Appendix F–Science Review Panel Report

Science Consistency Review Report—27 January 2012

Review Of:
Final Environmental Impact Statement:
Giant Sequoia National Monument

Review Administrator:

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Review Panel:

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Science Consistency Review
Giant Sequoia National Monument Plan FEIS
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Part I—Review Administrator's Summary
March 7, 2012

Introduction

At the request of then Forest Supervisor Tina Terrell, a panel of scientists was brought together on 1 April 2010 to conduct a science consistency review (SCR) to evaluate the Draft Environmental Impact Statement (DEIS) for the Giant Sequoia National Monument (GSNM) Plan. A report summarizing the findings of that panel was provided to the FS Terrell on 13 May 2010. The general findings were that the original review panel members judged the DEIS to be generally consistent with available scientific information with some important exceptions. The exceptions to consistency were primarily related to:

1. a general lack of citations (the link to scientific information) to support statements made in the DEIS,
2. concern that the cited scientific literature was at times outdated and the DEIS would be improved by using more recent literature,
3. lack of sufficient detail in the discussion of monitoring plans that might be used to check whether unacceptable outcomes associated with risk and uncertainty under various alternatives will occur or not,
4. lack of a clear connection or association of the scientific literature with the activities proposed to achieve the goals of the plan.

All reviewers suggested relevant recent scientific literature as well as potential ways to link the literature to the written discussions that they thought would help improve the DEIS.

After review of that report with the panel and GSNM specialists, FS Terrell requested a further SCR for the revised draft when it became available. The panel agreed to review the revised DEIS. Subsequently, at the request of Forest Supervisor Kevin Elliot, the second panel of scientists was brought together on 12 December 2011 for the second SCR. They were each provided copies of the FEIS. This panel consisted of the same scientists as the first with the exception of Dr. Craig Thompson taking the place of Dr. William Zielinski. Dr. Zielinski was no longer available for the second SCR. This report constitutes the findings of the second SCR panel.

As in the first review, a standardized process for the conduct of science consistency reviews (Guldin and others, 2003a, 2003b) provided a template under which the panel worked. The same list of specific topics and associated elements that were determined to warrant individual scrutiny for the DEIS were used by the panel members for the FEIS. These elements represent a distillation of the crucial scientific topics addressed in the DEIS, as viewed by Terrell and the GSNM planning team. The context for that scrutiny was based on a standardized set of science consistency evaluation criteria (Guldin and others, 2003a, 2003b):

1. Is the relevant scientific information considered?
2. Is the scientific information reasonably interpreted and accurately presented?
3. Are the uncertainties associated with the scientific information acknowledged and documented?
4. Are the relevant management consequences identified and documented, including associated risks and uncertainties?

SCR panel members were asked to review and rate each element under five categories that was thought to be important by each of the above evaluation criteria. The review panel responded to each category generally and more specifically to the elements. The five categories the SCR panel was asked to were:

- Vegetation, including giant sequoias
- Fire and fuels
- Wildlife and plant habitat
- Human uses
- Use of multi-criterion decision support

The review of the use of Multi-criteria Decision Support does not fit the standard SCR format. MCDS is a process for arriving at decisions rather than scientifically developed information.

As such, the review of the MCDS process relied on a different set of criteria than the reviews of the other topics. These criteria were:

1. Is MCDS used appropriately?
2. Is MCDS used effectively?
3. Are the MCDS process and results adequately documented in appropriate planning documents?

The reviews and ratings were conducted by each panel member individually and were then forwarded to the review administrator.

Each reviewer commented only on the portions of the FEIS for which each felt qualified. Therefore, some subject areas may not have received review ratings or have comments associated with them.

One final point deserves mention. Concerning wildlife issues, this SCR review panel focused on those issues primarily associated with evaluating the potential impacts of the GSNM Management Plan on the conservation of fishers, marten, and other old-growth/late-seral dependent wildlife and their habitat.

The Appendix to this report contains the review of each SCR panel member as submitted to the review administrator.

As envisioned in the process for the conduct of science consistency reviews, this report will be made available to the Regional Forester, the Forest Supervisor, and the technical experts responsible for preparation of the document.

The conclusion of the review panel is that science consistency has been improved compared to the original DEIS. Nonetheless, while judged by the panel as being largely consistent with available science, this revised FEIS still contains several of the shortcomings of the original in that there remains a lack of clear connection to the scientific literature. The science consistency review is not decisional, and the Regional Forester and Forest Supervisor have the authority to decide whether to undertake a revision of the FEIS and/or incorporate revisions into the FEIS to better reflect consistency with available science. If revisions are made, major progress will be made in developing a document that is consistent with available scientific information by addressing the attached comments and especially the individual reviewer comments.

Results Of The Review

General comments

Overall, review panel members judged the FEIS to be generally consistent with available scientific information with some important exceptions. The exceptions to consistency are primarily related to:

A. Though improved from first review, there is still a lack of citations (the link to scientific information) to support many statements made in the FEIS.

B. A lack of a clear connection or association of the scientific literature with the activities proposed to achieve the goals of the plan.

