in frequency of natural disturbance agents. Since we are experiencing increased number, size, and intensity of wildfires, and now experiencing an insect and disease epidemic, there should be text here that describes what climate change California has already experienced (not just what's expected to happen in the future) that has led to this rapid increase in the frequency and intensity of the natural disturbance agents.

Page 6, Forest Health

There should be a substantial expansion of text and graphs to display the current increase in frequency and intensity of the natural disturbance agents.

For example, since 2001, on average, the acres of National Forest burned is 320,174 acres/year (see Attachment #4). Further the burn intensity has been dramatically increasing from about 21% high severity in 1986 to near 50% in 2014 (King Fire). These wildfires are annually emitting an estimated 21.5 million tons of CO2 equivalent.

And now, the drought-induced and overly dense forest condition has led to an insect and disease epidemic. On January 28, 2016, the Forest Service estimates 5.1 billion

board feet of dead trees in the six county area (Tuolumne, Mariposa, Madera, Fresno, Tulare and Kern) in the southern Sierras (see Attachment 5). From plots taken by the Sierra National Forest late summer 2015, they find that at least 60% of the pine vegetative type is dead. They will take more plots this spring and early summer and expect to find that now 85% of the pine vegetative type is dead. The epidemic is moving north. Beetle activity has continued throughout the winter with notable die-off of trees in Tuolumne, Calaveras, Amador and Eldorado Counties. It could spread throughout northern and central California with double the amount of current mortality by the end of summer 2016.

The Forest Service, State and Private Forestry, will begin their annual aerial flights to map mortality starting in the southern Sierras next week.

Page 7, The Growing Forest Health Threat

The text should be expanded to incorporate the known reduction in productive forest land due to natural disturbance agents that the Forest Service has identified as being in need of restoration and reforestation (see Attachment #6). There are 3.5 million acres cumulatively since 1986 in need of reforestation. This data, from the Forest Service FACTS database, does not include the estimated additional 2.0 million acres of mortality identified from insect and disease in just 2015 alone. About 85% of the insect and disease mortality is on Forest Service forest land.

There's a high likelihood that there will be another 2.9 million acres of mortality from insect and disease in 2016 and 2017. That cumulatively suggests that perhaps 4 million acres (33%) of Forest Service productive forest land could be in need of reforestation by the end of 2017. The Forest Service total unreserved productive forest land is only 12.1 million acres (2001-2010 FIA, Table A2-5). The Forest Service may already be about to surpass Krist etal's estimate that 25% of standing live trees will be dead due to insect and disease by 2027.

Page 8 (bottom of the page), Implications for Forest Carbon Sinks

The text needs to be updated to include acres burned by year on Forest Service land through 2015 (with the associated estimate of 21.5 million tons of CO2equivalent annual emissions) and to include the Forest Service's 1/28/2016 estimate of mortality from insect and disease (5.1 billion board feet) (Attachments #4 and #5). The text needs to be expanded to analyze the amount of live tree carbon versus dead tree carbon with the dramatic increase in dead from natural disturbance agents particularly in the last 5 years. The analysis needs to include displaying how much

of the dead material has been removed and utilized in biomass powerplants versus what has been left on the landscape to decay (or was pile burned). The analysis needs to estimate the emissions associated with the dead material that was either burned or is still on the landscape decaying, which produces substantially more methane than pile burning or burning dead material in a biomass boiler.

Page 10, Species Range Shift

The 2014 work by McIntyre, Thorne etal should be added to this section ("Twentieth-century shifts in forest structure in California: Denser forests, smaller trees, and increased dominance of oaks.")

Page 13, middle of the page, a Vision for California's Forest

Uncertainty of future climate is noted but it should also be noted that there's uncertainty in how aggressive private non-industrial and Forest Service productive forest lands can move toward resilience.

Page 15, 2nd paragraph, Carbon Storage

The text states that above ground carbon in down wood is not included. FIA (2001-2010) displays above ground carbon in down wood at Table A2-96.

Page 18- Table 5

There is sufficient data available since 2010 to estimate mortality from megafires and the recent insect and disease epidemic. These estimates should be included in a separate column in Table 5 (see Attachment #4 and #5).

Page 18- Forest Service Timberland

There is sufficient data since 2010 that can be included, which will provide a current display of the total mortality on the Forest Service – Timber land (see Attachment #2, #4 and #5).

Page 19 – Non-Corporate Timberland

The text should note that for small private forest parcels, it is impossible to economically manage their forestland given the constraints of the California Forest Practices Act and its implementing regulations.

Pages 21-22; Goals and Management Strategies

CFA believes there is more than sufficient data to make annual inventory assessments of net CO2 equivalent for private forestland and public forestland. By incorporating: 1) emissions from megafires (2010-2015), 2) the estimate of insect and disease mortality (2013, 2014, 2015, 2016) by ownership, 3) harvest statistics, 4) a calculation of amount of harvest that goes to long-lived wood products, and 5) existing data on amount of forest feedstock and mill residuals used at biomass powerplants, it should be straightforward to make very reasonable estimates.

Annual growth can also be intelligently adjusted until the 2015 FIA publication comes out. We know that growth on private 2001-2005 FIA was about 3.5 billion board feet; the FIA 2010 data indicates about 3.8 billion board feet. For the Forest Service, annual growth FIA 2001-2005 versus FIA 2010 is flat at about 4.0 billion board feet.

Page 23 –Enhance; Strategies

Having the Forest Service as a full partner in this Forest Carbon Strategy is of extreme importance since they control over ½ of the productive forest land in the State. The text correctly notes that the Forest Service wants to move to about 500,000 acres/year of forest health and fuels reduction accomplishment. That direction has been in-place with the Regional Forester's Ecological Restoration: Leadership Intent publication March 2011. Since 2011, the Forest Service's accomplishment has actually declined.

In addition, the National Forests are being consumed by wildfire at an annual average rate of 320,174 acres per year (Attachment 3). Further, we know that burn intensity has drastically increased for high intensity burn from about 21% in 1986 to near 50% on the King Fire. We also know that what was mapped as vegetative low and moderate severity burn following megafires is now being consumed by insect and disease (Rim Fire is the best example). The Forest Service shows low severity wildfire burned acres as "accomplishment". All of that acreage within mega

fire perimeters need to be re-evaluated by the Forest Service as much of it is now dead.

Thank You for the Opportunity to Comment!

CFA appreciates this opportunity to comment on the Draft Carbon Plan and look forward to participating in helping with its continuing development.

Sincerely,

Steve Brink
Vice President-Public Resources
steveb@calforests.org
916-208-2425

George Gentry
Vice President- Regulatory Affairs
georgeg@calforests.org
916-584-2950

Enclosures:

Enclosure #1 - Comparison of Emissions Between Biomass Boilers and Field Burning

Enclosure #2 – 1980-Present Growth, Mortality, and Harvest on Forest Service forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)

Enclosure #3 - 1980-Present Growth, Mortality, and Harvest on Private forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)

Enclosure #4 - 1980-Present Growth, Mortality, and Harvest on Private forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)

Enclosure #5 – Forest Service Estimate of Mortality in the Southern Sierras (January 28, 2016)

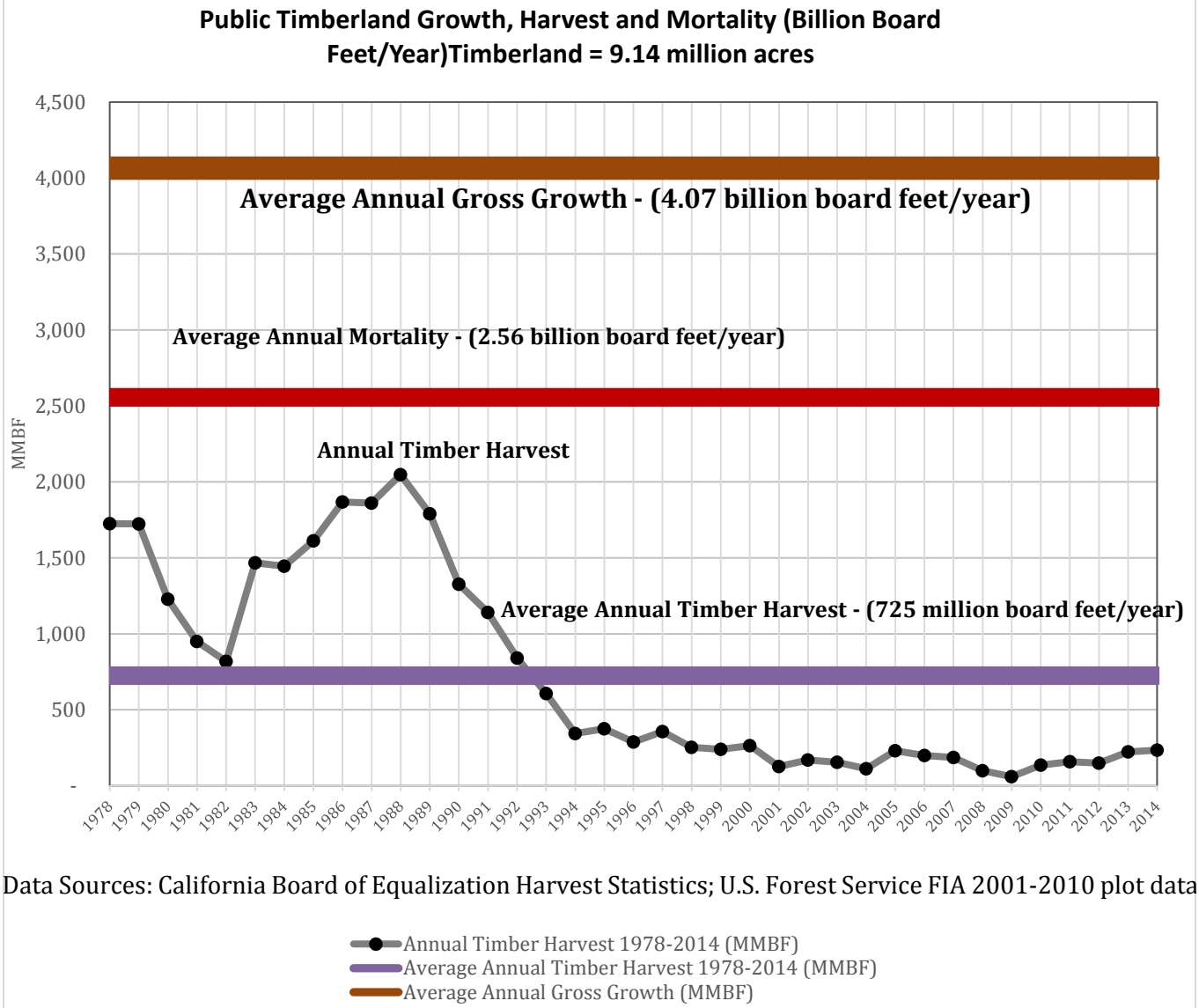
Enclosure #6 – Forest Service Identified Acres in Need of Restoration and Reforestation 1986-2015 (Data Source: Forest Service Facts Database)

Enclosure #1 - Comparison of Emissions Between Biomass Boilers and Field Burning

Pollutant	Field Burning (lb./ton)	Biomass Boiler (lb./ton)	Percent Reduction for Biomass Boiler (Percent Reduction)
Sulfur Oxides	1.7	0.04	97.6
Nitrogen Oxides	4.6	0.70	84.8
Carbon Monoxide	70.3	0.40	99.4
Particulate Matter (PM)	4.4	0.26	94.1
Hydrocarbons	6.3	0.00	100.0
Total	87.3	1.4	98.4

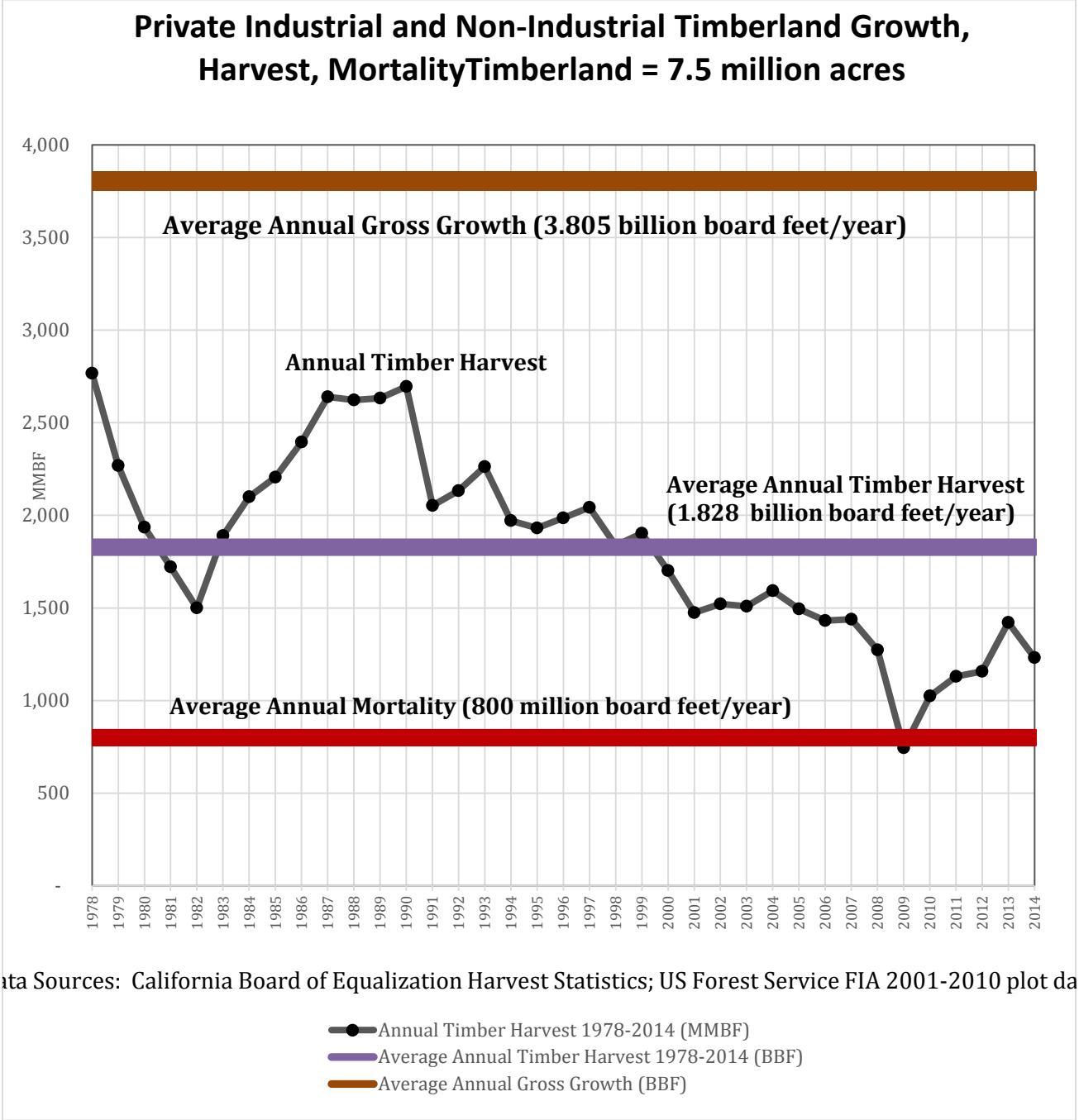
Emission factors from "Hydrocarbon Characterization of Agricultural Waste Burning", CAL/ARB Project A7-068-30, University of California, Riverside, E.F. Darley, April 1979.

Enclosure #2 – 1980-Present Growth, Mortality, and Harvest on Forest Service forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)



Data Sources: California Board of Equalization Harvest Statistics; U.S. Forest Service FIA 2001-2010 plot data

Enclosure #3 - 1980-Present Growth, Mortality, and Harvest on Private forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)



Enclosure #4 - 1980-Present Growth, Mortality, and Harvest on Private forest land (FIA 2010 and Board of Equalization Timber Yield Statistics)

Year	Forest Service Acres Burned	Total Acres Burned	Estimated Total CO_2 Emissions
			(@37 tons/burned Acre)
2001	106,798	329,126	12,177,662
2002	365,945	506,696	18,747,752
2003	363,964	793,402	29,355,874
2004	49,437	242,057	8,956,109
2005	19,583	202,754	7,501,898
2006	453,500	678,919	25,120,003
2007	551,932	1,087,110	40,223,070
2008	919,716	1,375,781	50,903,897
2009	305,371	405,585	15,006,645
2010	39,288	109,529	4,052,573
2011	41,777	126,854	4,693,598
2012	297,212	869,599	32,175,163
2013	350,642	577,675	21,373,975
2014	400,005	530,794	19,639,378
2015	537,446	893,362	33,054,394
Avg	320,174	581,950	21,532,133

Enclosure #5 – Forest Service Estimate of Mortality in the Southern Sierras (January 28, 2016)

WORKING DRAFT

Preliminary Summary of Estimated Tree Mortality Volume

Southern Sierra Nevada, California, 6 County Area
(Tuolumne, Mariposa, Madera, Fresno, Tulare and Kern)

Introduction

Following are preliminary estimates of tree mortality in the Southern Sierra Nevada for a 6-county area: Tuolumne, Mariposa, Madera, Fresno, Tulare and Kern. This area includes all or parts of the Sierra, Sequoia, Stanislaus and Inyo National Forests. The methodology and assumptions used to derive the estimates are included below after the tabular information.

Table 1, Tree Mortality Volume by Ownership/Management and County

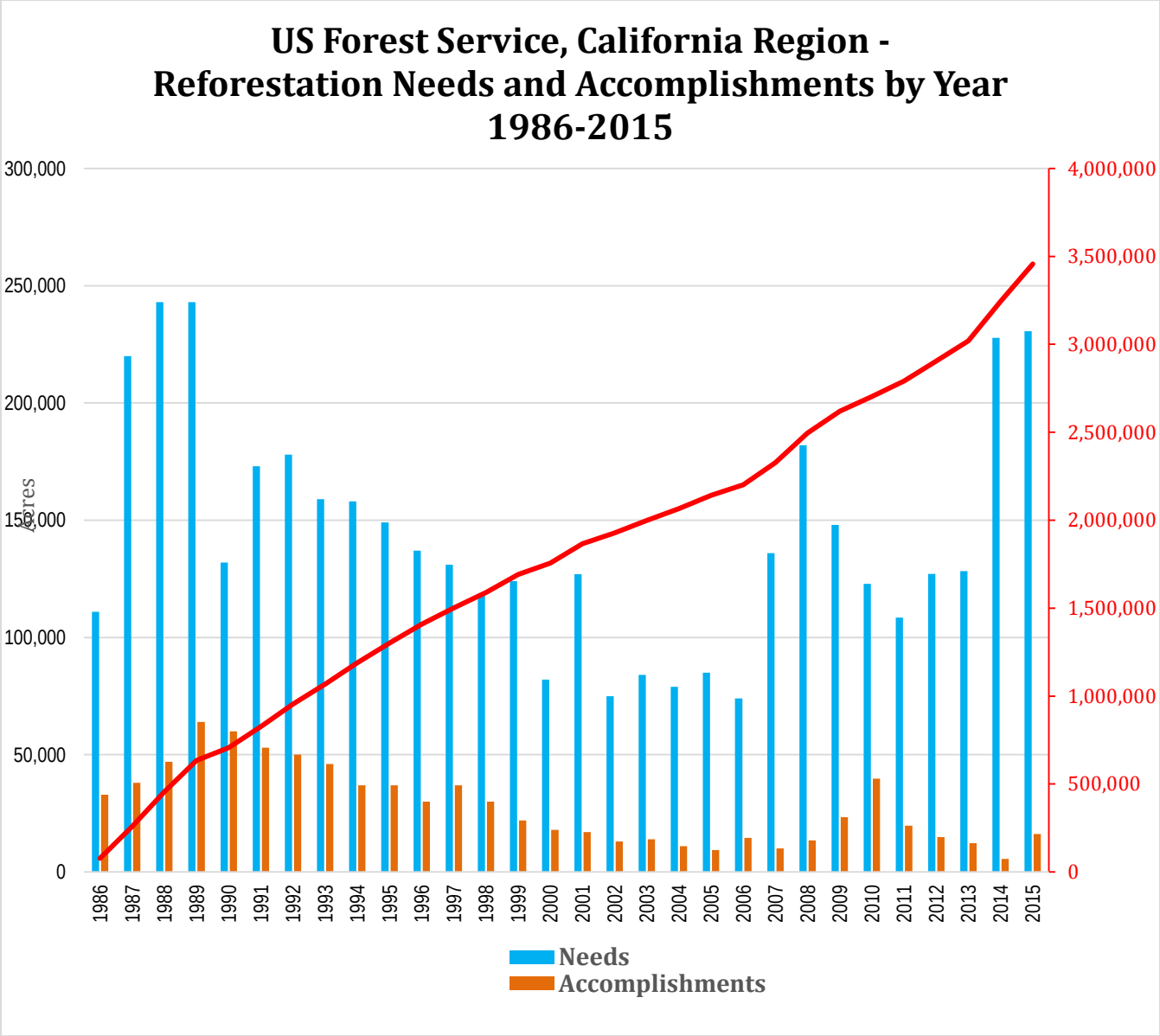
	FRESNO	KERN	MADERA	MARIPOSA	TULARE	TUOLUMNE	TOTAL
Other (non-USFS) (MBF)	59,341	123,698	33,054	44,599	180,128	10,893	451,713
Inyo (MBF)	30		103		9,771		9,905
Los Padres (MBF)		151,326					151,326
Sequoia (MBF)	265,797	206,139			1,124,773		1,596,709
Sierra (MBF)	1,227,869		917,091	234,542			2,379,502
Stanislaus (MBF)				91,442		485,363	576,805
TOTAL MBF	1,553,038	481,162	950,249	370,583	1,314,673	496,256	5,165,961
TOTAL BDT LOGS (bone dry tons)	4,659,114	1,443,486	2,850,747	1,111,749	3,944,019	1,488,768	15,497,883
TOTAL BDT LOGS, TOPS & LIMBS (bone dry tons)	6,212,152	1,924,648	3,800,996	1,482,332	5,258,692	1,985,024	20,663,844

Table 2, Draft CAL FIRE High Hazard Zone Tree Mortality Volume by Ownership/Management and County (MBF)

	FRESNO	KERN	MADERA	MARIPOSA	TULARE	TUOLUMNE	TOTAL
Other (non-USFS) (MBF)	745	9,904	2,584	6,189	9,389	2,425	31,236
Inyo (MBF)					382		382
Los Padres (MBF)		79,804					79,804
Sequoia (MBF)	28,297	23,097			187,995		239,389
Sierra (MBF)	164,842		115,452	35,363			315,657
Stanislaus (MB F)				31,366		104,391	135,757
TOTAL MBF	193,884	112,806	118,035	72,918	197,766	106,817	802,226
TOTAL BDT LOGS (bone dry tons)	581,652	338,418	354,105	218,754	593,298	320,451	2,406,678
TOTAL BDT LOGS, TOPS & LIMBS (bone dry tons)	775,536	451,224	472,140	291,672	791,064	427,268	3,208,904

Conversion Notes: Conversion factors used to generate "bone dry tons" (BDT) estimates include 6 green tons (GT)/MBF (drought wood), 1 BDT/2 GT, 1 GT/MBF tree tops and branches for average size tree mortality. Conversion factors will be refined as data are gathered from field operations.

Enclosure #6 – Forest Service Identified Acres in Need of Restoration and Reforestation 1986-2015 (Data Source: Forest Service Facts Database)



Cumulatively, 3.5 million acres of Reforestation Needed

Andrea Tuttle
Forest and Climate Policy
1215 Union St.
Arcata, California 95521
andreatuttle1@gmail.com

To: Forest Climate Action Team (FCAT) fcat.calfire@fire.ca.gov
Date: April 6, 2016

RE: **Comments on California Forest Carbon Plan Concept Paper: March 9, 2016 (Draft)**

Dear Members of the FCAT Team,

Thank you for the opportunity to comment on the March 9 review draft of the Forest Carbon Plan Concept Paper. By including forest carbon in its climate strategy California sends an important signal to national and international audiences on the critical role that forests play in affecting climate change. The state's 2030 and 2050 emission reduction goals cannot be met unless the forest sector is fully included in GHG accounting, both on the emission and sequestration sides of the ledger.

The concept paper provides an excellent overview of current forest carbon information and a vision for forests under changing climate conditions. A few additions are suggested however to improve its usefulness in developing the Forest Carbon Plan. Some of these comments may drift into the space between Concept Paper and Plan but I think they are worth raising now. These include:

1. **Expand cross-sector thinking: Add a section listing actions by non-forest agencies**
   The challenge of the ARB Scoping Plan is not just to assess each emission sector in isolation but also to break out of the silo-responsibility of each state agency and highlight where policies and recommendations of one agency dovetail with those of another. Specifically:

   - **Wood Products, the California Building Code, Building Efficiency, and Seismic standards**: Although references are sprinkled throughout the draft regarding the need to enhance the use of wood products, the draft does not describe how this can be made operational nor identify where bottlenecks exist. Specific reference should be made to working cooperatively with, e.g., GSA and the Building Standards Commission, CEC and the Building Energy Efficiency Program, the Seismic Safety Commission and the Division of the State Architect among others.

     CLT and Mass Timber: For example, cross-laminated timber (CLT) offers a tremendous opportunity to develop a desperately-needed market for low-value wood coming from forest thinnings and mortality. This mass timber product sequesters large amounts of carbon in long-term use and substitutes for high GHG concrete and steel in buildings. Attention has been drawn to CLT through the USDA Tall Building design competition but the most practical application appears to be in 6-8 story office and multi-family buildings. The shorter construction time and clean construction site means it is useful for buildings in urban in-fill locations. CLT may also be appropriate for some seismic retrofit, such as the hundreds of thousands of existing buildings needing earthquake upgrades in the Los Angeles basin, not to mention the beautiful design option it offers to architects.

     Key to stimulating a CLT market is coordination to unlock the building codes to allow the

material to be used. Oregon, Canada and Europe have already stimulated demand by providing a regulatory path, which in turn incentivizes producers to invest in the equipment to manufacture the panels. London alone has 600 CLT tall office buildings, and in the past year Portland, Oregon has at least 6 CLT office buildings under construction with more in the queue. The non-profit WoodWorks offers free design consulting to show developers of non-residential projects how mass wood can be used in place of their original proposal in concrete.

Thus the FCAT draft should not just *mention* the term CLT, but should actively identify all the pathways needed to allow it to be used, and raise the attention of sister agencies for actions needed on their side. The concept paper/Plan should:

- Lay out the code requirements needed to use the material in California, and report on the status of code amendments incorporating the 2015 International Building Code which permits CLT.
- All state agencies charged with "green building" and energy-efficiency (as well as cities), should be fully cognizant of the multiple GHG, energy efficiency, rural development and affordability aspects of wood products. So far I do not see the benefits of wood called out in their webpages, nor being promoted or incentivized as part of their own agency obligations to help meet state climate goals.
- Training of architects, project developers and construction crews in the use of CLT can be provided by professional organizations but should also be actively promoted by involved agencies.
- Suggest a requirement that CLT/mass wood construction be considered in all new and retrofit state building projects.

2. **Include a sample "Ledger" illustrating the desired accounting format to track forest carbon emissions and sequestration over time.**

The draft provides carbon stock information from FIA and other models but does not offer a sample template of what the *preferred* rows and columns *ought* to include for a spreadsheet that tracks statewide forest emissions and sequestration over time.

Forest carbon accounting is more complex than automobile tailpipes and fuel use but the need for a balance sheet is the same as any other sector. The ledger should capture, for example:

- the various emission sources (including, for example, wildfire and prescribed burns, pest mortality, land conversion, biomass combustion and decay, removals from thinnings and their fate through either a wood product, decay or combustion path, etc.);
- avoided fossil fuel combustion provided by the biomass-to-energy path;
- sequestration gains (growth on existing, reforestation, and afforestation sites)

This will allow forest sector data to be rolled up with other sectors to show the entire statewide GHG picture. Although it may not yet be possible to fill in all the cells due to lack of data, having a preferred accounting format laid out ahead of time will direct effort and research, especially as new monitoring techniques become available.

3. **Look forward, not just back in projecting forest conversion trends: Temperature refugees**

The draft addresses conversion and fragmentation of private forest lands and the need to support incentive programs to keep forest land in forest use.

Specific concerns:

- That findings from the 2015 FRAP assessment will be projected forward and assume that forest conversion of private lands is "not a problem".

  The FRAP summary states: "…The amount of forestland has not changed over the past decade or more i.e., land conversion is relatively minor" (http://ucanr.edu/sites/forestry/files/233351.pdf Slide 15 of 40).

  However, this report should also assess increasing development pressure on private forest land as climate change becomes real. As temperatures rise and Davis, for example, becomes the new Phoenix, urban residents will increasingly seek relief in the forests of the Sierra, Klamath/Cascades and north coast. Existing forest communities will need to examine their development limit lines, infrastructure areas of influence and expansion of the WUI into private forest lands.

  This is another example where cross-agency coordination should be highlighted between the forest and resources agencies, the Smart Growth (SB375) communities and rural planning departments to reduce the impacts of population growth on forests.

- **Forest Legacy and easement holders**: A tangible measure to reduce fragmentation and conversion would be endorsement by the State Forester (i.e. the Director of the Department of Forestry and Fire Protection) to allow accredited Land Trusts to hold easements when federal Forest Legacy money is used in the funding package. This apparently is not currently endorsed by the Department.

  As evidenced by recent easement negotiations, many private landowners reject Legacy funding because 1) it places CDF in the conflicting position of holding and monitoring the easement while at the same time wearing a regulatory hat to enforce Forest Practice regulations, and 2) landowners often prefer working with a familiar land trust rather than a governmental agency for instruments that bind them into the future. Standards to ensure land-trust integrity and successor processes for the easement are already available. If the intent is truly to discourage fragmentation, then all tools should be made available and not artificially constrained.

4. Ensure Transparency: The ARB has set a high standard of integrity in designing and implementing the many components of the climate change program. Transparency and clear communication are key to retaining public confidence and support.

Forest carbon accounting is complex, and emissions and sequestration do not always balance out on a yearly basis. As with any bank account, the gains and losses need to be tracked, and then explained as to why policy decisions are made. Specifically:

- **GGRF expenditures:** The primary example concerns expenditures from the Greenhouse Gas Reduction Fund (GGRF), where funding tree-thinning projects to reduce fuels may *increase* emissions in the short term, but result in climate benefit on the long term. A decision to use GGRF and incur the short-term emission may be a rational policy choice, but it needs to be legally defensible, and a clear emission tracking process will be essential for making the case. It does not seem appropriate to subsidize forest operations on private lands using public funds unless the climate benefits are tracked and documented. GGRF project expenditures for the purpose of fuel management should be accompanied by a requirement for forest carbon accounting to quantify emissions and long-term benefits as they accrue. Transparency is the best defense in explaining policy choices.

In sum, FCAT has been tasked to provide the best science and professional expertise on forest carbon and forest carbon accounting for the purpose of meeting the state's climate goals. It is incumbent on FCAT to offer the most complete, informed and transparent picture of a complicated topic. I wish you well in the process and thank you for the opportunity to comment.

Sincerely,
s/

Andrea Tuttle

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California Forest Carbon Plan Concept Paper

USFS Comments 4/8/2016

- Page 2, Purpose and Scope, 5th bullet: Consider adding "Provide framework…. to increase *the quantity of carbon sequestration and/or the quality and stability of the carbon sink* …and reduce climate-warming emissions…." To reflect that the goal is not just to increase forest carbon sequestration, but also long term sustainable and healthy levels of forest carbon
- P6, second to last paragraph: 14m acres, 1-2m acres, 9m acres. Provide context to the 3 diverse numbers re # acres of overstocked or needing treatment – is it to illustrate uncertainty in methods, or different contexts or ?? Is confusing as it is currently written
- Page 12, Carbon storage bullet: Consider adding "Functioning as a *sustainable and healthy* net carbon sink over time." To reflect quality of carbon stored
- Pages 13-15, Carbon Storage and Methods:
    - Consider adding the Canadian method that was presented to FCAT (model based)
    - Something that USFS is discussing right now is how to more accurately quantify forest carbon in the Southern CA forests, for which FIA plots and downscaled carbon estimates do not accurately reflect the ecosystem carbon of chaparral and some woodlands that are not conifer based. Pending where these carbon pools might be taken into account within a State-wide inventory, or how CALFIRE defines "Forests" and thus "Forest Carbon" would affect how this comment is considered.
- Page 18, table 4 & 5: consider adding acreage in CA as a reference
- Page 22, Enhance, Goals, first sentence: Consider adding "Increase *the quantity of carbon sequestered and/or the quality and stability of* all forest carbon storage pools….
- Page 23, Enhance, Strategy: Consider adding a section that reflects the need to move towards harmonized and cleanly compatible carbon quantification tools between both various landscape/project scales and land ownership.
- Page 28, Level of Investment: Consider adding "to meet planning targets for carbon storage *and/or carbon sink enhancement* or emissions avoidance…."
    - Also how will investment levels be coordinated or calculated across ownerships? In Federal Forests, we are not currently receiving additional federal funds to achieve CA targets.
- Page 30, 2nd bullet: Consider adding "Use the analytical components…. to identify the most cost-effective investments for carbon storage, *carbon enhancement,* emissions reductions, and related co-benefits."
- Page 31, Monitoring, Assessment and Reporting: Consider adding "forest health resiliency performance measures, carbon storage *and enhancement*, and GHG emission…"
    - See above note on harmonization and clean compatibility of monitoring tools across ownerships

Kelpie Wilson
Wilson Biochar Associates
www.wilsonbiochar.com
kelpiew@gmail.com
Office: 541-592-3083
Mobile: 541-218-9890

Biochar for Forest Restoration in the Western United States

By Kelpie Wilson, Wilson Biochar Associates, for South Umpqua Rural Community Partnership (SURCP)

Introduction

This paper examines the value of biochar for forest restoration in the western forests of the United States, and proposes some economically viable methods for producing it. Western forests have become degraded as a result of even-aged logging and suppression of natural fire regimes. Charcoal from historic wildfires is an important component of soil that has been depleted in forests where fire has been excluded. We review some of the literature reporting on the effects of biochar in forest soils and discuss some forest restoration activities that can replace soil charcoal, thereby increasing carbon sequestration in forest soils, and improving forest health. One important forest restoration activity is removal of small diameter trees and brush that may hamper the reintroduction of natural fire regimes. This material has limited economic value, but it can make good feedstock for biochar production. Biochar produced in the forest can be retained for forest soil improvement. Some fraction of the biochar produced in the forest can be exported for sale as a forest product that can help pay for the removal and treatment of problem biomass. We compare several systems for making biochar in the forest, including new ways to approach burn piles and broadcast burning for the purpose of maximizing charcoal production for use in place to help restore forest soil carbon. Finally, we introduce a new type of pyrolysis that is well suited for mobile biochar production in forest settings -- Flame Cap Pyrolysis -- and provide details of three different biochar production systems using these technologies.

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1. Historic charcoal in forest soils
2. Impact of charcoal on forest soils and plants
3. Impact of management on forest soil charcoal
4. Forest restoration goals and biochar
5. Flame Cap pyrolysis for mobile biochar production

1. Historic charcoal in forest soils

Soil charcoal (or black carbon) is a product of natural and anthropogenic vegetation fires that take place globally on many scales. Biochar is a recently coined term for human-produced charcoal that is deliberately added to soil to improve soil health and sequester carbon.

Some of the most productive and resilient soils in the world contain significant quantities of soil charcoal, or "natural" biochar. Nature makes megatonnes (40-240 Mt per year) of black carbon during wildfires or prescribed fires in forests and other vegetation types (Preston & Schmidt, 2006). This kind of natural charcoal is present in large quantities in some of the most valuable agricultural soils in the world, like the carbon-rich Chernozems of the Russian steppe and the Mollisols of the US Midwestern prairie states (Skjemstad et al. 2002, Glaser & Amelung 2003).

Recent reviews are revising upward the amount of pyrogenic black carbon (char and soot) produced each year in vegetation fires. A new global estimate (Santín et al. 2015) suggests that global black carbon production could be in the range of 116–385 Mt of C per year. This equals approximately 0.2–0.6% of the annual terrestrial net primary production of plants. This type of carbon is long-lived and about 50 percent of it is likely to resist oxidation to atmospheric CO_2 for centuries.

The amount of charcoal generated by wildfire depends on fire intensity, fire return interval, vegetation type, fuel loading and fire behavior. From 10-50% of the carbon found in forest soils is charcoal (Pingree 2012). Application of biochar is expected to mimic many soil properties associated with wildfire-generated charcoal (Harvey et al. 1979).

Several studies have estimated that the conversion rate of biomass to charcoal during a forest fire event ranges from 1-10% of the biomass consumed in a fire, or 1-2% of the biomass available in the forest (DeLuca & Aplet 2008). Based on biomass inventories, DeLuca & Aplet estimated that a single fire event in a mature lodgepole pine forest might deposit 3.25 tonnes per hectare of carbon in the form of charcoal. They concluded: "Thus, wildland fire need not be viewed only as a cause of C loss to the atmosphere, demanding suppression, but rather, as a driver of long-term C sequestration."

In some forest types and under some conditions, conversion rates of woody biomass to charcoal are higher. A post fire inventory of an experimental high-intensity crown fire in a Canadian boreal forest stand found that 27.6% of the carbon in the fire zone was converted to charcoal. Extrapolated globally, the researchers speculate that charcoal production in boreal forests could be as much as 100 Mt annually, more than five times the previous estimate (Santín et al. 2015).

2. Impact of charcoal on forest soils and plants

When considering the impact of biochar on soils and plants, it is important to recognize that biochar materials are highly variable, producing different results depending on soil type and

other factors. The main constituents of biochar are aromatic carbon and ash. The chemistry of aromatic carbon is highly dependent on the temperature of its formation. The proportion of ash can be higher or lower and will vary in the composition of its elements according to the biochar feedstock used. Charcoal made in a forest fire is likely to be much more variable than industrially produced biochar, containing everything from slightly burned wood to mineral ash, depending on the spatial distribution of fuels and fire intensity. Most biochar research to date has concentrated on specific kinds of biochar with consistent properties, applied to fields and crops. There is considerably less research on biochar in forests, whether applied as a soil amendment or as a result of fire (McElligot et al. 2011). Below, we review some of the published literature on the effects of biochar in forests.

Nutrient cycling

Biochar can have a strong impact on soil nutrients and their availability to plants. Both biochar and ash contain some nutrients. Due to its sorption properties, biochar can bind and retain certain nutrients for short or long periods of time. Biochar, like the activated carbon used in filters, is effective at both absorbing (like a sponge) and adsorbing (through surface electrical charges) many different substances. Biochar also affects the soil biological community and its role in nutrient cycling.

Ash - The fertilizing effects of ash following fire are well known. Wildfire charcoal and most biochars contain mineral ash that is a source of soluble nutrients such as potassium, phosphorus, calcium and magnesium.

Liming, pH and CEC - Char and ash have impacts on soil pH, base saturation and cation exchange capacity (CEC). All of these properties are involved in nutrient cycling. Lime is commonly added to agricultural soils and sometimes to forest soils to raise pH and mobilize soluble nutrients by increasing the saturation of basic cations. Ash does not generally increase soil base saturation (the number of basic cations in soil) as much as adding lime. However, biochar additions can improve soil CEC by providing numerous negatively charged cation exchange sites on the biochar aromatic carbon matrix. The combination of ash and char is likely to be more effective than lime alone or ash alone in promoting soil nutrient cycling (Omil et al. 2013).

Nitrogen - Nitrogen volatilizes in a fire, but ammonium, a combustion product, is often left behind, especially in fires that burn less severely at lower temperatures. Nitrifying bacteria transform ammonium to nitrates that will soon leach into waterways with harmful effects unless they are taken up by new plant growth after the fire; one reason why it is important to establish new vegetation soon after a fire (Certini 2015). Biochar is especially effective at sorbing ammonium (Wilson 2013). Depending on conditions, char sorption of ammonium can work like a carbon-based slow-release fertilizer (Gundale & DeLuca 2006).

Nitrification - Nitrification is the biological process that converts ammonium to nitrates that are easily used by plants. Several studies have shown that biochar enhances nitrification in forest soils (Berglund et al. 2004, DeLuca et al. 2006). This effect may be

especially important in forest soils where nitrogen is limited. The charcoal effect may be due to a combination of factors: sorption of phenolic compounds that inhibit nitrifier bacteria, and other properties of biochar that seem to promote the microbial community of nitrifiers. DeLuca et al. (2006) concluded that since fire is the dominant form of disturbance in western forest ecosystems, the exclusion of fire could eventually have a significant impact on forest nutrient cycles.

N immobilization – The electrochemical properties of the biochar aromatic carbon matrix seem to stimulate and support microbial activity (Chen et al. 2014). Biochar also contains some degradable carbon that is food for microbes. In some cases, increased microbial growth may thus tie up significant amounts of nitrogen, making it unavailable to plants (Omil et al. 2013).

Phosphorus - Biochar can sorb phosphorous, potentially making it temporarily less available to plants (Santalla et al. 2011).

Mycorrhizal fungi - Biochar is reported to change the abundance and species distribution of fungi, bacteria and other soil life forms (Lehmann et al. 2011). Biochar can have an especially beneficial effect on the mycorrhizal fungi that are essential for healthy forests. A pot study of charcoal used in larch tree seedlings found that biochar stimulated growth of roots and mycorrhizal fungi (Makoto et al. 2009). In this study, the fungi solubilized soil phosphorous that was otherwise unavailable to the seedlings. The phosphorous then showed up in greater concentrations in the needles of the seedlings grown in biochar-amended soil. However, in a variety of soil systems, biochar can also increase soil bacterial populations and alter the bacterial:fungi ratio (Chen et al. 2013; Farrell et al. 2013; Gomez et al. 2014).

