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SUMMARY OF COMMENTS & RESPONSES Forest Project Protocol White Papers

June 20, 2011

14 sets of formal comments on the white papers and 51 comments about even-aged management (specifically clear cutting, see Comment 60) were received during the public comment period for the Climate Action Reserve (Reserve) Forest Project Protocol (FPP) white papers. The white papers cover the following topics:

1. Accounting for carbon in soils affected by forest carbon projects
2. Accounting for carbon in lying dead wood
3. Effects on forest carbon of even-aged management and alternative silvicultural activities
4. Evaluation of sustainable forestry certification programs and criteria

Staff from the Reserve summarize and provide responses to comments on these white papers in this document. The comment letters can be viewed in their entirety on Reserve's website at <http://www.climateactionreserve.org/how/protocols/adopted/forest/forest-protocol-white-papers/>

COMMENTS RECEIVED BY:

1. Blue Source LLC (Blue Source)
2. Catherine Koehler, UC Davis, Lake County Land Trust (Koehler)
3. Center for Biological Diversity (CBD)
4. Central Coast Forest Watch (CCFW)
5. Deanna Wulff, Journalist (Wulff)
6. Ebbett's Pass Forest Watch (EPFW)
7. Forest Stewardship Council (FSC)
8. Karen Maki (Maki)
9. Kim Mattson, Ecologist, Ecosystems Northwest (Mattson)
10. L&C Carbon (L&C)
11. Pacific Forest Trust (PFT)
12. Rainforest Action Network (RAN)
13. Sustainable Forestry Initiative (SFI)
14. Weyerhaeuser Company (Weyerhaeuser)

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GENERAL COMMENTS

1. Unfortunately, the Climate Action Reserve missed an opportunity to solicit independent and unbiased opinions through all of these papers. For the paper on even-age management, the Reserve chose to contract with a member of the Reserve work group that drafted the current protocol, and who represents the interests of the California Department of Forestry and Fire Protection. For the paper on forest certification, the Reserve chose to contract with a firm that has a strong business interest in one particular certification system. The result is that those papers were defensive of the current protocol rather than offering an unbiased analysis of the topics. **(CBD, Maki, EPFW)**

RESPONSE: The white papers were intended to provide one basis for further policy discussion on carbon accounting activities and forest management safeguards. The Reserve works with experts from a wide range of backgrounds in a variety of ongoing formats to assist with updating protocol guidelines. The white papers are only one format for receiving and sharing feedback from forest scientists and experts.

2. EPFW is encouraged by the fact that the Soil Carbon and Lying Dead Wood White Papers are generally well-written and researched. They confirm many of the issues on which we and others have commented for the past year and a half. The Certification and Even-aged Management papers however are inadequate, appear biased, and need to be substantially revised. Neither of these papers is ready for Reserve acceptance without significant work. **(EPFW)**

RESPONSE: Please see response to Comment #1. The Reserve is not representing these papers as definitive, and they do not necessarily represent positions held or “accepted” by the Reserve.

3. While soil carbon storage is worthy of a white paper on carbon pools, Chaparral certainly is also worthy...arguably much more worthy than is downed wood. While I recognize that the current white papers consider forests specifically, the scope of consideration needs to be expanded to include significant natural plant communities that occur in climax state (i.e. are not a transitional community in a successional progressions towards forest) and if protected from destruction harbor and sequester substantial carbon. [See Koehler public comment submission for more information about Chaparral.] **(Koehler)**

RESPONSE: The points made in this comment regarding the potential for Chaparral vegetation to become a significant carbon pool have been noted. Projects involving Chaparral plant communities are not under consideration by the Reserve at this time. For more on future protocol development, please see <http://www.climateactionreserve.org/how/protocols/future-protocol-development/>.

4. We encourage the Reserve to maintain the existing monitoring requirements for soils and lying dead wood as they are in the existing FPP. **(L&C)**

RESPONSE: Due to the potential impacts of project activities on soil carbon and accounting issues with lying dead wood, the Reserve will consider revisions to the protocol to account more accurately for these pools given management activity, forest community and other factors.

5. For reasons explained in our comments, we believe that many issues can best be addressed by updating the approach to Natural Forest Management, making it more regionally and forest-type

specific. Such an approach will generally be more cost effective for project developers, while also better reflecting appropriate ecological standards.

The Natural Forest Management requirements of the FPP (IFM, section 3.10) are intended to ensure that active management of stands within project areas maintain and establish forests native to the area in which the project takes place, and to maintain a distribution of habitats/ age classes, and structural elements that provide for native species of plants and animals. The white papers on lying dead wood, soil carbon, and even-aged management all provide scientific support for improving the natural forest management requirements. The findings point to a need for better protection and recruitment of lying dead wood, better protection of soil carbon (while the soil carbon white paper focuses on the important carbon accounting issues involved, loss of soil carbon can have direct affects on being able to support native biodiversity over the long-term), and establishment of retention requirements for live trees within even-aged harvest units. The certification paper indirectly touches on the need to make sure that natural forest management provisions are properly addressing native tree species diversity.

Our broad recommendations for improving the Natural Forest Management provisions in response to the findings of the white papers are as follows:

The Natural Forest Management provisions should be regionally specific, reflecting different targets in different ecosystems. In particular the NMF provision should include the following items of critical ecological importance:

- Require ecologically appropriate amounts of Lying Dead Wood be maintained or recruited. Meeting a set target will generally be more cost effective than attempting to quantify LDW given current methodologies.
- Require ecologically appropriate levels of post-harvest retention, established regionally by forest type. Based on the research summarized in the white paper, this will be a minimum of 10% retention, higher in some regions.
- Minimum rotation ages or re-entry periods likely need to vary regionally, and be long enough to allow soil carbon to recover between harvests. **(PFT)**

RESPONSE: The Reserve agrees with the overall approach described in this comment. Due to the potential impacts of harvest activities on soil carbon, and forest structure, the Reserve is considering revisions to the Natural Forest Management criteria in the FPP to provide more protections for habitat, biodiversity, and watershed values in the forest. These will include revisions to minimum recruitment and retention levels of LDW and levels of post-harvest retention. Revised guidance may be designed to address targets in different ecosystems considering management activities, forest community, disturbance patterns, and soil types.

ACCOUNTING FOR CARBON IN SOILS

COMMENTS:

6. Accounting for Carbon in Soils makes a solid contribution towards identifying and addressing weaknesses in the current assumptions about soil carbon impacts of forest management in the current Forest Protocol. The use of scientifically sound and realistic assumptions related to soil carbon pool dynamics (as well as other carbon pools) is essential for achieving environmental integrity of any forest related climate mitigation activities. In other words, accurate assessment of carbon pool dynamics is the basis for ensuring that any accounting of forest activities closely corresponds to what the atmosphere actually sees. **(RAN)**

RESPONSE: Agreed. Based on the white paper and other input, the Reserve is considering additional guidance to account for soil carbon as both a source of emissions and as a means of generating credits. This guidance may provide more accurate accounting of GHG emissions and reductions in the comparison of project activities and baseline activities.

7. Given that the soil carbon pool is a large proportion of total forest ecosystem carbon (50-75%) and that management techniques can create losses of soil carbon up to 60% compared to unharvested or undisturbed conditions, and gains of up to 40% compared to different management approaches, the Reserve needs to refine its soil accounting procedures. Currently, very significant potential CO₂ emissions are not being accounted for, undermining the accuracy of the protocol. Further, the ability to properly incentivize gains in this pool is lacking. The protocol must be amended to fix this significant accounting weakness. **(PFT, Peter Fairchild)**

RESPONSE: Please see response to Comment #6.

8. Weyerhaeuser appreciates the thoughtful background paper on soil carbon and supports the conclusion that soil carbon gains and losses are highly variable and depend on many factors. As such, Weyerhaeuser supports including soil carbon as an optional pool for measurement. **(Weyerhaeuser)**

RESPONSE: Please see the response to Comment #6. The Reserve will consider publishing standardized guidance/look-up tables on how to account for soil carbon emissions which will become an included pool for measurement for certain management activities. This guidance may be defined by management activity, forest community, and soil types.

9. The White Paper does not explicitly consider the soil carbon loss associated with Avoided Conversion projects. This is an oversight as soil carbon is a very significant pool for many Avoided Conversion projects, particularly in areas that contain peat/muck coastal soils. These are important projects and ones where the inclusion of soil carbon value is a driving factor in some landowner decisions to conserve or cut their forests. **(Blue Source)**

RESPONSE: Please see response to Comment #6.

10. *Recommendation: The Reserve should carefully consider whether to include soil carbon accounting in avoided conversion projects. More information and analysis may be required to support such changes.*

Rationale: The logic of taking into account carbon that would be lost in certain land-use conversion activities is the same as crediting the retention of above-ground carbon that would otherwise be lost. However, the measurement of soil carbon loss is less precise. The white paper did not specifically address studies that look at the soil carbon impacts of conversion from forest to real estate or agriculture, therefore more analysis is required to determine the best way forward. Because the soil carbon pool is so large, allowing crediting in avoided conversion situations could result in the generation of very large numbers of credits. Therefore, having as accurate an assessment of whether the conversion would have actually occurred and the magnitude of soil carbon loss being avoided is crucial to avoid over-crediting. **(PFT)**

RESPONSE: Please see response to Comment #6.

11. There is no discussion of the success of models. The CENTURY model appears to be relatively good at predicting soil organic matter in agricultural systems. If soil organic matter was hopelessly variable, the model would be abandoned. Most models of soil carbon implicitly assume that carbon transfers from plant material to soil C. Based on this logic, it is presumable that leaving more debris on site will. **(Mattson)**

RESPONSE: In developing further guidance on soil carbon accounting, the Reserve will work with soil scientists to review the success of a variety of soil models. The models are expected to assist with determining the relationship of variables such as site management activities with soil carbon emissions.

12. The paper stresses that creating new or adapting current models may be the best approach to account for soil carbon changes. We agree that utilization of models can be an efficient tool, though we are concerned about the time it will take for soil carbon models to become operative for use under the Reserve's Forest Project Protocol. Another good option that could be applied immediately for creating soil carbon inventories and subsequent verification is to compare on-site measurements along with proxy site sampling. While adequate proxy sites are not available in all cases, they should be utilized to allow landowners with meaningful soil carbon volumes a means to move ahead with project implementation and accounting for this pool today. **(Blue Source)**

RESPONSE: In addition using soil carbon models to develop standardized guidance/look-up tables to account for soil carbon emissions, the Reserve intends to develop methodological guidance for projects intending to increase or retain soil carbon. Such guidance will likely require on-site measurements in order to ensure sufficient accuracy.

13. *Recommendation: The Reserve should commission the development of soil carbon models as described in Section 6 of the white paper to guide the development of discount factors to be applied for situations described in Comment 20. This should be done as soon as possible.*

Rationale: Requiring project proponents to directly sample soil carbon is impractical so models are likely the best option. The sooner the Reserve has such models completed, the better given the large implications for forest carbon accounting that this white paper has illustrated. (PFT)

RESPONSE: Please see the response to Comment #11 regarding the use of models. The models are expected to assist with determining the relationship of variables such as site management activities with soil carbon emissions and allow for standardized guidance/look up tables to account for soil carbon as an emissions source. Also, please see response to Comment #12.

14. *Recommendation: After the Reserve has developed the model described in Comment 13, it should determine whether appropriate discounts can be applied to vegetation management and thinning activities, or the effects of these activities are too variable depending on forest and soil type. If the latter is concluded, the Reserve should consider issuing guidelines about the use of these techniques in forest carbon projects, for example, prohibiting thinning entries more frequently than x years in certain forest and soil types.*

Rationale: The literature review on the effects of these techniques found impacts in some forest types but not others, and the impacts were variable. Therefore it may be difficult to establish quantitative discount factors at this time. However, where competing vegetation control or frequent thinning are known to cause losses of soil carbon (e.g., in southern pine forests), guidelines could be developed to prevent losses of soil carbon. (PFT)

RESPONSE: Please see responses to Comments #8 and #13. Standardized guidance on soil carbon accounting may include conservative discounts and/or management restrictions.

15. In addition to ensuring that previously unidentified negative impacts of alternative management regimes on soil carbon are accounted for, it is critical that any changes to the Forest Project Protocol also grant project owners full credit for positive soil carbon benefits generated by their actions. We see many potential project opportunities that deliver significant carbon and environmental co-benefits that face challenging economics under Reserve requirements. Soil carbon can offer an important enhancement that allows some of these projects to proceed if credited fairly. **(Blue Source)**

RESPONSE: Please see response to Comment #12.

16. *Recommendation: The Reserve should consider ways in which to credit management that rebuilds soil carbon from baseline conditions.* Such crediting should be conservative but create an incentive to add carbon back to depleted systems by, for example, switching from even-aged to selection management or significantly lengthening rotation ages.

Rationale: Forestlands that have been intensively managed in the past in ways known to decrease soil carbon can be restored. If project proponents are willing to adopt management approaches as part of new projects that significantly re-build soil carbon, accounting techniques should be developed that allow projects to accrue credits as soil carbon re-builds. Given the uncertainties involved in site-specific soil accounting however, care should be taken to use models to determine best estimates of both timing of soil carbon accrual and conservative estimates of gains. **(PFT)**

RESPONSE: Please see the response to Comment #12. Standardized guidance will also be considered for activities that increase carbon in soils over time. The consideration will include evaluating the confidence derived from a modeling approach for crediting.

17. The papers report that soil carbon accounts for 50-75% of all carbon on forest site, and lying dead wood makes up as much as 12% of total forest carbon on average for some forest types. Obviously, these are large pools that can have significant effects on the overall carbon accounting for the project. The papers on lying dead wood and soil carbon indicate that these carbon pools may eventually recover from harvest activities, given enough time between disturbances. However, even if this can be quantified by project type, it is obviously not acceptable to issue credits in the near term for presumed carbon benefits in the long term. To do so would undermine the intention of the protocol to issue credits for only the net sequestration above baseline achieved in any given time period. **(CBD, EPFW)**

RESPONSE: Please see the responses to Comments #6, #8, and #11.

18. With so much of the carbon being found in the soil, surely accounting for the carbon in the soil is of great importance. According to the white paper, pre-harvest, harvest, and post-harvest activities all can either increase or decrease the amount of carbon stored. **(Maki, EPFW, PFT)**

RESPONSE: Please see the responses to Comments #6, #8, and #11.

19. The findings of the soil carbon paper indicate that an accurate accounting of carbon emissions must include soil carbon for forest projects that include management activities that cause significant soil disturbance. The most obvious actions causing soil disturbance are even-age

management, soil ripping and tilling, and road-building. Even in cases where soils are not ripped, forest clearcutting removes the entire forest canopy, increasing the soil temperature and increasing soil erosion risk, and the extensive use of mechanized harvesting leads to soil compaction and increased soil erosion across the entirety of the harvest area. **(CBD, EPFW)**

RESPONSE: Please see the responses to Comments #6, #8, and #11.

20. *Recommendation: Require that discount factors be applied in projects that employ management techniques which result in immediate loss of soil carbon.* The list of such techniques should at least include deep ripping, plowing, furrowing, whole tree harvest, and removal of slash. Discount factors should be weighted based on the proportion of the project area disturbed or on which such techniques are applied in the year or years in which they are applied.

Rationale: Because these techniques cause material losses of soil carbon, and are likely to be employed on a scale in any project that produces measurable carbon emissions, there should be no minimum area threshold. Because soil disturbing techniques or management practices that remove soil inputs have a relatively immediate effect on soil carbon, the discounts should be applied in the year that the activity occurs. **(PFT)**

RESPONSE: Please see the responses to Comments #6, #8, and #11.

21. The paper on soil carbon identifies “a high amount of uncertainty regarding soil carbon dynamics in response to forest management.” Page 2. The word “uncertainty” is imprecise in this context, as the paper describes a high level of heterogeneity and complexity, as the carbon dynamics are dependent on the specific activities implemented on different soil types with different forest structures and site histories. This is very different from uncertainty. In fact, the paper itself makes a very good case that management activities are quite certain to impact soil carbon, but the specific impacts are dependent on the site characteristics.

It is clear from the paper that it is very difficult, if not impossible, to assign a meaningful value to the carbon impacts of a management action without knowing the specifics of the activities and the soil and site characteristics. However, that is a very strong argument for including a more in-depth accounting of the soil carbon impacts, not an argument for dismissing the soil carbon impacts as too uncertain. The paper on soil carbon states, on page 8, that achieving the level of certainty required for Reserve’s Forest protocol is difficult. This is precisely the point, of course. Considering the potential significance of emissions from this pool, the Reserve must choose between either accurately accounting for impacts to this carbon pool or conservatively assuming maximum emissions from the soil carbon pool. **(CBD, EPFW)**

RESPONSE: Please see the responses to Comments #6, #8, and #11. Standardized guidance for management activities will be developed that will allow the use of local variables.

22. The paper on soil carbon indicates that some management activities like forest thinning can result in increases in carbon stocks, but only when the harvest residue is left on site. This is obviously not what occurs when harvest residue is burned on-site or removed for biomass combustion, as is often the case with timber harvesting, and with even-age management in particular. In addition, the paper repeatedly states that treatment of post-logging debris may be the most critical variable in post-harvest management, with regard to soil carbon. “Multiple researchers note that when post-logging debris remains onsite, soil carbon increases in the short term after harvesting.” Page 29. However, the current Forest Protocol fails to account for the treatment of harvest debris. **(CBD, EPFW)**

RESPONSE: Please see the responses to Comments #6, #8, and #11.

23. The Reserve workshop presentation included the question: “What timescale should be applied to determine impacts on soil carbon?” In order to ensure that emissions in the near term are not being given credits for sequestration in the medium or long term, it is critical to account for soil carbon at whatever timescale the credits are being assigned. The paper notes that soil carbon pools recover in some systems within 50 years after harvest events. It is obviously not acceptable for the Reserve to issue credits to a forest project that fails to account for emissions that may not be mitigated by sequestration and soil processes for 50 years or more. Furthermore, since soil carbon generally increases with time in an undisturbed forest, the baseline is an increasing soil carbon pool, not a static value. Therefore, the business-as-usual baseline is an increasing value for forest projects that choose even-age management and soil ripping over other harvest regimes that result in lower soil disturbance. **(CBD, EPFW)**

RESPONSE: Actual business-as-usual practices consist of a wide array of management activities. The Reserve has standardized its definition of the baseline to avoid attempts to define business-as-usual on a project-by-project basis. The additional guidance for soil carbon accounting under consideration by the Reserve will consider the timing issues related to the loss and restoration of soil carbon in the context of comparing project activities with baseline activities.

24. *Recommendation: Projects involving even-aged management should be required to employ rotation ages that allow full recovery of soil carbon.* These rotation ages should be established specific to forest ecosystem type, but the minimum rotation age appears to be 50 years in temperate forests and 75 years in boreal and other low-productivity systems.

Rationale: Because losses of soil carbon can be cumulative and very long-lasting with repeated rotations shorter than soil carbon recovery time (see Figure 4 in white paper), projects with short rotations may not produce actual net gains in carbon over their lifetimes when soil carbon is taken into account and thus should not be eligible. **(PFT)**

RESPONSE: The protocol has an implicit requirement for minimum rotation ages of 50 years or more that applies to all projects. To meet the eligibility criteria for Natural Forest Management, projects cannot allow any more than 40% of the project area in age classes less than 20 years old and must maintain and/or increase standing live trees during the project life. The Reserve will continue to consult with soil science experts regarding the relationship between the time needed to restore soil carbon following harvest and rotation age with even-aged management silviculture.

25. The paper found that 50 years are needed for a soil to reach pre-harvest levels of carbon. Accounting for the carbon in the soil should be a requirement for all commercial logging projects. **(CCFW, Maki, EPFW)**

RESPONSE: Please see response to Comment #25.

26. We believe the protocols must take into account the impacts on carbon loss and storage from logging activities that adversely impact the soil. Clearcutting in particular impacts the soil of the whole project area through disturbance from intensive harvesting methods. Accounting for soil carbon is necessary for accurate carbon accounting particularly on intensive harvest sites. Methodologies exist that would make such accounting effective and affordable. **(CCFW)**

RESPONSE: Please see the response to Comment 6 and 11. The Reserve will consider developing standardized guidance based on modeling to facilitate effective and

affordable accounting methods.

27. We have submitted several photographs [see **EPFW public comment submission**] which show examples of extensive soil disturbance during clearcutting as well as infrared photography showing significant soil temperature increases in a clearcut patch versus in a shaded forest. Increased soil temperature is a contributor to increased soil CO₂ emissions. EPFW has also included a photo showing a typical clearcut with large burn piles of forest debris and limited lying dead wood or standing dead wood. These conditions are of course inconsistent with best forestry practices for ecological and climate sustainability. **(EPFW)**

RESPONSE: Please see previous responses that indicate updated standardized guidance will be provided that account for soil carbon emissions based on management activities and local variables.

28. We agree with the authors that “*monitoring techniques for soil carbon are imprecise, very expensive, and time consuming*”. We suggest a review of the following author statement that it will cost “*Hundreds of thousands of dollars per plot*” to measure soil carbon. We generally agree that soil carbon measurements are imprecise and expensive, and will not result in detectable differences in stocks in most IFM projects over time. The addition of a requirement to measure soil will add significant expense to project monitoring, for negligible change detection in soil carbon stocks (in the majority of project cases). We encourage the Reserve to continue to treat soil carbon as an optional pool in the existing Forest Project Protocol. **(L&C)**

RESPONSE: Due to the potential for emissions from certain management activities, the Reserve is considering development of standardized guidance/look-up tables on how to account for soil carbon emissions, which may become a required pool for measurement where certain management activities are practiced. This guidance will be standardized in that it will be based on a modeling effort using local variables.