Soil water holding capacity

One of the most important effects of biochar is its impact on soil water holding capacity and hydraulic conductivity. Because biochar is porous, it can absorb water like a sponge. Water is held in biochar pore spaces and voids, and in the spaces between particles in the soil. Biochar interacts with other soil constituents to form aggregates, and over time, it stimulates the formation of humus, which also retains water in soil (Masiello et al. 2014). The impact of biochar on soil water holding capacity has a lot to do with soil texture. A series of experiments in the 1940s looked at the impact of charcoal on three different forest soil types based on sand, clay and loam. Using different percentages of charcoal addition, different types of charcoal (hardwood and softwood) and different particle sizes, the results showed that, overall, charcoal greatly increased the water holding capacity of sand, slightly increased the capacity of loam, and reduced the water holding capacity of clay soil (Tyron, 1948). It is important to keep in mind that fresh, un-wetted biochar is hydrophobic. Therefore, the practical application of biochar may depend on overcoming this hydrophobicity before substantial gains in water holding capacity can be seen (Page-Dumroese et al. 2015).

Impacts on tree growth

Most biochar plant growth studies have been performed on field and horticultural crops, however, there are a growing number of studies on biochar and forest species. Many of these have been pot studies of forest tree seedlings. A meta-analysis has summarized a number of these studies on responses of woody plants to biochar (Thomas & Gale 2015). The analysis found a significant tree growth response to biochar, with an average 41% increase in biomass. This is a highly significant result, but it is important to understand that since many of the studies were of tree saplings in early growth stages, it is unlikely that this kind of response would apply to older trees with much slower growth rates. However, if biochar improves the early growth of tree seedlings, it would support the idea that biochar is a valuable tool for reforestation. The effects were less pronounced in temperate forests than in tropical or boreal forests. The authors of the study speculate that this could be due to a greater amount of nitrogen limitation in temperate forest soils than in other forest types. One reason for some of the positive effects of biochar in forest soils may be that biochar adsorbs salts, heavy metals and organic compounds like phenols that can inhibit plant germination and growth (Thomas, 2013). However, adding biochar to regular nursery potting media seemed to have little effect, either positive or negative (Matt 2015).

3. Impact of management on forest soil charcoal

Given the widespread presence and many functions of charcoal in fire-adapted forest soils, it is important to examine the impact of fire exclusion on forest soil charcoal and consider management changes that could restore it.

Management that reduces forest soil charcoal

A few studies have attempted to correlate soil charcoal with the history of fire suppression in order to estimate the charcoal deficit in forest soils. Looking at different site histories in ponderosa pine/Douglas-fir forests of the inland northwest, Brimmer (2006) found that sites that experienced multiple fires during the past 79–130 years contained about three times more charcoal than forests where fire was excluded.

Post-fire salvage logging is another management activity that can impact soil charcoal levels. Removing burned trees removes a lot of char that would otherwise fall to the ground and become incorporated into soil over time. Trees that tip over and fall will turn over soil as their root masses lift out of the soil. This is one of the ways that charcoal can get incorporated into soil. Charcoal that gets incorporated below the litter layer is more biologically active and also less vulnerable to incineration in the next fire (DeLuca & Aplet, 2008).

Management that can increase forest soil charcoal

Changes in the fire regime could potentially restore natural biochar to forest soils, however there are many site-specific considerations and unknowns. One of the goals of forest restoration in western North America is to return the natural fire return interval through a combination of biomass removal and controlled burning, eventually allowing fires to burn more naturally across larger landscapes.

Hart & Luckai (2014) concluded that active management to produce soil charcoal may be needed. They found that North American boreal forests had soil charcoal levels that were 2–3 times higher than in Eurasian boreal ecosystems, where fires are less intensive. Stand-replacing fires in North America produced larger amounts of charcoal. Because charcoal becomes less reactive in soil over time and less able to absorb phenolic compounds that inhibit seedling growth (after about 100 years), these researchers said: "In the absence of fire, management of boreal charcoal stocks may be required to maintain ecosystem function and C balance."

It would be useful to have management options to optimize charcoal production through natural fire processes; thereby restoring historic charcoal levels. A research program to understand the available options would evaluate variables such as fire return interval, fuel loading, fuel moisture, and other factors that are more site-specific such as forest species, climate and topography. An examination of soil charcoal in a forested landscape in the Pacific Northwest found that soil charcoal was correlated with site microclimate conditions such as temperature and moisture (Jauss et al. 2015). Warm-dry sites produced less charcoal than cool-wet sites and less intense fires may produce more charcoal (Knicker 2006). On the other hand, frequent fires can potentially incinerate char that remains in the litter layer, reducing the accumulation of charcoal, but that is not always the case (Santín et al. 2013). A modeling exercise that compared different fire return intervals in a 100-year old ponderosa pine forest found that more frequent fire is likely to promote the accumulation of char in mineral soil and slightly more soil charcoal overall, while less frequent, more severe fire left more charcoal in the soil organic horizon (DeLuca & Aplet 2008).

All of these site condition factors should be considered along with burning methods when determining fire prescriptions for optimizing soil charcoal formation. For instance, during a prescribed fire in north-central Florida, researchers tested char formation under two different fire-spread patterns: a head fire (with the wind) and a backing fire (against the wind). They found that backing fires formed more than twice as much charcoal as head fires due to differences in oxygen availability and residence time (Carvalho et al. 2011). This site-specific result would likely only be attained in similar wet, flat land forests, but this is also an example of the kind of investigations that could be conducted in western forests. Such an investigation should also consider the opportunistic use of managed wildfires to achieve restoration objectives (Ingalsbee & Raja 2015), including the restoration of soil charcoal. The interaction of prescribed fire with other fuel load reduction techniques like mastication could also be optimized for maximum charcoal production (Brewer et al. 2015).

4. Forest restoration goals and biochar

The most extensive forest management challenges in western forests today revolve around fire and watersheds. Large-scale logging and fire suppression have resulted in overstocked stands of small diameter trees that are vulnerable to extreme fire (Noss et al. 2006). As a result of climate change, rainfall and mountain snow packs are in decline and there is a longer summer drought period, which increases fire risk and lowers forest and soil resilience. Active management to remove excess biomass is being prescribed for the Wildland Urban Interface

(WUI) and other areas where it is ecologically warranted. The acreage of forestland that should be treated is extensive and disposal of the waste wood (tops, limbs, cull sections and unmerchantable round wood) from thinning or other harvest operations can be expensive. However, these residues are potentially available for bioenergy and biochar production.

Paying for restoration

Treatments to remove biomass from forests include various combinations of mechanical thinning, chipping or mastication, and prescribed fire. With thousands of acres needing treatment, managers are looking for ways to help pay for logging and residue disposal costs. Some sites can be commercially thinned which often pays for residue removal (slash pile or broadcast burning), however, many sites do not have commercial-sized timber or removal of large trees is not warranted for watershed health and restoration of late-seral conditions (old growth forest). Small-diameter residues or trees can be used for bioenergy, but economic constraints of transportation costs do not often support this use. Combining low energy prices and high costs for collecting and transporting biomass to facilities is the main barrier. One alternative may be a transportation subsidy, but this is not available at this time (Rapp 2010).

In-woods pyrolysis

The Forest Service has been evaluating the potential to reduce the cost of restoration treatments and biochar production through mobile, in-woods pyrolysis systems, obtaining biochar as a co-product of mobile bio-oil production systems using forest biomass. Since the production facility is located in the woods, there are no transportation costs for returning the biochar to the forest. Revenues from the energy production could pay for the biochar co-product and for applying it to forest soils (Page-Dumroese et al. 2009).

However, the challenges of implementing mobile plants that produce both bio-oil and biochar are significant. Aside from technical challenges, the economic performance of mobile pyrolysis is not promising, to date. In a thesis paper comparing the economics of mobile vs. stationary fast pyrolysis using forest biomass, Sorenson (2010) found that despite the mobile platform's advantage of a shorter biomass hauling distance, a stationary energy facility was three times more profitable, and both kinds of facilities were only marginally profitable under specific conditions. A sensitivity analysis pinned economic performance most strongly on capital costs, labor and feedstock costs, and projected bio-oil and biochar prices. However, methods to optimize harvesting, transportation, and centrally located pyrolysis equipment are now being developed (Harrill and Han 2014). This change in how forests are harvested and residues are treated may help make future efforts at in-woods processing more cost-effective. More favorable economic conditions would also include both higher energy prices and a tax or other mechanism to put a price on carbon emissions that would pay for carbon sequestration (and soil improvement) in the form of biochar.

Other than chipping for biomass energy, the main alternative for biomass disposal is the current practice of incinerating it in onsite burn piles, which is costly, can alter soil productivity, increase CO_2 emissions, and produce particulates. Slash pile burning may alter soil microbial populations, destroy seeds, and result in bare soil, which is vulnerable to colonization by

invasive species (Korb et al. 2004). Smoke and particulate production from slash pile burning limits the burning window especially in air-quality limited watersheds, making it more difficult to accomplish the work.

Mitigating biomass removal with biochar

There is concern that large-scale removal of biomass from forests will export nutrients and carbon that is needed to replenish soils, especially where whole trees are harvested. However, not all sites display a noticeable decline in nutrients or carbon after one-time harvest operations (Jang et al. 2015). On sites that are particularly susceptible to nutrient export, climatic changes, or insect and disease stress, biochar could help return nutrients and carbon, and increase water-holding capacity of soils as part of forest health restoration strategies.

Researchers at the US Forest Service have been investigating biochar applications for protecting soil quality, function, and site productivity following biomass removals for fuel load reduction and forest health, and have established both field research sites and pot studies to assess impacts of biochar addition. The US Forest Service is conducting multiple investigations of biochar as tool for improving soil water-holding capacity, reducing bulk density of compacted soils and old roads, restoring range soils and mine sites, filtering sediment to improve water quality, and as an amendment in container media for native plant nurseries (Page-Dumroese et al. 2011, Page-Dumroese & Anderson 2012).

5. Flame Cap Pyrolysis for mobile biochar production

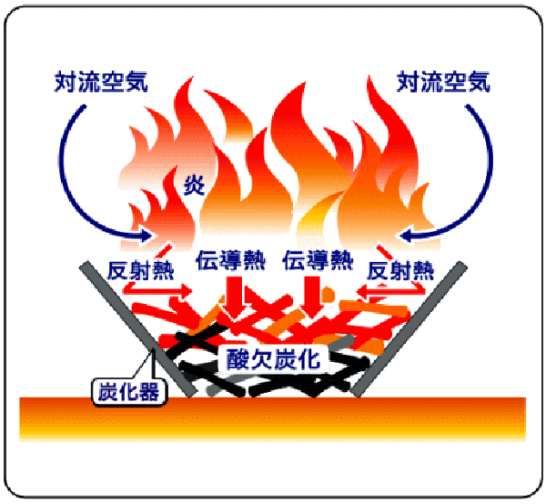
Wilson Biochar Associates (WBA) proposes an alternative for mobile pyrolysis of waste forest biomass that could be profitable under current conditions. In this section, we describe a suite of three low cost methods for biochar production at remote forest sites. These methods are based on Flame Cap Pyrolysis, a pyrolysis method that uses a curtain or cap of flame to exclude oxygen from the pyrolyzed biomass.

These technologies are characterized by low to extremely low capital cost and by the use of bulk woody debris as feedstock with no requirement for chipping and transport of raw biomass, similar to the current practice of pile and burn. We expect the overall economics of in-woods Flame Cap Pyrolysis to be competitive with current pile and burn methods for debris disposal.

Flame Cap Pyrolysis technologies do not produce an energy co-product, which could be seen as a lost opportunity. However, they do produce biochar which can be sold to help pay for the cost of fuels treatment. Some of the biochar produced can also be retained on site to help meet restoration objectives. Looking ahead to future conditions where oil prices begin to rise again, and biofuels production from woody waste may become economically profitable, it would be wise to invest now in the productivity of forest soils to meet future needs. In-woods Flame Cap Pyrolysis methods can help improve the health and resiliency of forest soils now, while also providing some biochar products to improve organic waste management (biochar is a valuable compost accelerator – see Ma et al, 2013) with benefits to agricultural soils.

Inspiration for the Flame Cap Pyrolysis technologies

The technologies discussed below were inspired by the Japanese Cone Kiln, also called the "Smokeless Kiln" (see illustration, below). The Japanese Cone Kiln makes high quality, well-carbonized biochar with reported biomass to char conversion efficiencies of around 15% (Inoue et al. 2011). We have found that other shapes like pyramids, tubes, metal boxes, trenches and pits work just as well as the cone shape. Collectively, these are known as "Flame Cap Kilns." To start the kiln, make a fire in the bottom and add new wood, slowly, in layers. Each new layer bursts into flame, excluding air from the layer below, and allowing pyrolysis to take place. Because there is always a flame present on top, most of the smoke burns in the flame. When the kiln is full of char, quench it and cool the char for use or sale.



***Left: Muentankaki (charcoal kiln)**. Diagram of the Japanese Cone Kiln shows how heat transfers from the flame on top to the biomass below for carbonization (http://xn--w8jwca1ob4719g78a.net/muentankaki/).*
***Right: Tube Kiln from Biochar Industries**. This 6-ft diameter tube can make about 5 cubic yards of biochar in one batch (http://biocharproject.org/tag/biochar-industries/*

Japanese Cone Kiln in a forest. *Japanese "Smokeless Kiln" makes charcoal in a bamboo forest. (from: http://aoiuminokai.junglekouen.com/d2011-01.html)*

Another inspiration is the "rick" method of making biochar, used by the Jack Daniels Distillery to make charcoal for filtering their whisky. The "rick" is an open pile of criss-crossed lumber that maintains air voids within the pile. The rick pile is lit from the top. The open rick structure allows flame to envelope each stick, burning the outside and charring the inside. When all the sticks are charred through, the pile collapses and it is quenched with water.

Jack Daniels Rick Method. *Making charcoal for the Jack Daniels Distillery using open ricks (photo: Wikipedia).*

Three Flame Cap Technologies

Wilson Biochar Associates has conducted preliminary analysis of three Flame Cap pyrolysis technologies. We also built prototypes and field-tested the first two of these:

1. Rick Pile Burns
2. Forestry Flame Cap Kiln
3. Air Curtain Burners operating in pyrolysis mode

#1 Rick Pile Burns

The least capital-intensive of the Flame Cap Pyrolysis methods is the Rick Pile Burn, which is simply a different way of constructing a burn pile in the woods, inspired by the "rick" method used by the Jack Daniels Distillery, as shown above. In November 2013, WBA sponsored a rick burning demonstration at an oak meadow restoration project in southwest Oregon being completed by Lomakatsi Restoration Project. A group of volunteers spent three days experimenting with different methods of piling and burning to achieve reduced smoke emissions and increased char production (Wilson 2014). The photos below illustrate some results of the successful demonstration.

Open Rick Burn in a forest: *a rick made of fir and pine from an oak meadow restoration project in Oregon. As the outside of each log burns, the inside chars. When fully charred, the rick collapses and can be quenched with water or dirt to save the char. (Photos copyright Kelpie Wilson, 2015.)*

In addition to making biochar, the Rick Pile Burn has other advantages:

- The Rick Pile maintains a flame on the top that burns most of the smoke produced, significantly reducing particulate emissions.
- Rick Piles are elevated off the forest floor, which reduces heating of the organic soil horizon for less severe impacts on soil life forms.
- Rick Piles could require less labor to construct than standard, compact piles. This needs to be tested in the field under different conditions including terrain and type of debris.
- Rick Piles can be quenched by spreading them out to cool and adding some dirt to exclude air. This activity serves to apply and incorporate the char into the soil where it can become biologically active. Incorporation also reduces the potential for loss of char from incineration in the next fire event.

Disadvantages of the Rick Pile Burn may include:

- Rick Pile Burns require labor to tend and quench the piles, however, under the right conditions of moisture and precipitation, quenching may not be needed.
- Rick piles could require more labor to construct than standard, compact piles. This needs to be tested in the field under different conditions of terrain and type of debris.
- Rick piles may have higher flame lengths than compact piles. However, it is possible to construct rick piles that are shorter with wider bases. Shorter piles would produce shorter flame lengths to overcome this problem.

#2 Forestry Flame Cap Kiln

The Forestry Flame Cap Kiln is a very simple, low cost device based on the Japanese Cone Kiln described above. WBA designed this version of the Flame Cap Kiln to be optimized for low cost manufacturing and for efficient logistical deployment and use along forest roads as an alternative to pile burning or chipping. Basically, it is a method of improving the efficiency and char recovery of the Rick Pile Burn by placing it inside a container.

The Forestry Flame Cap Kiln. *Designed by Wilson Biochar Associates for use in forestry to convert burn piles to biochar. Newer model will have fork pockets for lifting and unloading.*

Forestry Flame Cap Kiln design specifications:

- Shape: inverted truncated pyramid
- Bottom base: 4 ft square
- Top base: 5 ft square
- Height: 2 ft
- Capacity: 40 cf (when the chunky char is shredded, it will yield about 1 cy per kiln.
- Additional features: drain for quenching water, fork pockets for lifting, hinge and lock for dumping

Operational logistics are keyed to typical shaded fuel break treatments that thin 150' on either side of forest roads. Material is yarded to the roadside as for chipping, but instead of a chipper, a number of pyramid kilns are placed along the road. Material needs to be cut to 4-5' lengths.

Hand crews will begin by constructing and lighting a rick in each kiln and then continue to feed the material into the kilns until they are full of char. A water tank truck will dispense quenching water into the kilns. If limited water is available, a smaller amount (40 gallons) of water can be used with a loose fitting metal cover that will complete the quenching step. The cover will exclude air while the char cools overnight.

If water is abundant, kilns can be quickly quenched with 100 or more gallons of water. Once the water is drained, workers can immediately load the biochar into cubic yard size tote bags for transport to market.

Below is a detailed description of the operational steps needed with some projected numbers for production volumes and labor requirements:

Operational Plan for Roadside Biochar Production with Forestry Kilns

- Goal: Approximately 1/4 mile of roadside treatment per day
- Crew: 12 people in teams of 2
- Kilns: 48 kilns delivered on a truck or trailer and dropped off one every 50' along each side of the road. Each crew of 2 is responsible for 8 kilns
- Ancillary Equipment: 2000 gal water tender, loader, flatbed and totes for removing biochar
- Total daily production volume: 48 cy of biochar (4.8 tons if biochar is 200 lb/cy)
- Daily production per worker: 800 lbs
- Total value of daily production at $150/cy: $7,200

Description of operation steps:

1. Team builds a rick inside kiln about 4' tall and lights it
2. Move to next kiln and build another rick
3. Light that rick and move on until all kilns are ablaze
4. Return to first kiln which should have collapsed into hot coals
5. Build another rick on top of glowing coals - rick will self-ignite

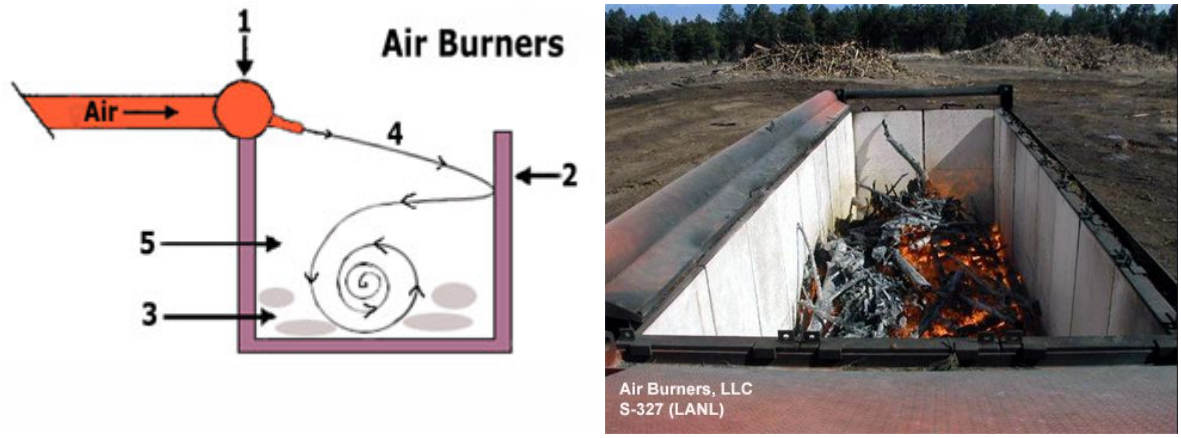
6. Return and build more ricks in each kiln until kiln is full
7. Bring 2000 gal water tender to first kiln that is finished
8. Each kiln gets 40 gal of water
9. Place thin sheet steel lid on kiln and leave overnight
10. Return to site next morning and unload biochar into totes
11. Pick up kilns and move to next site

There are several significant operational and economic advantages of the Forestry Kiln over mechanized mobile pyrolysis systems:

- **Low Capital Cost** - The Forestry Kiln has low capital cost. In our scenario, a full complement of 48 kilns capable of producing 48 cy of biochar a day would cost no more than $50,000 - far less than any mechanized system with similar capacity.
- **Always Ready** - Mechanized pyrolysis kilns and gasifiers are subject to equipment downtime and maintenance needs. The Forestry Kiln is always ready for work.
- **Highly Mobile** - The Forestry Kiln can be placed on a roadside berm or in the woods near a road or skid trail.
- **Scalable** - Adding or deleting capacity is simple and cheap.
- **Potentially Cheaper than Pile & Burn** - The Forestry Kiln system uses a large amount of labor and labor will be the most significant cost by far. However, it may not use a great deal more labor than current labor-intensive pile and burn methods that do not produce a useful product to offset costs.
- **Work Force Training** - Working with fire to produce biochar would be valuable training for the thousands of young people who are recruited to fight wildland fires every year. Doing this work in the winter keeps fire crews in shape and prepares them for summer firefighting.

#3 Air Curtain Burners operating in pyrolysis mode

The most capital intensive and least labor intensive of the Flame Cap Pyrolysis methods is the air curtain burner. An air curtain burner is a large, refractory-lined box equipped with a powerful blower that is used to incinerate biomass to ash. However, by changing some of the operating parameters, these units can be used to produce biochar. Several manufacturers make these units, but we focused our investigation on the units produced by Air Burners, Inc. The company website explains the principle of operation: "The purpose of the air curtain is to stall or slow down the smoke particles on their way out of the FireBox. In doing this, the particles are subjected to the highest temperatures in the FireBox. Stalling the smoke particles in this region just under the air curtain causes them to re-burn, further reducing their size to an acceptable limit."



Left: Air Burner principle of operation. Right: Air Burner S-327 unit in operation. (Photos from http://www.airburners.com)

The US Forest Service San Dimas Technology and Development Center (SDTDC) investigated Air Curtain Burners and recommended their use for incinerating forest waste with low emissions (Schapiro 2002). An in-depth analysis of air curtain burner emissions came to similar conclusions but also found that in some cases the air curtain burners produced very low particulate emissions even when the blower was turned off (Miller & Lemieux 2007). The authors noted: "It is very likely that even poorly operated systems will exhibit significantly lower PM emission levels when they are able to increase the high-temperature residence time of the pyrolyzed organics that form most of the fine PM." This has implications for our proposed modified use of the units to produce biochar.

WBA has proposed that the refractory lined box itself, either without the blower or with the blower operating at a lower speed, will be capable of producing biochar instead of full incineration to ash. It will operate like other Flame Cap Kilns, but more effectively since the refractory lining will create higher temperatures than can be achieved in a simple steel container. WBA contacted Air Burners, Inc. about using the units to produce biochar and was referred to Rick Whybra of PurFire (http://www.purfire.net/) who owns a small trailer-mounted Air Burner unit with a 4’x 4’x12’ fire box called the Burn Boss. Mr. Whybra reported that he had inadvertently made char on several occasions with the unit when he had to shut it down early. In discussions with Mr. Whybra, we estimated that the unit could make about 4 cubic yards of biochar per batch.

The largest unit that Air Burners, Inc. sells is the S-327, with firebox dimensions of 12'x12'x37'. This would give it a capacity of about 165 cubic yards. Air Burners, Inc. has a large rake attachment for a skid steer that can scrape the char out of the unit after opening the end gate of the box. Then the char can be quenched with water and left to cool. The 165 cubic yards of char would bring in $24,750 if sold for $150/cubic yard.

Conclusion

Biochar has value both as a forest product and as an amendment to forest soils. It can be made on site from excess biomass removed from the forest as part of forest management, using simple, economically viable methods. Given the ecological value of charcoal in forest soils, forest managers may determine that a percentage of biochar produced in the forest should be left behind to replenish soil charcoal stocks. Biochar production in the woods (especially at remote sites) is best viewed as a temporary project that will help prepare forests for the return of natural fire regimes. Biochar markets thus provide part of the financial support for biomass removal. Once fire is returned to the system, charcoal will begin to accumulate in soil once again, restoring its ecological function. In addition, managers may want to explore landscape level fire management tools for controlled or managed burning that could increase char production in order to accelerate forest soil charcoal development for forest health and/or carbon sequestration.

About SURCP

SURCP is a community-based 501(c)(3) non-profit dedicated to restoration ecology and sustainable stewardship in the South Umpqua river basin. We are very active in constructive collaborative restoration projects with many partners. These multifaceted projects and initiatives are supported by SURCP Directors and community members through our organizational committees and the collaborative process. The goal of our service is that ecological, environmental, social and economic stability is established in our region.

About WBA

Wilson Biochar Associates is a consultancy owned by Kelpie Wilson. Wilson is a mechanical engineer, project developer and writer. She has worked in the biochar field since 2008. Her contracts and clients have included work for the International Biochar Initiative, Washington Department of Ecology and many biochar companies. Wilson also has an extensive background in forestry and biodiversity protection resulting from her twelve years (five as executive director) with the Siskiyou Regional Education Project, an Oregon forest advocacy group.

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April 8, 2016

Submitted to the Forest Carbon Action Team (FCAT)
via email at *fcat.calfire@fire.ca.gov*.

Re: Comments on the California Forest Carbon Plan Concept Paper

To the Forest Carbon Action Team:

These comments are submitted on behalf of the Center for Biological Diversity in response to the "California Forest Carbon Action Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate" ("concept paper"), authored by the Forest Climate Action Team ("FCAT") on March 9, 2016. It is our understanding that the FCAT is soliciting public comment on all portions of the concept paper and the strategies of the Forest Carbon Plan. We also understand that the Air Resources Board intends to include this input in its development of goals for forest carbon sequestration and for reduction of greenhouse gas and black carbon emissions in the 2016 Scoping Plan Update. This comment letter is intended to offer comments relevant to both processes, while referencing specific passages in the concept paper.

I. Summary comments on the structure of the concept paper.

The concept paper identifies many appropriate goals for forest management, including the development of resilient forests and the protection of ecological values (although the latter are referred to almost exclusively in terms of "services"). However, the concept paper often fails to define key terms, provide robust scientific review of central concepts, or connect the proposed management goals to ecological objectives. In addition, the concept paper offers a sometimes unsupported and contradictory version of historical conditions and management of California's forests, placing much emphasis on thinning as a method for achieving ecological objectives, without acknowledging that logging in many cases can have (and many times has had) precisely the opposite results.

The concept paper also includes as a central assumption that “active management” (this term in the concept paper is often indistinguishable from commercial logging) as will lead inexorably to greater carbon storage. Although the paper acknowledges that mechanical thinning and other management will cause short-term reductions in carbon (a significant portion of which will likely be transferred to the atmosphere via combustion for bioenergy), it does not recognize the limitations on this assumption reflected in the scientific literature. For example, Campbell et al. (2011) and other studies (discussed in Part VII of these comments below) call this assumption into serious question. Even the studies cited in the concept paper in support of this assumption (at page 10) contain important qualifications and limitations; Hurteau and North (2010), for example, found substantial and continuing carbon losses from treatments that removed larger trees. Although the concept paper references this limitation obliquely, it is not fully reflected in

the paper's management proposals. Thinning operations in California routinely involve removal of large trees. (See Pub. Res. Code § 4584(j)(8), (11)(B) [authorizing removal of trees up to 18 inches in diameter, and in some cases up to 24 inches in diameter, in the course of thinning operations to reduce vertical continuity of fuels].) The concept paper fails to recognize that a great deal of current "active management" may be at cross purposes with the FCAT's goals.

We strongly urge the FCAT to perform a robust review of the most recent and best available science and provide the public with clear operational definitions of the key ecological and management concepts at the core of the policies proposed in the concept paper. Ecosystem resilience, fragmentation, conversion, environmental services, sustainability, and active management are some key terms in need of clarification. Similarly, it is necessary to provide some clarity regarding what the FCAT understands the term "active management" to mean. Forest thinning and harvesting comes in a wide range of operations with results that can vary widely. Without clarity and specificity on which management activities are being proposed for which results in which circumstances, policy proposals that foster "active management" are meaningless at best and at worst risk to undermine the ecological objectives.

Furthermore, we strongly urge the FCAT to develop their understanding of and position on the role of fire as a management objective and as a management tool. Similarly, the concept paper and the resulting policy objectives would benefit greatly from a review of current fire management policies in the context of moving away from fire suppression policies and attitudes that have contributed to the development of the current forest structure and continue to influence policy decisions today.

II. Restoring ecological structure and function at necessary scales.

Ecosystem resilience is a term that is highlighted as a primary objective and is mentioned repeatedly in the concept paper. However, the concept paper is often unclear in its use of the term in a way that allows for misunderstanding of the ecological concept. Page 12 of the concept paper defines resilience in this way: "Forests are able to regenerate after disturbance and adapt to changes in climate and precipitation regimes." To be clear, forest resilience, like many ecological attributes, must be considered at the appropriate scale. For processes like forest fire and climate change that work at large geographic scales, forest resilience also must be assessed at the large geographic scale. High resilience means that the forest at the landscape scale is able to maintain component species, structural diversity, and stable levels of ecosystem functions at the landscape scale; it does not mean that any individual forest stand or burned area is necessarily expected to return to its previous condition quickly after disturbance. Some disturbances such as fire can result in stand-scale changes over the course of decades, in the meantime contributing to necessary structural diversity at the landscape scale. Indeed, the concept paper, in the forest resilience section on page 12, points to the importance of such openings in reducing susceptibility to fires and environmental stressors such as drought, insects and disease. However, it is unclear from that passage whether the FCAT recognizes the role of natural disturbance processes in creating structural diversity, or whether the FCAT believes that diversity is best achieved through "active management." Elsewhere, on page 5, the concept paper discusses the benefits of managing for "larger and more fire resilient trees." Ecosystem resilience has little or no meaning at the level of an individual tree. Instead, what the FCAT

refers to here is "fire resistance." Growing fire-resistant trees is actually a very different objective from promoting an ecologically resilient forest; the latter is much more realistic and is associated much more strongly with positive ecological values.

Although the concept paper identifies early on the value of natural disturbances such as fire, there are statements throughout the concept paper that appear to overlook those values. Page 12 of the concept paper defines economic and ecological sustainability in this way: "Healthy forests are able to support ecosystem functions and processes while meeting current and future needs of people for aesthetics, recreation, health, products, and other ecosystem services." It would be very helpful to clarify that the FCAT understands that disturbance in general, and fire in particular, is among the ecosystem processes that must be supported. Indeed, we strongly urge the FCAT to substantially develop the discussion of landscape-level fire use as a management tool for promoting and maintaining forest health and resilience.

The concept paper must develop a clear review of the best available and most recent science on the use of fire as an ecosystem function and management tool. This is often dramatically understated or ignored in the concept paper. For example, in a reference to a Forest Service management document cited on page 6 of the concept paper: "The Forest Service estimates that 9 million acres of National Forest Lands in the state are in need of restoration in California." This statement is offered in a paragraph focusing on the need to reduce tree density, following a paragraph that equivocates on the ecological function of fire. The actual statement in the Forest Service document is that it is the Forest Service's intention to "Increase forest resilience through treatments (<u>including prescribed fire</u> and thinning) <u>and wildfire</u>, resulting in resource benefits to approximately 9 million acres on national forest system lands." Ecological Restoration Plan, Chapter 1: Region 5 Ecological Restoration Leadership Intent[1]; emphasis added. The strong reliance on fire, including wildfire, is completely missing in this paragraph of the concept paper and is repeatedly overlooked throughout the concept paper.

Furthermore, the concept paper acknowledges the ecological damage caused by decades of fire suppression as in this passage from page 6: "In addition, past fire suppression activities and lack of fuels management have left California forests particularly vulnerable and weakened." However, the concept paper offers no indication of moving away from the policy of continued fire suppression as in this passage on page 2: "It is our intent that the Forest Carbon Plan...Be consistent with state and federal wildland fire management goals and strategies." We strongly urge the concept paper to include a discussion of how the FCAT considers fire suppression in the context of the proposed forest management goals.

III. Developing an accurate understanding of past forest management.

The concept paper repeatedly laments the lack of forest management (in these references, logging), as in this passage from page 6: "In addition, past fire suppression activities and lack of fuels management have left California forests particularly vulnerable and weakened. Decades of conflict over the appropriate balance between active versus passive management and commodity production versus protecting or enhancing ecosystems has hindered progress on achieving a

[1] Available at http://www.fs.usda.gov/detail/r5/landmanagement/?cid=stelprdb5409054.

healthy forest landscape." This fails to recognize the role of logging in creating the current forest conditions and ignores completely the long-term impacts of high-grading, clearcutting, and plantation forestry implemented expansively throughout much of the state for decades. This biased version of history makes it impossible to take seriously the heavy emphasis the concept paper places on "active management" as a favored management tool and objective, as in this passage from the same section on page 6: "Some of this conflict has been declining in recent years as more stakeholders now recognize needs for active management to achieve and/or sustain desired ecosystem conditions." We strongly urge the FCAT to develop a historically accurate review of forest management that can provide a basis for future management goals.

Similarly, the discussion of carbon sequestration rates, starting on page 17 of the concept paper, appears completely unaware of the logging practices that have led to current forest conditions and resulting growth rates. For example, the section on Forest Service timberlands seems to imply that those forest stands are experiencing lower growth rates because logging has declined in recent years, and fails to contemplate that past logging in those stands has led to the forest conditions that now show lower growth rates.

IV. Developing a meaningful context for tree mortality.

The concept paper places much weight on current tree mortality rates in the southern Sierra Nevadas and beyond, with estimates as high as 29 million dead trees. Page 7. Elsewhere, the U.S Forest Service has estimated that in 2015 the ongoing drought and beetles created approximately 27 million new snags (standing dead trees), about 7 or 8 inches in diameter and larger, in California's forests. That is 27 million dead trees, out of of approximately 2.88 billion trees of this size in the state's 33 million acres of forestland; this is equivalent to approximately 1 percent of the trees in California's forests.

For these mortality statistics to be meaningful, it is absolutely critical that we place them clearly into the context of geographical scale and management objective. For example, the concept paper on page 7 cites a Forest Service publication that warns that California is at risk of losing 25% of standing live forest due to insects and disease over 5.7 million acres in the 15 years from 2013 and 2027. However, on the previous page, the concept paper cites two sources that 14 million acres and 9 million acres of these same forests are "overly dense." The concept paper strongly implies that reductions in tree density due to natural processes such as beetles, fire and drought have purely negative ecological consequences, while similar or greater reductions due to mechanical thinning operations are purely positive. The basis for this contradictory position is not clear. The FCAT needs to clarify precisely the criteria on which management objectives will be based with respect to tree density goals, and the scientific basis for those criteria.

V. The importance of fire as a natural ecosystem process.

The concept paper at page 3 acknowledges the role of fire as a natural ecosystem process: "Wildfire is an essential part of these ecosystems and many of the native tree and plant species are dependent on periodic disturbance from wildfire. However, altered wildfire regimes and changes due to land management have affected forest structure. Under these conditions many

western forests are overly dense and experiencing large and severe wildfires." While it is true that fire suppression and logging practices have altered forest structures, it is important to note that this does not eliminate the essential role of fire, including high-severity fire, as a natural ecosystem process in many forest types. In fact, fire can have an essential role in restoring forest structure at larger geographical scales.

Fire is a natural and necessary component of forest ecosystems, with many critical functions for diversity and wildlife. It would be a misunderstanding of the science and nature of forest and fire dynamics to approach these emissions in the same context as those from smokestacks, bioenergy and pile burning, which are discretionary activities that occur under direct human control.

Numerous studies and multiple lines of evidence indicate that the ponderosa pine and mixed-conifer forests of California are characterized by mixed-severity fire that includes ecologically significant amounts of high-severity fire (see review in Odion et al. 2014). Mixed-severity fire includes low-, moderate-, and high-severity effects that create complex successional diversity, high beta diversity, and diverse stand-structure across the landscape. High-intensity fire patches, including large patches, in large fires are natural in California mixed-conifer forests.

California's forested landscapes evolved with fire over thousands of years. This pre-European, forested landscape was shaped by mixed-severity fire, with low, moderate, and high-severity fire types. Plant and animal species in the forest evolved with fire, and many of these plant and animal species depend on wildfires, including high-severity fires, to reproduce and grow. For instance, fire can help return nutrients from plant matter back to soil, the heat from fire is necessary to the germination of certain types of seeds, and the snags (dead trees) and early succesional forests created by high-severity fire create habitat conditions that are beneficial to wildlife. Early successional forests created by high-severity fire support some of the highest levels of native biodiversity found in temperature conifer forests.

Several recent studies provide evidence for a mixed-severity fire regime in California forests, including an important role for high-severity fire, as well as declines in high-severity fire, as summarized here*:*

Beaty and Taylor 2001: On the western slope of the southern Cascades in California, historic fire intensity in mixed-conifer forests was predominantly moderate- and high-intensity, except in mesic canyon bottoms, where moderate- and high-intensity fire comprised 40.4% of fire effects [Table 7].)

Bekker and Taylor 2001: On the western slope of the southern Cascades in California, in mixed-conifer forests, fire was predominantly high-intensity historically [Fig. 2F].

Bekker and Taylor 2010: In mixed-conifer forests of the southern Cascades, reconstructed fire severity within the study area was dominated by high-severity fire effects, including high-severity fire patches over 2,000 acres in size [Tables I and II].

Collins and Stephens 2010: In a modern "reference" forest condition within mixed-conifer/fir forests in Yosemite National Park, 15% of the area experienced high-intensity fire over a 33-year period—a high-intensity fire rotation interval of approximately 223 years.

Nagel and Taylor 2005: The authors found that large high-severity fire patches were a natural part of 19th century fire regimes in mixed-conifer and eastside pine forests of the Lake Tahoe Basin, and montane chaparral created by high-severity fire has declined by 62% since the 19th century due to reduced high-severity fire occurrence. The authors expressed concern about harm to biodiversity due to loss of ecologically rich montane chaparral.

Odion et al. 2014: In the largest and most comprehensive analysis ever conducted regarding the historical occurrence of high-intensity fire, the authors found that ponderosa pine and mixed-conifer forests in every region of western North America had mixed-intensity fire regimes, which included substantial occurrence of high-intensity fire. The authors also found, using multiple lines of evidence, including over a hundred historical sources and fire history reconstructions, and an extensive forest age-class analysis, that we now have unnaturally low levels of high-intensity fire in these forest types in all regions, since the beginning of fire suppression policies in the early 20th century.

Numerous studies show that high-severity fire is beneficial to wildlife. High-severity fire creates very biodiverse, ecologically important, and unique habitat (often called "snag forest habitat"), which often has higher species richness and diversity than unburned old forest.

Bond et al. 2009: In a radio-telemetry study, California spotted owls preferentially selected high-intensity fire areas, which had not been salvage logged, for foraging, while selecting low- and moderate-intensity areas for nesting and roosting.

Buchalski et al. 2013: In mixed-conifer forests of the southern Sierra Nevada, rare myotis bats were found at greater levels in unmanaged high-severity fire areas of the McNally fire than in lower fire severity areas or unburned forest.

Burnett et al. 2010: Bird species richness was approximately the same between high-severity fire areas and unburned mature/old forest at 8 years post-fire in the Storrie fire, and total bird abundance was greatest in the high-severity fire areas of the Storrie fire [Figure 4]. Nest density of cavity-nesting species increased with higher proportions of high-severity fire, and was highest at 100% [Figure 8].

Cocking et al. 2014: High-intensity fire areas are vitally important to maintain and restore black oaks in mixed-conifer forests.

Donato et al. 2009: The high-severity re-burn [high-severity fire occurring 15 years after a previous high-severity fire] had the highest plant species richness and total plant cover, relative to high-severity fire alone [no re-burn] and unburned mature/old forest; and the high-severity fire re-burn area had over 1,000 seedlings/saplings per hectare of natural conifer regeneration.

Franklin et al. 2000: The authors found that stable or increasing populations of spotted owls resulted from a mix of dense old forest and complex early seral habitat, and less than approximately 25% complex early seral habitat in the home range was associated with declining populations [Fig. 10]; the authors emphasized that the complex early seral habitat was consistent with high-intensity fire effects, and inconsistent with clearcut logging.

Hanson and North 2008: Black-backed woodpeckers depend upon dense, mature/old forest that has recently experienced higher-intensity fire, and has not been salvage logged.

Hanson 2013: Pacific fishers are using pre-fire mature/old forest that experienced moderate/high-intensity fire more than expected based upon availability, just as fishers are selecting dense, mature/old forest in its unburned state. When fishers are near fire perimeters, they strongly select the burned side of the fire edge. Both males and female fishers are using large mixed-intensity fire areas, such as the McNally fire, including several kilometers into the fire area.

Hutto, R.L. 1995: A study in the northern Rocky Mountain region found that 15 bird species are generally more abundant in early post-fire communities than in any other major cover type occurring in the northern Rockies. Standing, fire-killed trees provided nest sites for nearly two-thirds of 31 species that were found nesting in the burned sites.

Hutto, R.L. 2008: Severely burned forest conditions have occurred naturally across a broad range of forest types for millennia and provide an important ecological backdrop for fire specialists like the black-backed woodpecker.

Lee and Bond 2015: California spotted owls exhibited high site occupancy in post-fire landscapes during the breeding season following the 2013 Rim Fire, even where large areas burned at high severity; the complex early seral forests created by high-severity fire appear to provide important habitat for the small mammal prey of the owl.

Malison and Baxter 2010: In ponderosa pine and Douglas-fir forests of Idaho at 5-10 years post-fire, levels of aquatic insects emerging from streams were two and a half times greater in high-intensity fire areas than in unburned mature/old forest, and bats were nearly 5 times more abundant in riparian areas with high-intensity fire than in unburned mature/old forest.

Raphael et al. 1987: At 25 years after high-intensity fire, total bird abundance was slightly higher in snag forest than in unburned old forest in eastside mixed-conifer forest of the northern Sierra Nevada; and bird species richness was 40% higher in snag forest habitat. In earlier post- fire years, woodpeckers were more abundant in snag forest, but were similar to unburned by 25 years post-fire, while flycatchers and species associated with shrubs continued to increase to 25 years post-fire.