29. My suggestion is to try to paint a more unifying picture. For example, Johnson and Curtis showed that coniferous soils do seem to accumulate carbon under a sawlog scenario. Other studies, particularly where there is soil disturbance as part of the site prep, soil C seems to decline. So, one conclusion may be that when logging debris or slash is left on site, it can end up in detritus and eventually soil organic matter. If the sites are disturbed, soil C likely declines.

This literature review also relies more on individual cites of results. I think they should try to give quantitative estimates from the reviews and from models and be more critical of the studies they review.

The soil carbon literature is notoriously full of contrasting results. Part of the problem is that the field methods do not measure carbon the same; time is important, disturbance history. There are likely ways forests can be managed for soil carbon: length of rotation, avoidance of disturbance (fires or insects), management of woody debris. Conversion of sites to forest assumes a short term loss of carbon. Discussion of measurement error. Bulk density, rock content, forest floor and mineral soil separation. More figures and data...less anecdotal writing. Less focus on the problems and more on what trends do appear to be established. Good discussion of N. No cites of Berg and McClaugherty—probably the best and most sophisticated discourse on carbon cycling. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

30. In the review of the literature, several examples of misstatements are: soil organic matter varies on micro and macro scales and it varies with depth. While this statement is not overtly incorrect, it is too general and leaves the reader that it is hopelessly variable. In fact, while soil organic matter has relatively high variation on a small spatial scale, there are discernable patterns on a larger scale. The soil organic matter does vary with depth, but again the variation has a discernable pattern. The fact that soil carbon varies with an observable pattern is quite different than being simply “variable.” These two patterns are readily described: soil organic matter increases with latitude and with rainfall, and soil organic matter decreases with depth. Knowing these sorts of patterns are a good thing in that we understand basic processes that contribute soil organic matter accumulation in soil. Instead of citing literature that does not make sense why not cite the literature that makes more sense. Are there results that show increases in soil organic matter? What have we learned from the Rothamsted studies? **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

31. I think the review highlights not so much that soils are highly variable, but instead, the results from field studies are highly variable. This is an important distinction. I personally believe that much of the variation we see in the literature is as much due to poor sampling as it is to natural variation. I think you cite Yanai, her paper does a good job of bringing up problems with field sampling. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

32. Page 2, line 5: The phrase...”or disturbance on contours” is a bit confusing. It appears to be a double negative. It seems to say that the Reserve does not consider any disturbance to soil to have an effect if the disturbance were not oriented along a contour? In other words, the Reserve thinks disturbance along contours would have an effect? This doesn’t make sense. **(Mattson)**

RESPONSE: To clarify what was paraphrased in the white paper on Accounting for Carbon in Soils, the current version of the FPP states that soil carbon must be included and accounted for in quantifying a Forest Project’s GHG reductions and removals if:

- ***Site preparation activities involve deep ripping, furrowing, or plowing where soil disturbance exceeds 25 percent of the Project Area, or***
- ***Mechanical site preparation activities are not conducted on contours.***
(FPP, 3.2, Section 5, p 22)

33. Page 2, line 6: Monitoring remains elusive. The results from monitoring that show clear effects are elusive—not the monitoring. I would take some issue that monitoring does not show clear effects. It may be more accurate to say that monitoring show variable effects, depending on the study. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

34. Page 2, first bullet: Again, I get the impression you are trying to put up a smoke screen that the research is hopelessly variable (what multiple other factors?). Again, I think a more accurate way to cast the state of science is that study results produce variable interpretations. Though, it seems to me that the level of disturbance to the soil is the most important factor, followed by the

particular techniques used by the study. The effect of tree species may embody other factors. For example conifer sites in the SE US probably have greater site prep following harvest and with replanting. Tree species will vary with climate and climate may be a larger factor. It seems reasonable to mention soil type is a good factor to consider. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

35. Page 2: Second bullet is somewhat soft. I had trouble reading it and making sense of it. It wasn't clear to me how thinning or veg control may alter site fertility per se. Maybe you are trying to say that soil carbon is a function of site production. This makes sense. I doubt that simply thinning or veg control will increase soil carbon. You may be trying to get at the effect of N on humus or stabilized carbon? I am not convinced that studies show that leaving detritus on hardwood sites causes loss of carbon. N-fixing plants may increase soil carbon on young sites. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

36. Page 3: Third bullet on thinning appears to contradict statement on thinning on page 2. I wonder how thinning may increase productivity of a site. I can see how individual trees left behind will grow faster due to the release. But the overall site productivity should diminish as you remove leaf area. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

37. Page 3: Last bullet on soil carbon monitoring is too general and is not very correct. Soil carbon monitoring can be precise, it is not very expensive (or expense is a relative term), and it is not necessarily very time consuming. At least state what you are comparing the monitoring to. Perhaps modeling is less expensive (after you have developed your model). Maybe you mean monitoring on every site? Maybe you mean monitoring to detect 5% change? I think monitoring is essential to helping determine whether certain sites or disturbances affect carbon. A better recommendation might be to state the importance of monitoring and but that it involves basic research that the Reserve cannot do. Still it is in the best interests of the Reserve to support monitoring and the development of better data sets so this uncertainty might be reduced. I think a better way to state your problem is that the state of science in soil carbon dynamics is still too young and is still developing and it cannot provide the sorts of answers with high degree of precision that the Reserve needs. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

38. Page 10, first paragraph: Where you state soil carbon accounts for 48% of forest carbon, are you citing Woodbury? Otherwise, this contradicts your general statements earlier of soils containing more carbon than biomass. Also this paragraph start with the idea that soils can sequester carbon but ends with the idea that soils are more inert.

Second paragraph paints too simplistic of a picture. The last sentence suggests that the CENTURY or other models of carbon are not accurate. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

39. Page 14: Your reasoning for stating that conversion of non-forest to forest will result in short term declines in soil carbon are not clear. Unless there is disturbance to the soil, it is not clear how planting trees may cause short term losses. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

40. Page 15: Your reasoning that increased production of litter will cause increased decomposition is not clear. Do you mean increased decomposition of the newly added litter or of carbon on the site before addition of litter? It doesn't make any sense to say that the increased decomposition of the newly added litter is higher than sites without the added litter, because in sites without added litter, decomposition is, by definition, zero (no litter is added so no decomposition of this non-added litter can occur). So, this causes some confusion for me. I see you cited Cheng for priming effects of root exudates. Is this what you mean? **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

41. Page 18: The section on thinning seems to presume that since thinning helps the remaining trees to grow faster, that overall net primary production on a thinned site will also be higher. This is counter-intuitive from the perspective of leaf area. If you thin, you will initially reduce leaf area and this should reduce the net photosynthesis of the site and the net primary production. I am pretty sure Powers data show this, that thinning reduces overall site carbon fixation but the left over trees do show a release response. It is not too surprising that a couple of cited studies show declines with thinning. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

42. Page 19: The conclusions in the first bullet do not seem correct. I fail to see how thinning will add soil carbon per se to infertile sites. In any event, it seems better to address this via some sort of process model that may show ways that adding litters may help them become incorporated into the soil carbon pools. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

43. Page 20: It may be more correct to paraphrase the Johnson and Curtis review as showing studies can be highly variable in the reported change of soil C. But the overall mean of the studies they cited showed small increases. To say that overall, there are no significant effects of harvesting on soil carbon misses the important points of harvest type and degree of disturbance. If you say there are no significant effects, you should at a minimum add the adjective no "statistically" significant effects. But clearly this is comparing apples with oranges. Given the wide range they report, it is not too surprising that the mean happens to fall near zero.

I think the big point is that, if disturbance is moderate or light, there are potential gains to the soil carbon pools via enhanced transfers. **(Mattson)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

44. Page 35, pages 16-17, *Fertilization* – The authors convey that many studies show that fertilization can increase soil carbon but references that currently the Forest Project Protocol, version 3.1, does not allow fertilization. Weyerhaeuser finds this ban on fertilization to be completely arbitrary and unfounded. In addition to the studies mentioned in this white paper, there are numerous other studies that support the finding that increased N-availability actually causes more litter deposition and larger forest floor accumulations. Forest floors have been found to decompose proportionally at the same rate, whether big or small, so if one does activities such as fertilization, then over multiple rotations there should be more soil organic matter built up in the ecosystem, which results in increased productivity resulting in a beneficial positive feedback. Although it is out of the scope of this white paper, Weyerhaeuser encourages the Climate Action Reserve to revisit the requirement to ban fertilization, taking into account the numerous benefits to soil carbon as highlighted in this white paper.

Furthermore, Weyerhaeuser would like to clarify the authors' statement that there is a general lack of multiple studies testing the effects of fertilization and competing vegetation on soil carbon. Several of the Forest Productivity Cooperative trials have studied these questions in the southeastern United States and have published numerous peer-reviewed journal articles on this topic. **[See Weyerhaeuser public comment submission for footnote references.]**
(Weyerhaeuser)

RESPONSE: The FPP currently prohibits the use of broadcast fertilization due to the current estimates showing notable amounts of N₂O emissions resulting from the application of organic and synthetic fertilizers. Although this prohibition may be revisited sometime in the future, it is currently not under review.

45. Page 36 and 21, *Harvest activity* – The authors' state that "whole tree harvesting has a significant negative effect on soil carbon" and cites the Johnson and Curtis (2001) article as the source for this finding. Johnson and Curtis actually found that whole-tree harvest creates a slight decrease on average (~5% according to Figure 2 of the white paper). The authors state the results accurately in the statement below the figure but mischaracterize the conclusions of Johnson and Curtis in the conclusion paragraph on page 22. In fact, Johnson and Curtis concluded that there is very little effect of harvesting on soil C and N and nowhere do they mention that residues should be kept on-site in the way that is portrayed in this white paper. Furthermore, the results of the Long Term Research Productivity study also do not support such a strong conclusion. These studies also found that post-harvest C increased at all depths across all studies (regardless of whether or not surface organic matter had been removed). The authors conclude that "soil inputs following disturbance depend less on decomposition of surface residues and more on the decay of fine roots that remained from the previously harvested stand." **[See footnote references in Weyerhaeuser public comment submission.]**
(Weyerhaeuser)

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

46. I would like to draw attention to one possible oversight in the paper on assessing soil carbon dynamics, and it is one that has received significant attention in the global climate negotiations. That is the issue of carbon emissions from peat lands, particularly those that have been put under land use management, whether for forestry or agriculture. Wetlands International has taken a leading role in this regard. A variety of briefing documents concerning wetlands, LULUCF in developed countries and carbon accounting for activities including afforestation, reforestation and forest management can be found on the Wetlands International website.¹

The US, including Alaska, has the fourth largest area of peatlands in the world, and also has the fourth highest rate of peatland emissions.² Recognizing and accounting for peat lands in forestry projects will be important for accurate soil carbon accounting. Because of their high carbon content and prevalence in many forest or formerly forested landscapes in North America where the Forest Protocols will be applied, I would strongly encourage some explicit consideration of peat land soil carbon issues as the Forest Protocols are further developed. **(RAN)**

RESPONSE: Please see earlier responses, particularly responses to Comments #6, #11 and #18 that describe the Reserve's approach to developing standardized guidance through modeling the effects of forest management on soil carbon. Peat land soil carbon is one of many issues involved in discussion with soil scientists as further guidance is developed.