Sestrich et al. 2011: Native Bull and Cutthroat trout tended to increase with higher fire intensity, particularly where debris flows occurred. Nonnative brook trout did not increase.

Siegel et al. 2011: Many more species occur at high burn severity sites starting several years post-fire, and these include the majority of ground and shrub nesters as well as many cavity

nesters. Secondary cavity nesters, such as swallows, bluebirds, and wrens, are particularly associated with severe burns, but only after nest cavities have been created, presumably by the pioneering cavity excavating species such as the Black-backed Woodpecker. As a result, fires that create preferred conditions for Black-backed Woodpeckers in the early post-fire years will likely result in increased nesting sites for secondary cavity nesters in successive years.

Swanson et al. 2010: A literature review concluding that some of the highest levels of native biodiversity found in temperate conifer forest types occur in complex early successional habitat created by stand-initiating [high severity] fire.

VI. Trends in fire behavior.

While climate change will almost certainly alter many forest processes, including fire behavior, in many ecosystems over the coming decades, the current body of science offers a complex range of projections for California forests. Notably, the majority of studies that have analyzed recent trends in fire severity and frequency in California forests have found no significant trends in these metrics. Studies that project trends in fire activity have no clear consensus on how climate change will affect fire behavior in California forests.

Nine studies have analyzed recent trends in fire severity in California's forests in terms of proportion, area, and/or patch size. Seven of nine studies found no significant trend in fire severity, including: Collins et al. 2009 (central Sierra Nevada), Dillon et al. 2011 (Northwest California), Hanson et al. 2009 (Klamath, southern Cascades), Hanson and Odion 2014 (Sierra Nevada, southern Cascades), Miller et al. 2012a (four Northwest CA forests), Odion et al. 2014 (eastern and western Sierra Nevada, eastern Cascades), and Schwind 2008 (California forests). The two studies that report an increasing trend in fire severity – Miller et al. 2009 and Miller and Safford 2012 (Sierra Nevada, southern Cascades) – were refuted by Hanson and Odion (2014) using a larger dataset.

Hanson and Odion (2014) conducted the first comprehensive assessment of fire intensity since 1984 in the Sierra Nevada using 100% of available fire intensity data, and found no increasing trend in terms of high-intensity fire proportion, area, mean patch size, or maximum patch size. Hanson and Odion (2014) reviewed the approach of Miller et al. (2009) and Miller and Safford (2012) for bias, due to the use of vegetation layers that post-date the fires being analyzed in those studies. Hanson and Odion (2014) found that there is a statistically significant bias in both studies ($p = 0.025$ and $p = 0.021$, respectively), the effect of which is to exclude relatively more conifer forest experiencing high-intensity fire in the earlier years of the time series, thus creating the erroneous appearance of an increasing trend in fire severity. Hanson and Odion (2014) also found that the regional fire severity data set used by Miller et al. (2009) and Miller and Safford (2012) disproportionately excluded fires in the earlier years of the time series, relative to the standard national fire severity data set (www.mtbs.gov) used in other fire severity trend studies, resulting in an additional bias which created, once again, the inaccurate appearance of relatively less high-severity fire in the earlier years, and relatively more in more recent years.

Three studies have analyzed recent trends in the number of fires in California's forests and have reported conflicting results for trends in fire frequency. Two studies found no trend in the number of fires -- Schwind (2008) and Syphard et al. (2007) -- while Westerling et al. (2006) reported evidence of an increasing number of fires.

Projection studies have generally not modeled trends in future fire frequency and severity. Instead most studies have projected changes in area burned and the probability of burning. There is no consensus among these studies on future fire activity.

Of seven studies that have projected trends in area burned in California forests, four projected both increases and decreases in total area burned varying by region, including: Lenihan et al. 2003, Lenihan et al. 2008, Krawchuk et al. 2009, and Spracklen et al. 2009. One study projected an overall decrease in area burned (McKenzie et al. 2004), while two studies projected increases: Fried et al. 2004 in a small region in the Amador-El Dorado Sierra foothills and Westerling et al. 2011. The projected increases reported in Westerling et al. (2011) are relatively modest: median increases in area burned of 15% and 19% by 2020 relative to 1961-1990 under a lower (B1) and higher emissions scenario (A2) respectively, 21% and 23% by 2050, and 20% and 44% by 2085.

Three studies have projected changes in the probability of burning or the probability of a large fire occurring, and these studies have projected no change, increases, or decreases varying by region: Krawchuk and Moritz 2012, Moritz et al. 2012, and Westerling and Bryant 2008.

The studies empirically investigating the assumption that the most fire-suppressed forests are burning predominantly at high severity have consistently found that forest areas in California that have missed the largest number of fire return intervals are not burning at higher fire severity. Specifically, six empirical studies that have investigated this question found that the most long-unburned (most fire-suppressed) forests burned mostly at low/moderate-severity, and did not have higher proportions of high-severity fire than less fire-suppressed forests. Forests that were not fire suppressed (those that had not missed fire cycles, i.e., Condition Class 1, or "Fire Return Interval Departure" class 1) generally had levels of high-severity fire similar to, or higher than, those in the most fire-suppressed forests, as found by Odion et al. 2004, Odion and Hanson 2006, Odion and Hanson 2008, Odion et al. 2010, Miller et al. 2012a, van Wagtendonk et al. 2012.

Finally, studies have found that California is experiencing a fire deficit compared to pre-settlement conditions, meaning that there is much less fire on the landscape than there was historically, and this deficit is detrimental to forests (Stephens et al. 2007).

VII. The carbon impacts of forest thinning.

The concept paper briefly acknowledges the carbon implications of management activities that remove biomass from the forest. However, the discussion of carbon storage, starting on page 16 of the concept paper, focuses almost entirely on the potential carbon storage of wood products without quantifying the associated carbon costs. The result is a highly one-sided defense of policy options to promote logging, followed by the burning of those woody materials for biomass energy production. However, studies that have specifically evaluated the

carbon implications of this strategy have found that thinning results in increased carbon emissions to the atmosphere for many decades.

Three recently published studies of forests in the western United States suggest that emissions from removal and combustion of forest materials for bioenergy would exceed emissions from even high intensity fires, at least for some period of time. One study examined forest carbon responses to three different levels of fuel reduction treatments in 19 West Coast ecoregions containing 80 different forest types and different fire regimes (Hudiburg et al. 2011). In nearly all forest types, intensive harvest for bioenergy production resulted in net carbon emissions to the atmosphere, at least over the 20-year time frame of the study. Even lighter-touch fire prevention scenarios produced net carbon emissions in most ecoregions. The study shows that at present, across a wide range of ecosystems, thinning for fuels reduction and using the thinnings for bioenergy increases carbon dioxide concentrations, at least in the short term.

A second study similarly found that thinning forests to avoid high-severity fire could actually increase overall carbon emissions (Campbell et al. 2011). Because the probability of a fire on any given acre of forest is relatively low, forest managers must treat many more acres than will actually burn in order to get much of a benefit—removing more carbon during "thinning" than would be released in a fire. The study also found that over a succession of disturbance cycles, models predicting forest growth, mortality, decomposition and combustion showed more carbon storage in a low-frequency, high-intensity fire regime than in a high-frequency, low-intensity fire regime. The study concluded: "we found little credible evidence that such efforts [fuel-reduction treatments] have the added benefit of increasing terrestrial C stocks" and "more often, treatment would result in a reduction in C stocks over space and time."

A review by Law and Harmon (2011) concluded that "Thinning forests to reduce potential carbon losses due to wildfire is in direct conflict with carbon sequestration goals, and, if implemented, would result in a net emission of CO_2 to the atmosphere because the amount of carbon removed to change fire behavior is often far larger than that saved by changing fire behavior, and more area has to be harvested than will ultimately burn over the period of effectiveness of the thinning treatment."

Furthermore, scientific studies have found that old forests store up to ~10 times more carbon in biomass per unit ground area than young forests, and old forests continue to have large carbon stores for hundreds of years (Luyssaert et al. 2008, Hudiburg et al. 2009, Law 2014, Schulze et al. 2012). Older trees not only store large amounts of carbon but actively sequester larger amounts of carbon compared to smaller trees (Stephenson et al. 2014). Contrary to the conventional forestry assumption that older trees are less productive, the mass growth rate for most temperate and tropical tree species increases continuously with age, meaning the biggest trees sequester the most carbon (Stephenson et al. 2014). In western USA old-growth forest plots, trees greater than 100 cm in diameter comprised 6% of trees, yet contributed 33% of the annual forest mass growth (Stephenson et al. 2014). Current research also shows that high-severity fire areas generally store the highest levels of carbon, due to the combination of the carbon in snags, downed logs, and post-fire regenerating vegetation, including shrubs and trees (Keith et al. 2009, Powers et al. 2013).

Logging significantly reduces forest carbon storage. Harvest of live trees from the forest not only reduces current standing carbon stocks, but also reduces the forest's future rate of carbon sequestration, and its future carbon storage capacity, by removing trees that otherwise would have continued to grow and remove CO_2 from the atmosphere (Holtsmark 2012). Even if harvested biomass is substituted for fossil fuels, it can be decades or centuries before the harvested forest achieves the same CO_2 reductions that could be achieved by leaving the forest unharvested (depending on harvest intensity, frequency, and forest characteristics) (Searchinger et al. 2009, Hudiberg et al. 2011, Campbell et al. 2012, Mitchell et al. 2012). It takes more than 100 years (~125-130 years) to make up for carbon loss after a forest is logged (Harmon 2014, Law 2014).

VIII. Accurate accounting of the carbon impacts of bioenergy

Any policy to promote the use of forest-sourced biomass for bioenergy production must fully account for the emissions and climate change consequences associated with those activities. In order to develop a program that makes sense within the forest carbon and GHG emissions contexts, biomass uses must be compared not only to alternative "waste diversion" options but to the full spectrum of alternative fates, including the carbon sequestration and storage associated with living and growing trees and forests.

Woody biomass combustion is not carbon-neutral, as acknowledged by numerous scientific studies (see, e.g., Searchinger et al. 2009, Repo et al. 2010, Brandão et al. 2013), the IPCC,[2] and the EPA.[3] Measured at the smokestack, replacing fossil fuels with biomass actually *increases* CO_2 emissions.[4] Notably, a recent study found that the climate impact per unit of CO_2 emitted seems to be even higher for the combustion of slow-growing biomass than for the combustion of fossil carbon in a 100-year time frame (Holtsmark 2013). The warming effect from biomass CO_2 can continue for decades or even centuries depending on the feedstock.

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[2] IPCC Task Force on National Greenhouse Gas Inventories, Frequently Asked Questions, at http://www.ipcc-nggip.iges.or.jp/faq/faq.html (last visited October 23, 2013) (Q1-4-5, Q2-10).

[3] U.S. EPA, Accounting Framework for Biogenic CO2 Emissions from Stationary Sources 11-12 (Sept. 2011) ("The IPCC . . . eschewed any statements indicating that its decision to account for biomass CO2 emissions in the Land-Use Sector rather than the Energy Sector was intended to signal that bioenergy truly has no impacton atmospheric CO2 concentrations."); see also Deferral for CO2 Emissions from Bioenergy and Other Biogenic Sources Under the Prevention of Significant Deterioration (PSD) and Title V Programs, 76 Fed. Reg. 43,490, 43,498 (July 20, 2011); Science Advisory Board Review of EPA's Accounting Framework for Biogenic CO2 Emissions from Stationary Sources 7 (Sept. 28, 2012) at 3.

[4] Typical CO2 emission rates for facilities:
Gas combined cycle 883 lb CO2/MWh
Gas steam turbine 1,218 lb CO2/MWh
Coal steam turbine 2,086 lb/CO2/MWh
Biomass steam turbine 3,029 lb CO2/MWh
Sources: EIA, Electric Power Annual, 2009: Carbon Dioxide Uncontrolled Emission Factors. Efficiency values used to calculate emissions from fossil fuel facilities calculated using EIA heat rate data. (http://www.eia.gov/cneaf/electricity/epa/epat5p4.html); biopower efficiency value is 24%, a standard industry value.

Multiple studies have shown that it can take a very long time for new biomass growth to recapture the carbon emitted by combustion, even where fossil fuel displacement is assumed, and even where "waste" materials like timber harvest residuals are used for fuel (Repo et al. 2010, Manomet Center for Conservation Sciences 2010, McKechnie et al. 2011, Mitchell et al. 2012, Schulze et al. 2012). One study, using realistic assumptions about repeat bioenergy harvests of woody biomass, concluded that the resulting atmospheric emissions increase may even be permanent (Holtsmark 2012).

In addition to producing large amounts of CO_2, biomass energy generation can result in significant emissions of other pollutants that worsen climate change and harm human health, such as black carbon. Many biomass emissions can exceed those of coal-fired power plants even after application of best available control technology.

Studies have found that global greenhouse gas emissions must peak by 2020 and drop sharply thereafter in order to preserve a likely chance of keeping global warming below 2°C — a level at which serious impacts will still occur (UNEP 2013). California's climate goals, as reflected in AB 32 and applicable executive orders (S-3-05 and B-30-15) also call for increasingly steep reductions in emissions over the next three decades. Yet the science shows this is precisely the time period during which biomass emissions released today will increase atmospheric CO_2 levels. The concept paper aims to inform development of the 2016 Scoping Plan, which will explicitly address the goal of reducing emissions 40 percent below 1990 levels by 2030. At a time when we need to reduce emissions dramatically in the short term and keep them down, California forest policy should not be promoting biomass burning that will exacerbate climate change.

IX. Conclusion

Thank you for your consideration of these comments. We look forward to working with the FCAT and the ARB in developing this strategy and implementing efforts to protect California's forests and promote forest resilience and carbon sequestration.

Please contact me if there are any questions about these comments or if you require any assistance with accessing background information and materials.

Sincerely,

Brian Nowicki
Center for Biological Diversity
(916) 201-6938
bnowicki@biologicaldiversity.org

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822 Fifth Street
Santa Rosa, CA 95404

Supplemental Appendix:

Sonoma County's Leadership, Plans, Programs, and Partners for Forest Conservation, Climate Adaptation, and Mitigation

A History of Sonoma County's Climate Change Leadership

For over ten years, Sonoma County's community leaders and forward-thinking elected officials in each city and county government have worked together to establish strong action on climate change. The following history is excerpted from the March 2016 draft of the Regional Climate Protection Authority's Climate Action Plan:[1]

- **1990:** Voters approved a sales tax measure to create the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD) to preserve agricultural and open space lands throughout the county. Voters overwhelmingly reauthorized the sales tax measure in 2006.

- **2001:** All Sonoma County communities committed to the International Council for Local Environmental Initiatives campaign called Cities for Climate Protection, an international initiative to reduce GHG emissions through local government action.

- **2005:** The elected leadership in all Sonoma County communities adopted a countywide GHG emissions reduction target of 25% below 1990 levels by 2015. The City of Cotati adopted an even more aggressive goal of 30% below 1990 levels by 2015.

- **2008:** A local community non-profit group, the Climate Protection Campaign (now known as the Center for Climate Protection), developed a Community Climate Action Plan, which was the first community-wide examination of strategies to reduce community-wide GHG emissions.

- **2008:** Voters in Sonoma (and Marin) County approved a local sales tax measure to fund development of passenger rail service, Sonoma-Marin Area Rail Transit (SMART).

[1] Regional Climate Protection Authority. 2016. Climate Action 2020 and Beyond. Accessed online 1 April 2016. http://rcpa.ca.gov/wp-content/uploads/2016/03/CA2020-Public-Review-Draft-Plan_3-4-16.pdf

- **2009:** Sonoma County jurisdictions established the Regional Climate Protection Authority (RCPA), a multi-jurisdictional agency tasked with coordinating countywide efforts to reduce GHG emissions and increase climate change resilience. RCPA member jurisdictions and their partners have created and successfully pioneered innovative approaches to climate solutions including Property Assessed Clean Energy (PACE) financing, Pay As You Save (PAYS) on-bill repayment for resource efficiency, community choice aggregation, carbon-free water, electric vehicle infrastructure deployment, climate action through conservation, adaptation planning, and more.

- **2009:** A coalition of natural resource managers, policy makers, and scientists formed the North Bay Climate Adaptation Initiative to create positive solutions to the problem of climate adaptation for the ecosystems and watersheds of the North Bay, with Sonoma County as the pilot. NBCAI has become RCPA's partner in climate resilience planning, producing Sonoma County's first climate vulnerability assessment.[2]

- **2011:** Sonoma County Water Agency adopts its Energy Policy, which commits the Water Agency to achieving:
    - Carbon Free Water - Recognizing the threat to economic security and public safety posed by climate change, the Agency continues to implement programs that reduce the Agency's greenhouse gas production and achieved a net carbon neutral energy supply by 2015.
    - Projects of Regional Benefit - The Agency continues to seek and develop more reliable sources of electricity for the region, including participating in local energy projects and programs that promote self-sufficiency and make North Bay residents less dependent on outside energy sources subject to market fluctuations, natural disasters, and transmission system failures.

- **2012:** The City of Santa Rosa was the first local government in the county to adopt its own Climate Action Plan and a new GHG emissions target of 25% below 1990 levels by 2020.

Community leadership has resulted in direct actions by the citizens, businesses, and communities in Sonoma County to reduce GHG emissions. For example:

- All communities in the county (except Healdsburg, which has its own electric utility) now participate in the local Community Choice Aggregation program, Sonoma Clean Power (SCP), which cost effectively provides electricity with a higher renewable energy content than otherwise available from the private utility already provided electricity with a large renewable portfolio for many years.

- The County established a PACE program known as the Sonoma County Energy Independence Program to help property owners finance energy and water efficiency improvements. This program has reduced GHG emissions equal to taking 3,000 cars off the road and generated enough clean energy to power nearly 6,000 homes for a year.

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[2] Cornwall, C., S. Moore, D. DiPietro, S. Veloz, L. Micheli, L. Casey, M. Mersich. 2014. Climate Ready Sonoma County: Climate Hazards and Vulnerabilities. Prepared as part of Climate Action 2020 by North Bay Climate Adaptation Initiative for Sonoma County Regional Climate Protection Authority. Santa Rosa, California, USA. rcpa.ca.gov/data-and-reports/climate-risks/

- RCPA and jurisdictions county-wide support energy-efficiency efforts and solar retrofits through a variety of programs. Waste minimization, recycling, and composting programs are already an essential part of resource conservation in the county. The Sonoma County Water Agency is a leader in innovating low-carbon methods for delivering water supplies and conserving water. The Agency reached its goal of a carbon-free water delivery system in 2015, and is also a prominent supporter of energy and water conservation financing.

- By 2010, Sonoma County communities had reduced countywide GHG emissions to approximately 7% below 1990 levels, even while the county's population grew by 25% and employment grew by 17% between 1990 and 2010. On a per capita basis, county GHG emissions declined approximately 26% over the same period.

Sonoma County's Planning Efforts for Climate Change and Forest Health

The following are a few examples of Sonoma County's planning and data collection efforts for climate change mitigation, adaptation, and forest health:

- **Sonoma County Community Wildfire Protection Plan (Draft)**: This draft 2016 plan was developed by Fire Safe Sonoma in collaboration with stakeholders from federal, state, and local agencies and community groups. It presents strategies to address WUI wildfire issues in rural, forested residential communities.[3]

- **Climate Action 2020:** This 2016 plan by the Regional Climate Protection Authority outlines specific actions to reduce greenhouse gas emissions and adapt to a changing climate in Sonoma County. It includes an inventory of emissions as well as total carbon stock in different sectors, cities, and land use types in Sonoma County, including our forests. It focuses attention on the greatest opportunities and key strategies for emissions reductions.[4]

- **The Climate Action through Conservation Project**: This 2015 planning tool developed by The Nature Conservancy and Sonoma County Agricultural Preservation and Open Space District helps jurisdictions estimate the greenhouse gas reductions that may be achieved through management, restoration, and conservation activities on a landscape scale. The project provides detailed information on the metric tons of carbon dioxide equivalent sequestered in Sonoma County's forests and urban forests.[5]

- **Sonoma County Community Climate Action Plan**: This 2008 plan by the Climate Protection Campaign presents solutions to meet Sonoma County's goal to reduce greenhouse gas

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[3] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

[4] Regional Climate Protection Authority. 2016. Climate Action 2020 and Beyond. Accessed online 1 April 2016. http://rcpa.ca.gov/wp-content/uploads/2016/03/CA2020-Public-Review-Draft-Plan_3-4-16.pdf

[5] The Nature Conservancy and Sonoma County Agricultural Preservation and Open Space District. 2015. Conserving landscapes, protecting the climate: The climate action through conservation project. San Francisco and Santa Rosa, CA. Accessed online 1 April 2016. http://scienceforconservation.org/dl/CATC_Final_Jan2016.pdf

reductions emissions by 25% below 1990 levels by 2015.[6] The solutions are organized into four sectors, including agriculture and forests. Sonoma County and all nine cities have adopted the plan.

- **Climate Ready North Bay:** To create a framework for adapting to climate change, decision-makers working in Northern California's watersheds are working to define climate vulnerabilities in the context of site-specific opportunities and constraints relative to water supply, land use suitability, wildfire risks, ecosystem services, biodiversity, and quality of life. Working in partnership with the Sonoma County Regional Climate Protection Authority (RCPA) and the North Bay Climate Adaptation Initiative (NBCAI), Pepperwood's Terrestrial Biodiversity Climate Change Collaborative (TBC3.org)developed customized climate vulnerability assessments with select natural resource agencies of California's Sonoma, Marin, Napa and Mendocino counties via "Climate Ready North Bay," a public-private partnership funded by the California Coastal Conservancy's Climate Ready program.

- **Sonoma County Sudden Oak Death Strategic Response Plan:** This 2008 plan by the University of California Cooperative Extension and other Sonoma County agencies presents goals and strategies to manage oak woodlands and hardwood forests impacted by Sudden Oak Death.[7]

- **Connecting Communities and the Land – A Long-Range Acquisition Plan:** This 2006 land acquisitions plan by the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD) recognizes the value of our intact working forest landscape. In implementing this plan, SCAPOSD has partnered with local, state, and federal partners (including Forest Legacy) on numerous forest land conservation projects, including the 5,630-acre Jenner Headlands, 19,000-acre Buckeye Forest (formerly Preservation Ranch), the 688-acre Richardson Trust/Kashia Pomo Project, as well as several other projects encompassing over 3,500 acres.[8]

- **Sonoma County Vegetation Mapping and LiDAR Program**: This joint program, led by SCAPOSD and the Sonoma County Water Agency, provides an inventory of the county's landscape features, ecological communities, and habitats. These data sets are intended to facilitate conservation planning, watershed management, and climate change mitigation and adaptation efforts in Sonoma County.

- **Urban Water Management Plan:** This 2010 Plan projects water supplies and water demands over the next 25 years and describes water supply reliability and climate change impacts to both groundwater and surface water supplies. The plan also describes water conservation activities and integrated implementation of strategies to actively manage the health of the water supply watersheds. This Plan is currently being updated this year which will include hydrologic

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[6] Climate Protection Campaign. 2008. Sonoma County Community Climate Action Plan. http://coolplan.org/ccap-report/CCAP_Final_11-05-08.pdf

[7] University of California Cooperative Extension, Sonoma County, Sonoma County Department of Emergency Services. 2008. Sonoma County Sudden Oak Death Strategic Response Plan. http://www.firesafesonoma.org/main/sites/default/files/sodsr_plan.pdf

[8] Sonoma County Agricultural Preservation and Open Space District. 2006. Connecting communities and the land: A long-range acquisition plan. http://www.sonomaopenspace.org/wp-content/uploads/2014/09/District-Acquisition-Plan-2006.pdf

modeling addressing future climate scenarios and large scale landscape conservation programs and incentives.

Other Ongoing Forest Management Activities

With appreciation for funding provided by CalFire, California Department of Fish and Wildlife and USDA's Natural Resources Conservation Service, the following forest management and conservation projects are in process, or being actively discussed:

- **CalFire:** In FY14 CalFire allocated a total of $99,012 for CFIP plans for 22 landowners in Sonoma County. So far in FY15, an additional $95,276 has been allocated for 18 management plans, and $22,782 for 2 fuels reduction projects. CalFire is working with local partners to implement these grants – see below.

- **FireSafe Council**: Recently completed the draft Sonoma County Community Wildfire Protection Plan.

- **Coast Ridge Community Forest**: Created in 2009, more than 50 private and public landowners are working jointly to plan and implement coordinated forest management across property boundaries within this region. In partnership with Cal Fire, CFIP grants were awarded to thirteen private landowners in 2015. High priorities among management activities are fuel load reduction and water conservation. An NRCS EQIP grant is funding a cooperative grazing program to reduce fuel load and improve soil health on multiple properties in the Gualala Ranch subdivision. In partnership with the Gualala River Watershed Council, a rainwater catchment grant is funding the Flow Bank program to increase stream flow in the Gualala River Watershed, as described below.

- **Gualala River Watershed Council:** The Gualala River, at 212,563 acres (332 mi^2) is the largest watershed in the Mendocino Coast Hydrological Unit. Two-thirds of the watershed is within Sonoma County. The GRWC is already assisting 17 landowners in the Forest Management Plan process and have approximately 15 more landowners on a wait list for future funding encompassing over 15,000 acres. The GRWC implements restoration and monitoring within the watershed at the programmatic scale, developing projects that integrate infrastructure upgrades, restoration, monitoring and public education to increase effectiveness and lower costs. Through this cohesive strategy and landowner support, the GRWC has upgraded 263 miles (18% of the watershed) of timber and ranch roads, installed over 800 large wood structures helping to restore 15 creeks, and conducted scientific monitoring of the watershed for the past 16 years.

  GRWC also works to increase off-creek water storage, and is currently installing fifty-five (55) 5,000-gallon tanks and seven (7) 55,000-gallon tanks for residential and agricultural landowners. The organization has been funded to upgrade the North Gualala off-stream pumping site, saving one million gallons of water per year from being pumped from the North Fork Gualala River.

- **Sonoma Land Trust and The Wildlands Conservancy:** Several of Sonoma Land Trust's properties are managed for forest health. The Jenner Headlands preserve, managed in partnership with

The Wildlands Conservancy, features shaded fuel breaks and a recently approved timber harvest plan, which is scheduled for implementation in summer 2016. The Little Black Mountain preserve also features a shaded fuel break, timber stand improvements, and other fuel load reduction management efforts. Management of this preserve has been supported by CalFire's CFIP program, Conservation Corps North Bay, and Fire Safe Sonoma. Finally, the Pole Mountain Preserve protects the forested landscape and ensures the continued operation of the Fire Lookout, the last remaining lookout in operation in the North Bay.

- **Sonoma County Water Agency, CalFire, and the U.S. Army Corps of Engineers:**

  The Russian River is the primary source of water for 600,000 people in Sonoma and Marin counties. Lake Sonoma collects runoff from a drainage area of approximately 130 square miles and stores water during the rainy season (November through April) for releases into the Russian River during the dry season (May through October). Large collector wells on riverbanks near the town of Forestville pump water through about 100 feet of sand and gravel. This naturally filtered water needs only a slight pH adjustment and the state-required addition of chlorine before it is pumped directly to customers.

  The Sonoma County Water Agency, which controls releases from the lake for water supply purposes, is concerned that a major fire in the heavily forested watershed could result in increased sediment to the lake. This could temporarily reduce water quality and could possibly have long-term impacts on the sands and gravels that naturally filter the water supply. The Water Agency is working with USACE, Cal-Fire, and local partners on plans to more actively manage the Lake Sonoma watershed to reduce the risks of a catastrophic fire and to maintain forest health.

- **Sonoma County Water Agency, Sonoma Ecology Center, Sonoma Clean Power:**

  - In partnership with USDA Natural Resources Conservation Service, the Sonoma County Water Agency funded a biochar demonstration project which featured local production of biochar from a retort unit producing 500 lbs of high quality char per batch. Project utilized local waste wood from tree service, recycling carbon into char which was then mixed with compost for soil amendment. Scientists tested biochar's effectiveness for water conservation, plant yield and soil health on farms in various soil types with conclusive water saving results. The Sonoma County Biochar Project, led by Sonoma Ecology Center includes the following partners: Gold Ridge Resource Conservation District, North Coast Resource Conservation & Development Council, New England Biochar and Banchero Tree Service.

  - In partnership with Sonoma Clean Power, the Water Agency is currently studying the feasibility of a forest fuel reduction pilot project featuring a mobile power generation unit serving to convert woody biomass to electric power to offset local energy needs and to make char.

  - Plans are underway to engage the Summer Youth Ecology Crews and Water Agency's Stream Maintenance Program crews in forest thinning and trail building activities reducing fire risk and training youth crews in skills for future forest management work.

- **Regional and/or County-wide PTEIR:** Numerous discussions are occurring about how best to plan for the fuel breaks, fuel reductions and other forest management needs throughout the county.

- **2017 North Coast Forest Conservation Conference**: The first North Coast Forest Conservation Conference occurred in 2012 at Santa Rosa Junior College's Shone Farm. The conference was wildly successful, and planning has begun for the next conference in June of 2017. The theme of the conference is "Growing Resilience in our Forests and Woodlands."

April 4, 2016

To the Forest Climate Action Team:

We appreciate the opportunity to review and offer our perspective on the **California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate** (March 9, 2016). We applaud your effort to use credible research to inform the development of the California Forest Carbon Plan. In the same spirit, we wish to share additional research from Save the Redwoods League's Redwoods and Climate Change Initiative, a $5 million research program investigating the impacts of climate change on the redwoods forest since 2009. This research shows that the coast redwood forest ecosystem is growing exceptionally well, is not suffering the same negative climate change impacts described in the Concept Paper and is, therefore, a highly effective forest type for carbon sequestration and long-term storage. The research results include:

- **Record-breaking carbon storage documented in coast redwood forests** – Aboveground biomass (5190 Mg ha^{-1}) and carbon (2600 Mg ha^{-1}) in old-growth coast redwood forests is the highest recorded globally for terrestrial ecosystems and is composed of 62-77% decay-resistant *Sequoia sempervirens* (coast redwood) heartwood (Van Pelt et al. Forest Ecology and Management). This demonstrates that forest conservation and management for retention and recruitment of old-growth forest structure and function protects California's best ecosystem for carbon storage.

- **Redwoods of all ages exhibit unprecedented growth rates** – Wood production has increased phenomenally in coast redwood over recent decades throughout its range, concurrent with anthropogenic climate change (see attached Fig. 1; Sillett et al. 2015, Ecological Monographs). Not only is coast redwood wood being produced quickly, but it this wood is known to be retained for centuries under compatible forest management because redwood is incredibly decay resistant and effective for carbon storage in both standing and dead trees (Van Pelt et al. Forest Ecology and Management).

- **North coast redwood forests are buffered from regionally intense droughts** – A recent study of tree rings from coast redwood throughout the ecosystem range shows that for centuries of California history, coast redwood trees up to 2500-years-old recover from drought conditions repeatedly and northern coast redwood trees are highly buffered from statewide drought impacts (Carroll et al. 2014, PLOS One).

- **Stable climate refuge predicted for north coast redwood forests** – Climate forecasts predict that while a significant portion of the coast redwood ecosystem may become warmer and slightly drier in the coming decades, a majority of coast redwood forests in Humboldt and Del Norte Counties will experience little to no change in climate (Fig. 2; Fernández et al. 2015, Global Change Biology). None of the predicted climate changes for the coast redwood region are likely to exceed the physiological thresholds for growth and reproduction.

Given the strong scientific evidence that coast redwood forests are champions at carbon sequestration, currently resilient in the face of climate change, and predicted to be a notable climate refuge in California, the redwood forests are especially worthy of California's investment to help reach the state's carbon sequestration and storage goals. We encourage the Team to reflect the lessons from the research described here in the Concept Paper, and to acknowledge the variability among California forest types and geographies and the corresponding variability in both resilience to climate change and potential for carbon sequestration and storage. Please let us know if we can be a further resource for information on north coast forests. Thank you for your consideration.

Best wishes,

Emily Burns, PhD
Director of Science

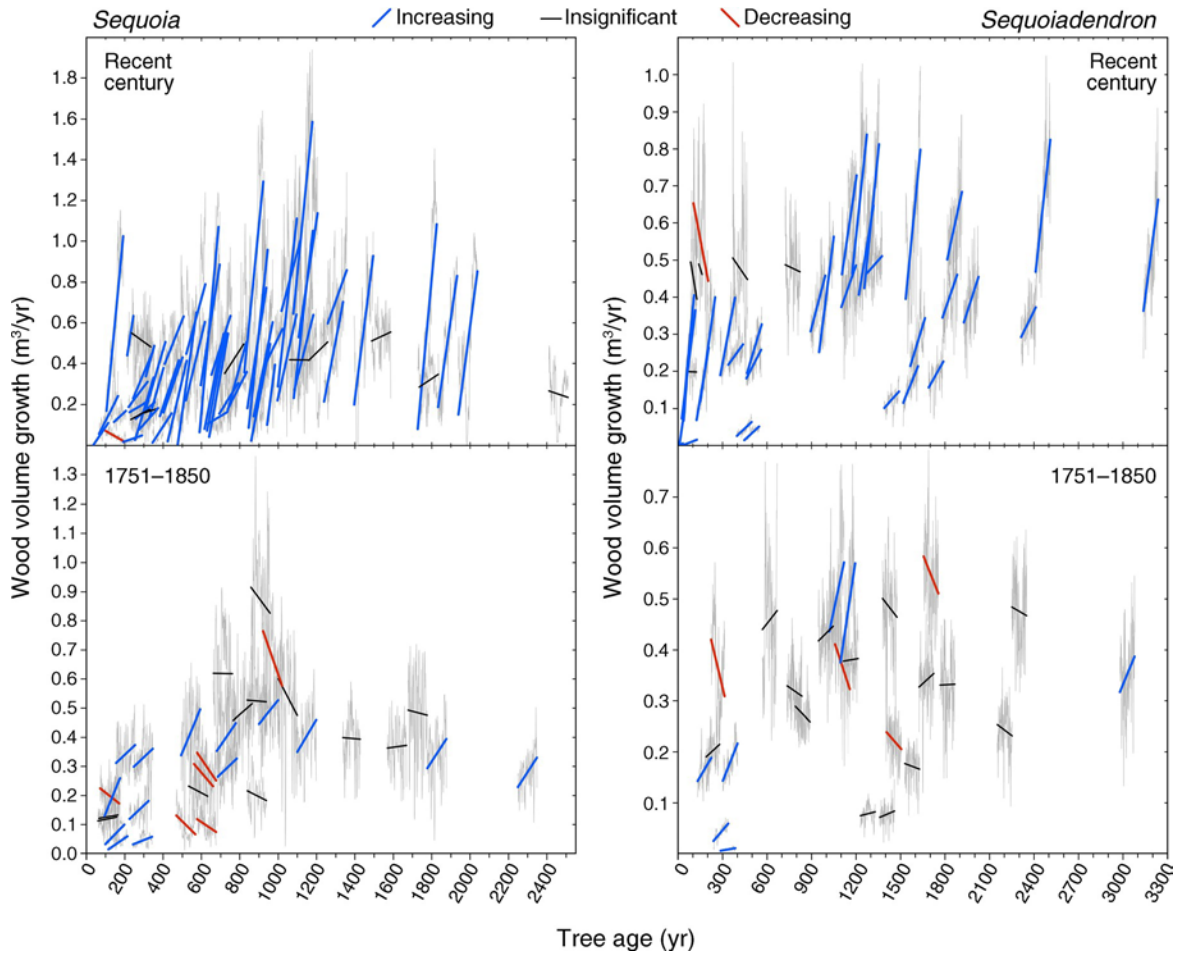

Figure 1 – The trends in coast redwood (*Sequoia*) and giant sequoia (*Sequoiadendron*) trunk growth for the time periods 1751-1850 and the recent century. Each grey line trace represents the growth history of an individual redwood over time. Each trace is fit with a colored line depicting the direction and magnitude of the average growth trend (two-tailed $P < 0.01$). A blue trend line indicates that the redwood increased wood production, a red trend line indicates the redwood decreased wood production, and a black line indicates the redwood showed no change in wood production over the time period. A majority of trees studied in the old-growth Redwoods and Climate Change plot network show significantly increased growth rates during the most recent century (a majority of the trend lines are blue and significantly positive). Figure from Sillett et al. 2014.

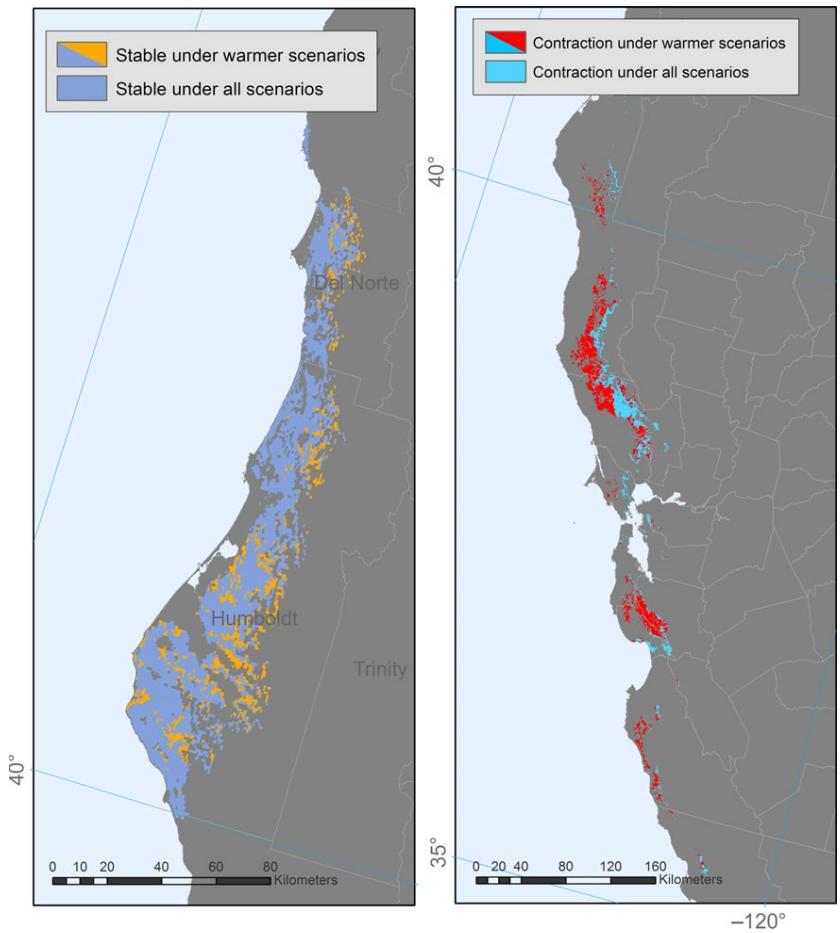

Figure 2 – Ensemble climate model results for the coast redwood range predict climate stability for the north coast redwood region of Humboldt and Del Norte County (left map) and a contraction in the historic climate regime for the central and southern portion of the range (right map). Predicted climate stability suggests that weather patterns will not significantly change, while the forecasted climate contraction of historic climate regime will expose southern coast redwood forest to different, but not necessarily detrimental weather patterns in coming decades. Figure from Fernández et al. 2015.

<u>Literature Cited</u>

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PLUMAS COUNTY PLANNING & BUILDING SERVICES
555 Main Street, Quincy, CA 95971 **www.countyofplumas.com**
(530) 283-7011

April 8, 2018

Re: Comments by Plumas County on the draft Forest Carbon Plan Concept Paper.
Via email transmission to: fcat.calfire@fire.ca.gov
From Randy Wilson @ randywilson@countyofplumas.com

Plumas County welcomes the opportunity to comment on the draft Forest Carbon Plan Concept Paper (Plan).

As the Planning Director for Plumas County, I would like to commend you on your Plan development approach. It is difficult to put unfinished work before the public. But as I know from our recent General Plan update, early involvement is a key to a successful Plan. For me, a successful Plan is built from the ground up by those that will carry it out and adapt it for the future.

The process you outline for completing the Plan means that while we can see the outlines of the Plan in the Forest Carbon Plan outline, there are different levels of detail. You are asking for input specifically on goals, vision, and intent. We get a preview of science, strategies, and a funding portfolio for more context.

We comment on the goals, vision, and intent sections recognizing that some of our suggested edits may belong elsewhere in the Plan. Please consider our comments in the development of the appropriate Plan sections. Plumas County supports the Plan's goals for wildland forests, with some suggestions.

Suggestions for the Goals for wildland forests: (Pg. 22) Added: *in italics*) below:

"Goal: Increase protections on forested lands to reduce the rate of fragmentation and conversion to non-forest uses, to preserve forestland sequestration potential, and to promote infill and compact development. "(Add: *In order to reduce risk of forest conversion to non-forested conditions through catastrophic wildfire, conserve carbon stocks in forestlands through restoring more open stands and fire resistant conditions.)*

"Goals: Increase all forest carbon storage pools and minimize GHG and black carbon emissions in a sustainable manner so that the carbon bank in living trees is resilient and grows over time, as ecological limits allow. These management and restoration objectives and strategies must be applied flexibly across National Parks, National Forests, other federal forests, State Forests, State Parks, County Parks, industrial timberlands, family forests, etc. The methods and intensity applied will have to be tailored to any given forest stand and related to conditions and management activities around it to maximize beneficial watershed or landscape-scale impacts.

California's high-level forest carbon goal is to progressively scale up to get an additional 500,000 acres/year of nonfederal forestlands and smaller federal forest lands under plans and appropriately managed to improve forest health, with performance assessment for carbon sequestration." (Add: *The total forest landscape restoration goal is 1 million acres of forestlands acres/year.)*

Plumas County supports the following draft strategies:

Local

- Support local efforts to generate funding for fire prevention, forest health projects, the development of wood product and biomass facilities, and urban forest projects.

- Land use planning for forest protection and conservation in general plans.

- Support rural and disadvantaged communities with opportunities for training and jobs implementing forest (wildland and urban) management and treatment programs.

Private

- Support purchases of forest carbon offsets to improve forest health, maintain working forestlands, and establish urban forests.

- Support the establishment and care of urban forests.

- Support voluntary conservation easements and tax credits to protect important native forests facing pressures for conversion to non-forest land uses.