ACCOUNTING FOR CARBON IN LYING DEAD WOOD

COMMENTS:

47. Both the lying dead wood and soil papers indicate the importance of accounting for portions of the dead wood cycle but together they fail to identify the full size of the carbon pool and potential emissions associated with dead wood cycling. Neither paper acknowledges the complex carbon pool that spans between lying dead wood and soil—the large array of fine woody debris, litter, humus, and soil O horizon. In addition, the fine woody debris, litter, humus, and soil O horizon are highly influenced by harvest technique and post-harvest management, but the current protocol accounts for none of these components. **(CBD, EPFW, Mattson)**

RESPONSE: Due to the potential role of LDW in forest ecosystems, the Reserve is considering revising the Natural Forest Management criteria to provide standardized guidance for LDW retention on all project types following harvest activities. Measurements of LDW may be required for all project types following harvest activities in order to account for GHG emissions from the LDW pool relative to baseline activities. The Reserve may develop minimum recruitment and retention levels of LDW for each Assessment Area and standardized guidance for obtaining LDW measurements. However, the Reserve may exclude the LDW pool from offset crediting because the techniques for measuring LDW are not accurate enough for this purpose.

48. *Recommendation: The protocol should require protection of existing large lying dead wood at the start of the project.*

Rationale: The white paper identifies the ecological roles that lying dead wood play in forest ecosystems as more important than the carbon storage function and as irreplaceable by other

¹<http://www.wetlands.org/NewsandEvents/CalendarofEvents/ClimateSummitinCanc%C3%BAAnMexico/Canc%C3%BAnAddressingPeatlandEmissions/tabid/2415/Default.aspx>

²<http://www.wetlands.org/LinkClick.aspx?fileticket=o%2bd%2bTaPldLI%3d&tabid=56>

components of the forest. While it is possible to replenish LDW that has been damaged or actively removed through recruitment from standing dead wood, this will take time, up to several decades. Given the ecological importance of LDW, the damage to these functions should be prevented, not just mitigated. Because it may be difficult to protect small pieces of LDW, and because large pieces take longer to be replaced, protection requirements should include size limits. **(PFT)**

RESPONSE: Revisions to Natural Forest Management criteria in the FPP will include minimum retention levels for LDW in each Assessment area. The criteria will address size limits.

49. The Reserve workshop presentation included the following question: "If standing dead wood provides a good surrogate for future levels of LDW, can the measurement of standing dead wood continue to be used instead of measuring LDW with some level of statistical confidence?" The paper on lying dead wood raises important points that indicate that standing dead wood is not a good surrogate for future levels of LDW in all project types. On page 22 of the workshop presentation, the Reserve presents the following statement from page 4 of the lying dead wood paper: "Forest projects designed to increase carbon storage under Climate Action Reserve's Forest Project Protocol are unlikely to have a negative impact on long-term LDW." However, this quote leaves out the very next sentence from the paper, which states: "Forest Projects usually employ uneven-aged silvicultural practices, and the main eligible management activities for these projects are, on balance, likely to increase LDW." That is, the authors were not considering the potential impacts of even-age management, which often involves extensive removal of snags and lying dead wood, and which eliminates natural snag recruitment by periodically removing the standing live trees. **(CBD, EPFW)**

RESPONSE: Please see response to Comment #47.

50. *Recommendation: The standing dead pool requirements should be adjusted to match natural levels of LDW found in un-managed forests by forest type with goals tracking higher levels reached during stand maturation.* If standing dead wood is to be used as a surrogate, rather than requiring actual measurement of LDW, forests that have starting stocks below natural levels of LDW should be assigned a timeline for reaching required levels.

Rationale: It is clear from the scientific literature that one size does not fit all. Tailoring the LDW requirements to forest ecosystem type should prevent build-up of LWD that are above levels typical of drier, more open forests and will bring up requirements where they are inadequate for wetter forest types. **(PFT)**

RESPONSE: Revisions to Natural Forest Management criteria in the FPP will include minimum recruitment and retention levels for LDW in each Assessment area.

51. *Recommendation: The requirements for LDW should be expanded beyond using standing dead trees as the only input to include felling live trees to add to the LDW pool immediately when levels are below the required threshold.* When salvage harvest has damaged existing down wood, half of the required amount could be met through input over time from standing dead while the other half could be met by intentionally felling live trees. When no active removal has taken place, but the amount of LDW is still significantly below naturally occurring levels, a smaller portion (e.g., 25%) could be met with felling live trees. Size of live and dead tree inputs should also be considered in the revision to the protocol because larger pieces of LDW tend to be lacking in managed forests and they resist decay and fire for longer periods of time.

Rationale: If LDW is below natural levels, these levels can be increased more quickly than

relying on natural recruitment of standing dead trees by requiring more active measures. Costs can be reduced by felling defective trees. Requiring that a higher proportion of the LDW requirement be met by felling live trees when active removal of LDW has occurred should serve as an incentive to protect existing stocks. It should be noted that down wood is recruited through natural disturbance processes in addition to falling dead trees. **(PFT)**

RESPONSE: Please see response to Comment #47.

52. *Recommendation: The protocol should provide more quantitative guidance on the rate at which lying down wood should be expected to be recruited from the standing dead pool.*

Rationale: The lack of quantitative guidance can result in disagreements between verifiers and project proponents and lead to unnecessary delays in verification of a project. In addition, given the lag time involved in recruiting lying dead wood, if a verifier has found that LDW has been actively removed, part of the requirement for increasing input should be met with more speed than waiting for natural processes to run their course. **(PFT)**

RESPONSE: Please see response to Comment #47.

53. The Reserve workshop presentation included the following question: “Are the [snag] recruitment/retention goals stated in Table 3.2 of the FPP (1 to 4 Metric Tons of Carbon per acres in standing dead wood) appropriate?” The conclusions of the lying dead wood paper indicate that recruitment goals are beside the point when it comes to accurately accounting for the carbon impacts of the lying dead wood component. The carbon loss associated with impacts to lying dead wood—not to mention litter and the dead wood cycle as a whole—can be substantial and must be accounted for any time period in which carbon credits are assigned. Otherwise, the Forest Protocol runs a high risk of assigning credits to a forest project that is actually a source of emissions from this carbon pool in the near term. An assumption of future recruitment of lying dead wood does not preclude the need for determining a project’s immediate impacts to this pool.

Even if snag recruitment goals in the protocol were developed to provide a level of dead wood cycling that ensures a minimum level of carbon sequestration in the lying dead wood and soil carbon pools, this would do little to ensure the values of lying dead wood as wildlife habitat, erosion control, water storage and nutrient cycling. **(CBD, EPFW)**

RESPONSE: Please see response to Comment #47.

54. According to *Carbon Accounting and Management for Lying Dead Wood*, lying dead wood can also be a significant source of forest carbon and needs to be included in forest carbon accounting. The percentage varies between 2- 5% depending on the region and the type of tree. Removal of LDW would also seem to result in less soil carbon later on.

Emissions from down wood can be substantial, but are spread out over many years and depend on how lying dead wood is inventoried, and how snags and soil carbon are accounted for. The current protocol accounts for none of these. This needs to be remedied. **(CCFW, Maki)**

RESPONSE: Please see response to Comment #47.

55. Current clearcutting logging conducted under the pre-AB32 California Forest Practice Rules does not leave significant amounts of downed or standing wood, live or dead. EPFW has previously submitted several photos [**see EPFW public comment submission**], showing landscapes following typical California clearcutting. These exhibit this dearth of standing or lying

live or dead wood. While these clearcuts are currently being allowed under California law, the Reserve must note that the current rules were developed prior to recent scientific knowledge on carbon as well as LDW wood. Additionally, the Reserve must take into account the numerous scientific studies that reinforce the criticality of these resources for wildlife and soil protection. (EPFW)

RESPONSE: Please see response to Comment #47.

56. EPFW wants to alert the Reserve that the “LDW Biomass Flux U shaped pattern” slide shown at the March 10th workshop does not provide an accurate representation of a clearcut/plantation biomass cycle. Our submitted pictures show that a typical clearcut has very limited LDW in the early years. (EPFW)

RESPONSE: The purpose of the “LDW Biomass Flux - U Shaped Pattern” graphic on slide 6 of the Reserve’s workshop presentation was to demonstrate how dead wood accumulation in forest stands is constantly in a state of flux. As pointed out in the comment, this is not representative of a clearcut or plantation operation where logging and other forest debris has been removed. Revisions to Natural Forest Management criteria in the FPP will include minimum retention levels for LDW in each Assessment area. The revised criteria are expected to address LDW issues of clearcut operations with little to no retention of LDW like those shown in the submitted pictures.

57. *Recommendation: Due to the cost and difficulty of accurately measuring LDW, exclude this pool.* Instead, address the critical ecological functions by setting clear regionally specific criteria in the Natural Forest Management provisions. Note that it may be worth including LDW as a mandatory pool in certain ecosystems with substantial LDW, if survey methods improve in the future.

Rationale: If CRTs are to be calculated including the lying dead pool, field measurement to an appropriate level of accuracy is required. However, given the expense and issues involved in getting an accurate sample, and the fact that ecological functions of LDW other than carbon storage are very important, it seems more straightforward to deal with LDW in a prescriptive manner under the natural forest management provisions. If project proponents are required to protect existing levels of large LDW from project start, and/or build back to natural levels over time, impacts to LDW for both its carbon pool and ecological functions should be protected. Potential CRTs lost by not allowing crediting this pool would likely be compensated for by savings on inventory expenses. The ability to make up for lack of LDW by felling live trees should make it straightforward to comply with required input levels. (PFT)

RESPONSE: Please see response to Comment #47.

58. We agree the paper correctly identifies the issues with lying dead wood sampling, the relatively minor stock it represents (in many forest ecosystems) and the accuracy challenges associated with adequate measurement. The authors mention the Reserve’s current use of standing dead wood as a proxy for compliance with lying dead wood requirements. We are of the opinion that the current guidelines about dead wood are reasonable and require no modification.