- Support strengthening of markets for forest products that provide carbon sequestration and emission displacement benefits

- Invest in infrastructure required for active management of forestlands and production of forest products and biomass energy.

Suggestions for broadening the **Vision**: (Added: *in italics*) below:

The Forest Climate Action Team (FCAT) has developed a Vision Statement for its work:

The Forest Carbon Plan will provide forest carbon targets and an array of strategies to promote healthy wildland and urban forests that protect and enhance forest carbon and the broader range of forest environmental services for all forests in California, (Add: *including providing opportunities to implement the Plan through partnerships with all levels of government, through local and regional forest and watershed collaboratives, and with the public.)*

Our vision of forest protection, enhancement, and innovation includes:

- Sustainable forests that are net sinks of carbon.

- Healthy forests that are resilient to anticipated climate change effects, including increased forest insect and disease threats and higher wildland fire risks (Add: *and increasing drought stress and mortality - especially for mature forests and habitats they provide for special status forest species).*

- Forests that provide for healthy watersheds and water supplies (quality, quantity, and infrastructure) (Add: *and that are more drought resilient in more variable precipitation regimes).*

- Forests that provide management (Add: *conservation and stewardship)* opportunities that generate long-term economic benefits for landowners, workers, and communities.

- Working forests that produce wood products and biomass for energy and (*that)* are managed to maintain forest health and biodiversity (Add: *and that include both forest product and forest stewardship related employment opportunities for DAC and tribal communities.)*

- Forests that are protected from fragmentation and conversion (Add: *from development and from conversion to non-forest conditions by catastrophic wildfire)* and that (Add: *across forest types and ownerships*) provide a diverse range of quality, interconnected habitat types for terrestrial and aquatic wildlife species, including listed and non-listed, (Add: *and tribally important*) species

- Forests that provide an abundance of outdoor recreational and tourism opportunities (Add: *and include opportunities for reintroducing tribal forest ecosystem management (Traditional Ecological Knowledge into outdoor education,)* recreation and tourist experiences in forests.

- Integrated carbon, restoration, and wildfire protection goals (Add*: that are implemented across all forest landownerships and that include opportunities for collaborative forest health assessments and actions. Include opportunities for reintroducing Traditional Ecological Knowledge as essential parts of fire reintroduction and forest and carbon conservation at multiple scales.)*

- Extensive, well-managed urban forests that sequester carbon; provide significant environmental, social, economic, (Add: *and public health*) co-benefits to communities rich and poor, (Add; *urban and rural*); and yield wood products and biomass when trees must be removed.

- Collaborative, adaptive, and innovative planning and implementation (Add: *at all scales and across all lands. Effective collaborative adaptive, and innovative planning and implementation includes existing and emerging forest, water and watershed, and habitat conservation partnerships at all levels and through developing targeted actions and investments for ensuring that DAC and tribal benefits are tangible co-benefits of sustaining and restoring the forest ecosystems*

<u>Suggestions for the broadening the **Intent** of the Forest Carbon Plan:</u> (Added: *in italics*) below:

It is our intent that the Forest Carbon Plan:

- Summarize the best available science about carbon sequestration and climate pollutant emissions in California's forests, over a wide range of natural conditions and management situations *(*Add*: including increasing and more prolonged drought stress and the conservation of forests and habitat connectivity through prolonged droughts.*

- Establish forest health and resiliency conditions (Add: *Forest health resiliency conditions at multiple management scales are needed to reach targets for carbon sequestration and net* reductions in emissions of greenhouse gases (GHGs) and atmospheric black carbon. (Add: *Collaborative landscape scale targets for the different forest types and ownerships can then be "downscaled" and phased into near, medium, and long-term action targets for different regions. Near-term actions should include community firesafe and community wildfire protection programs that are embedded within larger fireshed and watershed protection and enhancement programs and include public forest ownerships and projects surrounding communities as essential and fungible aspects of achieving forest health and resiliency conditions.*

- Develop near-, medium- and long-term targets for carbon sequestration and emissions reductions by region and ownership, through 2050 and beyond, based on goals and ecosystem potential. (Add: *Incorporate "ecosystem potential " and goals, strategies and performance measures developed by forest and water and watershed collaboratives in order to enhance the effective implementation of targets.)*

- Develop implementation and investment strategies to achieve carbon sequestration targets (Add: *and integration with other related targets in the Climate Scoping Plan Update. Benefits to Disadvantaged Communities (DACs) and tribes and including specific water-related co-benefits such more drought resilient forests, conserving and connecting water sensitive forest species and habitats using Traditional Ecological Knowledge (TEK), and watershed scale benefits from reestablishing a more historic forest hydrograph*).

- Provide a framework for managing California's forested landscapes to increase carbon sequestration and reduce climate-warming emissions, alongside other values of healthy forests (Add: *at multiple scales and across public and private forest ownerships.*)

- Identify synergies and gaps in various federal and state mandates, policies, regulations, and programs related to forests, *(Add: such as achieving co-benefits of reducing moisture stress in forests and thinking about a network of forest drought refuge reserves for conserving forest types during prolonged drought. Drought refugia should include watersheds with extensive forests overlying significant soil and groundwater reserves as well as drought refugia networks in more drought-vulnerable forests.)*

- Address both (Add: *public and privately owned)* wildland forests and urban forests.

- Be consistent with state and federal wildland fire management goals and strategies. (Add: *Strengthen the effectiveness of state and federal wildland fire goals and strategies by phasing and integrating wildland community safety and forest protection with conserving forest ecosystems and forest carbon across ownerships in the larger watershed, fireshed and landscape scales that surround communities.)*

The purpose of this concept paper is to describe the framework and process that FCAT is employing to develop the Forest Carbon Plan. The FCAT further aims for this paper to foster public discussion of carbon sequestration and emission reduction goals and strategies, as well as related ecosystem, social, and economic considerations. Timely identification and discussion of forest carbon goals and targets will allow the FCAT to

provide recommendations to the Air Resources Board (ARB) for inclusion in the anticipated spring 2016 release of the Scoping Plan Update Discussion Draft.

The problems that the Forest Carbon Plan (and program) must solve are integrated and connected across ownerships by the very characteristics of carbon sequestration/GHG emissions problem itself. Fire, drought, insect epidemics, and forest fragmentation and conversion to non-forest conditions are key carbon sequestration and GHG emission drivers that recognize no ownership boundaries and which have global to local dimensions and impacts. And these key drivers present challenges with timeframes from the immediate to at least 2050.

Suggestions on strengthening connections between carbon, forest health, drought and fire and the purpose of the concept paper:
Specifically, we would suggest that the discussion on pages 3-7 be reformatted around the following key points:

- **"Past human activities, such as fire suppression and logging, influence acres burned, but the impacts are small when compared to drought, wind and temperature. A meta-analysis of over 1,200 studies and 3,200 years of evidence concluded that "managers will have to learn to work with, not against, the time-varying influence of climate on widespread fire years; recent experience suggests that it is unlikely that the forces that set up west-wide years can be resisted at the scale of individual forests or management units" (Swetnam et al., 2011). "** (Pg.7)

- **"Carbon storage strategies must also consider the broader range of environmental services that forests provide (e.g. clean water, water storage, clean air, soil productivity nutrient cycling, wildlife habitat, forest products and recreation"** (Pg.4)

- **"Relatively small changes in temperature and precipitation can affect reforestation success, growth, susceptibility to pests and forest productivity".** (Pg.6)

- **"The risk of losing all the trees to severe wildfire suggests that redistributing the total carbon storage among fewer, larger and more fire resilient trees has the highest chance of storing the most carbon in the long term."** (Pp. 4&5)

- **Forest treatments can reduce stand densities and fuel loads, restoring the structure and composition of fire-excluded forest ecosystems to better match functioning, fire-adapted ecosystem conditions. Although these treatments may result in short-term forest carbon losses through biomass removal, carbon can quickly be recovered through retention of larger trees that have the capacity to rapidly add volume. These treatments also can lead to longer-term stability of the carbon sink and increased quality in terms of:**

  - **Decreased risk of loss to catastrophic wildfire;**

  - **Increased carbon sequestration rates over time rather than decreasing; and**

  - **Increased carbon stored in live biomass compared to dead.**

- **(Add: *Reduced drought stress for residual stands)*** (Pg. 23*)*

There appears to be some disconnects between the carbon conservation strategies listed above and other aspects of the Carbon Plan.

For example, it appears that cap and trade funds allocations exclude federal lands, which comprise 60% of forests in California, and the hope that the federal government will match the "state" program, which contain some of the largest mature tree carbon stocks. The Carbon Plan should not rely on passing federal legislation that stops fire borrowing or other unsecured federal funding. Funding carbon sequestration for private forest lands rather than on all California forest lands seems inconsistent with the intent of the Carbon Plan and the Climate Scoping Plan update.

For another example, forestlands that are unsuitable for commercial harvesting but that have significant carbon storage in mature trees can accomplish catastrophic fire risk reduction through alternative methods such as prescribed burning and hand thinning and biomass removal etc....and should be an important Carbon Plan element.

And finally, **"drought"** is not a manageable factor for FCAT. On the other hand, **"water stress"** is a more manageable factor. Reducing water stress can moderate some of the 27% of tree mortality attributed to climate change in the 2016 Climate Scoping Plan Update (Pgs.7 &27).

And reducing water stress is potentially a significant co-benefit for the Carbon Plan and for the 2016 Climate Scoping Plan Update to the extent it mitigates the disproportionate drought and insect mortality in mature forests and trees. In our Integrated Regional Water Management Plan update for the Upper Feather River we have developed policy recommendations for implementing resource management strategies including forests, for the Department of Water Resources California Water Plan update. We are conducting an exploratory study of forest and water balances in the Upper Feather River watershed to begin quantifying the benefits of a restored forest hydrograph. And we have developed a suite of projects that implement the Carbon Plan vision, goals, and strategies in our region. Some of our UFR IRWM projects are in partnership with the tribes and DACs in our region. In summary, our vision, goals, objectives, and strategies are in alignment with those that we discuss above.

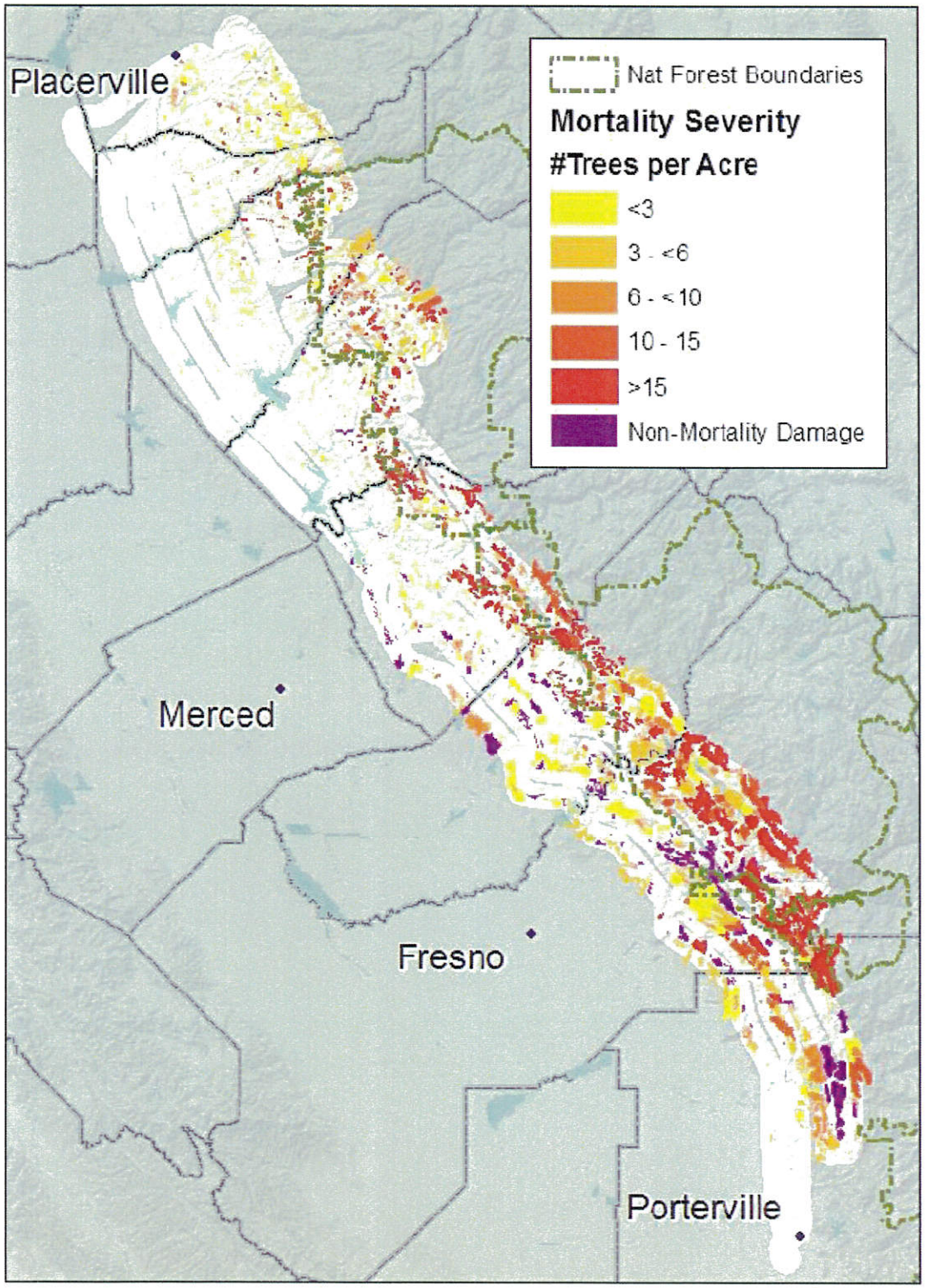


Figure 2. Tree Mortality and Other Damage in Southern Sierra Foothills, 2015 (USDA Forest Service, 2015).

Figure 2 from the Carbon Plan concept paper is illustrative of two key points. First, the drought hit some regions of California's forests harder than others. The severity of forest mortality across California's forestlands was driven by low precipitation and high temperature patterns. However, other factors such as fire and forest treatment histories, current forest structures, and available moisture were also drivers of mature tree mortality. Of these factors, water stress in multiple drought years is the least understood factor.

What is significant about the map is what is missing. Forests with more groundwater storage capacity may have exhibited less severe mortality by the 4th year of the drought. The sequestration of carbon in open stands of large trees potentially favors the forest hydrograph by reducing summer evapotranspiration and by enhancing winter infiltration into forest soils and groundwater as the forest canopy density is reduced.

"Carbon storage among fewer, larger and more fire resilient trees has the highest chance of storing the most carbon in the long term." And buffering these stands from acute moisture stress during prolonged or severe droughts may be a significant co-benefit- especially in forests overlying thick soils with connected aquifers

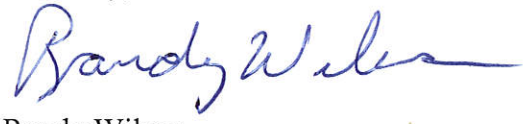
These more groundwater rich and drought tolerant forests may be the areas not depicted in Figure 2. The Southern Cascade and Northern Sierra regions have extensive forested areas overlying significant soil and groundwater storage capacity. And across headwater forests, there are pockets of deeper soils with connected aquifers. Groundwater augments summertime water supplies for many forest ecological hot spots such as mountain meadows and springs, aspen groves, black oak forests, riparian forests, seasonal meadows and wetlands, and stands of old growth conifers.

Plumas County supports the further integration of forest health with watershed health as the Carbon plan develops. Considering the importance of reducing moisture stress in forests and exploring the watershed benefits restoring a more natural forest hydrograph in forest health treatments may enrich the planning and implementation vision described here. **"Planning and implementation will be designed for effectiveness at the watershed or other regionally relevant large landscape scale. This approach will integrate forest management and restoration activities taking place through a number of existing statewide and regional programs and new or modified ones currently under development or recently proposed, such as the CAL FIRE GGRF-funded Forest Health Program and the Department of Fish and Wildlife GGRF-funded Greenhouse Gas Emissions Reduction through Restoration Program, both currently proposed in the Governor's fiscal year 2016-17 budget. If these proposed programs are funded by the Legislature, coordination between them would help to ensure the programs are aligned and generating watershed benefits."** (Pg. 23)

And the science described here. **"In addition to wildfire, increased stress from drought can have a deleterious effect on forest carbon sinks. A study conducted by the Universities of California, Berkeley and Davis, and the U.S. Geological Survey found that the drought has contributed to denser forests with smaller trees, which has implications for the quality of those forest carbon sinks and their risk of loss due to severe wildfires (McIntyre et al., 2015). Additionally, not only is tree growth, and therefore carbon sequestration rates, stunted during drought periods, but growth rates can remain impacted for additional years after the drought has ended (Anderegg et al., 2015). However, Dore et al. (2012) found that when a drought hit their study site in the third year following implementation of their treatments, treated forests were able to sustain their carbon sequestration rates under significantly hotter and dryer conditions than the untreated stands, despite the fact that the treated site had fewer trees and leaf area. These findings have important implications for the benefits of forest treatments on the resiliency of forest carbon sinks in times of drought. "**(Pg. 10)**. California's historic drought and unprecedented tree mortality have focused significant public attention on forests and the wildland-urban interface. Accordingly, there has been great public interest in the Forest Carbon Plan as a vehicle to deliver forest-based policies that will address concerns for forest health. This concept paper is intended to invite public engagement in developing forest health management strategies.** (Pg.3)

Thank you for the opportunity to comment. I look forward to further development of the Carbon Plan. If you have questions or comments, please do not hesitate to contact me.

Sincerely,



Randy Wilson,
Planning Director
County of Plumas
(530) 283-6214
randywilson@countyofplumas.com

cc: Directors for the Plumas County Flood Control and Water Conservation District (District).

cc: Regional Water Management Group for the UFR IRWM Plan

cc: Leah Wills leah2u@frontiernet.net (UFR IRWM Plan Uplands and Forests Workgroup Coordinator and staff for the District)

April 8th, 2016

Forest Climate Action Team
c/o California Department of Forestry and Fire Protection
1416 9th Street
Sacramento, CA 95814

Re: Comments on the California Forest Carbon Plan Concept Paper

Dear FCAT team:

Center for Sustainable Economy (CSE) has the following brief comments to offer on the "California Forest Carbon Plan Concept Paper: *Managing our Forest Landscapes in a Changing Climate*." CSE is a non-profit advocate for a sustainable economy. One of the issues of most concern to our partners and members is the ongoing crisis over deforestation and forest degradation in California, Oregon and Washington. The areal extent of forest cover in California has declined by at least 1.8 million acres since 2000.[1] Wildfires, drought, and disease have certainty taken their toll, but industrial forest practices are also to blame.

These practices include clearcutting and other forms of even-aged management, excessive building of logging roads, rapid rates of harvest, short rotations and heavy applications of chemicals and fertilizers. Roughly 35,000 acres of forest per year are cut down using intensive forest practices like these in California.[2] Not only are these practices devastating to clean water supplies, native coldwater fish, wildlife that needs interconnected and structurally diverse forests, soils, and scenic and recreational values, but they represent a significant source of greenhouse gas (GHG) pollution that is unregulated under California's climate action programs.[3] In western Oregon, industrial forest practices represent the second largest source of GHG emissions and are also completely unregulated.[4]

As such, we believe that the Forest Carbon Plan is a critical opportunity to reverse this trend by creating strong disincentives like carbon taxes, caps, or impact fees for high GHG practices and by incentivizing forest practices that minimize emissions and maximize carbon sequestration and storage. The payoff for California's climate goals could be substantial. If sustainable forest practices and investments in climate change resilience had been implemented over the past 14 years and successful at maintaining forest cover, forests lost during this time period could be

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[1] The World Resources Institute's Global Forest Watch program monitors forest cover loss and gain worldwide. Between 2000 and 2014, California has lost 1,029,003 hectares of land that meets a minimum forest cover definition of trees at least 5 meters high with a canopy closure of at least 30%. Reforestation and afforestation added 291,917 hectares through 2012. Available online at: www.globalforestwatch.org.

[2] CalFire maintains data on timber harvest plan (THP) submissions, and these figures are the most recent available for statewide clearcutting and shelterwood cutting treatments.

[3] Although California's Environmental Quality Act (CEQA) requires a timber harvest plan to include an estimate of carbon dioxide emissions, it is unenforceable. More importantly, emissions from this sector are not regulated with a mandatory cap or any other policy tool.

[4] Talberth, John, Dominick DelaSalla, and Erik Fernandez. 2015. Clearcutting our Carbon Accounts: *How state and private forest practices are subverting Oregon's climate agenda*. Lake Oswego, OR: Center for Sustainable Economy. Available online at:

sequestering roughly 3 million metric tons CO2-e per year.[5] Instead, they are largely in open clearcut condition or otherwise degraded and a net source of GHG emissions.

Against this backdrop, we find the Forest Carbon Plan Concept Paper lacking in several significant ways:

(1) The Forest Carbon Plan should establish mandatory GHG emissions reporting requirements that include emissions from timber harvest, post-harvest decay, foregone sequestration, and forest chemicals and fertilizers.

Industrial forest practices generate significant GHG emissions in a number of ways. Stored carbon is removed from the site, and, at best, only 18% of the original carbon stored ends up in long-lived wood products.[6] Decay of slash and waste generated throughout the product life cycle ensure that the other 82% of a site's original carbon stock ends up in the atmosphere in a very short time period. For the next twelve to fourteen years, sites treated with even-aged techniques continue to be net carbon dioxide emitters as decay of slash, roots, stumps, and other dead matter continues.[7]

Industrial forest practices also generate emissions associated with foregone sequestration – an important component of standard GHG emissions protocol developed by the IPCC at the international level.[8] These emissions are typically quantified as the sequestration that would have occurred if not for the timber harvest activity and associated road construction. In addition, chemical herbicides, pesticides, and fertilizers applied to reforested lands also have a high carbon content that has been well documented in the field.

These four elements: carbon lost to harvest, carbon lost from decay of waste, slash, roots, stumps and other debris over a 12-14 year period post-harvest, emissions associated with foregone sequestration, and emissions associated with forest chemicals and fertilizers should be part of a mandatory emissions reporting framework adopted by FCAT in the context of its Forest Carbon Plan. The existing CEQA reporting requirements administered by Cal Fire are insufficient as they exclude most of these factors. To be compatible with other mandatory reporting sectors, reporting should be required for each forestland owner (entity) who engages in industrial forest practices in a given year across its entire ownership.

(2) For the purposes of GHG emissions reporting, the amount of sequestration occurring on an entity's land that is not subject to timber harvest in a given year is irrelevant.

Reforestation is a legal baseline requirement of California's Forest Practices Act and thus the carbon sequestered by reforested lands should not be invoked directly or indirectly to mask or

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[5] Based on the average annual CO2 sequestration rates presented in Tables 4 and 5 of the Concept Paper.
[6] Ingerson, A. 2009 Wood Products and Carbon Storage: Can Increased Production Help Solve the Climate Crisis? Washington, D.C.: The Wilderness Society.
[7] Turner, David, Michael Guzy, Michael Lefsky, William D. Ritts, Steve Van Tuyl, and Beverly E. Law. 2004. Monitoring Forest Carbon Sequestration with Remote Sensing and Carbon Cycle Monitoring. *Environmental Management* 33(4): 457-466.
[8] See, e.g. Plevin, Richard, Holly K. Gibbs, James Duffy, Sahoko Yui and Sonia Yeh. 2014. Agro-ecological zone emission factor (AEZ-EF) model. Davis, CA: University of California and the California Air Resources Board.

offset an entity's actual emissions in a given year or responsibility for reducing those emissions should the industrial forest sector be regulated as recommended here. Enhanced sequestration projects that an entity implements in a given year are a better basis for any such "credits," but these need to be carefully evaluated against the standards of verifiability, additionality, permanence and other objective criteria. Closing, obliterating, and replanting logging roads or reforesting degraded lands are examples of sequestration-enhancing projects that are more likely to succeed.

(3) Emissions from industrial forest practices should be regulated on par with other GHG polluting sectors.

The current AB32 Scoping Plan contains a laudable goal for California's forests: "California forests must be managed to ensure that they provide net carbon storage even in the face of increased threats from wildfire, pests, disease, and conversion pressures."[9] But to accomplish this goal, GHG emissions from industrial forest practices should be regulated on par with other sectors. The Forest Carbon Plan should propose specific actions to accomplish this, including implementation of forest carbon taxes, impact fees for high GHG operations, mandatory reporting requirements based on the factors discussed above, enrolling industrial forest activities into the Cap-and-Trade program, or some combination of all these measures.

(4) Growth data is not a good indication of sequestration and should be dropped in favor of more reliable metrics such as net ecosystem productivity.

Although we oppose the concept of using sequestration estimates to mask or offset a particular entity's emissions because of the additionality constraint, it is important to understand the degree to which California's forests are meeting the goal of net carbon storage. In the Concept Paper, FCAT uses growth as a proxy for sequestration, with growth data derived from the Forest Inventory and Analysis (FIA) data.

However, growth is not synonymous with sequestration, in fact it greatly overstates it simply because forests do indeed put on more biomass each year as they grow but they also respire CO2 in the form of dead and dying vegetation, soils, fungi, and animals. Net ecosystem productivity (NEP) is viewed as a much more accurate metric. NEP is the net effect of photosynthetic carbon uptake and release of carbon to the atmosphere from respiration by autotrophs (plants) and heterotrophs.[10] The Forest Carbon Plan should establish a program to regularly monitor NEP as a basis for sequestration estimates.

(5) Maintenance of forest cover should be an important metric to gauge sustainability.

The maintenance of forest cover is, perhaps, the single most important metric to track since as forest cover disappears so to does the diverse array of ecosystem goods and services such forests provide. And as forest cover disappears, climate vulnerability increases as more watersheds are subject to abnormally hot and dry conditions. As noted above, California has experienced a loss

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[9] State of California. 2014. First Update to the Climate Change Scoping Plan: Building on the Framework Pursuant to AB32, The California Global Warming Solutions Act of 2006.
[10] Turner et al. 2004, Note 7.

of roughly 1.8 million acres of forest cover since 2000. Part of this loss is related to the rate of logging – rates of logging that exceed the rate of forest regrowth will cause a reduction in forest cover. The critical task for FCAT is to monitor forest cover trends with the eventual goal of halting and reversing its loss in California. Forest cover trends should be reported on an entity basis so that good actors (those who use forest management techniques that maintain forest cover) and bad actors (those who use clearcutting and other even aged techniques that reduce forest cover) can be identified and regulated accordingly.

(6) Forests managed for biomass and bioenergy will lead to increased GHG emissions and should thus not be encouraged through policy incentives.

Forests managed for to produce biomass for energy (bioenergy) or biomass for other uses are among the most intensive GHG emitters because they are typically managed in an industrial plantation style involving rapid harvest rates, extensive clearcutting or even aged management, dense road systems, and heavy use of fertilizers, pesticides, and herbicides. Foregone sequestration is a major issue since these plantations never have a chance to attain their peak sequestration and storage potential.

According to the US Energy Information Administration (EIA) "analysts have debated whether the increased use of biomass energy may result in a loss of terrestrial carbon stocks and foregone future sequestration by natural vegetation. The initial loss of carbon stocks in natural vegetation cleared to grow biomass feedstocks and the foregone future removal of CO_2 are not captured in energy sector emissions."[11] In fact, burning biomass has shown to emit more CO2 that fossil fuels per megawatt energy generated.[12] Given this the Forest Carbon Plan should not encourage the use of California's forests for biomass or bioenergy in any way. The references encouraging biomass and bioenergy facilities should be removed.

Thank you for the opportunity to comment. We look forward to seeing how these issues are addressed as you continue to develop the Forest Carbon Plan in the months ahead.

Sincerely,

H. John Talberth
President and Senior Economist
Center for Sustainable Economy
16869 SW 65th Avenue, Suite 493
Lake Oswego, OR 97035-7865
(503) 657-7336
jtalberth@sustainabe-economy.org

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[11] US Energy Information Administration. 2011. Emissions of Greenhouse Gases in the US. 6.1 Total land use, land use change, and forests. Available online at: http://www.eia.gov/environment/emissions/ghg_report/ghg_land.cfm.

[12] The Partnership For Policy Integrity maintains a good summary of the research on this issue. Please visit: http://www.pfpi.net/carbon-emissions.

A PUBLIC AGENCY
NCPA
NORTHERN CALIFORNIA POWER AGENCY

651 Commerce Drive
Roseville, CA 95678

(916) 781-3636

www.ncpa.com

April 6, 2016

Director Ken Pimlott
California Department of Forestry and Fire Protection
1416 9th Street
Sacramento, CA 95814

SUBJECT: **California Forest Carbon Plan Concept Plan**

Dear Director Pimlott:

NCPA thanks you for the opportunity to offer comments on the Forest Climate Action Team's (FCAT) *California Forest Carbon Plan Concept Plan* (Concept Plan), which we generally support. This letter provides (1) background information on why NCPA is interested in FCAT's efforts and (2) comments to help improve the Concept Plan. We appreciate the time and effort that went into preparing the Concept Plan and we look forward to working with you in the future on this high priority issue.

I. Background

A. NCPA and Impact of 2015 Fires

NCPA is a Joint Powers Agency that has been actively involved in the development of the state's climate program. We represent 15 utilities in northern and central California, including 13 public power municipal utilities and one rural electric cooperative—some of these utilities are in communities that are high risk fire zones. NCPA is focused on providing our member utilities with clean, affordable, and reliable power. The agency does this in large part through our member-owned geothermal power plant at the Geysers in Lake County and hydroelectric operations in Calaveras County.

Catastrophic wildfires—which are increasing in number and intensity each year in California—pose a real threat to the reliability of our state's energy supply. Additionally, any loss of renewable energy caused by wildfires has a direct impact on the ability of utilities to meet the state's energy and environmental standards.

Last September, the Valley Fire in Lake County burned more than 70,000 acres. In addition to several NCPA employees experiencing the loss or damage to their homes, the fire damaged several geothermal electric generation facilities as well as transmission lines at the Geysers. This reduced the availability of baseload renewable energy to California consumers, not to mention jeopardizing a highly-successful wastewater disposal system for Lake County that has helped extend the life of the Geysers by delivering treated wastewater to the steam fields.

With the aid of NCPA members who sent crews to Lake County to help, we were able to bring our geothermal plant operations back online within a week of the fire; however, we lost the ability to generate approximately 9,400 megawatt hours of renewable power during the time the plant was down. Our geothermal neighbors, however, were not so fortunate. Five of the 14 units operated by Calpine at the Geysers are too damaged to operate and may be offline for several months if not longer, which reduces the availability of clean geothermal power to California consumers by about 100 megawatts.

Simultaneously, the Butte Fire, which affected Amador and Calaveras Counties, threatened to shut down and potentially damage our 250 megawatt hydroelectric plant located in Calaveras County. For a few days, fire damage to transmission lines severed ties between NCPA's six megawatt New Spicer Meadow's hydroelectric powerhouse and the California Independent System Operator grid.

B. Impact of Fire on Renewable Energy

As the Concept Plan explains, "Decades of fire suppression, coupled with limited forest management activity, have left many of California's forests with higher densities of small trees and fewer large trees on the landscape overall compared to historic forest conditions." These forest conditions are unnatural, and when combined with climate change, prolonged periods of drought, and bark beetle infestation, substantially increase the risk of catastrophic wildfires and complicate response efforts.

Unfortunately, this fire issue poses a major threat to the state's renewable energy infrastructure. A significant amount of the state's GHG-free hydroelectric power and eligible RPS geothermal energy is generated in "very high fire hazard severity zones" according to CAL FIRE (see the attached maps). As the state experiences more frequent catastrophic wildfires, it is inevitable that more renewable energy will be lost and replaced with spot market purchases, which predominately consists of energy from fossil fuel power plants (this was the case when NCPA lost renewable generation due to the Valley Fire and Butte Fire). These types of impacts, if not addressed, will hinder efforts to comply with the state's ambitious 2030 GHG reduction and RPS goals.

C. Severe Wildfires Compromise the Energy Sector's Climate Efforts

In 2015, the Valley Fire, Butte Fire, Jerusalem Fire, and Rocky Fire burned a combined 241,491 acres of land. This equals approximately the same amount of land burned by the Rim Fire in 2013 (the third largest wildfire in California history). Initial estimates indicate that the Rim Fire released 11,352,608 metric tons of GHG emissions. Based on the US EPA's website, those emissions are roughly equivalent to each of the following:

- Annual greenhouse gas emissions from 2.3 million cars;
- Carbon dioxide emissions from 1.2 billion gallons of gas consumed;
- Carbon dioxide emissions from the electricity use of 1.5 million homes for one year; and,
- Annual carbon dioxide emissions of 3.2 coal fired power plants.

These fires compromise the significant efforts and resources utilities have put into reducing GHG emissions in the state. And the intensity and frequency of wildfires will only worsen. In fact, we are seeing this trend now, with 13 of the 20 largest fires in state history taking place in the last 15 years. This is a critical challenge that warrants immediate action.

D. Severe Wildfires Can Reduce Hydropower Generation

Wildfires such as the Rim Fire in 2013 and the King Fire in 2014 are already having impacts on hydroelectric generation in California, producing hundreds of thousands of fire-ravaged acres of runoff each year, with the sediments from these fires finding their way into the reservoirs that make up California's extensive system of hydroelectric resources. This can reduce hydroelectric generating capacity that provides critical operational flexibility to a grid more reliant than ever on intermittent resources to meet the needs of the California economy.

E. The State's Black Carbon Policy

Short-lived climate pollutants, such as black carbon, are powerful climate forcers and dangerous air pollutants that remain in the atmosphere for a much shorter period of time than longer-lived climate pollutants, such as CO2.

Black carbon emitting resources include wildfire, fuel combustion in the industrial and power sector, fireplaces and wood stoves, off-road mobile, and on-road diesel vehicles. Among these, wildfire is by far the largest source of black carbon emissions in California. An average wildfire season contributes two-thirds of current black carbon emissions in the state.

The California Air Resources Board (ARB) recently released its *Draft Short-Lived Climate Pollutant Reduction Strategy*. In this document, ARB proposes targets to reduce black carbon emissions by 50 percent below current levels by 2030. This target, however, purposely excludes reductions in black carbon from wildfires. Without considering wildfires in ARB's strategy, the 50 percent target becomes arbitrary and places a disproportionate burden on the energy sector, which is already making great strides in reducing overall carbon emissions.

F. NCPA Supports State Policies That Reduce the Risk of Wildfires

Reducing catastrophic wildfires in the state has multiple public benefits. It helps protect the reliability of much of the state's baseload renewable energy generation. From a GHG perspective, preventing wildfires reduces the risk of losing renewable energy generation and avoids harmful emissions, such as black carbon. To that end, NCPA supports policies and programs that address the wildfire issue, including promoting fuel treatment (e.g., forest thinning, prescribed fire) and biomass projects. NCPA supports funding these efforts with resources such as the Greenhouse Gas Reduction Fund (i.e., cap and trade auction revenues), as proposed earlier this year by the Governor.

II. Comments on the Concept Paper

A. Preamble

The preamble of the Concept Paper explains that "the Air Resources Board will use the information developed in this process as the basis for goals for forest carbon sequestration and for reduction of greenhouse gas and black carbon emissions in the 2016 Scoping Plan Update." The Concept Paper and any other work on FCAT's Forest Carbon Plan should also be shared with ARB to be incorporated in ARB's goal of reducing black carbon by 50 percent by 2030.

Pursuant to SB 605 (Lara, Chapter 523, Statutes of 2014), ARB was required to complete, no later than January 1, 2016, a comprehensive strategy to reduce emissions of short-lived climate pollutants in the state. As discussed above, ARB released a draft strategy on short-lived climate pollutants that calls for reducing anthropogenic black carbon by 50 percent by 2030. The draft strategy excludes a goal for reducing black carbon from wildfires; however, this exclusion was not authorized by SB 605. To complete its strategy, ARB should incorporate FCAT's plan to reduce black carbon from wildfires.

B. Introduction

NCPA agrees with FCAT's vision of forest protection, enhancement, and innovation, especially those related to healthy forests that are resilient to higher wildland fire risk; increasing water supplies; working forests that are managed to maintain forest health (this includes biomass for energy); and integrating wildfire protection goals.

Based on the impact fires have on energy reliability and renewable energy infrastructure—which is essential to meeting the state's GHG emission reduction goals—NCPA recommends including "the protection of the state's energy infrastructure" as part of FCAT's vision in the Concept Paper.

C. Purpose and Scope of the Forest Carbon Plan and this Concept Paper

NCPA agrees with FCAT's intent that the Forest Carbon Plan "[e]stablish forest health and resiliency conditions needed to reach targets for carbon sequestration and net reductions in emissions of greenhouse gases (GHGs) and atmospheric black carbon." As discussed above, catastrophic wildfires hinder the energy sectors efforts to reduce GHG emissions. Moreover, two-thirds of the state's black carbon comes from wildfires.

NCPA suggests that FCAT also lists "Promoting co-benefits, such protecting the state's energy infrastructure" as one of its intent items for the Forest Carbon Plan.

D. Forests of California

NCPA agrees with FCAT's statement that "[f]orest losses due to climate change not only threaten carbon storage and emissions from forests, but also threaten water resources, energy transmission, the survival of fish and wildlife, and human health." NCPA, however, suggests replacing "energy

transmission" with "energy infrastructure (e.g., transmission lines and power plants)," especially in light of the effects the Valley Fire and Butte Fire had on NCPA's renewable energy power plants.

E. Goals and Management Strategies

NCPA strongly agrees with FCAT's goals and management strategies to enhance wildland forests, especially related to the following management parameters and actions that will help reduce the risk of severe wildfires:

- Align and or integrate cross-jurisdictional management goals to optimize carbon storage and stewardship efforts, including wildfire protection strategies and actions (e.g., location and management of fuel breaks);
- Increase the pace and scale of the use prescribed fire for fuels reduction and restoration of ecological processes; and,
- Increase the pace and scale of mechanical and manual fuel reduction treatments.

NCPA also agrees with FCAT's strategies to innovate by "[p]romoting research and development of appropriate bioenergy, biofuels, product manufacturing and waste management technologies that serve to support sustainable resource management." As the Concept Paper explains, this involves supporting "existing and new facilities or infrastructure that provide utilization pathways for excess woody biomass removed from forest health treatments on private and public lands." This is a vital piece of an all-the-above strategy to reduce the risk of sever wildfires and climate pollutants. This is also has several co-benefits, such as creating renewable energy and support of rural economies.

III. Conclusion

Again, NCPA appreciates this opportunity to comment on the Concept Paper and looks forward to working with FCAT on these important issues. If you have any questions or require additional information, please contact Mario De Bernardo at (916)781-4222.