The authors requested input on whether or not the retention goals for dead wood should be tailored to each Assessment Area. We believe that they should not as the current language in the FPP is sufficient. Lying dead wood is an important component of forest ecosystems, but we do not recommend any changes in the current FPP. (L&C)

RESPONSE: Current FPP guidelines for measuring LDW can be improved. The Reserve

will develop more quantitative criteria for minimum recruitment and retention levels of LDW. In addition, the Reserve will develop standardized guidance for obtaining measurements of LDW which will be required for all project types following harvest activities.

EVEN-AGED MANAGEMENT AND ALTERNATIVE SILVICULTURAL ACTIVITIES

COMMENTS:

59. Many experts suggest that healthy (uneven-aged) forests provide ecological diversity, carbon storage and economic resilience for our state and country, and they do. According to Bill Libby, a UC Berkeley tree specialist, California's coastal redwoods and giant sequoias are best suited for sequestering carbon because of their size, rapid growth and durability. The longer a tree lives, the longer its carbon remains bottled up instead of reaching the atmosphere. Conversely, industry experts suggest that clear-cutting and tree farms provide jobs and the most efficient logging practices. New trees also absorb carbon. But the essential thrust of the conflict centers around one question: Does human short-term economic need come before the long-term health of all living things?

It comes down to special interests versus the needs of the community and the world as a whole, including those that have no voice. You've been entrusted with a great task, and you have the unique opportunity to preserve forests worldwide, if you keep clear cutting out of your landmark policies. **(Wulff)**

RESPONSE: All Forest Projects listed and registered at the Reserve are required to meet the criteria for Natural Forest Management, which include requirements for the promotion of ecological benefits, such as the use of native species, sustainable forest management, and protection of biodiversity. These criteria have been developed to promote and maintain native forests comprised of multiple ages and mixed native species within a project area. As indicated in the response to Comment #5, the Reserve is considering revision and refinement of these criteria and other guidance in the FPP based on research of natural disturbance patterns in different forest Assessment Areas throughout the United States. This guidance may determine what kind of harvest openings are allowed for an eligible project at the Reserve.

60. The recent Climate Action Reserve White Papers contain data revealing carbon emissions related to clearcutting not being accounted for under current rules. Based on information in these papers, the Climate Action Reserve must remove clearcutting from the allowable methods for carbon offset projects.

Please consider the carbon in soil and lying dead wood which together are a large percentage of the carbon in a forest.

There is a clear distinction between "clearcutting" and "industrial clearcutting and even-aged management." The key here is that by and of itself, clearcutting is recoverable--while it isn't a substitute ecologically for the benefits of fire, nevertheless, early successional species do grow back again, and in a very short time you can have a very biologically diverse landscape, provided no additional disturbances are permitted. But that's not what happens, as we know. Instead, the forests are subjected to deep ripping/plowing, herbicide applications, planting, more herbicide applications, and short rotations that follow that first clearcut. The reason why this matters is biodiversity. If you repeatedly remove the sources of seed or other propagules, there

will be nothing in the seed bank to replace species that once populated a region. There will be no sources for forage, nectar, pollen, nesting material, shelter, etc.

We should adopt only programs that will most reliably assure actual sequestration and avoid those, such as clearcuts, that ignore carbon impacts of entire components of the activity seeking to be called an "offset." We should particularly avoid subsidizing clearcuts because it is extremely difficult to assure additionality with them, and also because they pose significant environmental risks. Even-aged, clearcut forests are less resilient, more prone to fire and disease, and provide less diversity of habitat for the species on which nature and Californians depend.

Please protect the integrity of the climate program and resiliency of California's forests by:

- a) eliminating from the offset program clearcutting of our forests as a way of sequestering carbon
- b) adding provisions to assure that forest projects *do not* result in the conversion of naturally managed (uneven-aged forests) into clearcut plantations (even-aged forests).

(Amanda Wallner, Brent McIntosh, Bruce Castle, Bruce Gervais, Celeste Snavely, Dave Johnson, Deanna Wulff, Dianne Dryer, Don and Barbara Rivenes, Donald Forman, Donald Stitt, Edward Abbey, Edward Mainland, Gary Bailey, Graeme Kinsey, Jack Alexander, Jim Feichtl, John Cordes, John Warren, Juliette Beck, Katherine Evatt, Kathy Bailey, Kathy Seal, Kenneth King, Kevin Collins, Kim Floyd, Kim Hanks, Laurie Davis, Linda Brown, Linnea Fronce and Thomas Hall, Marilyn Jasper, Michelle Waters, Mike Linvill, Neahle Madden, Olivia Diaz, Ophelia Zeff, Patricia Gomez, Patricia Lind, Patricia Matejcek, Paula Carrell, Richard Kangas, Richard Kranzdorf, Robert Moncrieff, Ron Szymanski, Stuart Demmy, Sue Lynn, Tim Johnson, Vicky Hoover, William Buchholz, Wilma Wheeler)

RESPONSE: Please see the response to Comment #59. It is important to note that the protocol does not treat, and never has treated, clearcutting as a method for sequestering carbon. Forest projects only receive offset credits to the extent that they *reduce* harvesting intensity and store more carbon in forests.

61. The white paper does a good job of explaining the different silvicultural treatments and uses in different parts of the country and reinforces our conviction that there is not one universal way to practice forestry. The authors state throughout the report that there are many considerations in comparing carbon implications of different management techniques, including the impact of leakage (dispersing harvest to other lands) and product substitution (accounting for avoided GHG emissions from using wood products as opposed to more energy intensive materials) (see Introduction, heading 4, pg. 4-6). It is clear that this white paper does not support one "optimal" way to manage for maximal carbon storage. Moreover, in the offset context, having an optimal way is somewhat irrelevant since the landowner can only sell the additional carbon that has been quantified in the project. It is the choice of the landowner how much or how little of an increase they choose produce, and it will depend on many other factors, including economic considerations and other values for the land. So if the purpose of the white paper was general education into different kinds of forestry practices, we think it succeeded. It does not, however, provide the basis for making specific protocol changes unless it is to remove the arbitrary 40-acre clearcut limitation. **(Weyerhaeuser)**

RESPONSE: The policies and protocols of the Reserve are primarily developed to provide requirements and guidance for quantifying climate benefits of forest management activities. They are also intentionally designed with protections for habitat, biodiversity and watershed values in the forest. With these goals and with recognition of the different forest communities, revisions are being considered to the FPP related to

even-aged forest management that will involve updated guidance based on research of natural disturbance patterns for each Assessment Area (please see response to Comment #59).

62. Heading 1 - *The carbon storage potential based on the pre-treatment land use and productivity has a significant influence on carbon* (page 3). In the next sentence the authors state, "Any harvesting treatment will reduce carbon in stocked land versus not harvesting even accounting for in-use forest products pool due to conversion inefficiencies, with this effect particularly pronounced in forests with high initial stocking." This sentence is grossly misleading as it is true only in a limited temporal sense. Throughout the report all modeling is done over a 100-year time frame, which is appropriate since that is the time frame of the project crediting period. However, this time frame does not necessarily yield the same result as a 200-year or longer time frame. In fact, managing at or below the culmination of mean annual increment is seen as a widely accepted strategy for sequestering more carbon over the long term **[see footnote in Weyerhaeuser public comment submission]**. Figure 1 **[see Weyerhaeuser public comment submission]** illustrates the carbon dynamics of managing Loblolly pine on a 30-year rotation (around the culmination of mean annual increment) versus never harvesting. The no-harvest scenario reaches a stable state while the harvest scenario shows the continuous maintenance of a lower average carbon stock in the forest, but a continuous build-up of wood product carbon storage. In this scenario, it overtakes the no-harvest regime after about 130 years. The cross-over mark will be much longer in forest species that have longer growth periods (e.g., Douglas-fir) and much shorter if the system boundary expanded to include landfill carbon, avoided emissions from product substitution, and bioenergy. Please re-characterize the sentence in quotations above to reflect the limited temporal context of the statement. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

63. Heading 2 - *The quantity of live tree retention significantly determines forest carbon* (page 3). The results of the studies described in this paragraph do not support this general finding. In fact, it appears that this was true in only the intermediate to shade tolerant angiosperm forests as described in Nunery and Keeton (2010) in a northern hardwood forest type. Not surprisingly, this result supports the time-tested silvicultural practice that currently is used in these types of forests (partial retention). The authors even state that the "modeling results of intermediate to intolerant (shade) Douglas-fir showed no impact of silvicultural retention treatment with only rotation period providing a significant difference." Again, not surprisingly, this result supports the general practice of even-aged management in shade intolerant forest ecosystems, such as Douglas-fir and Loblolly pine. **[See Weyerhaeuser public comment submission for more information and figures showing regeneration growth under a clearcut scenario.]**

Please clarify the general description of heading to put in the context of intermediate to shade tolerant angiosperm forests or clarify that it is not a direct relationship (i.e., in shade intolerant species the quantity of live tree retention can have a negative impact on forest carbon by reducing stand productivity). **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

64. Heading 3 - *The length of the rotation length (even-aged) or entry period (uneven-aged) also significantly determines forest carbon* (page 4). In the last sentence the authors state that "our modeling suggests that rotation ages linked to annual growth culmination may maximize live

tree carbon stocks." Weyerhaeuser agrees with this statement and would like to point out that the culmination of mean annual increment (cMAI) varies significantly by tree species, site index, and silviculture treatment. For example, the biological cMAI in Loblolly pine can vary from 24 to 31 years depending on site index, stand planting density, and site treatment (e.g., fertilization, bedding, herbaceous weed control). cMAI of Douglas-fir, on the other hand, is closer to 70-90 years depending on site index, though silvicultural treatments such as thinning can extend this period and others such as fertilization can reduce this period.

Though cMAI is useful for understanding biological capacity it is not useful for determining practical management regimes for a particular stand. In the case of Loblolly pine, the financial optimal rotation is often longer than the biological optimal rotation, as lengthening rotations allows more growth of more saw timber, which commands a higher price than smaller diameter wood. Conversely, the financial optimal rotation for Douglas-fir is considerably shorter than the biological cMAI because such a long rotation age carries with it huge carrying costs. **[See footnotes and references in Weyerhaeuser public comment submission.] (Weyerhaeuser)**

RESPONSE: As noted in the response to Comment #59, the Reserve is considering revisions to the criteria for Natural Forest Management based on research of natural disturbance patterns in different forest Assessment Areas throughout the United States. Any revised criteria and guidance will take into account the variety of effects of natural disturbances, biological capacity, and implications for practical management regimes by forest community.

65. Heading 4 - *The quantified effects of silvicultural treatments on total net sequestration or emissions of carbon will depend significantly on how carbon accounting boundaries are drawn, i.e. which carbon pool and downstream effects are included in the analysis* (page 4).

Weyerhaeuser agrees with this statement and believes that the temporal component should also be added as an explicit parameter per justification above related to Heading 1.