Sincerely,

RANDY S. HOWARD
General Manager

FRAP

STATE OF CALIFORNIA

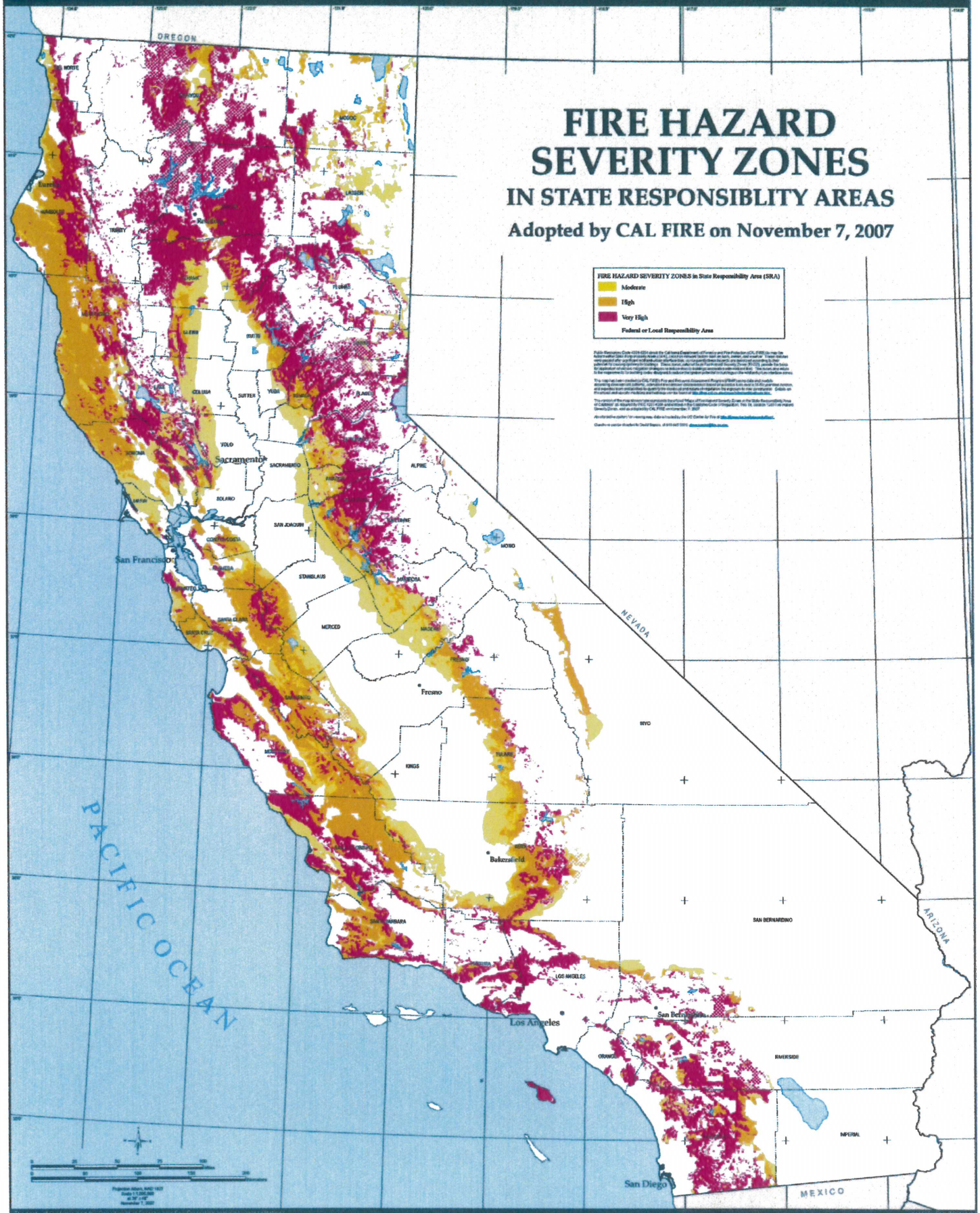
FIRE HAZARD SEVERITY ZONES

IN STATE RESPONSIBLITY AREAS

Adopted by CAL FIRE on November 7, 2007

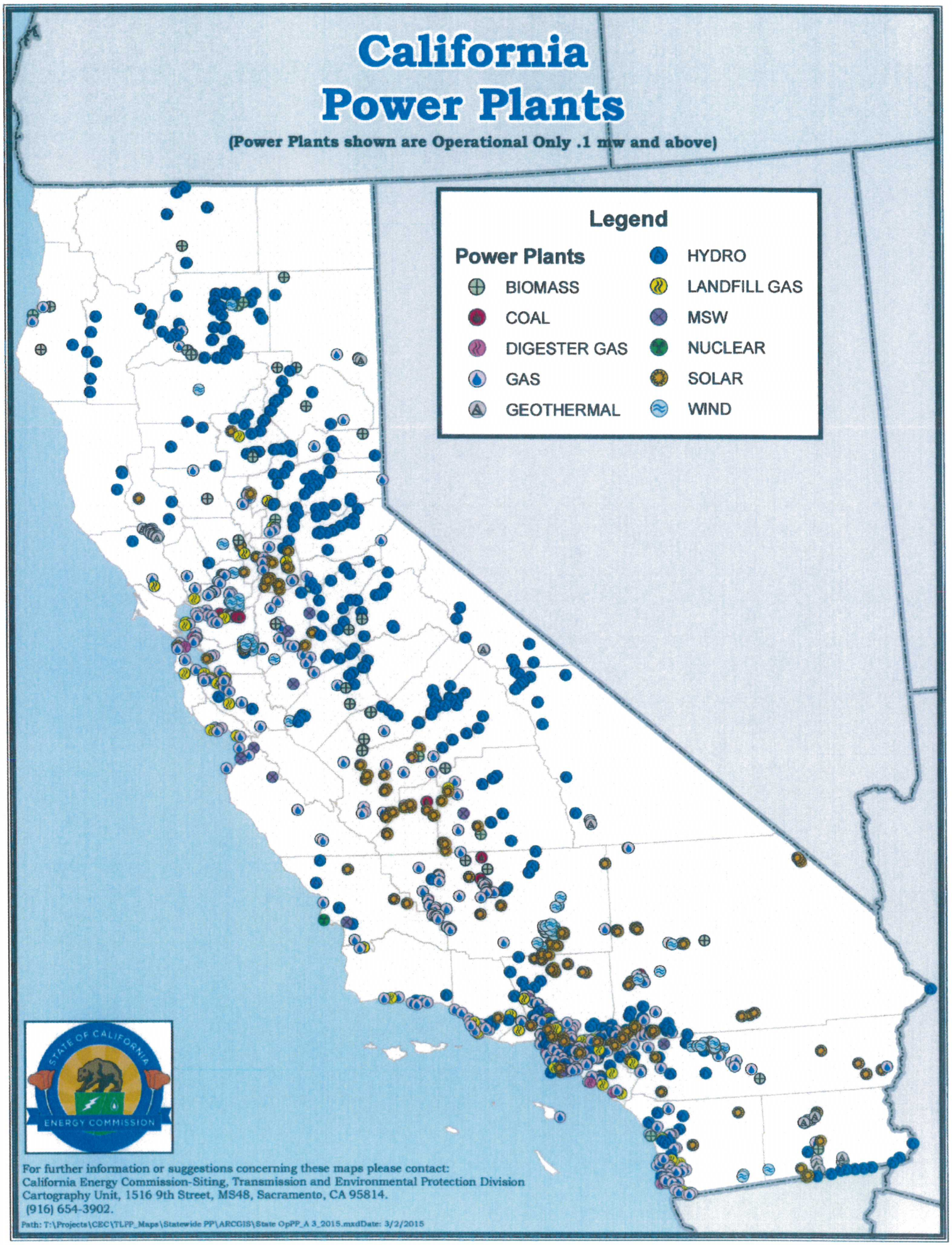
FIRE HAZARD SEVERITY ZONES in State Responsibility Area (SRA)

- Moderate
- High
- Very High
- Federal or Local Responsibility Area



California Power Plants

(Power Plants shown are Operational Only .1 mw and above)



For further information or suggestions concerning these maps please contact:
California Energy Commission-Siting, Transmission and Environmental Protection Division
Cartography Unit, 1516 9th Street, MS48, Sacramento, CA 95814.
(916) 654-3902.

Path: T:\Projects\CEC\TLPP_Maps\Statewide PP\ARCGIS\State OpPP_A 3_2015.mxdDate: 3/2/2015

April 8, 2016

Chief Ken Pimlott
CAL FIRE Director

Assistant Secretary Russ Henly
California Natural Resources Agency

Deputy Secretary Ashley Conrad-Saydah
California Environmental Protection Agency

RE: RECOMMENDATIONS ON THE CALIFORNIA FOREST CARBON PLAN CONCEPT PAPER

Dear Chief Pimlott, Assistant Secretary Henly, and Deputy Secretary Conrad-Saydah,

On behalf of the Climate Action Reserve, we would like to express our appreciation for the opportunity to submit comments following the *Recommendations on the California Forest Carbon Plan Concept Paper* released March 9, 2016. We appreciate the general direction of the FCAT team and are pleased to see the various agencies working in concert through this process.

Conservation and wise management of natural and working landscapes reduces GHG emissions, enhances carbon sequestration and delivers economic, social, and environmental benefits. In consideration of improving net climate benefits from natural and working landscapes, sustaining carbon stocks will require that natural and working landscapes remain intact and managed not only for appropriately high carbon stocking rates, but stocking rates that are appropriately resilient so that they can be sustained for long periods of time.

The Reserve recommends the following considerations as the FCAT team moves forward with the California Forest Carbon Plan:

Develop a rigorous GHG accounting framework to ensure reductions and emissions from the forest sector are accurately quantified.

- The accounting framework should describe how baselines, additionality, longevity of climate benefit, monitoring, and verification are addressed. It is important for the agencies to be clear with regards to expectations of non-offset activities in terms of the endurance of the reductions and removals.
- Establish metrics for assessing removals and reductions at a broad scale (counties for example) to enable management activities (reforestation, fuels treatments, avoided conversion etc.) to occur at a reduced cost and to improve overall certainty of GHG reductions accounting.

Improve the economic viability of California's forests through management.

- We encourage the use of incentive programs to improve forest management for increased carbon stocks and resiliency. Incentive programs should be as simple as possible to ensure a high level of participation. Streamlining programs and compliance standards to encourage active management that improves forest resiliency and rural economics is an important consideration. Local wood production means transportation costs and emissions are reduced as well.
- We encourage programs to support biomass energy that recognize the full set of benefits associated with renewable energy, including increased resiliency in forests, job production, and climate impacts. Such a program needs to be well thought out in terms of accounting for forest carbon stocks as well.

Engage local planning efforts.

- Statewide priorities can be fine-tuned through local stakeholders, such as RCDs, local NGOs, landowners, and fire safe councils. The engagement of local stakeholders will help to improve targeting the location of management and policy actions that meet local priorities.
- We recommend county level planning be a base with regional efforts to address watershed issues.

Integrate social and environmental benefits.

- Managing forests for long-term increased (where possible) and resilient carbon stocks offers a number of social and environmental co-benefits beyond increased carbon stocks, such as improving forest resiliency, job creation, water filtration, preventing erosion and increasing soil stabilization, improved habitat for endangered or high value species, renewable energy and biodiversity.
- Planning and implementation of incentive programs should be strategic with a goal of leveraging the expenditure to achieve the greatest amount of combined social and environmental benefits.

Thank you again for this opportunity to provide comments to the *Recommendations on the California Forest Carbon Plan Concept Paper*. We again applaud FCAT's work in developing comprehensive goals in an inclusive and participatory manner. We would be happy to continue to support with any further clarification or discussion.

Sincerely,

John Nickerson RPF #2549
Director of Forestry
Climate Action Reserve

RONDAL SNODGRASS
CONSERVATION LAND CONSULTANT
rondalsnodgrassconsultations@gmail.com
707-496-8729

APRIL 8, 2016

STAKEHOLDER COMMENT: CA. FOREST CARBON PLAN CONCEPT PAPER

VITA: *Rondal Snodgrass was a founder of Sanctuary Forest, and the Executive Director from 1987-2000. He is a co-founder of Northcoast Regional Land Trust, serving Humboldt, Trinity, and Del Norte counties since 2000 in Northern California. He has been a primary consultant for numerous Northcoast California conservation projects from 2000 to 2016. Working with private landowners, non-profits and public agencies, his leadership and involvement has helped create over 150,000 acres of protected and conserved forestlands, farmlands, streams, and rivers with investments of multiple millions of dollars by public and private funds.*
BS in Economics, University of Oregon, Masters of Arts in Teaching, Reed College, and Certified Land Counselor by California Coastal Conservancy and Trust for Public Land

I offer thanks, respect and congratulations to the Forest Climate Action Team (FCAT) that produced this comprehensive document. They have garnered valuable information and data with links; provided scientific references; and, established worthy goals and strategies.

COMMENTS:

These comments are in response to the request for *"input from stakeholders to define the regional delineation and/or regional considerations that should be incorporated into applicable protection, enhancement, and innovation strategies.*
My expertise and experience is derived from 30 years of professional, forestland conservation in the California Northcoast's temperate rain forest.

1) I do not see a specific description and evaluation of the temperate rain forest, ranging from Santa Cruz to the Oregon border. Those forestlands are unique in many ways as the Redwood/Douglas fir ecosystem benefit from rain, fog, and soil conditions unlike the rest of California. Vigorous growth of these forestlands allow for economic use of the working forest, with growth way ahead of fire or conversion and perfect for positive net carbon sequestration. The wide spread fire regime and bark beetle attack of the Sierra and particular attention to Urban Forest are highlighted within the report. I recommend that the Northcoast temperate, rain forest bioregion be established and the report expanded to include specific recommendations: goals and strategies for this region.

2) The paper does not have a section devoted to how State programs have contributed to saving, maintaining and enhancing the internationally recognized

Carbon Sink of California's forestlands. Why we have such a vast resource is largely because of such investments and improved forest practices. California voters approved a number of Bond Acts established to protect natural lands, and their co-benefits.

For example:
Prop 70 passed in 1998 for 776M for Parks and Wildlife Conservation
Prop 12 passed in March 2000 for 2.1B Water, Forests and Open Space
Prop 13 passed in March 2000 for 1.97B Water Bond
Prop 40 passed in March 2002 for 2.6 B Resources Bond
Prop 50 passed in Nov 2002 for 3.4 B Bay Delta and River Parkways
Prop 84 passed in 2006 for 5.38 B Protection of Rivers, Lakes and Streams, Forest and Wildlife Conservation, Protections of Beaches, Bays, Coastal Waters, State Parks and Natural Education Facilities, Sustainable Communities/Climate Change

Now, when much of the money from those bond acts is greatly reduced or expended the auction proceeds from AB 32 Cap and Trade are the next step to fund conservation to reduce Green House Gas Emission. Carbon sequestration has ascended even beyond state priorities to now include worldwide needs. There is a pathway established and evaluation can be made as to how these past efforts worked, what methods were successful, timely, efficient, and effective. What state agencies and methodologies were best able to deliver these expenditures needs to be a consideration and precedent for Cap and Trade budget expenditures.

3) Strategies listed for Wildland Forests in the FCAT paper are clear and consistent with historical purposes of successful bond acts. *"Provide funding for working forest and other conservation easements, delivering funding through the CA Forest Legacy Program, Wildlife Conservation Board, and other forest conservation granting programs, and working in collaboration with land trusts and other related nongovernmental organizations.* The Cap and Trade auction proceeds are at a level to match previous bond act totals. A 2017 allocation in that budget for 1 Billion would be entirely consistent with the present need for carbon sequestering and the agencies are in place as a result of the previous bond act appropriations.

4) In response to the request: *FCAT will work internally and with external stakeholders throughout 2016 to improve goals and strategies.*
I suggest that a section be developed that would have a goal of refining and prioritizing a cost-benefit analysis for implementing any specific programs. The Dept of Finance has produced data that can be utilized for this approach. Priorities based on proven methodologies that can easily be utilized are smart and can be stated in this paper. Measurement and estimates of tree growth, therefore increase in sequestration, is finite, clear, and assessable, and can be matched with Cap and Trade mitigation and investments benefits.

5) In response to: *"Strategies to achieve goals for forest carbon and health must be flexible and nimble enough to address the varying biophysical conditions or landowner goals and capacities for forest management throughout California. Goals and strategies must recognize bioregional and landowner class differences.*

There is a need for new and innovative instruments to incentivize forest landowners to participate in processes that would guarantee positive carbon sequestration on their properties. A primary and successful tool has been conservation easements purchased with public funds that have restrictions and prohibition on land use. Now new terms need to be developed with specific legalities directed at insuring carbon storage protection and increase. Thousands of non-industrial forest landowners want to join in this effort but do not qualify, nor can afford present costs for cumbersome certification. Many larger landowners now faced with choices of selling parcels and converting ownership are ready to commit to conservation easements. Acquiring carbon sequestration via conservation easements has been reported as cost effective with respect to dollars invested per metric ton of CO2e reduced.

THANK YOU FOR YOUR CONSIDERATION

Comments by: John Livingston, Sierra Club Member, Redding, CA: livingstonjohn@att.net

Compiled: 3-28-2015

Forest Carbon Plan Vision

Taken from website: FCAT.CALFIRE.C.GOV

Draft February, 2015

The Forest Carbon Plan will provide forest carbon targets for private lands and an array of strategies to promote healthy forests that protect biodiversity and enhance forest carbon sequestration and the broader range of forest resource environmental ~~services~~values for all ~~forests~~ in California. Our vision of forest protection and enhancement includes:

- Sustainable forests that are net sinks of carbon.
- Healthy forests that are resilient to anticipated climate change effects, including volatile weather and changing precipitation regimes; increased forest insect and disease threats; and higher wildland fire risks.
- Protection of watersheds and water supplies (quality, quantity, and infrastructure).
- Forests that provide management opportunities that generate ~~long-term~~ sustainable economic benefits for landowners, workers, and communities.
- Working forests that produce wood products and biomass for energy and are managed to maintain forest health and biodiversity.
- Forests that are protected from fragmentation and conversion, and that provide a diversity of quality, interconnected habitat types for terrestrial and aquatic wildlife species, including listed and non-listed species.
- Forests that provide an abundance of outdoor recreational and tourism opportunities.

Comment [JL1]: This is a weak word. Perhaps foster. Climate change is not about "promoting" a sustainable world. Actions must create or ensure. If we are not sure if the strategies will ensure a sustainable environment then somewhere in the document we must indicate its limitations.

Comment [JL2]: What is a "forest". How many trees of what species per acre at what elevation constitute a forest?

Comment [JL3]: This word makes it a first person document and is probably not appropriate. The entire document should be written in 3rd person.

Additional Comments:

For the committees working on the Forest Carbon Plan, persons outside state government should be invited to be members and writers of the Plan. This should include university scientific people, ecologists, planners, environmental groups, industry, hydrologists, biologists, and should include a wide diversity of race and gender. This will result in a Plan that is supported by all groups. It is only by being much more inclusive in the committee composition that new paradigms will evolve that lead to effective actions.

Forest Carbon Plan outline dated February 9, 2015:

The title needs to be: Forest Carbon Plan. California Forests and Climate Change. The words "Enhancing Carbon Storage through Forest Health" implies that the current forests are not healthy and the Plan is about much more than "Enhancing" carbon storage.

Section V.a Targets and Goals. There must be immediate, short, and long term actions that will sequester more carbon and in each category range from inexpensive to expensive. What is the difference between a target and a goal? The subsequent parts of Section V do not contain the word "goals".

April 8, 2016

Ken Pimlott, Director
California Department of Forestry and Fire Protection
Forest Climate Action Team
Sacramento Headquarters
1416 Ninth St.
Sacramento, CA 94244

Submitted via electronic mail to fcat.calfire@fire.ca.gov

Re: Comments on Draft Forest Carbon Plan Concept Paper

Dear Director Pimlott and other responsible officials:

These brief comments regarding the **Draft Forest Carbon Plan Concept Paper: *Managing our Forest Landscapes in a Changing Climate*** are respectfully submitted on behalf of Friends of the Earth – United States (FOE-US). Our organization is grateful for the opportunity to provide early comment on this process regarding California's forests and the role of forests in responding to the environmental, economic, and social threats of local and global climate change.

As you must know, climate change is arising from the past and present mobilization of stable ***biocarbon*** and ***geocarbon*** reservoirs by human industrial activity. These stable ***biocarbon*** reservoirs that have been mobilized include the stocks once held in California's ancient forests, which had evolved over millennia to include some of the most carbon dense forests on the planet before being subject to a massive deforestation event over the course of the past approximately 160 years, a mere blip of time compared to the time-scale relevant to understanding the evolution and ecology of old growth forests. It is this unprecedented rapid mobilization of stable stocks of carbon by past and present human industrial activity that is resulting in an ever-increasing concentration of greenhouse gases in our atmosphere and oceans. The increased concentrations of greenhouse gases in our atmosphere and oceans is forcing a global warming trend that the best available climate and carbon science demonstrates must be kept below a certain threshold to avert the worst impacts of global warming.

Considering the urgency of this situation we are eager to contribute to a process that will be integrated in the 2016 Scoping Plan Update. <u>We take this opportunity to express our profound concern that there are a series of erroneous assumptions underpinning this draft concept paper that will undermine any serious effort for California to develop climate policy that will help avert the worst impacts of human induced climate change</u>. These assumptions need to be addressed in a scientifically rigorous manner in order that development of policy for the protection

and conservation of California's forest carbon functions as an important tool in responding to the threats of human induced climate change – and that it does not actually present a greater danger due to policy being based on erroneous assumptions that will aggravate the clearly delicate situation regarding forest carbon stocks and climate change.

The risk of ignoring the best contemporary science regarding the appropriate role of forests in mitigation and adaptation to global and local climate change is that precious time will be wasted with inadequate and even harmful polices. In this letter our organization must be emphatic and express our concerns that if this draft Forest Carbon Plan is not subject to substantial changes that include the integration of the best available science regarding carbon cycles and their relation with a changing climate that the resultant policy will not help California prepare for climate change -- **it will make the situation substantially worse**.

The following bullet points are intended to highlight a series of assumptions present in the draft concept paper that need to be subject to rigorous peer driven and globally contemporary scientific review as a part of a process that involves substantial revision of the draft:

- The role of past deforestation and land use change has to be taken into account in any forest carbon plan for California's forests. It is an imperative that the baseline concerning carbon stocks in California's forests be determined by an estimation of the sum of carbon held in the original old growth forest cover. To not do so is to simply ignore physical reality. To understand carbon sequestration in land-based ecosystems such as forests it is fundamental to understand the role of past deforestation and land-use change in creating a carbon depleted landscape.
- The assumption that we can "neutralize" the emissions from the burning of fossil fuels with carbon sequestration in forest ecosystems may be a commonly held belief, but it is not scientifically defensible. It is an imperative that this assumption regarding the efficacy of offsets as a climate change mitigation tool is subject to rigorous scientific review. Offsets are not a means to achieving a reduction in concentrations of greenhouse gases in our atmosphere and oceans, in many instances they are fully lacking in additionality and permanence, and they obfuscate the dangers of ongoing mobilization of the ***geocarbon*** reservoirs that human industry exploits as fossil fuels.
- A full decoupling of carbon "accounting" between forest carbon (***biocarbon***) and fossil fuel carbon (***geocarbon***) must take place in California climate policy as soon as possible, and California must develop a Carbon Budget. Failure to develop a carbon budget and base forest carbon management upon

that carbon budget would be a total failure to base policy development on the best available science.

- Biomass is mentioned repeatedly as a climate solution, when an increasing body of evidence demonstrates that biomass energy generation on a large scale is harmful to local environments and contributes significantly to greenhouse gas concentrations in the atmosphere and oceans. Also, for long-term carbon sequestration in forest ecosystems, including in soils, forest debris matters. Assumptions regarding biomass must be seriously addressed for a future Forests Carbon Plan to be based upon the best available science.
- Natural forest processes need to be accepted for what they are: natural forest processes. Disturbance regimes, whether they be fire or insects, are an essential part of the evolution and maintenance of the forests in California. The importance of standing dead trees for wildlife habitat and in forest succession needs to be re-examined and better understood, and the assumptions regarding tree mortality as expressed in the draft paper need to be subject to a rigorous scientific review. It is imperative that the biological and ecological importance of standing dead trees, of post-fire (including severe incidences) forest landscapes, and the diverse interrelations of wildlife and the mosaic of natural forest disturbance regimes be better understood and included in California policy related to forests and climate change.
- The detrimental and destructive role of salvage logging must be examined in full in order that California develop climate and forest carbon management policy that is based upon the best available science. There is nothing more destructive to a delicate post-fire forest ecosystem than salvage logging. The role of salvage logging in exacerbating complications around the natural role of fire in our forests must be taken seriously and policy regarding salvage logging in California, both on public and private lands, must be subject to rigorous scientific review. The draft Forest Carbon Plan does not even mention salvage logging, which is simply a dangerous and inexcusable omission.
- Industrial forest management must be subject to an honest and scientifically based climate impact assessment. The role of past deforestation; the role of ongoing clearcutting and high intensity industrial forest management practices; the role of high-density selection forestry; the role of fossil fuel intensive pesticides, herbicides, and fertilizers; and the role of short rotation forest management must all be subject to a rigorous scientific review in order that the true climate impacts of industrial forestry in California are fully understood. As an example of what needs to be fully examined, short rotation forestry results in poor quality wood products, reduced carbon sequestration, and impaired forest function—yet the draft carbon plan ignores or obfuscates these critical issues that must be addressed to develop

effective policy, never once even mentioning the negative impacts of short rotations. It is clear that this industrial forestry model must be fully and correctly assessed to determine the extent of the real harm that ongoing forest degradation by the timber industry in California is doing to the local and global climate.

- The concept of permanence needs to be revisited. We suggest that the original old growth forest be considered the baseline for the concept of permanence when discussing carbon sequestration potential and limits in forests in California. To suggest that 100 years is by any means permanent when speaking of forest carbon is laughable when one considers that it is a commonly known fact that an old growth redwood tree can remain intact on the forest floor after finally falling over for as long as it lived, which is to say many hundreds of years, at the least. It is imperative that a baseline for carbon sequestration for California's forests is based on forest ecology and that it includes the appropriate ecologically based time-scale. For developing science-based policy it is imperative that pre-industrial frontier forest conditions be better taken in to account when discussing what is the appropriate forest carbon management policy in order that the State of California actually take effective steps to avert the worst impacts of human induced climate change, and that an honest assessment of the climate and environmental damage that deforestation and the liquidation of ancient forest ecosystems in California has done to the state and the planet.
- Harvested wood products are not sequestered forest carbon; a reservoir of harvested wood products is scientifically defined as an Anthropogenic Store of carbon. Anthropogenic Carbon Stores are notoriously retained for very short periods of time, with a quality of permanence that is elusive at best, especially when the wood products are coming from an industrial model based on short forest rotations that produce wood products that are widely known to be deficient in durability due to the immature qualities of the harvested wood.

In conclusion, it is the view of our organization that a correct and science based assessment of the climate impacts of industrial forest management in California will reveal that the timber industry is actually a significant source of emissions and actually contributes in a significant way to the negative affects of climate damage in California, and that industrial forestry is not the benign climate positive sector that is portrayed in the Draft Forest Carbon Plan Concept Paper. Failure to engage with the pursuit of an honest and science-based evaluation of forest management in California is to develop policy that will be based on erroneous assumptions. Such a route is particularly dangerous because it will waste precious time and will not support the development of policy for the State of California that will assist in averting the worst impacts of human induced climate change.

It is a moral and ethical imperative that the State of California does not pursue a policy vision for the role of forests in responding to climate change that is harmful to forests and wildlife, harmful to the global climate, and harmful to the desires of the citizens of California to develop a science based response to the threats of climate change that is actually effective in taking steps towards a sustainable and indeed inhabitable future in the State of California. As such we reiterate our main comment that this Draft Forest Carbon Plan must be subject to significant and dramatic revisions in order that it adequately inform the development of a correct understanding of the role of forests in establishing climate change mitigation policy for the State of California that will actually assist in averting the worst impacts of human-induced climate change.

Respectfully,

Gary Graham Hughes
California Advocacy Campaigner
Friends of the Earth – US
2150 Allston Way, Suite 360
Berkeley, CA 94704 USA
Email: ghughes@foe.org
Office Phone: 510-900-8807

April 8, 2016

To: Forest Carbon Action Team

RE: Comments on the California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate, authored by the Forest Climate Action Team (FCAT)—March 9, 2016.

We understand that this Concept Paper is an "overview of proposed goals and strategies of the under-development Forest Carbon Plan" and that you are seeking comments on the draft Concept Paper at this time and that CARB will use this document as a basis for carbon sequestration and reduction of greenhouse gas and black carbon emissions in the 2016 Scoping Plan Update.

I. General Summary

The FCAT Concept Paper has several appropriate goals and policy framing for achieving resilient forests that will support forest and watershed resilience, limit fragmentation, and help stabilize carbon storage in the future. Unfortunately, the multi-agency authorship has created a misalignment in the vision and blueprint for moving forward. The contradictory focus on both short-term "sustained yield" forest management actions juxtaposed with statements characterizing the negative impacts of forest fragmentation, fire suppression, and past logging are at cross purposes in the document. There is only a cursory discussion of the changes in long-term management practices such as increased, landscape-level fire use and retention and enhancement of large tree dominated old forest condition needed to accomplish forest carbon goals.

Clear, science-based definitions of key terms such as sustainability, fragmentation, and black carbon in the context of an active fire regime are absent in the current draft concept paper.

The need for a robust science review of key concepts and clarification of divergent and contradictory visions is highly evident. An accurate characterization of fire regimes and effects,

the description of the scientific basis and measures associated with broad concepts such as sustainability and fragmentation, and balanced discussions of forest resource outputs across jurisdictions with very different management guidelines, is sorely needed in the document.

Coordination and consistency with other plans such as the Draft Short-lived Climate Pollutant Plan, the California Wildlife Action Plan, State Fire Plan, CA Water Plan, and various federal mandates pertaining to public lands will be needed to maintain consistency between agencies, and will better inform policy makers and the public in support of the final Forest Carbon Plan.

Finally, the characterization of Forest Service timber outputs and management are inappropriate and simplistic in light of the broader Forest Service mandate to manage for ecological integrity and strong sustainability. The current characterization should be stricken from the document.

2. Vision Statement—Sustainable forests that are net sinks of carbon. (Pg. 1)

Comment: Absent a science-based definition of "sustainable" the Vision Statement seems to validate and even promote a broad contradictory range of interpretations, some science-based, and some politically motivated and therefore less likely to promote carbon stability in the forest sector. One such example is to conflate "sustained-yield" management with ecological, science-based sustainable forest ecosystems which are managed through the use of the best available science to address composition, structure, function, connectivity, and species diversity at a range of appropriate scales. These public forests sustain a wide range of public benefits while "working forests" have narrower economic goals that can run counter to longer term carbon stability.

Additionally, the Concept Paper (CP) suggests the California Forest Practice Rules provide a level of logging that is a "near perfect example of sustained yield" and one that represents sustainable forest management and carbon stability. The CP fails to discuss the contribution of short-rotation plantation forestry practices to widespread increased susceptibility to severe fire effects (e.g., Rim Fire--15,000 ac. of plantation mortality; King Fire—30,000 acres of plantation mortality on private lands) and similar negative effects in similar stands on public lands. These homogeneous conditions are prone to density and drought-driven beetle mortality that are impacting plantations in the Sierra Nevada. As noted in a recent forest health report on the Sierra National Forest, "Pine plantations in both districts have been the hardest hit by western pine beetle (*Dendroctonus brevicomis*, WPB) due to their high proportions of even-aged trees, at high densities." The report further states, "Entire patches of older plantations that would have previously been regarded at lower risk – low basal area, minimal brush competition, and adequate spacing – were completely infested within a single year (Figures 2 and 3). (Sierra NF—Forest Health Report 2015).

Figure 2 (right, Bass Lake RD) and 3 (left, High Sierra RD). *Recent western pine beetle-kill in mature Ponderosa pine plantations, previously thinned.*

Vision Statement—Protect from Fragmentation (Pg. 2). Forests that are protected from fragmentation and conversion, and that provide a diverse range of quality, interconnected habitat types for terrestrial and aquatic wildlife species, including listed and non-listed species.

Comment: Absent a science-based definition of forest "fragmentation," the Concept Paper leaves open for interpretation a simplistic vision of forest cover versus barren (or conversion) as sufficient to qualify as sustainable as distinguished from an assessment of ecological integrity of a unit of forest cover on the landscape. Lacking clear scientific definition, forest practices that may be cutting slightly less than growth in short-term rotations, producing a landscape condition that has no historic analog, may yet qualify as non-fragmented forest cover. A science-based definition would view a range of native forest conditions (structure, function, process, composition, connectivity and diversity) as benchmarks for judging sustainability, whether monitoring human impacts, fire effects, climate change impacts or extended drought.

Vision Statement--Wood products and carbon benefits (Pg. 2)

Comment: We are not debating that there are carbon benefits of at least medium-term when wood fiber is "stored" as wood products. What should be questioned in much greater detail is the suggestion that "carbon storage in wood products" is the end of the conversation regarding a viable carbon sequestration strategy. Additional carbon cycle questions should include:

- What are the carbon implications of relying on the increased housing market as a sequestration strategy?
- How much California farm land will be paved over to support more subdivisions?

- How many new units will be built in high and very high fire hazard zones, increasing fire risk?
- How will the expected increased housing market contribute or detract from the historic model of car-dependent subdivisions in California?
- What do changing fire regimes, extended droughts, lower snow pack, and limited water supplies mean to the support of wood products (growing the housing market) as a carbon sequestration strategy?
- What portion of these wood products travel across oceans via container shipping that currently is assessed no carbon burden, as per the recent COP21 agreement?

Need to shift the focus from wood products to older, more natural forests.

Comment: The importance of harvested wood products as a carbon store is often overstated, as these products do not actually increase the total amount of carbon taken up. Instead, more emphasis should be placed on creating older, more natural forests which can create a net increase in total carbon stocks.

The Vision for California's Forests (page 12) should incorporate clear measures for assessing increased "complexity" and "variable stand structures" and for assessing biodiversity benefits (or losses) from specific management practices with appropriate scales of space and time. Emphasis should be on creating older, more resilient forest landscapes and sustaining ecosystem processes and biodiversity at the watershed scale.

Management for the long-term: The "protect" and "enhance" management strategy (pages 22-24) recognizes that there are many forests below their ecological potential for carbon sequestration, watershed function, and wildlife habitat. Improving the ecological potential of these forests involves not just short-term restoration activities, but also acknowledging that these forests need time to realize this potential in terms of shifting unstable conditions to more stable conditions in an active fire regime. We support the notion that there is a monetary value to that time that competes with other economic pressures, and that it is necessary to "secure" more private land for the long-term, via conservation easements or other means. "Secure" means more than title or easement purchase. In the long run "secure" means managing landscapes in fire-associated ecosystems for fire resilience, biodiversity, and carbon stability versus short-term economic gain.

3. Intent to use Best Available Science (Pg. 2) and developing near-, medium-, and longer-term targets for carbon sequestration, black carbon emissions or GHG emissions.

Comment: The criteria used to measure progress in meeting carbon goals need to calibrate to specific ecosystems and their specific vegetation types and fire regimes on a particular landscape. Key natural disturbance processes or the decades-long need to "re-arrange" forest carbon stocks to resemble those conditions under a natural fire regime will take time.

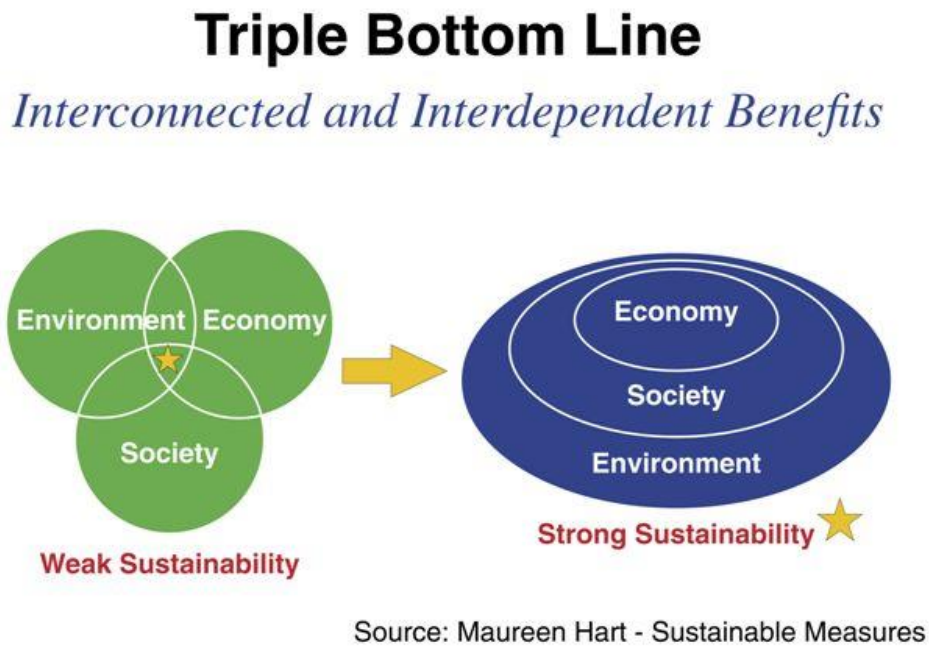
There are serious "carbon dues" to be paid in the short and medium term due to a century of fire suppression, intentional fire exclusion, and past management decisions including the high-grading and clear-cutting of large, fire resilient trees. It is critical to ensure that fire use emissions and black carbon are not called out as a climate "bad" when significant increases in fire use at landscape scales is a key management tool for building forest resilience and stabilizing carbon long-term, while protecting multiple public benefits (North et al. 2012; North et al. 2015).

Prioritizing opportunity: The priority areas (page 27) focus on high hazard areas, unique resource values, and high population levels. This is a focus on the areas that are under threat, but there is an equal need to focus priority investments on areas of opportunity. These opportunity areas are those that provide important ecosystem services and co-benefits such as water provision, have the potential to store significant amounts of carbon, and could be managed for an older stand structure.

Strategies that support research and development of bioenergy (page 25) should focus on appropriately scaled community-based facilities with state-of-art emissions technologies that combine heat and power production from excess forest waste material—material that would normally be pile burned that can supply multiple public benefits.

4. Sustainability definitions related to ecology and cultural context.

Comment: Weak Sustainability and concepts such as the debunked "3-legged stool" model, coupled with existing trends and conditions of forest resources, strongly suggest Concept Paper recommendations should reflect and be built upon a foundation of Strong Sustainability and grounded in Best Available Science information.



(Source: Figure 1.1 Triple Bottom Line: interconnected and interdependent benefits USDA, Forest Service, National Report on Sustainable Forests—2010, p.1-2)

The concept of Strong Sustainability depicted here is at the heart of the USDA, Forest Service vision for sustainability: "The earlier thinking about sustainability (as shown at the left side of figure l-1 and referred to as Weak Sustainability) envisioned the environmental, social, and economic realms as intersecting, yet separate, parts of a system. More recently, thinking about the relationship between these three realms has evolved, and today, the depiction of sustainability shown on the right hand side of figure I-1(Strong Sustainability) is the one adopted by this report."

The Forest Service goes on to state, "This updated model reflects the understanding that the environmental realm is the foundation of strong sustainability because the environment provides natural goods and services that cannot be obtained through any other means. Human society cannot exist without the environment, which provides the basic necessities of life: air, water, food, energy, and raw materials. The human economy depends on people and social interaction. The core concept of strong sustainability is the benefits of nature are irreplaceable and that the entire economy is reliant on society, which in turn is entirely dependent on the environment. This emphasizes the interdependencies between our society, our economy, and the natural environment."

Because California has led the nation in its response to climate change, we believe that is it equally appropriate for California to adopt a "Strong Sustainability" foundation in its policy decisions included in the FCAT Concept Paper.

Key points of a Strong Sustainability framework for the Concept Paper would include promoting "carbon worthy" recommendations for funding that include:

- Creation of measurable sustainability criteria for a representative suite of biodiversity components including wildlife habitat and populations, forest ecological integrity requirements that limit homogenous stand structure and composition, and significant reintroduction of fire at appropriate ecological scales for various vegetation types and fire regimes should be supported.
- Promotion of uneven-aged management, with significant portions of the landscape (public and private) in fire-resilient, old forest condition should be supported.
- Forest fragmentation is defined ecologically and not simply by land cover type. Conditions that enhance connectivity and diversity of vegetation types in natural systems, and stand structures that are resilient to fire should be supported.
- Fire suppression is limited to within, and adjacent to, communities while prescribed fire and managed natural ignitions are expected, planned for and promoted in the wildlands of California when occurring within the natural range of variation for specific fire regime and when public safety is not likely to be compromised.

- Fire Safe and FireWise, USA community-based fire planning, community and home-ignition zone treatments and programs that build fire awareness should be supported to help communities better understand and live with fire.

5. State and Federal Wildland Fire Management Goals and Strategies.

Comment: Currently both State and Federal Wildland Fire Management goals and strategies retain a strong suppression orientation. Federal land managers have in addition, authority to manage natural ignitions for multiple ecological and other benefits such as protection of public safety. The California State Fire Plan support prescribed fire use, but not the management of natural ignitions.

The best available fire science (Stephens et al. 2007; Marlon et al. 2012; North et al. 2012; North et al. 2015; Hessberg et al. 2016; Parks et al. 2016) has called out for increased use of natural ignitions to return to a level of fire on the California landscape that approaches the natural fire regimes associated with current existing vegetation types. California's forested landscapes remain forested and strongly tied to the fire regimes having co-evolved over tens of thousands of years.

Sierra Forest Legacy strongly recommends that the Concept Paper adopt collaborative, cross-jurisdictional use of natural ignitions to bring fire back into California's forests at ecologically significant scales. Logging alone can't come close to treating enough acres (North et al. 2012).

We are in a serious and dangerous fuels build-up backlog resulting from a century of fire exclusion. It is time to end the fire exclusion era with bold measures supporting managed fire use when fires are in wildlands and burning within Natural Range of Variation (NRV). Low and mixed-severity fire is the general fire regime for the Sierra Nevada pine and mixed conifer forests. Wildlands can include lands near communities (commonly referred to as the "threat zone") such as in the recent forest plan revision at Lake Tahoe Basin Management Unit, where fire use and community fire protection are tied to a collaborative vision of living with fire.

As stated (page 4) of the Concept Paper, "managers will have to learn to work with, not against, the time-varying influence of climate on widespread fire years . . . (Swetnam et al. 2011)."

6. Characterizations of past human activities impacts are problematic for several reasons.

First, statements regarding fire suppression and past management in the Concept Paper are contradictory as mentioned above. Second, the statement on page 4 is misleading and poorly describes the role of weather, climate, topography and other factors. The suggestion that, "Past human activities, such as fire suppression and logging, influence acres burned, but the impacts are small when compared to drought, wind and temperature" lacks the fundamental fact that past management, fire suppression and fire exclusion are all related to the critical factor in all fire behavior—fuel. Absent the uncharacteristic fuel conditions and stand structure changes related to

a century of old growth logging and fire suppression, forests are much better prepared to withstand changes in climate, drought, wind, beetle outbreaks and other factors. While it is true that uncharacteristic fire behavior is influenced by many factors, fire has been a part of the Sierra Nevada since soon after the Sierra uplift (10 million years ago). Dry periods, wind and temperature fluctuations have been a part of the Earth's ecosystem processes since time began. What has changed in the past century is the aggressive human-caused disruption of fire as a critical ecological process and the persistent removal of larger fire-resilient trees, dramatically altering the historic fire regimes associated with California's diverse, fire-associated vegetation types. The legacy of fire suppression and past management are directly related to fuel conditions that destabilize the forest landscape in California today. Today we are in a major fire deficit where "current levels of fire activity are clearly out of equilibrium with contemporary climate conditions" (Marlon et al. 2011).

7. Forest treatment recommendations (understory thinning, surface fuel treatments, prescribed fire) p.10.

Comment: The Concept Paper's recommendations should be clear about specific treatments supported within the context of the State SRA and GHG fund utilization. Most important in terms of fuels management are actions that break the continuity between surface and ladder fuels in the understory and adjacent tree crowns. The following treatments and spatial scales are recommended:

- Funds should support the planning and implementation of landscape scale (>10,000 ac to 100,000-acre planning units) prescribed fire use across jurisdictions prioritized by ecological need, potential for public benefits, level of fire return interval departure, resources at risk and strategic ability to implement.
- Managed natural ignitions, burning at low and mixed-severity, are supported by funding pre-ignition planning across multiple jurisdictions and increases in logistical support (trained fire use teams) to take advantage of multiple ignitions without drawing on back up, stand-by suppression personal.
- Support and fund, as a top priority, surface and ladder fuel treatments. Surface and ladder fuels are the primary driver of fire behavior. Generally, these ladder fuels are sixteen inches and under (North et al. 2009). This focus also allows for the removal of overly dense small trees as part of the effort to lower small tree densities to allow more growing space and lower fire risk for larger, fire resilient trees.

  For "working landscapes,"[1] projects that utilize fire and un-even aged management should be supported.

[1] "Working landscapes" is another poorly defined and socially questionable term since there is seldom a discussion of what the "work" actually is or whether it has positive or negative implications for forest ecology and resilience, carbon stability or public health.

8. Carbon stability in strongly fire-associated landscapes in California

"Accumulating evidence suggests that in Mediterranean-climate forests the optimal level of carbon storage in living trees is much less than what the site can maximally support at a given point in time, and strongly reflects the disturbance regime that it grows under (North and Hurteau, 2011; Collins et al. 2015)" (Page 4, Concept Paper).

Comment:

Timeframes to develop forest carbon sinks given carbon emissions tradeoffs related to fire use, thinning and other efforts to build resilient forests may be underestimated and understated. Risk of under-estimating climate change impacts and carbon emissions (Hurteau et al. 2014) require some level of worst-case planning which may push current policy in areas of air quality controls to gain longer term benefits for forests and public health in the long run.

9. Characterization of timber harvest declines and tree mortality (p. 17- 8)

Comment: Timber harvest declines (McIver et al. 2015) in California are characterized as negative impacts to California's economy and forests. Differences in forest management guidance, law, public benefits, etc., under different jurisdictions, regulations and visions of sustainability are not addressed in the Concept Paper. It therefore presents an inaccurate, unbalanced and problematic representation of federal land management that maligns the broader Forest Service mandate to protect biodiversity, recreation, water quality, and other values on public lands. The Concept Paper presents an arbitrary and unsupported bias toward industrial timber management. One example is that there is no carbon accounting (i.e., burden assigned) to all the wood products that container-ship to and from foreign counties (COP 21 limitations on aviation and container shipping).

There are several references in the Concept Paper to fire suppression and past management as being the root cause of unsustainable forest conditions (p.4) and elsewhere. The reduction in timber harvest that included high-grading and clear-cutting old growth forests, especially during the 1980s on public lands, is something to celebrate, not mourn. This bias towards industrial timber practice and its questionable carbon benefits should be struck from the document.

10. "Wilderness is unmanaged land" (p.18)

Comment: The negative characterization of wilderness is arbitrary and problematic for its lack of understanding of the purpose and mandate to protect wilderness values (which aren't even mentioned). First, there would be little possibility to recover economic value in most of the wilderness areas of California, even if there were no rules. The steep and rugged terrain, high potential for resource damage, lower value wood, extreme haul distances, etc., are self-evident.

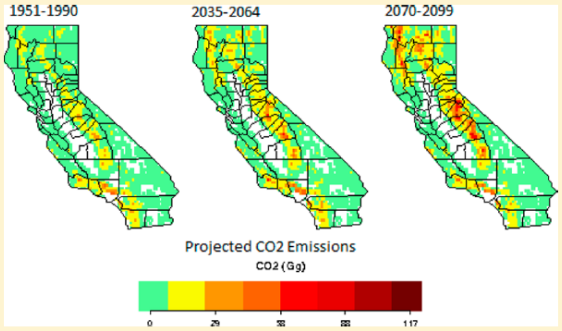
Wilderness lands are managed for wilderness values under federal and state laws, and managed natural ignitions there are an appropriate management tool when allowed to function and not inappropriately extinguished by a flawed and over-zealous fire suppression strategy.

The flawed characterization of Forest Service wilderness should be stricken from the document.

11. Important additional references, with brief annotation, that can better inform the Concept Paper.

Hurteau et al. 2014: Examination of various wildfire emissions scenarios with median increase of 56% above baseline period with largest increases in northern California. Promotes prescribed fire use to reduce wildfire emissions.

ABSTRACT: Changing climatic conditions are influencing large wildfire frequency, a globally widespread disturbance that affects both human and natural systems. Understanding how climate change, population growth, and development patterns will affect the area burned by and emissions from wildfires and how populations will in turn be exposed to emissions is critical for climate change adaptation and mitigation planning. We quantified the effects of a range of population growth and development patterns in California on emission projections from large wildfires under six future climate scenarios. Here we show that end-of-century wildfire emissions are projected to increase by 19–101% (median increase 56%) above the baseline period (1961–1990) in California for a medium-high temperature scenario, with the largest emissions increases concentrated in northern California. In contrast to other measures of wildfire impacts previously studied (e.g., structural loss), projected population growth and development patterns are unlikely to substantially influence the amount of projected statewide wildfire emissions. However, increases in wildfire emissions due to climate change may have detrimental impacts on air quality and, combined with a growing population, may result in increased population exposure to unhealthy air pollutants.



Hessburg et al. 2016: A meta-examination of challenges related to restoration of forest resilience, active fire use, value of large old trees, and reduction of surface and ladder fuels which can greatly reduce likelihood of severe fire behavior; need to reduce barriers to fire use. No known ecological benefits from post-fire salvage of large tree components.

Parks et al. 2016: Assisting plant communities towards a state of equilibrium with emerging climate through thinning and prescribed fire and managed natural fire. Aggressive suppression will amplify disequilibrium conditions and create increased fire severity in future decades.

North et al. 2009 (GTR-220) calls out for extensive fire use, breaking fuel continuity between surface and ladder fuels and tree crowns, disturbance based management, and retention and creation of heterogeneity. Since 2009, GTR-220 has been used across most Sierra Nevada national forests to collaboratively develop marking guidelines that try to emulate natural disturbance patterns and maintain important ecological attributes.

North et al. 2012: Promotes increasing the scale of low and moderate-severity fire which would have substantial ecological and economics benefits if implemented soon. Uses mean historic fire return interval (HFRI) to identify a 487,846 ac/yr. (Table 1) as a level of annual fire occurrence in the Sierra Nevada under historic natural fire regime. Discusses remedies and risks of ignoring this fire deficit.

North et al. 2015: Analyzes constraints on mechanical treatments in the Sierra Nevada bioregion that limit getting to necessary pace and scale of restoration. Found that while 58% of national forest lands are productive forests, 25% are available for mechanical treatments with limited ability to affect wildfire extent and severity. Primary constraints are steep slopes and road access. Efforts to increase the pace and scale of fuels reduction and forest restoration are unlikely to succeed without more extensive and innovative use of managed fire.

North et al. 2015: Reform forest fire management. Agency incentives undermine policy effectiveness. Suppression generally begets larger, more intense wildfires. Researchers recommend increased fire use and change in agency management culture. Increase outreach to public regarding the inevitability of fire and ecological benefits build support for fire use and smoke tolerance.

Meyer 2015: Wildfires managed with resource objectives benefit forests. Compared to the natural range of variation (NRV) of fire effects, managed fire effects compare favorably to NRV while fire suppression effects are outside the range of NRV in southern Sierra Nevada in examination of 17 wildfires.

12. The reference to Simard et al. 2010

Comment: We could not find the reference but did find a Simard et al. 2011 reference that supports a different conclusion than the one cited on page 7. The relationship of tree mortality to fire intensity (in Rocky Mountain lodgepole pine) is complicated and is based upon many factors including mortality stage, weather and other factors.

Finally, thank you for mentioning and support the multi-stakeholder **Fire MOU Partnership** http://www.sierraforestlegacy.org/CF_ManagingFire/FireMOU.php and its possibilities to achieve large-landscape fire reintroduction though prescribed fire and use of natural ignitions. If scale matters like we think it does, greatly expanding fire use is one of the most important tools we have to stabilize forest carbon stocks in the long term.

Thank you for this opportunity to comment on the Forest Carbon Plan Concept Paper.

Craig Thomas, Conservation Director
Sierra Forest Legacy
P.O. Box 244
Garden Valley, CA 95633
(916) 708-9409
craig@sierraforestlegacy.org
www.sierraforestlegacy.org

s/Matthew S. Dietz, Ph.D
Lead Ecologist, Research Department
The Wilderness Society
San Francisco, CA

Alan Carlton
Sierra Nevada Team Leader, Sierra Club
San Francisco, CA

Malcolm Clark, vice-chair & conservation chair
Range of Light Group, Toiyabe Chapter, Sierra Club
Mammoth Lakes, CA

Don Rivenes
Executive Director
Forest Issues Group
Nevada City, CA

Michael J. Connor, Ph.D.
California Director
Western Watersheds Project
Reseda, CA 91337

s/Patricia Puterbaugh
Lassen Forest Preservation Group
Cohasset, CA

Karen Schambach
President
Center for Sierra Nevada Conservation
Georgetown, CA

Greg Suba
Conservation Director
California Native Plant Society
Sacramento, CA

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The Nature Conservancy
Protecting nature. Preserving life.™

California Regional Office201
Mission St, 4th Floor
San Francisco, CA 94105

Tel (415)793-5035
Fax (415)777-0244

nature.org

April 8, 2016

Russ Henley
Assistant Secretary of Forest Resource Management
1416 Ninth Street, Suite 1311
Sacramento, CA 95814
Submitted electronically

Re: Comments in response to the March 9, 2016 Draft California Forest Carbon Plan Concept Paper: *Managing our Forest Landscapes in a Changing Climate*

Dear Mr. Henley:

The Nature Conservancy appreciates the opportunity to submit comments on the March 9, 2016 draft California Forest Carbon Plan Concept Paper (hereafter "Concept Paper"). The Conservancy strongly supports the Governor's Executive Order B-30-15, establishing interim greenhouse gas reduction goals for 2030 so the State can meet its longer term goals established for 2050. Moreover, we support the inclusion of forests and natural and working lands as one of the six pillars of the State's long-term climate strategy. The State will not be able to meet its long term goals without the inclusion of these resources.

Overall, the ideas presented in the Concept Paper provide a good foundation for the kinds of actions that the state could undertake in the forest sector to reduce greenhouse gas emissions beyond the current 2020 goal. In the following pages, we offer specific comments on the Concept Paper. In addition to these specific comments, we also restate an overarching recommendation that we submitted in response to the Draft Healthy Landscapes 2030: Climate Vision and Goals for Natural and Working Lands (see attachment A). While the suggestion applies more broadly to natural and working lands, it also applies to forests as a subset of this climate change "sector."

Overarching Recommendations:

<u>The state should establish greenhouse gas reduction goals for natural and working lands (including forests) that are informed and supported by a quantitative, standardized greenhouse gas accounting framework and a clear definition of a greenhouse gas reduction</u>

To understand the scope of greenhouse gas reduction potential from California's natural and working lands and monitor progress over time, the state should establish goals for this sector that are informed by a standardized and quantitative greenhouse gas (GHG) accounting framework, which also defines a greenhouse gas reduction. While a host of other considerations, such as climate resilience, habitat, water quality, biodiversity, and jobs, should be applied as additional filters to statewide GHG goals for natural and working lands, this fundamental building block should be established so the reduction potential is well understood by the state and the public and can be monitored and considered alongside the many other objectives for our natural resources.

Such a framework is also needed in California to advance a common understanding of what constitutes a GHG reduction in the natural and working lands sector, thereby reducing different and often conflicting assumptions about what constitutes a greenhouse gas reduction (vs. a carbon/GHG inventory or a carbon pool). It will also help minimize uncertainty about the sector to which to attribute a reduction (e.g., whether a reduction should be counted in the energy sector, transportation sector or natural and working lands sector). Furthermore, this type of framework can create better synergy and bridge accounting gaps across different landscape scales, from the activity (or project scale) to the regional and statewide scales. For precedent, the state should refer to "jurisdictional accounting" approaches being developed and implemented in tropical forest jurisdictions to meet international greenhouse gas reductions pledges.[1]

Attributes of statewide GHG reduction goals and supporting accounting framework should include the following:

1) A statewide carbon inventory:

   A landscape carbon inventory is essential for establishing a GHG baseline (or reference scenario) for natural and working lands and monitoring emissions and reductions from land-based activities that either increase or decrease carbon over time. The California Air Resources Board's recent carbon inventory analysis and any recent updates could serve as the basis of this inventory.[2]

2) A statewide GHG baseline scenario:

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[1] "Guidelines for REDD+ Reference Levels: Principles and Recommendations" Prepared for the Government of Norway, by Arild Anglesen, Doug Boucher, Sandra Brown, Valerie Merckx, Charlotte Streck, and Daniel Zarin. Available at www.REDD-OAR.org. *See also,* http://scienceforconservation.org/downloads/climate_action_through_conservation

[2] *See* http://www.arb.ca.gov/cc/inventory/pubs/battles%20final%20report%2030jan14.pdf

Similar to the reference scenarios (or GHG baseline scenarios) that the state is developing for other sectors, GHG baseline scenario(s) should be developed for natural and working lands that also includes an agreed upon set of carbon pools (e.g., live pools like above ground vegetation and/or dead pools like wood products). Without a GHG baseline for the landscape, it will be very challenging for the state to estimate and monitor GHG reductions over time. Baseline scenarios are projections into the future of "business as usual" or what is likely to happen in the absence of human interventions to minimize emissions and sequester carbon. Other jurisdictions have developed GHG baselines for the landscape by using historical carbon inventory data over different points in time to establish trends for net changes in landscape carbon, which can inform how a GHG baseline can be forecasted into the future. Establishing a trend or reference scenario for the baseline (versus just one inventory year) is also important to be able to capture net sequestration over time (including baseline fire emissions) and the relative permanence of carbon sequestered in the landscape.

3) Develop statewide GHG reduction scenarios that are spatial:

   Once a carbon inventory and GHG baseline are established for natural and working lands, it is possible to develop estimates of GHG reduction potential based on alternative scenarios (relative to the baseline) across regions in the state. This type of analysis should be spatial, where opportunities for interventions (or activities) to sequester more carbon or minimize emissions across regions of the state can be identified. Anticipated climate change impacts can also be included in the scenarios. This carbon data can be aggregated and compared to the GHG baseline to develop ranges of GHG reduction potential that can be achieved through a variety of activities and incentives. They could be used to inform the 2030 Scoping Plan target. This type of assessment should be considered alongside other statewide plans, such as the State Water Action Plan and Safeguarding California, to provide the opportunity to optimize multiple benefits and make strategic investments.

4) Develop a monitoring, reporting and verification system that bridges different landscape scales (i.e., landowner to region and state):

   Building from the statewide baseline and scenarios mentioned above, a statewide monitoring, reporting and verification framework should also be established to track progress in the natural and working lands sector. The statewide carbon inventory, as it is updated over time, can be used as the basis to track changes in carbon across the landscape and monitored against the GHG baseline and reduction scenarios mentioned

earlier. A complementary monitoring and reporting framework can also be developed for the interventions or activities that are implemented at the smaller scale to reduce emissions/sequester carbon through programs or policies. This complementary framework can act as a bridge between monitoring at the project/activity scale and the monitoring at the statewide and regional scales.

Incorporate specific recommendations for climate resilience in all goals

We appreciate and strongly support the acknowledgment that resilience should be incorporated in the state's goals and strategies to reduce greenhouse gas emissions in the natural and working lands sector. As stated in EO B-30-15 and the Environmental Goals and Policy Report, the state's planning and investments should *prioritize* actions that "build climate preparedness and reduce greenhouse gas emissions" (EO B 30 15), "especially in the natural resource sector" (EGPR, page 26).

Within the goals identified in the Concept Paper, resilience is explicitly mentioned in the goal to enhance carbon and manage forests for resilience. The goal of resilience in this category is important, and it should also be explicitly included in the other goals related to forest protection and urban forests. Part of the limited application of resilience may be due to the interpretation of resilience for forest carbon alone. Healthy forests sequester carbon and are resilient to climate impacts. Resilience should have a broader interpretation and also be considered for habit, species and people. Such a lens will broaden the discussion in all of the goals and potentially highlight additional recommendations.

Recognize the importance of large trees for carbon sequestration and other co-benefits

We recommend that the "Vision for California's Forests" (Concept Paper, p. 12) include a specific acknowledgment of the importance of protecting and recruiting large trees across the landscape. Because of their commercial value, there are far fewer large trees on both private and public lands than existed prior to European settlement. Large, old trees sequester enormous amounts of carbon, are more resilient to wildfire, and provide habitat for sensitive species that require large standing trees, large snags, and large downed logs. We suggest that the description of "healthy forest attributes" in the Concept Paper explicitly recognizes the need to protect and recruit more large trees, large snags, and large downed logs across the forested landscape based on their value for carbon sequestration and other co-benefits.

Specific Recommendations:

Use consistent terminology to support more clearly the Governor's Executive Order to reduce emissions

The Forest Carbon Plan vision statement refers to a goal of setting "forest carbon targets," which is potentially different from a "greenhouse gas reduction" target. The Governor's executive order B-30-15 establishes goals to reduce emissions by 2030. For clarity and consistency, we recommend that the vision statement reflect the term "greenhouse gas reduction" (GHG) and the goal for the forest carbon plan to be the identification of GHG reduction potential with supporting strategies that can achieve this goal alongside many other important benefits. As mentioned earlier, the term greenhouse gas reduction and its supporting accounting method should be clearly articulated as well.

Keep the vision statement simple

While the bullet points supporting the vision statement are important goals to support a vision statement, the vision itself should be simple and support the central purpose of the plan and the Governor's Executive Order to reduce emissions. The best and clearest vision statement appears on page 2 with respect to the forest climate action team's task to "develop and implement plans to improve the health of California's forests, increase their carbon storage and reduce their emissions of carbon to the atmosphere." This is a concise and clear statement that can guide a host of actions and other desirable outcomes, and it also provides the ability to assess its progress over time. The other list of goals are also important and should be listed, but should be listed as other objectives that support the main vision.

Avoid conflation of carbon pools and GHG reductions

The absence of a clear definition and approach to estimating and monitoring GHG reductions creates ambiguity over what constitutes a greenhouse gas reduction. For example, on page 5 of the Concept Paper, in paragraph 2, there is discussion of carbon storage, sustainable harvest and storage of carbon in wood products. In reference to large private ownerships, it is suggested that the balance of harvest vs growth, plus carbon storage in wood products makes these ownerships "produce and store the greatest amounts of carbon." Is the reference to carbon storage meant to imply that this is also a GHG reduction? The different terminology (carbon storage, carbon stocks, GHG reductions, carbon sequestration) and lack of definition for a GHG reduction and other similar references in the document create uncertainty about what constitutes a GHG reduction and the assumptions that underpin the concept.

In addition to discussion of different carbon inventory options, include discussion of approach to GHG reductions and associated assumptions

The Concept Paper provides a good overview of the variety of carbon/GHG inventory methods and technologies that are available. The Air Resources Board has been developing an updated GHG inventory for natural and working lands over the past several years, using LANDFIRE, which is based on a combination of remote sensing and FIA data plots. We urge the State to

either use this inventory or identify as quickly as possible the inventory it will use to serve as the basis of establishing baseline trends and monitoring of GHG emissions and reductions over time.

Include discussion of carbon stocks and relationship to sequestration rates as part of a GHG reduction analysis

The Concept Paper provides a good discussion of carbon sequestration rates, which can influence how quickly GHG reductions (i.e., carbon sequestration) accrue over time. The total amount of carbon stocks accumulated is also a critical component of GHG reduction estimates as their total loss or gains are a measure of emissions or reductions. This section would benefit from additional elaboration on how both rates and carbon stocks factor into GHG reductions.

Clarify the intended greenhouse gas reduction benefit of each of the goals to protect, enhance, and innovate

The Conservancy supports the overall goal to increase protection of forestlands to reduce fragmentation and conversion to non-forest uses. Doing so would not only preserve future sequestration potential, but it would also avoid direct biological emissions that are associated with the land conversion itself. This greenhouse gas reduction benefit should be clearly recognized in the goal alongside the other potential benefits such as maintaining ongoing sequestration benefits.

The goal to enhance all forest carbon storage pools appears to be used as a proxy for achieving GHG reductions through increased carbon sequestration. The two characterizations may not be equivalent, so we therefore recommend that this recommendation be clarified to enhance carbon sequestration while also managing for resilience and reduced fire risk, which is an important goal. By clarifying this goal, the recommendations can (and should) also expand to include other activities, in addition to risk reduction, that will restore more carbon on the landscape, such as reforestation of formerly forested lands and riparian corridors.

The GHG reduction goal to innovate appears to focus on reducing GHG emissions through increased downstream use of wood products. There are potential GHG reductions that could be achieved through wood product substitution, some of which would be achieved in the energy or transportation sector. As written, the intended GHG reductions of the stated activities and how they would be estimated and monitored is unclear. This section should be clarified with a more robust discussion of how downstream activities would create reductions (i.e. what is the accounting method and carbon pools included), and what sector the reductions would be counted in.

The Conservancy supports the inclusion of urban forestry in the Concept Paper and goals to protect existing greenspace and urban trees and increase canopy cover.

The Conservancy supports urban forestry as a strategy to reduce GHG emissions as urban forests and green space can provide a host of GHG reduction benefits, including carbon sequestration and other indirect GHG reductions in the energy sector. Similar to the other goals stated in the report, this section would benefit from a more detailed discussion of the GHG reductions that could be achieved (e.g., carbon sequestration, avoided emissions, which sector, etc.). It would also be helpful to discuss the synergy between this section and the urban greening/green infrastructure section in the Climate Vision and Goals for Natural and Working Lands.

We appreciate your consideration and are happy to provide input in this important process. Our forests are a critical part of the climate solution and California's leadership provides a strong platform to demonstrate how this can be implemented to provide multiple benefits. If you have any questions, please contact Michelle Passero at mpassero@tnc.org.

Attachment A

The Nature Conservancy
Protecting nature. Preserving life.™

California Regional Office201
Mission St, 4th Floor
San Francisco, CA 94105

Tel (415)793-5035
Fax (415)777-0244

nature.org

April 6, 2016

Rajinder Sahota
Branch Chief, Climate Change Program Evaluation
California Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Comments in response to the Draft Healthy Landscapes 2030: Climate Vision and Goals for Natural and Working Lands

Dear Ms. Sahota:

The Nature Conservancy appreciates the opportunity to submit comments on the draft vision, Healthy Landscapes 2030: California's Climate Change Vision and Goals for Natural and Working Lands (hereafter "Draft Vision"). The Conservancy strongly supports the Governor's Executive Order B-30-15, establishing interim greenhouse gas reduction goals for 2030 so the State can meet its longer term goals established for 2050. Moreover, we support the inclusion of natural and working lands as one of the six pillars of the State's long-term climate strategy. The State will not be able to meet its long term goals without the inclusion of this sector.

Overall, the ideas presented in the Draft Vision lay a strong foundation for the kinds of actions that the state should undertake to continue reducing greenhouse gas emissions beyond 2020. We provide specific comments on these recommendations in the following pages. In addition to these specific comments, we also offer some overarching recommendations that are fundamental to advance natural and working lands as a key strategy to meet long-term climate goals.

Overarching Recommendations:

The state should establish greenhouse gas reduction goals for natural and working lands that are informed and supported by a quantitative, standardized greenhouse gas accounting framework and a clear definition of a greenhouse gas reduction

To understand the scope of greenhouse gas reduction potential from California's natural and working lands and monitor progress over time, the state should establish goals for this sector that are informed by a standardized and quantitative greenhouse has (GHG) accounting framework, which also defines a greenhouse gas reduction. While a host of other considerations, such as climate resilience, habitat, water quality, biodiversity, and jobs, should be applied as additional filters to statewide GHG goals for natural and working lands, this fundamental building block should be established so the reduction potential is well understood by the state and the public and can be monitored and considered alongside the many other objectives for our natural resources.

Such a framework is also needed in California to advance a common understanding of what constitutes a GHG reduction in the natural and working lands sector, thereby reducing different and often conflicting assumptions about what constitutes a greenhouse gas reduction (vs. a carbon or GHG inventory or a carbon pool). It will also help minimize uncertainty about which sector to attribute a reduction (e.g., whether a reduction should be counted in the energy sector, transportation sector or natural and working lands sector). Furthermore, this type of framework can create better synergy and bridge accounting gaps across different landscape scales, from the activity (or project scale) to the regional and statewide scales. For precedent, the state should refer to "jurisdictional accounting" approaches being developed and implemented in tropical forest jurisdictions to meet international greenhouse gas reductions pledges.[3]

Attributes of establishing GHG reduction goals and supporting accounting framework should include the following:

5) A statewide carbon inventory:

   A landscape carbon inventory is essential for establishing a GHG baseline (or reference scenario) for natural and working lands and monitoring emissions and reductions from land-based activities that either increase or decrease carbon over time. The California Air Resources Board's recent carbon inventory analysis and any recent updates could serve as the basis of this inventory.[4]

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[3] "Guidelines for REDD+ Reference Levels: Principles and Recommendations" Prepared for the Government of Norway, by Arild Anglesen, Doug Boucher, Sandra Brown, Valerie Merckx, Charlotte Streck, and Daniel Zarin. Available at www.REDD-OAR.org.

[4] *See* http://www.arb.ca.gov/cc/inventory/pubs/battles%20final%20report%2030jan14.pdf

6) A statewide GHG baseline scenario:

Similar to the reference scenarios (or GHG baseline scenarios) that the state is developing for other sectors, GHG baseline scenario(s) should be developed for natural and working lands. Without a GHG baseline for the landscape, it will be very challenging for the state to estimate and monitor GHG reductions over time. Baseline scenarios are projections into the future of "business as usual" or what is likely to happen in the absence of human interventions to minimize emissions and sequester carbon. Other jurisdictions have developed GHG baselines for the landscape by using historical carbon inventory data over different points in time to establish trends for net changes in landscape carbon, which can inform how a GHG baseline can be forecasted into the future. Establishing a trend or reference scenario for the baseline (versus just one inventory year) is also important to be able capture net sequestration over time and the relative permanence of carbon sequestered in the landscape.

7) Develop statewide GHG reduction scenarios that are spatial:

Once a carbon inventory and GHG baseline are established for natural and working lands, it is possible to develop estimates of GHG reduction potential based on alternative scenarios (relative to the baseline) across regions in the state. This type of analysis should be spatial, where opportunities for interventions (or activities) to sequester more carbon or minimize emissions across regions of the state can be identified. Anticipated climate change impacts can also be included in the scenarios. This carbon data can be aggregated and compared to the GHG baseline to develop ranges of GHG reduction potential that can be achieved through a variety of activities and incentives. They could be used to inform the 2030 Scoping Plan target. This type of assessment should be considered alongside other statewide plans, such as the State Water Action Plan and Safeguarding California, to provide the opportunity to optimize multiple benefits and make strategic investments.

8) Develop a monitoring, reporting and verification system that bridges different landscape scales (i.e., landowner to region and state):

Building from the statewide baseline and scenarios mentioned above, a statewide monitoring, reporting and verification framework should also be established to track progress in the natural and working lands sector. The statewide carbon inventory, as it

is updated over time, can be used as the basis to track changes in carbon across the landscape and monitored against the GHG baseline and reduction scenarios mentioned earlier. A complementary monitoring and reporting framework can also be developed for the interventions or activities that are implemented at the smaller scale to reduce emissions/sequester carbon through programs or policies. This complementary framework can act as a bridge between monitoring at the project/activity scale and the monitoring at the statewide and regional scales.

Express a priority for climate resilience by incorporating specific recommendations for it in all goals

We appreciate and strongly support the acknowledgment that resilience should be incorporated in the state's goals and strategies to reduce greenhouse gas emissions in the natural and working lands sector. As stated in EO B-30-15 and the Environmental Goals and Policy Report, the state's planning and investments should *prioritize* actions that "build climate preparedness and reduce greenhouse gas emissions" (EO B 30 15), "especially in the natural resource sector" (EGPR, page 26).

Within the goals, resilience is explicitly mentioned in goal #2 (enhance carbon resilience through management and restoration). We strongly recommend the inclusion of resilience in all of the goals with examples of how resilience may be included alongside the activities to reduce GHG emissions. For example, in goal #1 (Land Protection and Land Use), the suggestion to protect natural and working lands would provide resilience for species habitat and migratory corridors.

In goal #2, in addition to the overarching goal of building a resilient carbon bank, climate resilience could be recognized throughout each of the recommended sub-goals. The restoration of wetlands can protect against sea level rise and flooding. Riparian restoration can protect water quality and habitat for fish. Healthy soils with more carbon can retain more moisture and be more resilient to drought. Goal #3 seems to emphasize the need to integrate strategies across sectors. Such an effort could be designed to not only optimize and create more synergies for GHG reductions, but it can create more synergies to build resilience and should be explicitly be incorporated in the design. Likewise, in goal #4, urban forestry and green infrastructure in general can reduce emissions and enhance resilience. A more explicit acknowledgment of how this can and should be done would provide helpful additional direction.

Provide flexibility to adjust goals once analysis of greenhouse gas reduction potential for natural and working lands is completed

Overall, the draft vision provides good recommendations for activities that will likely reduce greenhouse gas emissions (i.e., sequester carbon and minimize emissions) across natural and working lands while enhancing other important public and environmental benefits. The document suggests that additional analysis on statewide GHG reduction potential will be conducted. This analysis could highlight additional or different opportunities for achieving reductions and other public benefits than what is currently identified. Consequently, it would be helpful for the Draft Vision to acknowledge this and identify a process for adjusting the document to reflect this new information. The "Related Activities" section could be the section where this kind of language could be inserted.

Include a guiding principle that aligns climate actions for natural and working lands with benefits to disadvantaged and low income communities

The guiding principles enumerated in the Draft Vision are constructive and will help guide meaningful climate outcomes with respect to natural and working lands. In parallel policies, the Administration and Legislature have sought to ensure that communities that are most vulnerable to climate change, such as disadvantaged and low income communities, are protected. With this in mind, we recommend that the guiding principles include an additional principle to align greenhouse gas reduction strategies (and climate strategies overall) with existing and evolving goals to protect and assist communities that are most vulnerable to climate change.

Clarify the intended Greenhouse Gas Reduction Benefit of Each of the Goals

The goals identified in the Draft Vision contain a number of strong recommendations that will likely produce GHG reductions. The goals would be clearer, from a greenhouse gas reduction perspective, if each of the objectives explicitly stated the anticipated GHG reduction benefit (in addition to other important public benefits). For instance, the Land Protection and Land Use Goal, which we strongly support, would benefit from an explicit statement that the increased protection of natural and working lands will avoid GHG emissions and foster ongoing and additional carbon sequestration. The objective in goal #2 more clearly identifies the GHG reduction benefits – increase carbon storage (or carbon sequestration) and minimize emissions. The GHG reduction objective for goal #3 is less clear and would benefit from additional language that explains the intended GHG reduction benefit (optimizing GHG emission reductions by integrating GHG strategies across sectors?).

Provide more detail on the kinds of tools and policies that could be employed to achieve GHG reductions across natural and working lands

Overall, there are many good ideas expressed in the Draft Vision for how the state might incorporate natural and working lands into the State's reduction goals. The Vision would be

even stronger if it provided more detail on the kinds of tools, mechanisms and policies that could be implemented to help achieve the stated goals and objectives. Each of the categorical goals could include a section of specific measures that could be considered to achieve the identified goals and strategies.

Specific Recommendations:

Goal Category #1: Land Protection and Land Use

- The Conservancy supports this goal as a means to reduce biological carbon emissions and other indirect emissions (e.g., transportation and energy) associated with land conversion to other uses.
- We support the recommendation to promote the development of regional plans, climate action plans, and greenprints as a means to reduce greenhouse gas emissions and sequester carbon and recommend that the draft vision provide specific recommendations to advance this goal. Recommendations should include the provision of funds to develop/augment such plans to include natural and working lands and criteria and points in state grant processes that strongly encourage the development and implementation of such plans. The Draft Vision document should also encourage these plans as a mechanism to optimize and integrate HG reduction efforts and benefits across sectors (which dovetails with Goals 3 and 4).

Goal Category #2: Enhance: Management and Restoration

- The conservancy supports the general objective for this goal and suggests that the recommendation to develop common accounting be moved to an overarching goal that applies to all the goals and strategies since the framework will be needed for all activities.
- The forest goals would benefit from a more explicit explanation of the intended GHG reduction goals for this resource. For example, in certain regions of the state, forests may be managed for decreased risk of catastrophic fire, while other areas may be restored or reforested to sequester more carbon. Forest management planning can be an important part of this overall GHG goal. The Conservancy will provide more explicit recommendations for forest-based GHG reduction goals in response to the Forest Carbon Action Plan.

Goal Category #3: Innovate

- As stated earlier, this goal and objective would benefit from more explicit language regarding the GHG reduction that would be achieved through this objective. It appears that the objective is integration of natural and working land strategies with other sectors to reduce emissions and promote sustainable management. As currently written, it is a little unclear.
- If the objective is to encourage strategies that integrate natural and working lands with other sectors, this section should also include the recommendation for the state to support the development of plans that help integrate such strategies.

Goal Category #4: Urban Forestry and Green Infrastructure

- The conservancy supports this goal and objective. Urban forestry and green infrastructure are important strategies for reducing greenhouse gas emission, enhancing resilience and achieving many other public benefits.
- For the same reasons that green infrastructure is important in highly urban areas, green infrastructure is also important in both exurban and more rural areas. We, therefore, recommend that the Draft Vision include the goal to conserve or restore green infrastructure across different communities.
- Green infrastructure could be encouraged with better upfront planning. Therefore, we recommend that the Draft Vision include the recommendation for funding and incentives to include green infrastructure in multi-sector plans to reduce GHG emissions.

We appreciate your consideration and are happy to provide input in this important process. Our natural and working lands are a critical part of the climate solution and California's leadership provides a strong platform to demonstrate how this can be implemented to provide multiple benefits. If you have any questions, please contact Michelle Passero at mpassero@tnc.org.

Lack of Infrastruture to Process Feed Stock/Biomass to attain Forest Health/Improve Forest C Storage - Message (HTML)

File | Message | Adobe PDF

Ignore | Junk | Delete | Reply | Reply All | Forward | Meeting | More | Move to: ? | Team E-mail | Reply & Delete | To Manager | Done | Create New | Move | Rules | OneNote | Actions | Mark Unread | Categorize | Follow Up | Translate | Find | Related | Select | Zoom

Delete | Respond | Quick Steps | Move | Tags | Editing | Zoom

From: don hittenmiller <ctvh2006@yahoo.com>
To: CALFIRE Forest Climate Advisory Team
Cc:
Subject: Lack of Infrastruture to Process Feed Stock/Biomass to attain Forest Health/Improve Forest C Storage

Sent: Thu 3/24/2016 10:10 AM

California lacks the infrastructure to process the biomass that must come out of the forests per fuel reduction management guidelines. If we look at California's consumption of forest feed stock (small diameter trees) for bio-energy in 2009 at 0.8 million bone dry tons (BDT), we fall severely short on the consumption side if we use the accepted harvesting guidelines established by forest management groups at 10-100 BDT per acre for some 17 million acres. At these consumption rates, between 200-2000 years would be needed by the bio-energy sector. This level of consumption is completely insufficient for proper forest management set by the GTR 220 guidelines. The ramifications of this limited removal of biomass will result in the loss of our forests as carbon storage sources and will damage associated watersheds. The severity and scale of fires will increase beyond what we have seen historically.

The only solution is long term planning for infrastructure of wood products, such as Oriented Strand Board (OSB) and Wood Fiber Insulated Board (WFIB) plants and/or other composite panel plants to scale. These wood products use the same biomass as bio-energy plants. They are long lasting C-storage wood products. The current market in California for OSB is quite large. By developing other markets for panel wood products such as CLT and WFIB we enhance the flow of feed stock out of the forests and thereby Forest Health/Forest C storage. We also add C storage via these long lasting wood products
We will not achieve our vision of Forest Health/Forest C storage without manufacturing infrastructure to process the feed stock at appropriate scale.

Don Hittenmiller, Alpine Biomass Committee (ABC), ACCG member

See more about: don hittenmiller.

4:38 PM
4/15/2016

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Dept of Environmental Science, Policy, and Management
130 Mulford Hall #3114
Berkeley, CA 94720-3114
carlinstarrs@berkeley.edu
(510) 685-4049
March 23, 2016

Hello. My name is Carlin Starrs, and I am here representing the University of California's Center for Forestry[1] and the Center for Fire Research and Outreach[2].

We are encouraged that the team is articulating how carbon goals fit with other goals for all of California's diverse forests and is engaging stakeholders to promote innovative approaches.

The California Forest Carbon Plan Concept Paper uses many different definitions of the climate benefits related to our forests. For California to be a global leader in increasing the global climate benefits we can get from forests, we suggest that California use a consistent approach to accounting for the climate benefits and impacts related to forests and forest products. In this very room in December 2015, Werner Kurz from the Canadian Forest Service described an approach they have developed that is fully compliant with the most recent guidance from the Intergovernmental Panel on Climate Change (IPCC). His presentation and related papers are available on the Center for Forestry website[3].

In particular, it will be very important to clarify how harvested wood products can fit into climate mitigation strategies, as there are significant opportunities to promote innovations to increase the efficiency of how they are produced and to reduce future emissions from our current 'less than optimal' recycling efforts. These pathways are shown in the 'Mitigation Strategies: Need for Systems Perspective' figure on the next page that comes from Werner Kurz's December 2015 presentation (Figure 2). Given that many wood framed homes in cities like Berkeley are over 100 years old and that modern landfills can store waste wood essentially forever, including the carbon sequestration and substitution benefits into scenarios will be critical for accuracy.

Since carbon is only the latest value we ascribe to California's many forests, developing a shared understanding of the relative importance of different benefits and co-benefits for the major types of forests is important. For example, it may make sense to consider the anti-fragmentation strategy for forests under the threat of residential conversion to be 'urban forests' as opposed to working forests, where sustainable forest management and the judicious reintroduction of prescribed fire is feasible. It is also important to consider our cherished parks, wilderness areas, and roadless areas as 'reserve forests' with their own unique set of values. For discussion, we present a rough cut of climate benefits by three different forest types (Figure 1).

Thank you for the opportunity to comment on this important work. Please feel free to contact myself or my colleague, Dr. William Stewart, with any questions or comments.

Sincerely,

Carlin Starrs
Policy Analyst, Center for Forestry & Center for Fire Research and Outreach

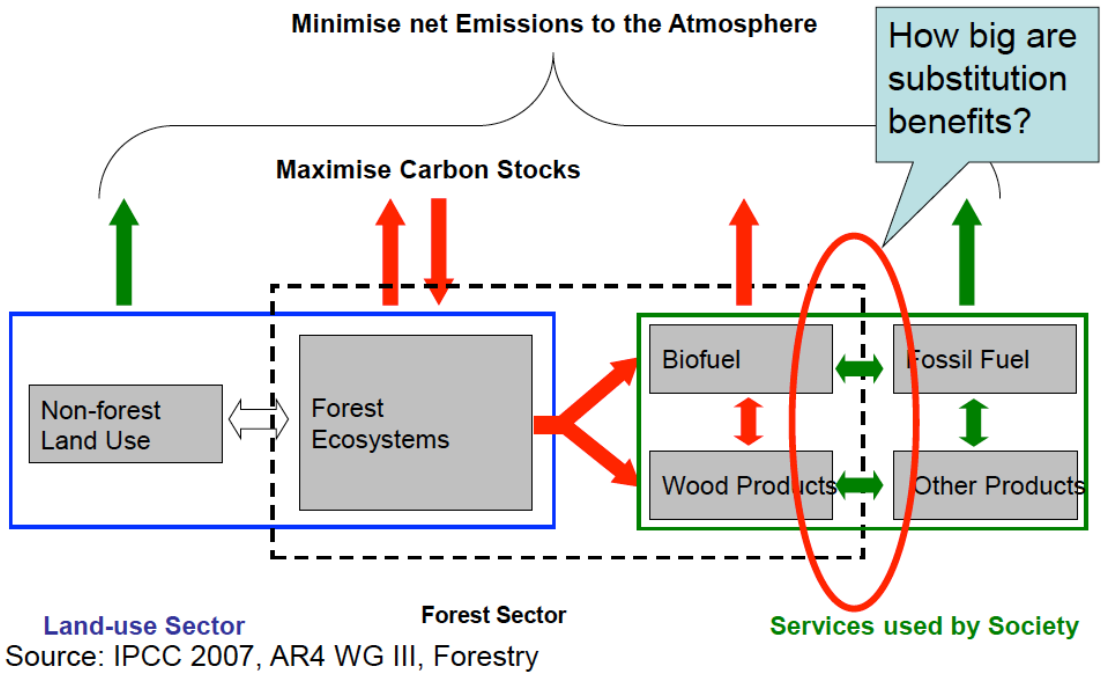
[1] http://ucanr.edu/sites/cff/
[2] http://ucanr.edu/sites/cfro/
[3] http://ucanr.edu/sites/cff/2015_William_Main_Seminar_Series/Forest_Carbon_in_Canada/

Figure 1. Rough cut estimates of climate benefits on a per acre basis (5-highest, 0-lowest)

Type of climate benefit or risk	Urban	Working	Reserve
Net in-forest carbon sequestration	2	5	5
Risks to forest health and loss of carbon	-3	-5	-3
Timber product carbon sequestration and substitution	1	5	0
Bioenergy carbon substitution	2	5	0
Watershed protection	3	5	5
Wildlife habitats	2	4	5
Biodiversity	2	4	5
Open space and recreation	5	3	4
Human habitat enhancement	5	2	1
Economic activity benefits	2	5	1

The greatest social return on new investments will vary depending on how different types of benefits (and risk avoidance) are considered. For example, while planting urban trees is more expensive per tree, they have much greater human habitat enhancement benefits per tree. On the other hand the ability to reduce risks to forest health and the potential loss of climate benefits are greater in the working forests than our reserve forests where lack of roads and legal restrictions limit treatment options.

Figure 2. Mitigation Strategies: Need for Systems Perspective



Source: Kurz, W. A., C. Smyth and T. Lempriere (2015). Forest sector contributions to climate change mitigation: opportunities from Canada to California. William Main Seminar Series. Sacramento, CA, University of California Center for Forestry. http://ucanr.edu/sites/cff/2015_William_Main_Seminar_Series/Forest_Carbon_in_Canada/

This conceptual diagram from the 2007 IPCC report illustrates the interlinked character of overall land use, the forest sector, and the services used by society that need to be considered when crafting state or national level approaches to minimize net GHG emissions.

MENDOCINO COUNTY
RESOURCE CONSERVATION DISTRICT

Conserving Wild and Working Landscapes since 1945

April 6, 2016

Chief Ken Pimlott
CAL FIRE Director

Assistant Secretary Russ Henly
California Natural Resources Agency

Deputy Secretary Ashley Conrad-Saydah
California Environmental Protection Agency

RE: RECOMMENDATIONS ON THE CALIFORNIA FOREST CARBON PLAN CONCEPT PAPER

Dear Chief Pimlott, Assistant Secretary Henly, and Deputy Secretary Conrad-Saydah,

On behalf of the Mendocino County Resource Conservation District (District), I am pleased to submit the following recommendations to the Forest Climate Action Team on the draft *California Forest Carbon Plan Concept Paper* published on March 9th, 2016. The Forest Carbon Plan has the opportunity to help conserve and sustainably manage natural and working forestlands to reduce potent greenhouse gas (GHG) emissions, enhance carbon sequestration improving our carbon sinks, and deliver economic, social, and environmental co-benefits.