Weyerhaeuser also believes that the rest of the case studies compiled in the white paper should begin with the explicit context in which the study was conducted. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

66. Page 5, *Forest Product Accounting* - The authors should clarify that Hannon's study was referring to the roundwood and not the entire live tree. This is interpreted by reading Hannon's (2009) paper, which refers to assuming percentages of the "harvest would be converted to a mix of various long-term products ... " and from checking the definition of harvest in STANDCARB Version 2.0 manual, which states that "only sapwood and heartwood (i.e., boles) either alive or dead can be removed from the simulated forest." If the assumption is correct that the utilization rates refer to percentage of roundwood (e.g., harvested material) and not the live tree (i.e., including branches, etc.) then the high utilization assumption is quite realistic for Douglas-fir forests. In fact, the Department of Energy Voluntary GHG Reporting 1605b) wood product calculation tables state that 74% of PNW round wood becomes a product and that the decay rate is only 0.6% (0.3% if include landfill carbon as well as in-use). **[See Weyerhaeuser public comment submission for footnote references.] (Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

67. Pages 5-6, *Leakage* - In the section on leakage the authors suggest that the wood product leakage effect between partial harvest stands and clearcut stands could be mitigated by harvesting more acres. In order for this to work, these would have to be acres that weren't previously being harvested, in which case there would be potentially another leakage between the unharvested and newly harvested stands unless there is an assumption that there is a market response to increase productivity somewhere. Such a scenario is plausible but needs to be specifically stated in the sentence. Otherwise the sentence should be removed. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

68. Page 13, *Case study on variable retention component of natural disturbance based silviculture: DEMO* - Since the DEMO study did not include a zero retention option (i.e., to simulate even-aged management) it is misleading to have a title that concludes "Dispersed retention patterns provided greatest tree growth benefits, but studies vary on appropriate level of retention for Douglas-fir to provide sufficient light." As shown in Figure 2 [see **Weyerhaeuser public comment submission**], Douglas-fir seedlings have a dramatic reduction in growth with any form of retention relative to clearcut, a finding DEMO could not know because there was no clearcut option included in the study. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

69. Page 26, Soil Carbon, *(C) Effect of even-aged management and uneven-aged management on lying dead wood, litter and duff, and soil carbon.* – The USFS North American Long-Term Soil Productivity Experiment found similar results to those described in Slesak et al., 2009. Specifically, the study found that that removing all surface organic matter had no impact on C or N levels in the upper soil profiles after 10 years across the studied geographies (five from the Sierra Nevada's and seven from the Southeastern Coastal Plain). Ares et al. found similar results on a long-term research study site in Washington State (at a separate site than the Slesak study with similar treatments but different soil types). Incidentally, these studies also found that post-harvest C increased at all depths across all studies (regardless of whether or not surface organic matter had been removed). Powers et al. conclude that "soil inputs following disturbance depend less on decomposition of surface residues and more on the decay of fine roots that remained from the previously harvested stand." [See footnote references in the **Weyerhaeuser public comment submission**] **(Weyerhaeuser)**

RESPONSE: Please see response to Comment #13.

70. The papers find that the current forest protocol runs a high risk of significantly underestimating the carbon emissions associated with forest projects that disturb soil or disrupt dead wood processes over a significant portion of the project area; as a result, the current forest protocol runs a high risk of over-counting carbon benefits from some forest project types. In particular, forest projects that include even-age management may appear to be a carbon benefit in many situations only if one ignores the impacts to soil, lying dead wood, litter and other carbon pools, and only under a number of highly uncertain assumptions about the business-as-usual harvest levels and replanting, and the persistence of wood products. **(CBD, CCFW, EPFW)**

RESPONSE: Please see response to Comments #4 and #5.

71. The Reserve workshop presentation included the following statement: “Even-aged forest can disturb the forest floor, which results in reduction of litter and duff through increased decomposition. However, this can be offset by contributions from logging and slash.” This seems clear from the paper, but it is important to note that the paper offers no strategy for estimating the extent to which logging slash will offset the carbon losses from the other pools. These carbon impacts must be measured to determine their relative influences on the overall carbon balance. Also, as noted elsewhere in our comments, the protocol does not account for impacts to carbon associated with the wood cycling, despite the fact that this carbon dynamic is a critical and large component of forest carbon, and can be substantially altered and emitted as a result of management actions, as found in the papers on soil carbon and lying dead wood. **(CBD, EPFW)**

RESPONSE: Please see response to Comment #47.

72. The Reserve workshop presentation included the following question: “Can historical natural disturbances provide guidelines to incorporate the following factors in the Forest Project Protocol? • Harvest retention of live trees, snags, and LDW. • Targets for maintaining large diameter trees. • Rotation limitations. • Spatial limitations for disturbance.” It is very likely that a consideration of the impacts and dynamics of natural disturbances would identify options for improving the natural forest management definition in the Forest Protocol. However, this is very different from saying that timber harvesting mimics natural disturbance regimes. Even-age management in particular is not consistent with the impacts of natural disturbances because clearcutting eliminates the forest structure, removes the vast majority of the large trees, and greatly reduces woody debris through on-site burning or collection for biomass combustion. In contrast, natural disturbances generally leave many large trees standing, retain structural characteristics important to wildlife even when the trees have been killed, and retain and recycle woody debris. **[See additional information and references in the CBD public comment submission.]**

In addition to the critical ecological distinctions between logging regimes and natural disturbances, it is important to account for geographic and temporal scales. Perhaps most important for the purposes of comparing a forest project to a business-as-usual baseline is the fact that a harvest regime occurs with certainty on a particular forest area, whereas a natural disturbance is a relatively low probability event occurring at various geographic scales and distributions, often at a scale of centuries. **(CBD, CCFW, EPFW, Maki)**

RESPONSE: Prior to issuing updated guidance related to even-aged forest management, the Reserve will review how harvest operations can better mimic natural disturbance patterns for each Assessment Area. Please see response to Comment #5.

73. Even-aged management does not mimic natural disturbance such as fire as claimed. The ecosystem after a fire will recreate itself over time. Even- aged management, on the other hand, removes most of the biomass, returning little of value, and transforms a natural diverse ecosystem into a plantation of one or two commercial crops. The forest never regains its original character and can only regain its carbon sequestration potential over an extended period of time. Even-aged management creates greater soil carbon disturbance, and removal of more live carbon than uneven-aged management practices. **(CCFW, Maki)**

RESPONSE: Please see response to Comments #5 and #59. Revised natural forest management criteria may include restricting harvest openings to those that better mimic natural disturbance.

74. *Recommendation: The protocol should be revised to require minimum retention levels within even-aged management units. Retention levels should take into account natural disturbance regimes in different forest types and the optimum level for carbon accumulation given the effects of retention on regeneration of shade intolerant species. Research indicates that retention levels should be at least 10 percent of pre-harvest basal area and leave trees should be distributed in the uplands and not just counted in riparian buffers in order to more closely resemble natural disturbance patterns*

Rationale: The white paper demonstrated that retention combined with long rotations can be as effective at increasing carbon stocks as uneven-aged management. In addition, natural disturbance regimes that serve as justification for even-aged management result in more retention post-disturbance than typical even-aged management systems. **(PFT)**

RESPONSE: Please see response to Comments #73.

75. Even-aged management techniques are more intense than uneven-management techniques, which means the soil carbon suffers more disturbance, more live carbon (in commercial and non-commercial plan material) is removed or destroyed). The difference in intensity and scale between even-aged and uneven-aged management overshadows any difference in the techniques they may utilize. As stated in the *Accounting for Carbon in Soils* white paper, pre-harvest, harvest, and post-harvest activities all can increase or decrease the amount of carbon stored. It is not reasonable to assume that even-aged management, the most intense forest management practice utilized, will have no effect upon soil carbon as claimed in the *Carbon Dynamics Associated with Even-Aged Forest Management* white paper. **(Maki)**

RESPONSE: Please see response to Comment #13.

76. Further requirements should be added to the natural forest management section of the protocol to require that projects safeguard our watersheds and protect the state's wildlife. **(CCFW)**

RESPONSE: Please see response to Comment #5.

77. *Recommendation: Clarify the scale at which minimum rotation age applies within a project area and develop requirements for project proponents that employ even-aged management on projects less than 10,000 acres in size.*

Rationale: Current protocol language applies the age-class distribution requirement at the scale of a watershed or 10,000 acre area. This leaves out the effects of shorter cutting cycles on projects that are smaller than 10,000 acres. Even though smaller ownerships may not achieve full area regulation, if they use even-aged management, they will have a predictable impact on overall disturbance of the project area over time depending on their chosen rotation age. The protocol should take this into account and apply minimum rotation ages to projects smaller than 10,000 acres. **(PFT)**

RESPONSE: Please see response to Comment #24.

78. Page 29, (D) *A Case Study of the Carbon Stocks in Various Management Regimes in a Coastal Pacific Northwest Douglas-fir Forest Type* – In the method section, the authors' state that they assumed a 12x12 foot replanting density, which produced 304 trees per acre. This planting density is much lower than a typical Douglas-fir planting regime. It would be useful to rerun the model with a sensitivity analysis of different planting densities as it would appear that the chosen planting density would result in a bias against shorter rotations because there would be less carbon accumulated in the early years of the rotation. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

79. We support modifications of rotation and retention requirements and the ability to tailor prescriptions to specific forest types and regions. **(L&C)**

RESPONSE: Please see response to Comment #59.

80. *Wood product accounting* - It is unclear what accounting method was used for harvested wood product accounting (i.e., whether the Reserve Forest Protocol Version 3.1 accounting method or another one). Please clarify. In addition, on page 35 the authors state that "the in-use wood product pool ranged from between 15% and 24%, but was not all countable towards reductions." Please clarify why some of the in-use product carbon wasn't countable towards reductions. Finally, it would be helpful to separate out the live carbon pools from the wood product carbon pools in the results tables. **(Weyerhaeuser)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see response to Comment #2.

81. This paper needs to be rewritten and reviewed by a panel of non-biased experts. **[See comment under General Comments, above.] (EPFW)**

RESPONSE: Please see responses to Comments #1 and #2.

82. *Should localized guidance be included in consideration of any revisions to these limitations in the protocol?* The objective of a Reserve qualifying IFM project is: (a) Ensure sustainable management of the forest resource over time, (b) Increase carbon stocks over the project period.

To that end, it is our opinion that the Reserve should rely on the professional judgment and knowledge of local Foresters and Natural Resource Managers rather than the current broad prescriptions applicable for all regions of the country. For example Section 3.10.4 of the FPP requires 40 acre maximum openings, and no more than 40% of age classes less than 20 years old. Forest management is part art and part science. Restricting the land manager to specific forest management prescriptions that can be implemented (and necessary) at the project level are not as efficient. If the management is sustainable (which will be determined as the landowner successfully completes third party auditing under FSC, ATFS, or SFI) and the project area is increasing carbon stocks over the project period, those actions should be sufficient under FPP rules. **(L&C)**

RESPONSE: Please see response to Comments #5 and #59.

SUSTAINABLE FORESTRY CERTIFICATION PROGRAMS AND CRITERIA

COMMENTS:

83. Given that all certification programs do not adequately address issues of carbon sequestration, many include clearcutting practices and other practices such as removal of old growth trees, we

do not support the use of any of the current certification systems as a replacement for meeting specific, set criteria for carbon sequestration. We believe the protocols should provide strong language that protects forests, watersheds and wildlife, while providing appropriate guidelines for natural forest management that will lead to an increase in carbon sequestration. **(CCFW)**

RESPONSE: The purpose of third party certification in the context of the FPP will continue to be to address the issue of sustainability (harvest levels that can be permanently sustained over time) in order to prevent activity-shifting leakage within the Forest Owner's land holdings. All three certification systems (FSC, SFI, ATFS) provide adequate assurances for this purpose.

84. "Sustainable" is an over-used word whose meaning is often unclear. Rather than thinking of sustainability only in terms of sustainable yield, sustainable forestry should encompass its impact on the natural world (wild life, watershed) and nearby human communities. It is not reasonable to believe that all certification systems, the state and federal forest regulations are sustainable when the number of impaired waterways and endangered species in this state are on the rise. Another problem is the high joblessness rates in forested communities. **(Maki)**

RESPONSE: Please see response to Comment #83, as well as the response to Comment #5. Although some of the certification systems address jobs in forested communities (i.e., FSC Principle 4: *COMMUNITY RELATIONS AND WORKER'S RIGHTS Forest management operations shall maintain or enhance the long-term social and economic well-being of forest workers and local communities.*), the Reserve is not planning to publish requirements related to joblessness rates or job creation at this time.

85. *The sustainable harvest test is important and should be maintained, but the more important question is how to improve the natural forest management criteria.* Given that there are up to five different ways to satisfy the sustainability test we could easily get distracted with a lengthy debate on relative merits of one of three certifications vs. the other two tests. Certification does offer many benefits and addresses some of the risks to sustainability and maintenance of ecosystem services and functions throughout all of a forest owner's landholdings, but this should be supplemented with universal natural forest management criteria **[more detail in PFT Comment 5, above]**. **(PFT)**

RESPONSE: Please see responses to Comments #5 and #83.

86. EPFW has forwarded separately the following two letters **[see EPFW public comment submission]**: October 28, 2010 letter from FSC on "Reasons why proposed LEED benchmark is a big step backward", and "Dear USGBC members" letter re FSC vs. SFI differences signed by major environmental groups. These letters outline additional issues regarding certifications that were not included in this White Paper but which should be addressed during its revision including the fact that FSC is the only protocol that comes close to being an adequate certification method for the retention of viable forest ecosystems and resilient forest habitats.

Certification of forest projects is not an acceptable substitute for a robust definition and requirement for "Natural Forest Management." This paper needs to be re-written and reviewed by non-biased experts. **(EPFW)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

87. The protocol should continue to require that projects meet the criteria for natural forest management. Of the three mentioned, only FSC comes close to being an adequate replacement for the text in the protocol. SFI includes none of the limitations, in stand size or project timing, or native species, that are contained in the natural forest management section. Additional requirements should be added to natural forest management section of the protocol to require that projects safeguard our watersheds and protect the state's wildlife. It would be beneficial to also add language to the protocol to ensure that forest projects brought jobs to local forested communities. **(Maki)**

RESPONSE: Please see response to Comment #84.

88. *Certification should not be a substitute for natural forest management requirements in the protocol.*

Rationale: Certification standards address some of the risks to sustainability and maintenance of ecosystem services and functions. Some do this more than others. Certification systems review sustainability of harvest levels throughout all forest owner's landholdings. Certification is more robust than other options in the Sustainable Harvest test at addressing ecological function and services, but there are limitations. Certification is focused at the broader forest management unit or ownership level and land on which forest carbon projects are active may be only a very small part of the scope of the certification. As a result, the ability to use certification reports to draw conclusions regarding project level conformance to ecological function and services indicators may be limited.

Therefore it is logical, necessary, effective, and cost efficient to supplement certification with a small number of indicators to address Natural Forest Management at the project level which is the approach taken in the FPP. However PFT has specific recommendations for improving the NFM criteria [see PFT Comment 5, above]. **(PFT)**

RESPONSE: Please see response to Comments #5 and #83. Also, the Reserve is considering modifications of the other options contained in the FPP for demonstrating sustainable management.

89. *Can Forest Owners with certification be excluded from the Natural Forest Management criteria in the protocol?* In our opinion the Natural Forest Management requirements in the current FPP are too prescriptive and it is best to leave these types of decisions at the local level rather than to be set by the Reserve. Forest certification is an excellent proxy for sustainable forest management and to ensure environmental protection. We encourage the Reserve to consider the use of forest certification (FSC, ATFS, SFI) as proof of compliance with current FPP rules in lieu of natural forest management requirements. **(L&C)**

RESPONSE: No, the purpose of third party certification in the context of the FPP will be to continue to address the issue of sustainability (harvest levels that can be permanently sustained over time) and activity-shifting leakage within the Forest Owner's land holdings. Please see response to Comment #83.

90. The report notes certification standards *provide greater assurance of sustainable harvesting practices than the alternative options provided by the protocol (state or federal approval and monitoring or long-term plans or uneven age management practices)* (page 2). While SFI Inc. understands the need to have pathways of entry for all interested landowners into the program, SFI Inc. agrees with this conclusion and believes the Reserve Protocol will be stronger over the long-term if more specific criteria and processes exist for management activities and monitoring and verification for those landowners who choose to not be certified. **(SFI)**

RESPONSE: The Reserve is considering revisions to the Natural Forest Management criteria to adjust for issues raised concerning adequate assurances from the second or third options for demonstrating sustainable harvest practices. (See FPP, Table 3.2, p. 16)

91. Page 7, paragraph 5: *“Environmental requirements are similarly driven from a broader perspective than US forests.”* FSC-US finds this comment misleading and founded on the presumption that there are not the same significant challenging issues surrounding forest management in the US. We are confident that this does not represent the perspective of most Reserve stakeholders. The FSC Criteria pertaining to environmental issues address environmental impacts, rare species, forest ecology functions, ecological reference areas, erosion and water quality, pesticide use, exotic species, and conversion – all of which are central to forest management concerns in the US. The indicator-level modifications for regional or national standards allow definition of *how* they are relevant, not *if* they are relevant. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

92. *Process-based versus Performance-based Indicators* (pages 11-12). While the report authors accurately describe the types of indicators and their distribution among the various standards, the comments regarding process-based indicators having “no detailed requirements as to what outcome should be sought” is subjective and requires clarification. Taken singularly, the indicators may be interpreted in this fashion. However, taken collectively and considering their role *vis-a-vis* the entire SFI Standard, these indicators support Performance Measures and Objectives which do describe the desired outcome. **(SFI)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

93. Page 12, paragraph 2: *“Process based indicators require a specific process to be in place (e.g. a program to manage water quality). From an audit perspective, an assessment is required as to whether the program has been developed, implemented and effective [underline added].”* FSC-US suspects the claim that assessments are required to determine effectiveness of programs is generally not true. For example, when programs are required via certification to manage water quality are they assessed to verify that they are effective at managing water quality? **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

94. Page 13, paragraph 2: *“Each of the standards maintains a standard development process that is open to any interested party and a standards approval process that is designed to reflect the opinions of a broad range of stakeholders. While these processes differ substantially, the stated intent is similar.”* We encourage the authors to note that while the processes reflect the opinions of a broad range of stakeholders that they are clear that it is a very different set of stakeholders and that while the stated intent is the same, both the processes and the outcomes differ substantially. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also,

please see responses to Comments #1 and #2.

95. *Audit Process.* In Table 2 (page 14), the description of stakeholder engagement in the certification audit process for SFI should more accurately reflect the language of the Standard. The Standard requires more than just “an assessment of concerns,” as stated in 5.3 of Section 9 of the SFI Standard: *Evidence shall be compiled by examining operating procedures, materials relating to forestry practices and on-the-ground field performance, and through meetings with employees, contractors and other third parties (e.g., government agencies, community groups, conservation organizations), as appropriate, to determine conformance to the SFI 2010-2014 Standard. (SFI)*

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

96. *Audit Process.* On page 15 there is a discussion of audit time regarding the FSC Standard, but no information is given on the other Standards, such as SFI. Time spent on an audit is not necessarily an indicator of audit robustness. In the case of SFI, because major non-conformances found during a certification audit will result in a company not receiving a certificate, many companies choose to work with consultants extensively prior to certification to ensure their processes and implementation of the Standard are in place and working before initiating an audit. Thus, certification bodies may not need to spend as many days on SFI audits as with other certification program audits. **(SFI)**

RESPONSE: Noted.

97. *Review of Certification Comparison Reports.* SFI Inc. noted that the authors referred to the Yale Program on Forest Policy and Governance report (page 17) created for the US Green Building Council. SFI Inc. has noted previously that this report is flawed and does not accurately describe any of the certification programs completely. SFI Inc. has extensive written comments on this report and is happy to share our comments, upon request by and directly with the report authors. **(SFI)**

RESPONSE: Noted and passed on to the authors.

98. *Review of Certification Comparison Reports.* The report notes that comparisons of standards “favor the more prescriptive standard because it is easier” overall to assess conformance to the standard requirements. There should be further clarification explaining that simply because one standard is written differently, it is not automatically a more robust Standard. **(SFI)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

99. *Sustainable Harvest Levels.* In Table 5 (page 20), the SFI requirements pertaining to “allowance for harvest in excess of calculated sustained yield” should refer to both Objectives 1 and 5 of the SFI Standard. As noted in other areas of the report, Objective 1 provides the requirements for calculating, monitoring and adjusting sustainable harvesting levels. Objective 5 limits clear cuts, but allows for harvesting on a greater scale *when necessary to respond to forest health emergencies or other natural catastrophes. (SFI)*

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also,

please see responses to Comments #1 and #2.

100. Page 23, Table 7: it seems there is a missing row here addressing excessive harvest. Unless “very aggressive forest health strategy” is a funny way of stating “very aggressive economic model” – there is no category that captures designing harvests to meet short-term economic goals at the expense of long-term values. This is a regular occurrence and should not be discounted. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

101. The conclusion the authors want to show in Table 8 (page 26) is sound, but the subsequent paragraphs are misleading and wrong as it pertains to FSC. For FSC-US, the indicators that address soils and productivity are addressed in Criterion 6.5 and not Criterion 6.3. For example: Indicator 6.5.c Management activities including site preparation, harvest prescriptions, techniques, timing, and equipment are selected and used to protect soil and water resources and to avoid erosion, landslides, and significant soil disturbance. Logging and other activities that significantly increase the risk of landslides are excluded in areas where risk of landslides is high. The following actions are addressed: [...] slash is concentrated only as much as necessary to achieve the goals of site preparation and the reduction of fuels to moderate or low levels of fire hazard.