The District is a non-regulatory, local agency supporting voluntary stewardship of natural resources on wild and working landscapes in Mendocino County and its mission is closely aligned with the successful outcomes of the Forest Carbon Plan. We are one of 99 Resource Conservation Districts (RCDs) in the state that were formed to facilitate coordinated resource management efforts with the purpose of local, state, and federal resource conservation planning. RCDs are in the position to collaborate and share program expertise across the state while tailoring their services to the needs of local landowners and ecosystems. The District sees our current role of conservation organization, public agency, and private landowner coordination as a way to fulfill FCAT's goals of engaging private and public landowners with local, state, and federal agencies.

To date, participating agencies in the Forest Climate Action Team have identified the following broad concepts to organize more specific goals and strategies around within the Concept Paper:

- Protect – Increase protections on forested lands to reduce the rate of fragmentation and conversion to non-forest uses and preserve forestland carbon sequestration potential

- Enhance – Increase forest carbon storage pools and minimize GHG and black carbon emissions in a sustainable manner
- Innovate – Optimize net carbon storage and GHG emission reduction while sustaining working lands and rural economies

The District's comments are relevant to all three of these broad concepts. Recommendations are intended to meet the needs of forest landowners of all sizes and management capabilities to keep their lands sequestering carbon in perpetuity.

Recommendations on Planning and Implementation

Federal, state, and large industrial landowners inherently have more technical and economic support to implement management activities. Generally, it is more of a financial burden for smaller landowners to hire technical assistance, such as an RPF, to evaluate and develop management prescriptions. It is recommended that FCAT ensure clear direction for the implementation of carbon sequestering and GHG emission reducing activities through the following guiding principles:

- **Outreach:** FCAT should work with local county partners to develop an outreach program that targets landowners by utilizing RCDs, University of California Cooperative Extension (UCCE) advisors, and technical service providers, ensuring widespread awareness and buy-in for the Forest Carbon Plan. Future outreach should include recognition of forest landowner and manager participants for their work to address climate change and provide multiple benefits for their communities.
- **Practice Standards:** Develop standard carbon sequestration and emission reduction practices similar in format to the Natural Resource Conservation Service's (NRCS) Conservation Practices. These practice standards should define the activity and where it applies, allowing a landowner to get a sense of what management activities may be appropriate for their parcels. Furthermore, practice standards should be refined by region and forest type, reflecting California's great ecosystem diversity.
- **Regional Scale**: County level planning is recommended as the basis for regional delineation, with the intent that regional efforts be coordinated with one another when watershed boundaries span jurisdictional lines. Statewide priorities can be fine-tuned through local stakeholders, such as RCDs, local non-governmental organizations, fire safe councils, and landowners.
- **Regional Production Potential**: When setting regional goals, it is recommended that targets reflect the potential of the forest type to sequester carbon. For example, the redwood region is one of the most productive sites in the world, and has great potential to sequester carbon.
- **Focus Groups:** To determine the success and interest among forest landowners and management organizations to participate in such planning and implementation efforts, it is recommended FCAT develop regional focus groups of community leaders, local agencies, and land managers to discuss how best to roll-out new carbon driven programs to accommodate a variety of landowners and managers

Recommendations on Incentives and Landowner Participation

Land managers and landowners implement management practices for a variety of purposes, which may include economic, environmental, regulatory, and personal reasons. To achieve the widespread engagement and implementation of carbon sequestration and GHG emission reduction management activities, well-designed incentives must remove barriers to their adoption. Current barriers include economic limitations and lack of technical assistance for smaller landowners, among others.

Incentives proposed by the Forest Carbon Plan should facilitate participation from landowners of all size, from large industrial companies to local homeowners. Additionally, incentives should encourage and facilitate management activities on a long-term, sustained time scale while increasing economic viability and resilience. It is recommended that the following objectives be integrated into incentive programs:

- **Incentive Program Simplicity:** The incentive program should be designed to serve a diverse array of landowners across various regions, stand types, and scale. Both the application process for and selected compliance standards used in adopted incentive programs should be as simple as possible. Simplicity is needed to keep the costs of participation manageable for as many eligible landowners as possible, regardless of parcel size and capacity for forest management.
- **Technical Assistance:** Incentives should not be considered strictly financial, but should also encompass training and technical assistance benefits. The State should consider providing funding to local agencies, such as RCDs or UCCE, that may employ staff with the technical skills to evaluate and prescribe management action plans.
- **Streamline Compliance Standards:** Methodologies to assess carbon stocks and other greenhouse gas exchange between forests and the atmosphere are time and capital intensive and currently excludes small landowners from participating in greenhouse gas off-set programs. This should be kept in mind when a standard forest carbon accounting framework is in development. The framework should provide a simple and streamline inventory and application process to participate in state or federal programs.
- **Incentives for All Landownership Classes:** The goal of redistributing total carbon storage among fewer, larger, more fire resilient trees will have huge implications for much of the current management over the many ownership classes across the State. In addition to supporting non-industrial landowners, corporate or capital intensive lands will need economic incentives to carry larger trees over a longer rotation and must have the milling capacity to handle these when eventually harvested and replaced by other trees recruited for these characteristics.

Recommendations on Innovation and Sustaining Economies

The District applauds FCAT for specifically pointing out long-term economic benefits for landowners and workers, as well as committing to the production of wood products and biomass for energy as key factors in protecting and enhancing our forests. The need to make forest management economically viable cannot be understated. Incentive programs are a critical piece of the puzzle, but

the Forest Carbon Plan should look broadly at the forest products industry which sustains so many of California's rural and forested communities.

Successful implementation of FCAT's management recommendations depends on the following elements:

- **Regulatory Reform:** Support regulatory reform to reduce costs of legal compliance for active forest management.
- **Infrastructure:** State and private investment in infrastructure, such as saw mills and woody biomass energy facilities. Subsidies to the biomass energy sector are currently needed. The District recognizes that this may be beyond the scope of FCAT, however, the Forest Carbon Plan should recognize and acknowledge the full suite of benefits biomass extraction provides, including producing renewable energy, jobs, and increased forest stand resilience from a product that currently has little to no economic value.
- **Support and Elevate the Forest Products Industry:** Maintaining and elevating the forest products industry is key in keeping forestland under effective long-term management to enhance forest health and prevent the parcelization and conversion of potentially productive land.
- **Public Education on the Topic of Forest Management:** Outreach and education about forest management's role in carbon sequestration and GHG emission reductions should extend beyond timberland owners and into urban communities. Urban perceptions create rural realities. Thus, in order for forest landowners, both industrial and non-industrial, to manage in ways that support the goals of the Carbon Action Plan, urban communities must be supportive of the wood products industry.

The District would like to again emphasize the importance of engaging local partners in planning efforts. Community-based organizations are instrumental in motivating landowners to engage in the conservation and responsible management of forestland for the purpose of enhancing carbon sequestration and reducing greenhouse gas emissions. Collaboration between neighbors, facilitated by locally based organizations, will provide more landscape level treatments.

Thank you for the opportunity to provide input on this important and timely issue. The success of the Forest Carbon Plan and how it facilitates and dictates forest management for the purpose of carbon sequestration and GHG reduction is integrated into the Districts goals of watershed restoration and enhancement. Please contact me at 707-462-3664, or at patricia.hickey@mcrcd.org if I can provide you with any additional information.

Sincerely,

Patricia Hickey
Executive Director

MOUNTAINS RECREATION & CONSERVATION AUTHORITY
Los Angeles River Center & Gardens
570 West Avenue Twenty-six, Suite 100
Los Angeles, California 90065
Phone (323) 221-9944

April 7, 2016

Mary D. Nichols, Chairperson
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Comments on the Forest Carbon Plan

Dear Chairperson Nichols:

The Mountains Recreation and Conservation Authority (MRCA) is grateful for this opportunity to provide comments to the California Air Resources Board and Forest Climate Action Team (FCAT) with regards to the Forest Carbon Plan Concept Paper (Plan).

The MRCA is a local government public entity established in 1985 pursuant to the Joint Powers Act. The MRCA is a local partnership between the Santa Monica Mountains Conservancy (Conservancy), which is a state agency established by the Legislature, and the Conejo Recreation and Park District and the Rancho Simi Recreation and Park District, both of which are local park agencies established by the vote of the people in those communities.

The MRCA is dedicated to the preservation and management of local open space and parkland, watershed lands, trails, and wildlife habitat. The MRCA manages and provides ranger services for almost 72,000 acres of public lands and parks that it owns and that are owned by the Conservancy or other agencies, and provides comprehensive education and interpretation programs for the public. The MRCA works in cooperation with the Conservancy and other local government partners to acquire parkland, participate in vital planning processes, and complete major park improvement projects.

The MRCA provides natural resources, scientific expertise, critical regional planning services, park construction services, park operations, fire prevention, ranger services, educational and leadership programs for thousands of youth each year, and is one of the lead agencies providing for the revitalization of the Los Angeles River.

Because of MRCA's dedication and long history of preservation and management of local open space, natural resources and parkland, the MRCA takes the threats climate change presents seriously and seeks proactively to implement climate change

mitigation and adaptation efforts. MRCA protects some of California's most at risk species and biodiversity from human encroachment, drought, pollution and climate change. The lands we own and manage for all Californians provide important local air quality, water quality and heat island mitigation for the local population, including many disadvantaged and environmental justice communities.

Looking towards climate change's future and existing threats and uncertainties, the MRCA has embarked on a research and planning program to investigate how parks, local planning, development and open space efforts can mitigate greenhouse gas emissions and implement cost-effective climate change adaptation measures. MRCA has worked closely on this program with the Santa Monica Mountains Conservancy.

Given MRCA's roles and perspectives, MRCA makes the following recommendations to CARB and FCAT. MRCA staff are also available to meet with your staff as desired to discuss these ideas further.

1. Regionally Based Entities as Implementors:

MRCA requests that CARB and FCAT specifically designate State Conservancies and other regionally based entities, such as MRCA, as Implementing Entities for investment funds. State Conservancies have the ability to implement climate change adaptation and mitigation projects quickly, equitably and efficiently. California's Conservancies and MRCA are particularly well suited to meet greenhouse gas emissions (GHG) reductions goals and targets because they already have the mechanisms and partnerships in place to implement regional programs that serve statewide priorities. Conservancies and MRCA will be able to leverage allowance revenues with existing funds, form strategic partnerships with local entities, and utilize existing administrative infrastructure to efficiently roll out projects that incentivize and foster GHG reduction goals and further the purposes of AB 32 and the Forest Carbon Action Plan.

Many of the current or proposed projects by MRCA, the Santa Monica Mountains Conservancy, and similar regionally focused entities are located in and serve disadvantaged communities (DACs) as identified by Cal/EPA. The Los Angeles area has the largest concentration of DACs in California. These areas of high need have long been a focus for the MRCA because every dollar invested achieves important statewide co-benefits like job creation, advanced skills and job training, and neighborhood revitalization. The MRCA is in a position to quickly implement this work should strategic investment funds from auction proceeds become available.

Both regionally based entities, like MRCA, and regional state agencies, like State Conservancies, have the local implementing knowledge and networks designed to respond quickly and adapt to local needs. These tested capabilities allow these entities to prioritize environmental concerns, identify environmental hazards, work with affected

communities, continually monitor and adapt solutions, provide transparency, and ensure regionalized participation in climate change solutions.

2. Invest in chaparral for climate adaptation and carbon sequestration:

In addition to forests, California's important chaparral ecosystems serve as important carbon sinks and, in many areas, are better adapted to endure the stresses of climate change.

Chaparral systems serve, like forests, as important carbon sinks and must be protected. [See, for example, Luo, H. 2007. Mature semiarid chaparral ecosystems can be a significant sink for atmospheric carbon dioxide. Global Change Biology 13: 386-396.]

The water needs of chaparral ecosystems also indicate that they might be more resilient to negative changes in state water availability as droughts increase and climate change alters water cycle patterns. These ecosystems often sequester significant portions of their stored carbon underground, providing greater carbon sequestration resiliency in the wake of wildfires.

Thus, it is important for CARB and FCAT to ensure that chaparral systems are considered along with forests in California's carbon sequestration and climate adaptation equations. There must exist similar policy incentives for chaparral to ensure that these ecosystems are protected. CARB and FCAT should ensure that forest carbon initiatives do not have the perverse incentive of encouraging conversion and development of chaparral ecosystems by not prioritizing chaparral through regulatory and economic incentives at parity with forest ecosystems. Otherwise, attempts to improve forest health may have the negative impact of signaling to developers and planners that chaparral ecosystems are still ripe targets for conversion.

3. Habitat interconnectivity and wildlife corridors under a changed climate:

FCAT intends that the Plan (page 2)

- "Establish forest health and resiliency conditions needed to reach targets for carbon sequestration and net reductions in emissions of greenhouse gases (GHGs) and atmospheric black carbon;"...

- "Develop near-, medium- and long-term targets for carbon sequestration and emissions reductions by region and ownership, through 2050 and beyond, based on goals and ecosystem potential."

The Plan also recognizes that (page 6)

> "Forest losses due to climate change not only threaten carbon storage and emissions from forests, but also threaten water resources, energy transmission, the survival of fish and wildlife, and human health. These losses also will negatively impact tourism, recreation opportunities, and the timber industry."

Therefore, MRCA recommends that the Plan provide financial incentives, research support and funding, and technical assistance. Local operators need to implement the best forest health strategies for resilient ecosystems during and after climatic changes. Local entities will need to plant and manage forests, rural and urban, that will adapt to fire pattern changes; temperature changes; humidity changes; wildlife changes, including invasive species; and water availability changes, including precipitation changes. Local planners, like MRCA and its partners will better sequester carbon and plan for the future if they have the support to know which species will survive and thrive in their jurisdictions as climatic changes affects their regions.

Similarly, MRCA and other entities will need to manage forests in a way that ensures current wildlife corridors will be able to adapt as climate change shifts vegetation patters. This is especially important for megafauna and keystone species that may not be able to survive in their current ranges if changes in vegetation patterns limit the availability of food sources in shifting corridors.

Thus, it is not enough that the forests today are "protected from fragmentation and conversion, and that [forests] provide a diverse range of quality, interconnected habitat types for terrestrial and aquatic wildlife species, including listed and non-listed species." Rather, it is important to ensure that the forests of the future are similarly protected. To better ensure this happens, the state should provide incentives, research support and technical assistance so that current investments realize their goals.

4. Active Transportation and Urban Forest Health

Regionally focused entities, like MRCA and State Conservancies, are in the best position to exploit synergies between the urban forest and GHG reduction co-benefits. As the FCAT recognizes, urban forests serve as important carbon sinks. However, it is also important to prioritize urban forest programs that leverage urban forestry investment with other strategies to reduce carbon emissions.

MRCA and the Santa Monica Mountains Conservancy have worked together with their consultants to research quantifiable methods of leveraging urban park and urban forestry investments to reduce GHG emissions from the urban area. State funds and incentives should be made available so that local actors, like MRCA and the Santa Monica Mountains Conservancy, have the ability to prioritized urban forestry investments that provide important climate change adaptation and mitigation co-benefits. State funding can catalyze local actors to invest in these multi-benefit urban park and urban forestry strategies. Examples of these strategies include:

• **Active Transportation:**

The strategic co-location of urban parks and urban forestry investments to mitigate heat island effect and provide shade along potential and important active transportation routes can reduce VMTs and encourage dense urban living. This is especially important along bus and rail stations, dense urban infill areas, important walking corridors, and bike paths.

• **Greenbelts:**

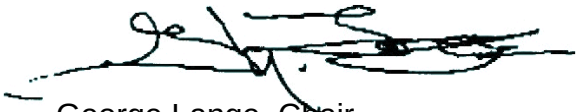
Forestry programs can incentivize the acquisition, maintenance and preservation of urban greenbelts, containing the urban limit line. Forestry programs, thus, cannot only help combat climate change through directly sequestering carbon, but also by reducing VMTs. Strong urban limit lines encourage dense urban living and infill development. By creating incentives for forestry acquisitions to create strong greenbelts, especially when combined with the Sustainable Agricultural Land Conservation (SALC) program, forestry programs can make sustainable and significant GHG reductions in addition to direct sequestration, water quality and wildlife benefits.

• **Urban Amenities:**

Urban parks and inviting urban open spaces and corridors enhance the value and increase the desirability of dense urban living. Strategic urban forestry investments that support park growth, stabilize neighborhoods and create inviting urban open spaces, such as the future redevelopment plans for the Los Angeles River, can create additional GHG benefits outside the urban forest's carbon sequestration and urban runoff nutrient load reducing abilities. By making dense urban living attractive, entities like MRCA and State Conservancies, can help reduce urban sprawl, related VMTs, and related land conversion losses.

Thank you again for the opportunity to comment. Please do not hesitate to contact me if you have any questions.

Sincerely,



George Lange, Chair
Mountains Recreation and Conservation Authority

PACIFIC FOREST TRUST
Private Forests. Public Treasures.

8 April 2016

Re: California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate

Dear Forest Climate Action Team members:

We appreciate this opportunity to comment on the California Forest Carbon Plan Concept Paper and welcome continued conversation as the plan develops. We support the broader vision for resilient forests that store significant amounts of carbon and provide important co-benefits for wildlife, water, and communities. However, this document focusses almost exclusively on short-term actions, which while necessary, cannot be sufficient as resiliency is a process and achieved overtime. We believe that a greater focus on long-term forest conditions throughout the concept paper will help make these goals an enduring reality. Achieving and sustaining resilient forests for the long-term underpins our recommendations on the description of current forest conditions, identification of priority areas, management actions, planning targets, and investment. In addition to supporting and sustaining more resilient forests, we believe this paper must embrace a goal of steadily increasing net carbon stores over time in our productive California forest, aiding in achieving their ecological potential, and contributing to essential climate solutions.

Accurate portrayal of human influence on forests

It is important to take the proper time perspective on the historic conditions of forests as this informs future forest management decisions. In the concept paper, the effects of human influence on forest conditions are understated. The statement, "past human activities, such as fire suppression and logging, influence acres burned, but the impacts are small when compared to drought, wind, and temperature" (page 4) is not born out by reality. While there may be some truth to the statement over timeframes of thousands of years, it fundamentally glosses over the very real changes that have been made to forest structure in the last hundred years:

- Historical management patterns have created young, dense, homogenous forests.
- Fire suppression and over-planting result in excessively dense forests.
- Fragmentation and development increase fire ignition sites and decrease forest resilience. Intactness is prime factor in supporting forest health and ecological function.

The Presidio of San Francisco, CA • 1001-A O'Reilly Avenue, San Francisco, CA 94129 • TEL 415.561.0700 • FAX 415.561.9559
Sacramento, CA • TEL 916.214.1382 • www.PacificForest.org

See Marlon et al. 2011[1] for counter-arguments such as: "current levels of fire activity are clearly out of equilibrium with contemporary climate conditions."

Identification of priority areas should take into account broader time scales
The identification of priority areas as described in the *Analytical Approach* section would benefit from a stronger recognition that forests need time to realize their ecological potential for carbon sequestration, watershed function, and wildlife habitat. This involves: (1) recognizing areas of opportunity for carbon sequestration and adaptation (as well as threat of emissions), (2) a long-term perspective on future stressors such as climate change, and (3) a commitment to revisit and refine priority areas over time.

The identification of priority areas is narrowly defined by the current tree mortality crisis. We cannot achieve resilient forests with only a reactionary, crisis-oriented approach. We also need robust plans to address forest function in the long-term. The criteria for priority areas is described as "high hazard areas" characterized by "unique resource values." This intersection focuses on areas under threat while neglecting areas of opportunity that should be considered. These opportunity areas are those that provide important ecosystem services and co-benefits such as water provision, have the potential to store significant amounts of carbon, and could be managed for an older stand structure. Both objectives can be achieved by: (1) nesting near-term restoration activities to address threats within long-term plans for improved management and (2) sustaining forests over time through specific conservation tools or other equally enduring means.

Utilizing climate models and other tools can help identify which areas of the state will become increasingly important for their ecological functions. For instance, the Shasta and Oroville reservoirs currently provide drinking water for 25 million Californians. As the state population increases and hotter temperatures increase water stress – these watersheds, which are projected to remain cooler and wetter relative to the rest of the state, will become increasingly important. The identification of priority areas should take a proactive approach to identifying key areas of current and future ecological importance.

Even with the best modeling technology, the reality is that the landscape will change over time. The identification of priority areas should dynamically reflect these changes. We appreciate the recognition that the Forest Carbon Plan should be reviewed and adjusted periodically, and hope that in doing so the identification of priority areas will not become a fixed metric, but one that can adapt to changing conditions.

---

[1] Marlon, J.R., Bartlein, P.J., Gavin, D.G., Long, C.J., Anderson, R.S., Briles, C.E., Brown, K.J., Colombaroli, D., Hallett, D.J., Power, M.J., Scharf, E.A., Walsh, M.K., 2012. Long-term perspective on wildfires in the western USA. PNAS 109, E535–E543. doi:10.1073/pnas.1112839109

Management actions should promote long-term improved management and resilience

There are commendable larger goals about achieving resilient forests that provide for healthy watersheds, are protected from fragmentation, and store significant amounts of carbon. However, there is a misalignment between the heavy focus on near-term management actions such as fuel reduction and a nominal discussion of mechanisms for long-term management and conservation commitments needed to accomplish these goals.

There is a need to clearly articulate pathways to achieve the older, well-spaced stands which include larger, fire-resistant trees and make up resilient forest landscapes. Growing and retaining those larger, fire resistant trees has a cost to the landowner and is unlikely to happen without a policy intervention. Without a long-term framework, it is likely that many of intended benefits of the actions and investments will be reversed by future management or land use conversion. As is appropriately recognized by the "protect" management strategy, there is a significant need to increase protection on managed forested lands, through mechanisms such as conservation easements.

However, the "enhance" management strategy does not adequately address the long time horizon needed to meet its goal of a growing and resilient living carbon store in large trees. This section recognizes that there are many forests well below their ecological potential for carbon sequestration, watershed function, and wildlife habitat. However, harnessing the ecological potential of these forests involves not just short-term restoration activities, but also acknowledging that these forests need <u>time</u> to realize this potential. As there is a monetary value to that time that competes with other economic pressures, it is necessary to secure the commitment to manage the land for the long-term, via conservation easements or other equally enduring means.

Similarly, the management actions that follow from the identification of priority areas also need to take into account a longer time horizon. The 10-year time horizon suggested on page 27 could lead to a focus on the near-term management goals, with the potential for net increased emissions. Instead, management should focus on nested short, medium, and long-term goals which insure that investments will be durable over time. Nesting these goals will allow decisions to more effectively create the desirable forest characteristics – well spaced stands with big trees, snags, and large downed logs – that take time to develop.

Planning targets could be refined

The planning targets need to be refined with a greater focus on forest resilience, which will help ensure that carbon stores are more dynamically stable. For instance, the target under the "enhance" strategy to place 500,000 acres/year of non-federal forest land under plans and to manage these lands for improved forest health. It is unclear what the concept paper means by: "this acreage target will include capture the carbon outcomes of commercial timber harvesting" (page 23). Carbon products

from the forest are the residue of the carbon that was in the stand. While these remaining carbon stores are important, our focus should primarily be on increasing net carbon stocks in the forest. Commercial timber products do contribute to overall goals. Instead, targets should focus on promoting more carbon rich older, complex, diverse stands which are more resilient. This approach allows for continued timber harvest that sustains rural economies, while shifting management practices to enhance carbon storage and other co-benefits.

A sharper focus on creating resilient forests will also involve a shift in the specific strategies used to achieve the "enhance" management goal. The strategies currently mentioned focus on fuel management, which is a much-needed, but short-term management action. Achieving forests that embody more resilient carbon stocks will involve both near-term thinning activities and long-term commitments to older trees, diverse species, complex stand structure, and a secured land base. To this end, a specific management activity could be added on page 24 that reads along the lines of: "9. Develop tools to achieve older forest characteristics that represent healthy, resilient stands." Including this type of management strategy that captures the time component needed for resilience to develop will help meet the outlined goals around achieving older, more resilient forests.

As with the management strategies just discussed, other strategies need to be up to the task of meeting the goals outlined in the concept paper. For instance, the existing "habitat conservations plans, Nonindustrial Timber Management Plans, Program Timberland Environmental Impact Reports," and others are not adequate "implementation mechanisms." First, these plans are often in place for decades and not easily mutable. More importantly, these plans are not designed around carbon storage and climate goals and so would likely be ineffective at meeting these goals. Finally, they were not designed to specifically enhance or increase carbon stores, rather they meet a regulatory permitting function (or functional equivalent) for other purposes. We need a comprehensive climate plan on an appropriate landscape scale.

Investment opportunities

As we have emphasized throughout this letter, the need for improved management of forest lands for the long-term is paramount in ensuring enduring carbon stores. However, the historic bond funding that has supported forest conservation and improved management projects is nearly exhausted. While some funds from the GGRF have been made available through the Forest Legacy Program, the need vastly exceeds this modest allocation. Further, there is an important role for working forest easements that secure existing carbon and enshrine high standards of forest stewardship across the landscape, often in areas that are not immediately threatened by residential development. Forest Legacy targets those more discrete areas already fragmented and in the WUI; an important objective but not sufficient to secure more carbon rich resilient landscapes.

We strongly support an investment plan that includes investments both in short-term activities to address imminent threats and opportunities, as well as investments that

create benefits over the long-term by ensuring the development of healthy resilient forests for future generations.

To this end, the investment mechanisms laid out in the concept paper for private lands (page 30) should include mechanisms for *increasing net carbon stores* on private lands though improved management. Private forests have enormous potential to hold stores of carbon beyond current "business as usual". Making appropriate incentives available for willing landowners, such as conservation easements that secure high levels of stewardship above the regulatory floor (not just for lands at risk of conversion), can help harness the untapped ecological potential of private forest land to meet climate goals.

We applaud your recognition of new finance mechanisms such as the possibility for collaboration between California's forested watersheds and the downstream beneficiaries of the improved water quality. Forested watersheds are a critical resource for the state, yet their maintenance has been long neglected.

A forest climate plan, not just a forest carbon plan

The concept paper does a decent job of recognizing that forests are important for more than just carbon, but the title does not currently reflect this. Shifting the title from a "forest carbon plan" to a "forest climate plan" will help broaden the framing of the plan to reflect a more holistic perspective on the benefits of forest for both climate change mitigation and adaptation.

We look forward to discussing the suggestions outlined in these comments and providing further input as the Forest Carbon Plan progresses.

The Presidio of San Francisco, CA • 1001-A O'Reilly Avenue, San Francisco, CA 94129 • TEL 415.561.0700 • FAX 415.561.9559
Sacramento, CA • TEL 916.214.1382 • www.PacificForest.org

Pacific Gas and Electric Company

Claire Halbrook
Climate Policy Principal
State Agency Relations

1415 L Street, Suite 280
Sacramento, CA 95814
(916) 386-5711

April 8, 2016

Forest Climate Action Team
fcat.calfire@fire.ca.gov

RE: Forest Climate Action Team – Draft Forest Carbon Plan Concept Paper

Pacific Gas and Electric Company (PG&E) appreciates the opportunity to provide comments on both the March 23, 2016 Workshop on the Draft Forest Carbon Plan Concept Paper[1] (Draft Concept Paper) and the March 23, 2016 Workshop on the Natural Working Lands Discussion Paper[2] (Discussion Paper).

Both the Draft Concept Paper and Discussion Paper outlined a number of important goals and strategies needed to ensure California's wildlands and urban forests, and natural and working lands are preserved for future generations and continue to provide environmental benefits to the state. Forest health is especially important to PG&E. Under PG&E's comprehensive Electric Vegetation Management Program, 300 arborists and 19 foresters inspect every mile of overhead power line (approx. 132,000 miles of line) in PG&E's service area each year. In addition, we provided $2 million to local Fire Safe Councils for fire fuel reduction.

The Discussion Paper[3] and the Draft Concept Paper[4] also both emphasize the need to increase opportunities to use forest waste materials for bioenergy production. PG&E is a long-time supporter of the biomass industry and continues to be the largest purchaser of biomass-generated electricity in California. In 2015, PG&E procured 92 percent of total Renewable Portfolio Standard (RPS) eligible biomass generated electricity in the state. PG&E understands that biomass plays an important role in forest and land management. However, the cost of biomass electricity is considerably higher relative to other renewable energy sources, making it increasingly challenging to justify continued procurement which results in higher costs for our customers. For example, the levelized cost of solar ($76 per megawatt-hour [MWh]) and wind ($75 per MWh) is currently about half the cost of biomass ($143 per MWh).[5] Moreover, PG&E does not have an immediate need to procure additional renewable resources and is well-positioned to meet its RPS requirements for the second (2014-2016) and third (2017-2020) compliance periods. Finally, PG&E's total need for *all* electric energy is declining, as the

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[1] Forest Climate Action Team. March 9, 2016. California Forest Carbon Action Plan: Managing our Forest Landscapes in a Changing Climate. Website: http://calfire.ca.gov/fcat/downloads/Forest_Carbon_Plan-ConceptPaper_Draft_PublicOutreach.pdf

[2] California Department of Food and Agriculture, California Natural Resources Agency, Governor's Office of Planning and Research, California Air Resources Board. March 17. Healthy Landscapes 2030: California's Climate Change Vision and Goals for Natural Working Lands. Website: http://www.arb.ca.gov/cc/scopingplan/meetings/03232016/nwlvisiongoalsdiscussion.pdf

[3] See pgs. 8-9.

[4] See pgs. 1,6,12, and 30.

[5] Values calculated for new facilities using the California Public Utilities Commission's (CPUC) RPS calculator.

penetration of customer generation (e.g., rooftop solar) and benefits of energy efficiency investments grow.

Given these challenges, PG&E recommends that the state foster a long-term, sustainable structure for funding biomass investments, as it considers the role of bioenergy in healthy forests and natural working lands. Such an approach should include:

- **Investment by all load-serving entities:** PG&E supports economy wide, sustainable solutions to biomass issues shared across all load serving entities.

- **Provide public funding for societal benefits:** PG&E acknowledges that various social benefits are ascribed to biomass in particular and bioenergy in general beyond their value as energy products. A sustainable funding structure would provide public funding equivalent to the value of these broader societal benefits; ensuring that everyone who benefits from these investments help bear the incremental costs and the burden is not borne solely by PG&E's customers. PG&E supports the Draft Concept Paper's suggestion that Greenhouse Gas Reduction Fund (GGRF) is one of many sources of funding that should be explored for any above-market costs of biomass energy.

- **Ensure solutions are targeted to address specific problems:** The solutions developed to address the state's goals should be determined by the specific problems the state is trying to solve with a clearly established link to the proposed solution.

- **Promote and develop biomass alternatives:** The key to a healthy, sustainable, forest is not the generation of electricity subsidized by electric customers but rather the outcome of management practices that result in sustainable environmental and economic benefits. The state should explore, support, and prioritize the development of sustainable funding sources for biomass utilization and cost-effective alternative uses for biomass waste beyond electricity generation. For example, new technologies such as the production of synthesis gas from woody biomass materials for injection into the natural gas system may provide viable alternative uses for biomass material. The state should also evaluate whether transportation applications using synthesis gas from biomass could provide a more cost-effective solution for disposing of forest waste.

PG&E appreciates the opportunity to participate in and comment on the Draft Concept Paper and Discussion Paper, and looks forward to continued participation in this endeavor.

Sincerely,

/s/

Claire Halbrook

Climate Policy Principal
Pacific Gas and Electric Company

May 18, 2015

Dear Forest Climate Action Team members:

Attached please find a set of consensus principles from the conservation community that can help inform the Forest Carbon Plan and related documents, such as the Greenhouse Gas Reduction Fund (GGRF) Investment Plan update and the Scoping Plan update.

Our organizations look forward to a Forest Carbon Plan that sets quantitative targets for carbon sequestration in California's forests, and represents a strategy for achieving and maintaining healthy, diverse forest ecosystems. The Plan should protect and improve areas where large blocks of relatively intact forestland can provide strongholds for wildlife and provide pathways for migration and adaptation in a changing climate, while also restoring and enhancing forestland that is already impacted by past management, fire suppression, and development pressures.

The goals, principles, tactics, and actions in the attached document are relatively high-level. We look forward to providing more detailed comments and recommendations when there is an opportunity for further stakeholder involvement and discussion.

Thank you for your work on this important effort, and we look forward to talking to you further.

Regards,

Paul Mason
Pacific Forest Trust

Michelle Passero
The Nature Conservancy

Brian Nowicki
Center for Biological Diversity

Kathryn Phillips
Sierra Club California

Peter Miller
Natural Resources Defense Council

Greg Suba
California Native Plant Society

PACIFIC FOREST TRUST

CALIFORNIA NATIVE PLANT SOCIETY

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NATURAL RESOURCES DEFENSE COUNCIL

Conservation Community Recommendations on the Forest Carbon Plan

Goal: Achieve future forest conditions across the landscape (public and private owners, large and small) to maintain and increase net forest carbon stocks in a manner that restores more natural forest structure and fire regimes, provides high-quality, diverse habitat that is functionally connected across the landscape, and protects and restores water quality and watershed integrity in a changing climate.

Guiding Principles:

- Promote actions that provide benefits that persist over the long term.
- Recognize that restoring natural structural diversity and fire to forests (at multiple scales) is essential to promoting and achieving the goals of increased carbon stocks, enhanced habitat, and improved watershed health.
- Ensure that forest ecosystems include the full range of naturally occurring habitat types, including complex early seral and complex late seral conditions, by valuing them in the Forest Carbon Plan.
- Conserve and promote natural forest structure and function and natural diversity of structure at all scales. Both conserving the extent of forestland, as well as ensuring more natural forest management systems, are needed to achieve resilience.
- Protect and enhance native biodiversity as a core element of the FCP.
- Fully account for the net emissions that generally occur from thinning, even when deployed to reduce fire risk.
- Recognize that different areas on the landscape will have different planning and management priorities. For example, management of forests within and adjacent to communities may place a greater emphasis on actions to reduce fire intensity to increase public safety, while management of forests farther from communities should focus on protecting and improving fish and wildlife habitat, water quality and watershed integrity (diverse, natural structure in the forest, streams, riparian areas and wetlands).

May 18, 2015

- Maintain, rebuild and protect large intact landscapes, recognizing that land-use conversion and intensive harvest practices degrade critical habitat, and impair wildlife migration and watershed integrity.
- Fully mitigate carbon lost to land use conversion, including lost future sequestration capacity.
- Develop forest carbon accounting methodologies that allow for site-specific analysis of the carbon impacts of individual projects, and analysis of policy proposals at multiple scales, including site, regional and state levels. These methods should be compatible with and include timescales relevant to both short-term and long-term climate goals.

Suggested tactics:

- Within the next two years, the state should develop spatially explicit GHG reduction goals and a monitoring and reporting system for the forest sector based on a statewide analysis of GHG emissions threats and sequestration opportunities. This analysis will allow the state to invest resources and design policies more strategically to optimize climate and multiple benefits.
- Align the outcomes desired for carbon storage, wildlife habitat, and watershed health to create an integrated climate approach.
- Use prescribed and managed fire on the landscape. Work at a watershed or regional scale to allow for fire across substantially large areas at mixed severity.
- Prioritize conservation and restoration in key watersheds to improve forest watershed integrity, with diverse, natural structure in the forest, streams, riparian areas and wetlands.
- Use easements or acquisitions to connect and expand existing public lands that serve as wildlife refugia, to facilitate adaptation.
- Protect watersheds as essential components of our state's water supply.

FCAT Actions and Investments should:

1) **Establish a carbon accounting framework for the forest sector.**
No later than July 1, 2015, the Air Resources Board, with input from the Natural Resources Agency, should convene a public proceeding to develop accounting methodologies that account for GHG emissions and reductions at multiple scales, including site, regional and statewide, and permit evaluation of the net atmospheric impacts of projects and policy proposals relative to both short-term and long-term climate goals.
2) **Be enduring**. Interventions should focus on creating benefits that are intended to be permanent, consistent with global climate goals.
3) **Establish a program to fully mitigate the carbon emissions from forest conversion.**
4) **Support & restore natural systems that are resilient under climate stresses.** Increasing forest carbon storage must be integrated with and support well-functioning natural systems. To avoid unintended consequences and foster multiple benefits, carbon sequestration goals must include criteria for evaluating associated environmental impacts and benefits, including wildlife habitat, structural diversity, and stream and watershed health.

April 8, 2016

Forest Climate Action Team
c/o CalFIRE Director
PO Box 944246
Sacramento, CA 94244-2460

RE: California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate (Released March 9, 2016)

Dear Chair Pimlott and FCAT members:

The Sierra Climate Adaptation and Mitigation Partnership (Sierra CAMP) is a public-private, cross-sectoral partnership dedicated to promoting climate action and resilience in the Sierra Nevada region. Sierra CAMP is a member of the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA), which is supported by the Governor's Office of Planning and Research, and is hosted as a project of the Sierra Business Council. Sierra CAMP is pleased to provide comments on the Draft California Forest Carbon Plan Concept Paper, dated March 9, 2016.

There is much to commend in this concept paper. We support many elements of the draft, including the vision statement bullet points, the stated purpose and scope of the document, the work done to begin estimating the amount of carbon that is and can be stored in the state's forested lands, and especially the recognition of what is at risk if we let our forests burn up in the kind of record-breaking, severely damaging wildfires we've seen over the past few fire seasons. We strongly agree that all responsible entities need to act now to return our forests to a more natural, resilient, sustainable state that contributes to, rather than impairs, overall ecosystem health.

Sierra CAMP offers the following comments and questions to help strengthen and clarify portions of the concept paper:

p. 6 – Forest Health: the figures for density as an indicator of restoration need vary widely among the three measures presented (SDI, FIA, USFS estimate); will the plan ultimately choose a single indicator to define restoration need? If so, which will it be and why?

p. 11 – Urban Forests: urban forests clearly benefit those who live in and immediately adjacent to them; but rural or wildland forests also provide important benefits to urban dwellers by virtue of the carbon and other ecosystem services they supply to downstream communities and the state overall. How is the relative benefit of rural forestland factored into the "proportionally increase[d]" benefit statement related to urban forests and human populations?

p. 12 – Attributes of a Healthy Forest: the attribute statements would be stronger if they included some indication of degree, making them more like desired conditions, similar to what

phone: 530.214.0575
fax: 530.582.1230
Sierra Climate Adaptation and Mitigation Partnership
Sierra Business Council
mailing address: P.O. Box 2428 Truckee, CA 96160
website: www.sbcsierracamp.org
email: dmadson@sierrabusiness.org

was done in the Urban Forestry section of the paper. We need to know when/whether we've achieved the attributes or conditions in order to prioritize actions and gauge success over time. Also, regarding insects and disease, the attribute or desired condition should go beyond just *levels* of insect/disease to include the concept of endemic species vs. invasive species.

p. 12 – Co-Benefits: the evaluation of environmental, social and economic co-benefits and downstream dependencies is critical to the true cost-benefit analysis of different management strategies and actions; co-benefits and downstream dependencies must be a robust part of the ultimate carbon action plan or we will never get past uncertainties that have stymied successful forest management to date.

p. 20 – Improving Carbon Quantification: we support the notion that any valuation system needs to include full lifecycle cost accounting, including environmental, social and economic co-benefits and downstream dependencies; Sierra CAMP commits to working with partners to identify and suggest potential data and quantification methods as this process continues.

p. 22 – Wildland Forests/Protect/Strategies: we strongly support the strategy of funding conservation easements, sharing best management practices and coordinating across agencies. We suggest adding State conservancies – especially the Sierra Nevada Conservancy, given the amount of rural forest area it covers and its WIP program, called out in other parts of this concept paper, which is designed around forest and watershed health – to the list of potential State fund delivery mechanisms, given conservancies' strong relationships with forest owners in their regions. We also suggest including willing-seller fee title acquisition as a strategy, where appropriate, for permanent protection of important forestland resources.

pp. 22-23 – Wildland Forests/Enhance: there needs to be more emphasis on the benefits of reducing large, damaging wildfire as a means of reducing black carbon emissions, especially since the Short-Term Climate Pollutants Plan chose not to address wildfire as a source of black carbon, stating that the issue would be addressed instead in the Carbon Action Plan. Since wildfire accounts for the largest proportion of black carbon emissions, the State can achieve important emission reduction goals in the short-term by making that connection explicit and taking action to reduce wildfire.

p. 25 – Wildland Forests/Innovate: we also strongly support the goal of emphasizing multiple-benefit management and projects that sustainably optimize carbon storage and reduce emission potential while supporting rural communities that help steward these resources. We recommend adding to strategy #1, or including a new strategy similar to #6, to remove barriers to the production of energy from woody biomass, such as the difficulty of securing power purchase agreements. Promoting development of new or improved technologies and supporting existing and new facilities will be meaningless if there is no market for the energy produced.

pp. 25-27 – Urban Forests: we support goals and strategies for urban forestry given the many benefits urban forests contribute not only to carbon storage but also to public health and energy efficiency in the state's more developed areas. In addition to considering changing social demographics and potential displacement issues, urban forestry projects must also take potential drought conditions and resulting watering restrictions into account as part of project design.

pp. 27-28 – Analytical Approach/Management Actions: relative success should not be measured strictly by number of acres or percentage of priority area treated. This can inadvertently lead to

choosing less effective measures simply because they are cheaper and can be spread over more territory. Measures of success must also address outcomes from the treatment or management activity, regardless of acreage.

p. 29 – Implementation and Investment Mechanisms/Collaborative Opportunities: Sierra CAMP is a strong proponent of collaborative efforts and supports the concept of using existing collaboratives and collaborative approaches to help achieve the plan's goals. We would be very interested in working with the FCAT on a collaboration between rural forest and watershed landowners and managers and the downstream beneficiaries of forest/watershed ecosystem services on planning and implementing projects and exploring long-term investment mechanisms. This is something we are already working on as part of our involvement in ARCCA, the Alliance of Regional Collaboratives for Climate Adaptation.

p. 31 – Measuring Progress/Research and Development: in addition to funding standalone studies, the Carbon Action Plan should prioritize funding research and data collection as part of on-the-ground implementation projects. Such realtime data can be used to test concepts and refine existing methodologies.

Thank you to the Forest Carbon Action Team for this important work on the action plan concept paper. We look forward to continued engagement as the process unfolds.