Further, taking Indicator 6.3.f out of context is troublesome, because that’s where much of your commentary is answered. Please use the correct example of indicators in Criterion 6.5. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

102. Regarding the function of certification programs to address internal leakage of harvest activities by the forest owner (pages 29-32), it is our impression that due to flexibilities in certification programs that they do vary quite substantially in their capacities to address this function – this is contrary to the conclusions stated in the paper. The real issue is if certification programs require calculations of allowable cut to span across multiple units. If each unit requires independent calculation, then internal leakage is prevented. If allowable cut calculations are made across multiple units, then the certification program does little or nothing to prevent an increase in harvest on one side of the ownership to compensate for decreased harvest in the forest carbon project area (i.e. leakage). **[See FSC public comment submission for analysis of each certification program concerning leakage as well as suggested clarifications to the paper.] (FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

103. Desired future forest condition (pg. 31): A forest certification Standard cannot be expected to describe specific future forest conditions for all forest types in North America. The comment on page 31 regarding the SFI program may “insufficiently” define the future forest condition should be removed. As the appendix clearly states, Objectives 1-6, in addition to Objectives 15 and 17 all have requirements that must be met, outlined in the management plan, and adhered to. In creating the management plan as required in Objective 1, the forest manager will describe the future forest state for each stand, in order to meet the standard requirements, including wildlife

habitat, water quality, soil productivity, special sites, and others. **(SFI)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

104. SFI Inc. agrees with the report that the other programs researched (page 35), such as Ancient Forest Friendly, do not offer the same level of risk mitigation as the credible certification programs and should not be included in the Protocol. **(SFI)**

RESPONSE: Noted. The Reserve is not planning to add any additional forest certification programs which can be used to address issues of sustainable management or activity-shifting leakage in the FPP.

105. ATFS relies very heavily on desired future conditions and management objectives which provides an exceptionally tenuous link to ecological conditions (it depends entirely on if the landowner wants these conditions). These are recognized as "compensating controls" (page 40) in the paper, but frankly they mean little on the ground. **(FSC)**

RESPONSE: Noted. The paper points out that any of the available certification methods are reasonable for addressing issues of sustainable management and activity-shifting leakage.

106. Long-term harvest levels (pg. 40-41): the SFI standard was designed to address the entire spectrum of forest management regimes (both forest type and desired forest products) in North America. Thus it is not practical to set a defined harvest level for all users of the Standard. Instead, Objective 1 in its entirety describes the process and activities a company must complete to define their management plans, harvest levels, modeling, monitoring and restructuring their harvest plans to ensure they meet all requirements of the Standard and that management decisions are based upon accurate information to maintain long-term productivity and yield. It is impractical to assume that a Standard designed for forest certification for all of North America would be able to define what "long-term" growth would be for all forest types. **(SFI)**

RESPONSE: The definition of the specific time frame encompassed by long-term sustainability is listed as a residual risk for all three certification systems in the white paper. The authors defer to periodic recalculation of planned harvest levels and updating of long-term management plans required by the certification systems as the primary method to ameliorate risks associated with this issue.

107. Excessive flexibility provided to exceed growth rate for > 10 years (very aggressive forest health strategy) (pg. 41-42):
- ATFS – the connection here is very confusing between the evidence the authors have for controlling harvests. This is about harvests exceeding growth rates but that seems lost on the authors. The fact that the management plan addresses forest health and that the owner consider IPM are not controls and should be removed. ATFS has no explicit requirements that address this concern.
 - SFI - has very little capacity to control harvesting for short-term economic goals at the expense of long-term values. The fact that SFI doesn't control conversion (e.g. future growth is zero) is at the heart of this matter. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of

the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

108. Increased chemical use (pg. 42):

- SFI – the SFI requirement is to minimize chemical use required to achieve management objectives. It is overstated in the paper which implies that chemical use might really be minimized. Further, it is unclear of the real value of participation in pest prevention programs... participation is rather vague.
- FSC – the criterion 6.6 explicitly states that managers “strive to avoid the use of chemical pesticides.” Additionally FSC prohibits highly hazardous chemicals that have been shown to have likely negative impacts on water quality. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

109. Where requirements are requirements to “consider” (i.e. ATFS 4.2 “*landowners consider integrated pest management*”), we strongly suggest that requirements to “consider” options are not strong safeguards and should be dismissed for lack of credible outcomes. We are not opposed, however, to using land owner/manager judgments and considerations on the best mechanisms to achieve a particular goal. For example if the requirement were to utilize alternative sources to minimize chemical use, certainly part of the guidance would be that landowners consider IPM... but as stated, it doesn't provide much confidence. **(FSC)**

RESPONSE: Please see response to Comment #105.

110. Reduced rotation length (pg.45):

- ATFS – there is nothing in the standard that prevents this. The indicators that are mentioned have a tenuous at best relation to the activity and in practice have less.
- FSC – in addition to those controls mentioned, please also see Criterion 6.5 which is designed to capture soil values. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

111. Alteration of landscape level tree species composition (e.g. toward higher value or faster growing timber) (pg. 48):

- ATFS – management plans outlining desired future conditions is not an adequate safeguard for this! Recall that ATFS can certify up to 20,000 acres! Further, multiple ATFS certified properties within a landscape can have major cumulative effects.
- SFI – we don't see where an assessment of forest cover types and consideration of this in planning suffices as a safeguard. Further, a program to promote the conservation of native biodiversity has no connections to on the ground activities. Further, SFI has no requirement to prohibit conversion of natural forest to monoculture and exotic plantations – it's done regularly.
- FSC – includes on the ground requirements that safeguard. In addition to the indicator you noted, please see all the Indicators restricting the use of even-aged management and opening sizes (e.g. for California see pages 90 and 91 of the FSC-US FM standard) and see Criterion 6.10 prohibiting conversion. **[See further detailed comments in FSC public comment submission.] (FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

112. Alteration of spatial/temporal availability of specific successional habitat types (pg. 48):

- ATFS – an exceptionally tenuous link between protection of T&E species to the risk. When successional habitat types are not mentioned, it should be taken as good evidence that it's not addressed!
- SFI – again, a program to promote conservation is very different than on-the-ground conservation that is the goal of this endeavor. Second, conducting an assessment for forest cover types, age or size classes and habitats – it's hard to see how you conclude that this suffices.
- FSC – it's explicitly addressed in the single indicator noted, but also in many others. See Criterion 6.4 where these under-represented areas must be protected, and 6.3.a.3 protection of old growth, and other requirements in Criterion 6.3 about the use of clearcuts, and Principle 10 – restoration requirements associated with plantation certification. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

113. Alteration of spatial/temporal habitat availability for sensitive species (pg. 49):

- ATFS and SFI – both defer to agencies and regulatory processes for protection requirements. There are no requirements to adjust management to protect common species from becoming rare and from rare species from becoming threatened.
- FSC has explicit requirements (as noted in the table). Additionally, it's interesting that for ATF, the authors mentioned HCVF, but this was omitted for FSC... **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

114. Use of seed source with limited genetic variability for planting (pg. 49):

- ATFS – what is the link between the evidence 3.1.1 and the activity? There is none.... ATFS does not address this item.
- SFI – use of sound scientific measures regarding improved planting stock, including SE clones of conifers is not a compensating control by any stretch of the imagination. SFI companies plant clonal pine species in large blocks all the time. Simply stated this does not control against changes to biological diversity (the forest risk factor).
- FSC – the most important component is not mentioned here. FSC prohibits conversion from a natural forest to a plantation (sensu FSC – see 6.10). In other words one cannot clear a forest that contains genetic diversity representative of native biodiversity and plant clonally derived trees or exotic species in blocks... it's prohibited. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve's ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

115. SFI and ATFS both allow conversion of natural forest to depauperate plantations (e.g. exotic species) (pg. 50). There is nothing in either standard that addresses this. We are confused

then at how KPMG can conclude that both control for such risk factors as “impact on ecological integrity” and “changes to biological diversity / and wildlife habitat.” Fundamentally, that’s what conversion is changing. FSC prohibits converting rich natural forests to forests that do not contain the principle components and key elements of natural forest ecosystems.

- General – the authors addressed the concept of controlling invasive species, but not the issue of the use of exotic species... this should be rectified.
- ATFS – no control over the planting of non-native species. Simple.
- SFI – minimal control over the planting of non-native species.
- FSC – as noted, there are strong controls against the mis-use of exotic species (see Criterion 6.9 which is about the use of exotic species). Also please see Criterion 10.4 which in some cases prohibits the use of exotic tree species, and as always Criterion 6.10 which addresses conversion. **(FSC)**

RESPONSE: This comment has been passed on to the authors for review as a part of the Reserve’s ongoing process of gathering data for potential protocol revisions. Also, please see responses to Comments #1 and #2.

116. *Should all forest owners be required to enroll in ATFS, FSC, and/or SFI?* L&C is of the opinion that all forest owners (for example projects on public lands) should not have to enroll in ATFS, SFI, or FSC and that the current FPP language giving Project Owners the option of creating a “renewable long-term management plan sanctioned and monitored by a state or federal” agency is sufficient. **(L&C)**

RESPONSE: Please see response to Comment #90.

117. The report concludes that the current approach on the Forest Project Protocol meets the needs of the Reserve program. Thus, SFI Inc. agrees with the authors that adding any more requirements beyond the sustainability requirements and requirements in 3.9.2 of the Protocol will only increase project costs with little added benefit. SFI Inc. does not recommend adding additional requirements for forest projects as this will only increase costs for participants and reduce interest in the Reserve among forest landowners. **(SFI, Weyerhaeuser)**

RESPONSE: Noted.

118. *Forest Certification should not be mandatory.* It offers clear benefits, but making it mandatory can create barriers for certain smaller landowners to participate in registering emission reduction projects. Certification is a market choice and confers market advantage to forest owners who choose to seek certification.

Rationale: The paper concludes that:

- Forest certification is well suited to address ownership level sustainable harvest tests established in the FPP.
- Certification is more robust than Option 2: State or Federal Agency Sanctioned Management Plan and option 3: Employ Uneven-Aged Management Plan.
- Certification has clearer and more consistent criteria for determining sustainable harvest levels.
- Certification has audit monitoring process in place.
- Certification criteria are applied to the full ownership.
- Certification utilizes a broader range of indicators to assess ecosystem function and services.

However, some land owners could be prohibited from participating. Therefore we recommend leaving the sustainable harvesting test as is, and strengthening the NFM criteria for all projects.
(PFT)

RESPONSE: As stated in the response to Comment #88, the Reserve is considering modifications to strengthen the other mechanisms used to address the requirements of sustainable management.