All best,

SIERRA BUSINESS COUNCIL

COUNTY OF PLACER STATE OF CALIFORNIA

Pride of the West Portola, CA

Mammoth Lakes CALIFORNIA

TOWN OF TRUCKEE Established 1863 Incorporated 1993

TMS tahoemountainsports.com

Sierra Institute for Community and Environment

Sierra Nevada Alliance

Sierra Water Workgroup

- Karen Ferrell-Ingram, Land Conservation Specialist
- Scott Warner, Hydrogeologist

SANTA MONICA MOUNTAINS CONSERVANCY
RAMIREZ CANYON PARK
5750 RAMIREZ CANYON ROAD
MALIBU, CALIFORNIA 90265
PHONE (310) 589-3200
FAX (310) 589-3207
WWW.SMMC.CA.GOV

April 5, 2016

Mary D. Nichols, Chairperson
California Air Resources Board
1001 "I" Street
Sacramento, CA 95814

Comments on the Forest Carbon Plan

Dear Chairperson Nichols:

The Santa Monica Mountains Conservancy (Conservancy), which is a state agency established by the Legislature, is grateful for this opportunity to provide comments to the California Air Resources Board and Forest Climate Action Team (FCAT) with regards to the Forest Carbon Plan Concept Paper (Plan).

The Conservancy urges the Agencies and the Administration to make natural resource protection a priority in developing new ways to prevent and adapt to climate change by leveraging the opportunities available in California's rich forests, including urban forests.

The Conservancy has worked on comments with the Mountains Recreation and Conservation Authority (MRCA). The MRCA is a local government public entity established in 1985 pursuant to the Joint Powers Act. The MRCA is a local partnership between the Santa Monica Mountains Conservancy, and the Conejo Recreation and Park District and the Rancho Simi Recreation and Park District, both of which are local park agencies established by the vote of the people in those communities. The Conservancy incorporates the comments submitted by MRCA by reference.

The Conservancy wold like to highlight:

1. **The importance of regionally based entities, including the Conservancy, as implementors of forestry cap-and-trade program and projects:**

These regional entities often are in the best position to ensure environmental justice concerns are addressed, disadvantaged community (DAC) needs are identified, co-benefits are maximized, and local funds are leveraged with state funding.

2. **The importance of protecting chaparral ecosystems:**

The Plan identifies several mechanisms to leverage forests for safeguarding California's carbon future. It is important to provide similar incentives for chaparral ecosystems. Chaparral systems serve, like forests, as important carbon sinks and must be protected. The water needs of chaparral ecosystems also indicate that they might be more resilient to negative changes in state water availability as droughts increase and climate change alters water cycle patterns. These ecosystems often sequester significant portions of their stored carbon underground, providing greater carbon sequestration resiliency when wildfires strike.

3. Greenbelts:

Cap-and-trade programs, including those focused on forestry and green spaces, can incentivize the acquisition, maintenance and preservation of urban greenbelts, containing the urban limit line. A robust and thoughtful urban and rural forestry program can help create a strong greenbelt program. These greenbelts should be formed out of a variety of natural and working lands, including parks and open space, combined with rural and urban forestry protections. The Sustainable Agricultural Land Conservation (SALC) program is an important greenbelt program for agricultural lands. A similar program should exist for forests and chaparral around urban areas. This will also ensure that there is some sort of policy parity between the SALC program and forest protection. Otherwise, the efforts to preserve agricultural areas as part of an effort to promote greenbelts will have the perverse incentive of making forests and chaparral the prime targets for conversion into urban sprawl because these lands will lack the same protection incentives as agricultural lands.

Thank you again for the opportunity to comment. Please do not hesitate to contact me if you have any questions.

Sincerely,

Joseph T. Edmiston, FAICP, Hon. ASLA
Executive Director

822 Fifth Street
Santa Rosa, CA 95404

Comment Letter From Sonoma County Interests on California Forest Carbon Plan Concept Paper (March 9, 2016)

April 8, 2016

Submitted Via Email: fcat.calfire@fire.ca.gov

Dear Chair Pimlott and Members of the Forest Climate Action Team:

As a broad coalition of Sonoma County agencies, organizations, and individuals, we offer the following comments on the March 9, 2016 "*California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate (Concept Paper).*" We applaud the leadership of the FCAT, and the stated vision of the Concept Paper, and we appreciate the several years of work that have resulted in this implementation strategy for the AB 32 Scoping Plan.

Introduction and Background

Although we are not providing detailed comments on the Concept Paper we are very supportive of the vision, purpose and scope, goals and management strategies, analytical approach and implementation and investment mechanisms in the Paper. We would like to focus our comments on the opportunity in Sonoma County for a collaborative partnership with the state to meet the goals of AB 32 and of the Forest Carbon Plan.

Sonoma County is united and prepared to meet the stated purpose of the Carbon Plan to "*develop and implement plans to improve the health of California's forests, increase their carbon storage, and reduce their emission of carbon to the atmosphere*." Our local governments, NGOs, and community groups have a long history of planning and collaboration and have developed a common vision for Sonoma County's Forests: that they are protected and enhanced to sequester forest carbon and to achieve a broader range of benefits including healthy ecological systems, economic viability and sustainability, and possibilities for biomass utilization.

For over a decade, Sonoma County's local governments, nonprofits, and community groups have worked toward the common vision of preserving and enhancing our forests' ecological and economic health, viability, and sustainability. Sonoma County's NGOs and local government agencies have been thought leaders and early adopters of comprehensive plans for reducing greenhouse gas emissions, ensuring strategic and integrated land use and transportation policies, managing our water supplies in a sustainable manner, and investing locally in agricultural, forest and natural resource land conservation. Our collective efforts demonstrate recognition of the critical roles that forest protection and management play as part of a comprehensive response to climate change. We have multiple partners who plan, study, educate, protect, enhance, and manage our forestlands. Our work here to maintain the health of our forests and the viability of our forest industry can also further the state's vision and goals of AB 32 and the Forest Carbon Plan.

Recognizing Sonoma County as a "High Priority Landscape" for Implementing CalFire's Healthy Forests Program

The FCAT's Concept Paper calls for public comment to define the regional delineation and/or regional considerations that should be incorporated into applicable protection, enhancement, and innovation strategies for the Forest Carbon Plan. Given our collective work over the past ten years, Sonoma County should be considered a "high-priority landscape" for funding from the Healthy Forests Program proposed by CalFire in the FY 2016-2017 budget. Our region's unique forested landscapes, ownership patterns, and forest management challenges make Sonoma County extremely well-qualified for designation as a high-priority landscape where Healthy Forest Program funds may be leveraged to reap the largest direct benefits for forest resiliency, carbon sequestration, and other co-benefits.

The Forests of Sonoma County

Sonoma County's 513,000 acres of coniferous forests and oak woodlands represent 50% of the county's land base, representing a large-scale, rural, forested landscape that provides a host of valuable ecological, economic, and social benefits. However, both local and state-wide trends in forest ownership and climate-related impacts create a host of management challenges that threaten the viability of our forested landscapes:

- Sonoma County is the most highly parcelized county in California. Most of the oak woodland, and over with 68% of our coniferous forestland, is held in private ownerships of 50 acres or less.[1,2]

[1] Euphrat, F. D., S. Swain, D. Swanhuyser, J. Butler, A. Chesnut, K. Batchelder, C. Safford, and E. Cummings. 2011. Protecting forests across landscapes and through generations: the Sonoma County Forest Conservation Working Group. U.S. Forest Service General Technical Report PSW-GTR-238. Accessed online 1 April 2016. http://www.fs.fed.us/psw/publications/documents/psw_gtr238/psw_gtr238_603.pdf

- Rural residential housing pressure and a growing population is increasing our wildland-urban interface.

- Population growth, regulatory requirements, and economic changes are leading to increased pressure to convert forests and woodlands to other uses.[3,4]

- Pathogens like Sudden Oak Death and insects such as pine/fir borer beetles are devastating our trees, creating hazards for rural communities, increasing our fire risk, and reducing the carbon sequestration of our woodlands.[4]

Our county's carbon accounting tools and plans demonstrate that our forested landscapes, including redwood forests and urban forests, have high levels of carbon stock as well as the potential to sequester even more carbon.[5] At the same time, our forests and rural communities are at risk of wildfire due to the lack of forest management practices on privately owned forest parcels. Our forests suffer from sudden oak death and insect outbreaks, creating hazards from falling trees and increased wildfire risk in rural residential areas.[6] Forest management is greatly needed to ensure that our forests continue to sequester carbon and provide GHG reduction benefits.

Our forests also provide a number of co-benefits. We have two of the last remaining commercial forestry mills on the North Coast. It is imperative that we help these mills and our forest industry remain economically viable both for the health of our forests and our rural communities. Additionally, we have many opportunities to explore and develop biomass utilization and co-generation, which will provide new income sources for our forest industry and mills as well as generate renewable energy sources for Sonoma County.

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[2] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

[3] Euphrat, F. D., S. Swain, D. Swanhuyser, J. Butler, A. Chesnut, K. Batchelder, C. Safford, and E. Cummings. 2011. Protecting forests across landscapes and through generations: the Sonoma County Forest Conservation Working Group. U.S. Forest Service General Technical Report PSW-GTR-238. Accessed online 1 April 2016. http://www.fs.fed.us/psw/publications/documents/psw_gtr238/psw_gtr238_603.pdf

[4] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

[5] The Nature Conservancy and Sonoma County Agricultural Preservation and Open Space District. 2015. Conserving landscapes, protecting the climate: The climate action through conservation project. San Francisco and Santa Rosa, CA. Accessed online 1 April 2016. http://scienceforconservation.org/dl/CATC_Final_Jan2016.pdf

[6] University of California Cooperative Extension, Sonoma County, Sonoma County Department of Emergency Services. 2008. Sonoma County Sudden Oak Death Strategic Response Plan. http://www.firesafesonoma.org/main/sites/default/files/sodsr_plan.pdf

Sonoma County's Wildfire Risk

Sonoma County has a history of devastating wildfires. CalFire has identified several "historical wildfire corridors" in our county that have together burned several hundred thousand acres in the past century, damaging homes and structures.[7] Each year we face the potential of experiencing a catastrophic wildfire, and this risk is likely to increase in the years to come as a result of climate change. In addition to the management challenges cited above, the following are some factors that contribute to our wildfire risk:

- Approximately one-third of the county's 495,000 residents reside in Sonoma County's Wildland/Urban Interface (WUI), where wildland fuels intermix with homes and structures.[7]

- Most of Sonoma County's WUI areas are identified by CalFire as high or very high fuel rank/potential, high or very high fire hazard severity zones, and high or very high fire threat zones.[7]

- Our "State Responsibility Area" is wildland-urban interface, representing nearly 80% of the county's acreage.[7]

- Northeastern Sonoma County contains the largest number of acres in the county that are classified in the Very High Fire Severity zone.[7] This area includes the forested upper watershed of Lake Sonoma and part of the Russian River Watershed, which provides drinking water to over 600,000 people.

- Most of the WUI is served by volunteer or "combination" fire departments. However, some volunteer departments are finding it hard to attract new members and retain volunteers. Because volunteers may work in urban centers, their response time to fires in rural areas may be delayed.[7]

Sonoma County's WUI residents are extremely concerned about wildfire safety. However, many lack the knowledge and financial resources to manage their forests for reduced wildfire risk. The following are some factors contributing to the difficulty of our WUI residents' ability to manage their lands for wildfire risk reduction:

- The costs of mechanical clearing and/or prescribed burning are prohibitive for many of Sonoma County's landowners, both small and large.[7]

[7] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

- Grant funding is a crucial component to mitigate the risk of wildland fire by landowners, yet CalFire's California Forest Improvement Program (CFIP) is usually only able to fund approximately 10 projects in the county each year.[7]

- Sonoma County has virtually no federal lands, which decreases our access to some federal grant programs which fund fuels management for communities near federal lands.

Our WUI residents are extremely interested in gaining information about making their homes and communities more wildfire safe. They are eager for more programs that can help them accomplish this goal.[8] With new funding sources, we can provide these residents with the resources they need to implement wildfire mitigation activities on their lands and better manage our county for wildfire risk reduction.

Sonoma County's Climate Leadership and Planning Efforts

Our increasing risk of wildfire—along with emerging insects and pathogens in our forests—is symptomatic of a larger suite of climate change impacts facing Sonoma County. For over ten years, Sonoma County's community leaders and forward-thinking elected officials in each city and in county government have worked together to establish strong action on climate change. Community leadership has also resulted in direct actions by the citizens, businesses, and communities in Sonoma County to reduce GHG emissions.[9] By 2010, Sonoma County communities had reduced countywide GHG emissions to approximately 7% below 1990 levels, even while the county's population grew by 25% and employment grew by 17% between 1990 and 2010. On a per capita basis, county GHG emissions declined approximately 26% over the same period. Our county has a demonstrated ability to foster successful collaborations between local governments and other groups – an essential component for successful implementation of the Forest Carbon Plan.

Our county's actions to address climate change are supported by rigorous regional planning efforts. These plans can be incorporated into and inform implementation of the Forest Carbon Plan. Numerous plans and studies have been prepared by Sonoma County's residents, local government agencies, organizations, and community groups as part of ongoing efforts to prepare for climate change and address the health of our forests.[10] These plans emphasize the important role that forest conservation and management plays in meeting emissions reduction targets and climate adaptation goals. Some examples include the Draft Sonoma County

[8] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

[9] See attached appendix for a detailed history of Sonoma County's climate change leadership.

[10] See attached appendix for detailed examples of Sonoma County's climate change and forest health plans.

Community Wildfire Protection Plan by Fire Safe Sonoma,[11] Climate Action 2020 by the Regional Climate Protection Authority[12], and the Climate Action through Conservation Project by The Nature Conservancy and Sonoma County Agricultural Preservation and Open Space District.[13]

The Concept Paper states that execution of the Forest Carbon Plan will include "*successful implementation of existing plans and modification of such plans through adaptive management*." Sonoma County's existing plans demonstrate that we have already identified regional, landscape-level strategic priorities and actions for climate change mitigation, adaptation, and forest health. Additionally, projects like "Climate Action through Conservation" demonstrate carbon accounting tools developed for Sonoma County that can be scaled up and/or used to inform a standardized carbon quantification method for California. These plans and tools can be implemented and adapted as needed to meet California's broader forest health and carbon management objectives.

Sonoma County Partnerships and Collaborations

The Concept Paper states that *"collaboration of a wide range of players – land owners and managers, agencies at multiple levels of government, businesses, nongovernmental organizations, and stakeholders – is essential for implementation success, particularly for working at the landscape level."* Sonoma County is home to a diverse and committed group of partners actively engaged in forest conservation, forest management, and climate change mitigation and adaptation efforts. We possess the necessary expertise, knowledge, and connections that can help us successfully implement the Forest Carbon Plan as well as our existing plans.

The Sonoma County Forest Conservation Working Group is a prime example of a successful collaborative effort to address our region's forest conservation and management challenges. The working group is a highly networked, engaged, and effective coalition that works together to perpetuate sustainable, healthy, and diverse forests, woodlands, and watersheds across the Sonoma County landscape. For over a decade, the Working Group has provided knowledge and resources to forest landowners that empower them to manage their lands for forest health and resiliency. Members include forest landowners, local and regional land trusts, watershed councils, state and local agencies, and others. Active members include:

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[11] Fire Safe Sonoma. 2016. Sonoma County Community Wildfire Protection Plan. Accessed online 1 April 2016. http://www.firesafesonoma.org/main/docs

[12] Regional Climate Protection Authority. 2016. Climate Action 2020 and Beyond. Accessed online 1 April 2016. http://rcpa.ca.gov/wp-content/uploads/2016/03/CA2020-Public-Review-Draft-Plan_3-4-16.pdf

[13] The Nature Conservancy and Sonoma County Agricultural Preservation and Open Space District. 2015. Conserving landscapes, protecting the climate: The climate action through conservation project. San Francisco and Santa Rosa, CA. Accessed online 1 April 2016. http://scienceforconservation.org/dl/CATC_Final_Jan2016.pdf

- Baseline Consulting, Arthur Dawson, www.baselineconsult.com
- CalFire, Jill Butler, http://ceres.ca.gov/foresteward/
- Coast Ridge Community Forest, Judy Rosales, http://coastridgecommunityforest-org.webs.com
- Fire Safe Sonoma, Caerleon Safford, firesafesonoma.org
- Friends of Mark West Watershed, Penny Sirota, www.markwestwatershed.org
- Forest, Soil & Water, Inc., Fred Euphrat, Ph.D., RPF, www.euphrat.org
- Gold Ridge Resource Conservation District, Brittany Heck, www.goldridgercd.org
- Greenbelt Alliance, Dee Swanhuyser, www.greenbelt.org
- Gualala River Watershed Council, Kathleen Morgan, http://grwc.info
- Santa Rosa Junior College, Kasey Wade, www.santarosa.edu
- Sonoma County Agricultural Preservation and Open Space District, Kim Batchelder, www.sonomaopenspace.org
- Sonoma Land Trust, Amy Chesnut, www.sonomalandtrust.org
- Sonoma Resource Conservation District, Earle Cummings, www.sonomarcd.org
- The Wildlands Conservancy, Brook Edwards, www.thewildlandsconservancy.org
- University of California Cooperative Extension, Steven Swain, http://cemarin.ucanr.edu

Clearly, Sonoma County has a wealth of organizations and agencies that are actively collaborating on plans and projects across our forested landscape to address climate change and increase forest health and resiliency. The Working Group in particular is not only positioned to scale up forest management efforts on privately owned forestland, but can also help the FCAT design similar partnerships and collaborations throughout California. With the help of new financial resources, we can quickly act to expand the scope and impact of all our collaborative efforts throughout Sonoma County.

Conclusion

Our coalition is very supportive of the Governor's proposed FY 2016-2017 budget allocation of Greenhouse Gas Reduction Funds (GGRF) to strategically invest GGRF auction proceeds into a comprehensive, landscape-scale forest health and climate resiliency program (the Healthy Forests Program). We support the use of these funds in high-priority regions to realize the largest direct benefits for greenhouse gas reduction while also providing other co-benefits, such as protection of water resources, wildlife habitat, and rural economic stability; improvements to rural forestry infrastructure; and generation of renewable energy sources from biomass and biochar while also reducing risks to life and property from wildland fire.[14]

Sonoma County should be considered a "high-priority landscape" for funding from the Healthy Forests Program proposed by CalFire in the FY 2016-2017 budget. Our forests are threatened by wildfire, insects, and other forest pathogens, and our forest ownership patterns create unique

[14] California Department of Forestry and Fire Protection. 2015. Budget Change Proposal DF-46. State of California.

management challenges. At the same time, our agencies and organizations are already thinking about and planning for climate adaptation, mitigation, and forest health in a regional, landscape-scale context. We have identified projects, strategies, and priorities that together can maximize our local impact in addressing climate change. We possess the expertise, knowledge, and connections to effectively collaborate with others. We have scientifically supported carbon accounting tools and methodologies in place to prioritize and evaluate the performance of our forest management projects. We have great potential to increase the breadth and scope of these projects and implementation of our climate adaptation, mitigation, and forest health plans. With increased state funding, we will be able to make significant progress to protect and enhance our forests and be an innovative leader for new economic programs, such as biomass utilization and development of wood products campuses.

We thank you for the opportunity to comment on the "*California Forest Carbon Plan Concept Paper: Managing our Forest Landscapes in a Changing Climate (Concept Paper).*" We look forward to continued engagement with the planning process.

Sincerely,

Sonoma Land Trust
Amy Chesnut, Acquisitions Director

Baseline Consulting
Arthur Dawson, Founder

Jill Butler, CalFire

Center for Climate Protection
Ann Hancock, Executive Director and Co-Founder

Coast Ridge Community Forest
Judy Rosales, Executive Director

Forest, Soil & Water, Inc.
Fred Euphrat, Ph.D., RPF

Fire Safe Sonoma
Caerleon Safford, Executive Coordinator

Gold Ridge Resource Conservation District
Brittany Heck, Executive Director

Greenbelt Alliance
Dee Swanhuyser, Board of Directors

Gualala River Watershed Council
Kathleen Morgan, Executive Director

Sonoma County Agricultural Preservation and Open Space District
Bill Keene, General Manager

Sonoma County Fire and Emergency Services Department
Al Terrell, Fire Chief and Department Director

Sonoma County Regional Climate Protection Authority
Suzanne Smith, Executive Director

Sonoma County Water Agency
Grant Davis, General Manager

Sonoma Ecology Center
Caitlin Cornwall, Biologist, Research Program Manager

Sonoma Resource Conservation District
Kara Heckert, Executive Director

The Wildlands Conservancy
Brook Edwards, Jenner Headlands Preserve Manager

University of California Cooperative Extension
Steven Swain, Environmental Horticulture Advisor

Cc:
Sonoma County Board of Supervisors:
- Efren Carrillo, Chair, District 5
- Susan Gorin, District 1
- David Rabbitt, District 2
- Shirlee Zane, District 3
- James Gore, District 4

Senator Mike McGuire
Senator Lois Wolk
Assemblymember Bill Dodd
Assemblymember Marc Levine
Assemblymember Jim Wood

YSS YOSEMITE STANISLAUS SOLUTIONS

Date: April 5,2016

Dr. Russell Henly
Assistant Secretary, Forest Resource Management
California Natural Resources Agency
1416 Ninth Street, Suite 1311 Sacramento, California 95814

RE: Review of the "California Forest Carbon Plan Concept Paper"

Dear Dr. Henly,

These comments are submitted by the Yosemite Stanislaus Solutions (YSS) collaborative group. We appreciate the extensive effort by the FCAT staff in compiling this draft and believe it represents an important step forward in recognizing the essential role healthy and fire resilient forests must serve in order to achieve California's laudable and challenging GHG reduction goals.

Located in Tuolumne County, California, YSS is a collaborative group of diverse interests, ranging from timber companies to environmental organizations to local government representatives, working together to assist public and private land managers in achieving healthy forests and watersheds. There are 27 member organizations and five public agency liaisons actively engaged in our process. (For additional information concerning the collaborative see http://yosemitestanislaussolutions.com/about-yss/).

YSS is committed to restoring and preserving healthy forestlands in California, specifically in the Tuolumne and Stanislaus watersheds, especially because of the multitude of environmental and economic benefits forestlands provide, including as an essential element of achieving California's greenhouse gas reduction goals.

Before providing specific comments on the current draft, we wish to convey several overarching factors we believe still need to be more fully addressed in order for appropriate goals and feasible approaches to forest health and resiliency to be established as part of the overall AB32 Program.

The stark reality is California's laudable GHG reduction targets cannot be achieved if we fail to address the growing trend of mega-fires that began before the current drought, and according to the recent science, will likely worsen in coming decades due to future droughts being hotter.

Additionally, as was highlighted in the public comments of Ms. Lucy Blake, President of the Northern Sierra Partnership, at a Joint USFS-Sierra Nevada Conservancy Public Forum on March 3, 2016, the current accounting by ARB of GHG emissions in California is incomplete and therefore inaccurate because of the continued failure to factor in wildfire emissions. Resources Agency Secretary

Laird has publicly noted the Rim Fire alone emitted the equivalent of the annual emission of 2.3 million cars. Perhaps more relevant is that the Rim Fire GHG emissions replaced almost three years of AB 32 program reductions achieved from all other sectors. In fact, the Rim Fire emitted five times more GHG than from the much more publicized Porter Ranch natural gas leak, the largest ever in U.S. history.

Engaging partners and beneficiaries beyond the Sierra Nevada Region in investing to protect and enhance those benefits is essential. We recognize it is extremely difficult to persuade such current beneficiaries, quite accustomed to their "free lunch," to voluntarily contribute. The reality is, if one downstream beneficiary volunteered while others did not, the result would likely be a combination of creating a competitive disadvantage for the entity volunteering and resentment from their ratepayers.

Instead, we suggest you explore how to equitably have beneficiaries contribute to what they receive from healthy forests. Government has long embraced the responsibility of requiring those who profit/benefit from an activity to pay its full cost, including controlling pollution, rather than have the public subsidize their activities through increased public health costs. The corollary today is to fairly gauge the economic value to downstream beneficiaries attributable to forest health treatments. This should then become a basis for a public benefits charge that would be a very small cost to individual beneficiaries but a significant revenue stream for maintaining and enhancing forest and watershed health.

While minor modifications to existing wood and biomass utilization policies and contracts are now being explored due to the bark beetle crisis, restoring forest health can only occur with much more significant changes in current policies and investments. Again, achieving California's AB 32 GHG reduction goals simply cannot be achieved without far-reaching advances in environmentally responsible utilization of the humongous volumes of biomass. Without a fundamentally new course of action, the existing forest biomass both enables future mega-fires and will emit vast streams of GHG even if they do not burn, but decompose in place. This was powerfully communicated in the coordinated Sierra Nevada Conservancy and Region 5 Forest Service August 4, 2015 presentation to the ARB that the burnt area "…will continue to emit GHG for decades resulting in emissions more than 4 times greater than those during the event."

Wood and biomass require solutions commensurate with the magnitude of the challenge and the risk they pose to our forests and public health. Again, we urge full consideration of the Public Benefit Charge described above in relationship to downstream beneficiaries. In this case, all Californians are genuinely downstream beneficiaries. Additionally, it is imperative to foster and support innovation in more economical end-uses of biomass. This should include development of biofuels as part of meeting the Governor's goal to reduce carbon in vehicle fuels by 50%; as well as the potential for building materials such as now being utilized in constructing a nine-story building in Portland, Oregon.

YSS is also deeply concerned that the current California screening criteria used to identify Disadvantaged Communities may be sound for urban areas, but is highly prejudicial when applied to rural areas, such as Tuolumne County. This issue was particularly well-articulated and documented at the August 4, 2015 ARB public meeting by Mr. Jonathan Kusel, a panel participant representing the Sierra Institute. We request that you engage on this issue, as the failure to fairly recognize rural disadvantaged communities deprives them of significant public resources, including from the AB 32 GHG

funds. We understand this may require a change in statute, which we urge the Administration develop and pursue.

This draft makes a compelling case that appropriate, landscape level forest treatments will significantly reduce GHG over the coming decades. This justifies GGRF funding even as work continues to refine quantification. In light of these critical findings, we urge that the existing CAL FIRE Guidance on Methods for Evaluating GHG Emission Reductions for Programs in the CAL FIRE Greenhouse Gas Reduction Fund should be reviewed to simplify the procedure to be followed for GGRF grants.

Consideration should be given to federal and state agency collaboration on this revision to allow for landscape or watershed level analysis and not require a project specific analysis. Further, projects should be given the option of allowing the analysis to be conducted by CAL FIRE rather than requiring individual project analyses to be submitted. Analysis pursuant to the existing ARB Offset Protocol should not be required since no offset is being sought for projects on federal land and since the statutory requirement for GGRF expenditures is only to spend funds for "reductions". There is no requirement that such reductions be "real, quantifiable, verifiable, enforceable and additional" as for offsets.

Overall, we believe there is strong alignment between the underlying purposes and objectives of this document and the position of Yosemite Stanislaus Solutions (YSS). The paper provides a strong and defensible set of steps necessary to create a robust statewide forest carbon plan. The basic objectives are clear and largely supportable, though, some of the references used seem a bit dated. We stress the use of the most current science to bolster points being made in the document.

Specific Comments

Page 1- Vision Statement

You present a good list of aspirations within your vision. However, we suggest you include an additional bullet point that advocates management/policy that accommodates the dynamic, constantly changing nature of forests. People have a tendency to consider forests in a static condition, i.e., it will be largely unchanging over time. We know this is not true, but we tend to underestimate how much forests can change in response to natural succession and a variety of disturbances. The ever-dynamic nature of forests should be acknowledged explicitly.

Page 2 – Intentions for the Forest Carbon Plan (bottom half of page 2)

It is important to recognize appropriate strategies for carbon sequestration depend heavily on the forest type in question. For example, the strong seasonal conditions of Sierra Nevada forests are very different than the coastal Redwood/Douglas Fir forests. California has a diverse array of forest types north to south and west to east. More explicit recognition of this geographic diversity and its implications for carbon management is warranted.

An additional bullet for the intent of the Forest Carbon Plan should be the desire to fine-tune the quantification of carbon markets. This topic is alluded to elsewhere, but it seems important enough to include as part of the overarching intents of the plan.

Page 3- 1st paragraph

Recent drought conditions have certainly focused attention on forest health. It is important to couple that discussion with recognition that forest management over the last century has led to major

changes in forest structure and composition. Current conditions of a large proportion of the dry conifer forest types widely distributed across California are overly dense with a high proportion of shade-tolerant species. This has significantly exacerbated vulnerability to disturbance and increased risk of mortality. Again, this is addressed elsewhere in the document, but should be highlighted up front when discussing drought.

Similarly, we suggest some discussion about the periodicity of drought. Drought is a naturally recurring phenomenon. While unpredictable, it does recur periodically. Future climate conditions are likely going to include not only more frequent drought, but perhaps more importantly hotter droughts, which would increase water stress, as well as fire and pest susceptibility. Forests must, in turn, be capable of tolerating this conditions.

Page 3 – last paragraph

Add emphasis to a couple of points related to increased burning. Not only is fire burning larger areas, but importantly we are seeing a larger proportion of burned areas experiencing high severity fire, such as the almost 40% high severity burnt within the Rim Fire. This has obvious important implications for sustainability of forests. Also add emphasis to the increase in extreme weather conditions under which some fires are burning. These are the kinds of fires that result in stand replacement; significantly different outcomes than after a low-to-moderate severity fire which was more the norm until recently. Also, mention in this context, that past forest management activities, e.g. preferential and almost complete removal of the largest, most fire resistant trees, contributed to the fire risk we see today. Historic forests were characterized by low densities of mostly large trees with thick bark and high height to crown base. Current forests, in many places, have very different structure, largely characterized by dense smaller trees, ladder fuels, and abundant surface fuels.

Page 4 – 2nd paragraph

The opportunity to offset GHG emissions by forests will depend heavily on the forest type. Not all forests have the same capacity. It is true the mixture of ownerships and their respective forest management objectives presents a challenge to coordinating carbon storage strategies. However, it should be noted here there are a number of emerging programs to encourage cross-boundary collaboration such as the Department of Agriculture's "All Lands" initiative and the Good Neighbor Authority that increase the ability for the federal government to work with neighboring state and private lands.

Page 4 – last sentence going to Page 5

We support this statement (carbon storage among fewer, larger trees). It would be useful to discuss why this is a prudent approach.

Page 5 – 1st full paragraph

Acknowledge Table 1 is a crude summary and does not capture the diversity of forest types on different ownerships, especially the different ecological trajectories of different forest types depending on geography and ownership.

Page 5 – 2nd full paragraph

Acknowledge timber production and carbon sequestration are two quite different objectives that would result in different management decisions. A complete carbon accounting must consider many subtle details such as the value of dead wood in ecosystems despite the emission of carbon in that process, or the loss of carbon at many different stages of the wood processing cycle.

Page 5- last paragraph

Provide some discussion of the uncertainty in rates of carbon sequestration with changing climates. Higher concentrations of CO_2 could increase rates of sequestration but changes in growing seasons due to warming trends are two of many factors in flux that will collectively influence carbon sequestration. Uncertainty is a strong theme in response to changing climates.

Page 6 – 1st full paragraph

The availability of forest products infrastructure is a major concern for forest management in California. Almost all forest management activities that would be employed for restoring desirable conditions depend on having a forest products processing infrastructure. The clear decline in capacity over the last 30 years is limiting options. This is true not only with raw capacity, but also with the lack of ability to handle the diversity of materials that comes from a forest (e.g. biomass, small diameter trees, etc.). Important consideration. **(Colorado examples)**

Page 6 – 4th full paragraph

One needs to be careful when using broad generalizations such as the term "dense stands." The significance of stand density and what constitutes a dense stand depends on a number of factors. This nuance is important to understand, because in some locations, it may be desirable to maintain what appears to be a dense stand (e.g. drainage bottoms that are inherently wetter and have deeper soils). While there is a need to make generalized statements to communicate, such statements should be qualified.

Page 7 – 1st paragraph

Discuss more about the vulnerability of trees to climate change depending on the life stage of the tree. Seedlings in today's climate may respond very differently than seedlings that germinated 100 years ago. Mature trees may persist in a different climate than they germinated in, but there may be no recruitment of the same species.

Page 7 – 2nd paragraph

Climate predictions are less certain when it comes to changes in precipitation. We do not necessarily expect decreasing precipitation, although we do expect proportionately less snow and more rain.

Page 8 – 1st and 2nd paragraphs

Explain the significance of the "insect and disease threatened" areas. This seems like a very brief treatment of that topic and could use some more explanation.

Page 8 – "Implications for Forest Carbon Sinks"

This discussion is missing an important factor. Selective logging of large trees, across much of California over the last 100 years, has had an important influence on forest structure. Fire suppression/exclusion has certainly been an important factor but logging has also.

We do not necessarily expect thinned stands to enable unabated increases in carbon sequestration rates. There are many factors that will influence what we expect to be healthy, sustainable carbon sequestration. Rates will sooner or later begin to decline because growth rates of trees will slow and there will also be some amount of natural mortality, particularly in forests that are managed for multiple ecological objectives.

There are many moving parts in the balance of the carbon pool, even in response to fire. Large trees are typically more fire resistant, but can become more vulnerable under certain circumstances. It would be insightful here to discuss this. The main point is carbon fluxes in forests, over time, in response to many factors.

The notion that unmanaged forests can be carbon emitters vs. managed forests tend to sequester carbon begs more discussion. The entire carbon life cycle analysis must take into account many factors, including the management objectives of a given forest. Additionally, only considering wildfires through 2010 distorts the true picture of wildfire-related GHG emissions, as during the past five years California has experienced increasingly larger and higher severity wildfires, continuing what some of the most knowledgeable forest researchers believe will become more common.

Page 10 – 2nd paragraph

The concept of variable density thinning is important to recognize as a needed approach to restoring resiliency to fire-adapted forests as it appropriately reflects the varied diversity of forest conditions.

Page 10 – "Species Range Shift"

There is much debate in the scientific literature, and relatively little empirical evidence to support any conclusions, about how species ranges will shift over time. Given the long life of trees, and the relative robustness of mature trees, it may be quite a while before the effects of changing climate results in a new equilibrium of vegetation across the landscape. Much of what we anticipate is speculation at this point is highly uncertain. Nonetheless, we agree with the principle that forest management and restoration practices undertaken today should be informed by expected future climates and should be robust to handle much uncertainty.

Page 12 – Description of Attributes for healthy California Forests

We recommend adding the term "heterogeneity" to this list of terms that characterizes resiliency. Many forests in California are inherently heterogeneous in response to periodic disturbance, especially fire. However, management activities in recent decades have trended forests towards homogeneous stands with even spacing. Restoring forests in many places will involve reestablishing heterogeneity at different scales.

Page 13 – 2nd through 4th paragraphs

These paragraph mentions that legal restrictions inhibit management efforts and treatment goals. It should be noted often it is policy considerations that have the biggest influence on what can or cannot be done on a given forest, particularly federal forests. Work to improve forest resiliency is underway, but is slow and limited for many reasons. For meaningful restoration to happen, it needs to be expanded to a landscape scale and there needs to be reasonable and carefully considered modifications to policies that are in place to prevent unforeseen outcomes from management. Without landscape-scale restoration efforts to restore forests, they will continue to fall further and further behind.

Page 14 –

Analytical approaches that combine LIDAR and FIA data are strong and provide the most data-rich and supportable evidence for taking actions. It offers a strong foundation for analysis and decision-making and expanding its availability, as funding permits, should be supported.

Page 15 – Carbon Storage

There are important questions around the assessment of below-ground carbon and the loss of carbon in the complete life cycle of wood product development. These are crucial facets of the complete carbon storage budget and must be carefully assessed and quantified. Below-ground carbon, as the paper suggests, is a significant component of live and dead sources of carbon in forest ecosystems. However, it is much harder to measure and undoubtedly varies from forest-type to forest-type. This should be fully fleshed out in the discussion. By the same token the amount of carbon stored in wood products after processing can vary quite a bit, as well, depending on the end product and the processing methods. For example, it is important to include the decomposition of slash and removal of non-marketable trees that result from the harvesting process. Once again, we urge the full Forest Carbon Plan thoroughly treat this topic and reveal the important nuances that will have a big impact on final assessments of carbon storage from wood products.

Page 16

It should be noted these estimates are a snapshot in time. Values are constantly changing, depending on many different conditions, especially significant events such as a wildfire or timber harvest. The importance of federal lands is starkly evident, comprising over 60% of total estimated carbon in California's forests. This needs to be highlighted, and appropriately reflected in action recommendations.

Page 16 – Carbon Storage – Wood Products and other Uses

The full life cycle of wood products has many junctures in the processing development where losses of carbon can occur. The phrase "less than 1% of the harvested material goes unused" is questionable. We recognize there are constant efforts to better utilize all material, however, it is likely more than 1% of the carbon from forests is emitted somewhere along the wood processing cycle. Ideally, all materials not used in manufacturing an end-product could be used for bioenergy. But current and recent markets suggest that is still not generally viable financially. So the point here is the Forest Carbon Plan should present a thorough life cycle analysis for the major wood products that reveals all sources of emissions, (e.g. fuels costs for trucks to haul material or decomposition of slash) as well as, the carbon savings where wood products provide a substitute for more energy-intensive materials (e.g. manufacturing furniture from metal).

Page 17 – last paragraph

Again the argument is made that private lands do a better job of sequestering carbon than public lands. This discussion should be expanded to reveal the reasons for these findings. There are many factors that play into this conclusion including current conditions, past management history, management objectives, future management plans, etc. Sequestration rates of 9.6 million metric tons of CO_2 per/year may not be sustainable depending on the many factors just mentioned. The point is the inherent variability of forests to sequester carbon over time.

Page 18 – Tables 4 and 5

It would be helpful to present these values on a per acre basis so the reader can get a better sense of performance.

Page 18 – Growth and Harvest by Ownership

Once again, to be fair and to leave the reader with an objective impression, it is important to express carbon balances in terms of management objectives, the impacts of natural disturbances, and the variability in current conditions. To state Forest Service Reserves are net sources of carbon

emissions sounds judgmental. Discuss the factors behind these conclusions, so the reader understands why emissions and sequestration varies between different ownerships. Critical to this discussion, once again, are underlying management objectives and a thorough understanding of the life cycle of different wood products.

Page 20 - Carbon Accounting

This is a good discussion on the evolution of carbon accounting and methods for improving it. It is definitely an area that will need to provide reliable, defensible methods for quantifying carbon flux across complex landscapes and management outputs.

Page 22 – Protect

We suggest adding to the goal, managing forest ecosystems to minimize impacts of uncharacteristic disturbances such as high severity fire. With current conditions and changing climate, much of California's forested landscape is vulnerable to catastrophic disturbance. It should be a priority to learn how to live with fire and other natural disturbances. For too long, we have tried to prevent these occurrences only causing more vulnerable conditions. This is clearly an "all-lands' challenge given large scape disturbances easily cross ownership boundaries.

Managing fire is the first and foremost challenge throughout the Sierra Nevada and many other places in California. The problem is exacerbated by changing climates and also fragmentation of forest landscapes with structures scattered across the landscape. Firefighting has become a larger and larger portion of land management budgets, in large part because fire management agencies by default must assume responsibility to protect structures. There is a direct correlation between landscape fragmentation by human structures and firefighting challenges and this should be considered within the discussion of protecting wildland forests.

We suggest adding two of additional strategies to the list:

* Develop approaches to identifying and prioritizing areas for management
* Support the efforts of NGOs, such as The Nature Conservancy, in their efforts to manage and protect forests.

Pages 22 – 23: Enhance

The goal to enhance references increasing carbon storage pools "as ecological limits allow." This is an interesting thought that should be expanded in the full Forest Carbon Plan. Given the variability of forest types throughout California, this will be an important discussion.

Coupling increased forest management targets with other directives, such as the State Wildlife Action Plan, will reveal some of the difficult challenges in balancing objectives. For example, the wildlife plan likely calls for some downed wood and decadent stands to provide habitat for certain species. This will run counter to objectives for net sequestration of as much carbon as possible. While this is not a bad thing, it is illustrative of the challenges of balancing many different objectives.

We applaud, and strongly endorse, the vision to step up treatments to larger areas. This is the only way current poor conditions, on many forests, can be reversed in a meaningful way. However, this will require some things to change, notably budgets for treatments and infrastructure for processing wood. Current levels of infrastructure are inadequate for handling larger volumes of material, especially smaller material that is not in the traditional lumber market. It would be helpful for the plan to discuss this challenge and to explore ways of encouraging investments in non-traditional and innovative wood processing infrastructure, such as biomass.

Page 24 – 2nd paragraph

When discussing reforestation after fire or harvest, it would seem important to consider how planting and other reforestation methods would perform under changing climates. This is a significant unknown with important consequences for reestablishing forests in the coming years.

Under the list of management parameters and actions we suggest adding a few thoughts:

* Promote an "All-Lands" approach to landscape management actions
* Work with the Air Resources Board to consider ways of increasing prescribed fire
* Emphasize the value of variable density thinning and creating heterogeneity as part of forest management and restoration
* Be cautious about employing "sanitation" treatments. Some can construe this as a need to remove all damaged or diseased trees. Such trees can be vitally important trees for many species of wildlife. There is a significant deficit of such structures in most forests as a result of sanitation treatments and other forest practices of the past several decades.

Page 25 – Strategies

We fully support the use of forest waste products for use in bioenergy. However, we already know the number one limiting factor to the development of bioenergy is relative costs in the energy market. Hauling biomass from its source to a market is expensive and thus the competitiveness of forest biomass is low.

We want to promote a variety of ways to make use of what is traditionally considered unusable forest waste valuable. Support innovative markets and industries that can make broader uses of forest products and create more competition for forest products, in general.

Page 29 – Investment Mechanisms

We add emphasis to the multi-ownership and cross boundary planning and funding strategies. Landscape restoration approaches offer the best opportunity for successful changes in forest conditions. This approach needs to be supported.

Page 31 – Research and Development

Do not relegate research and development to an afterthought. There are critical areas of additional information needed to forge desired progress. Research and development should be emphasized as a vital foundation for the entire Forest Carbon Plan.

Thank you for providing an opportunity to submit comments. YSS hopes our contribution is found useful and helps inform the final product. Please feel free to contact me if YSS can be of further assistance.

Sincerely,

Chris Trott
Chair, Yosemite Stanislaus Solutions (YSS)