1. All reviewers noted a general lack of citations to support statements made in the FEIS. This was true even though many of the statements made were considered consistent with current science. The panel determined that citations to relevant scientific information had to be present to make a determination of 'consistent with scientific information.' There needs to be a clear trail from the scientific literature to the FEIS for the decision makers and the public.

2. The reviewers found that a number of papers listed in the Literature Cited section did not appear to have citations in the text of the document. This made is had to determine where and how the information from those documents had been incorporated.

3. Several reviewers noted that, given the lack of citations, it was confusing and difficult to see how current scientific information would be used to develop monitoring plans that would help to determine the success of the plan.

All reviewers suggested relevant recent scientific literature as well as potential ways to link the literature to written discussions that they thought would help improve the FEIS. The suggested scientific literature is listed in each report.

Reviewers stated they believe the treatment of climate change and its potential effect on ecosystems, though brief, was generally adequate and consistent with current scientific information.

Summary by Topic

Vegetation: Including Giant Sequoias

See reports of North, O'Hara, and Stephens.

In general, the document is greatly improved over the original. What is stated appears to be largely consistent with current science. Yet, there remains the problem of a general lack of citations. Thus, it is still difficult to see the connection of the statements made with specific pieces of the scientific literature.

A number of papers that were suggested as important for inclusion in the first review appear in the Literature Cited section with no citation in the text to indicate where or how that information was incorporated in the document.

One reviewer (O'Hara) noted that some significant relevant scientific literature is not discussed: especially information concerning sugar pine and California black oak.

The section discussing potential influence of climate change on vegetation and connection to management is improved and was considered largely sufficient.

Fire and Fuels

See reports of Stephens and North

In general, the document is greatly improved over the original. What is stated appears to be largely consistent with current science. Yet, there remains the problem of a general lack of citations. Thus, it is still difficult to see the connection of the statements made with specific pieces of the scientific literature.

A number of papers that were suggested as important for inclusion in the first review appear in the Literature Cited section with no citation in the text to indicate where or how that information was incorporated in the document.

The reviewers have pointed out some statements that do not seem consistent with science (e.g., long fire intervals in giant sequoia stands) and should have citations to support them.

Wildlife and Plant Habitat

See report of Thompson

This reviewer found that the document had improved greatly from the first. However, the reviewer found that significant relevant scientific information had not been considered or it was not clear, due to lack of citations, where it had been included or discussed. The specific papers are pointed out in the reviewer's report.

The reviewer found that the scientific information presented was generally reasonably interpreted and accurately presented.

The reviewer found that due to a lack of spatial modeling and no clear sense of how the species discussed will likely respond to the types of habitat alterations discussed, that the uncertainties associated with the scientific information were not fully acknowledged or documented.

The reviewer did not believe the relevant management consequences (including risk and uncertainties) had been adequately identified and documented. He stated this was largely due to a lack of spatial modeling and no sense of cumulative impacts over time depending upon how habitat alterations are implemented.

Human Uses

See report of Roberts and Wilson

This part of the document was found to have been greatly improved. The reviewers found that "… the science components are sufficiently accurate." However, similar to the other reviewers, they found that there were still some problems with a lack of citations in the text indicating where in science the information presented came from.

They found, though the science presented was largely accurate, there was not always a clear connection to why it mattered in the context of the alternatives proposed.

Use of Multi-Criterion Decision Support

See report of Reynolds

The reviewer found that MCDS was used appropriately, was used effectively, and was largely adequately documented.

The reviewer said that one improvement in documentation would be "…to make the decision framework itself, including criteria, subcriteria, weights, ratings … and consequent results …"

more transparent and specifically documented. He recommended this be included in an appendix.

Report Summary

The FEIS has been improved considerably over the first DEIS. However, the second science consistency review has not resolved all questions of whether the document is consistent with available scientific information.

Reviewers have still found many statements made in the document that, though consistent with current science, have no citations to tie them to the relevant scientific documents. Citations should be more complete and the FEIS Literature Cited section should include all citations used to develop the text, figures, and tables of the FEIS. Additionally, the Literature Cited section should not include documents that were not cited in the text of the FEIS.

Some of these problems can be quickly dispensed with by relatively straightforward editing, additions (especially citations), or revisions. However, a few of the comments are more substantive in scope (especially in the wildlife section) and will require a more arduous response.

Finally, the science consistency review process is designed to be iterative, but decisions about editing the FEIS and subsequent review are at the discretion of the responsible official. The responsible official may discuss with the SCR panel the need for further review and comment about whether a revised FEIS is consistent with available scientific information.

References for Science Consistency Review

Guldin, James M.; Cawrse, David; Graham, Russell; Hemstrom, Miles; Joyce, Linda; Kessler, Steve; McNair, Ranotta; Peterson, George; Shaw, Charles G.; Stine, Peter; Twery, Mark; Walter, Jeffrey. 2003a. The Science Consistency Review: A Tool To Evaluate the Use of Scientific Information in Land Management Decisionmaking. Publication FS-771. Washington, D.C.: U.S. Department of Agriculture, Forest Service, Washington Office. 9 p.

Guldin, James M.; Cawrse, David; Graham, Russell; Hemstrom, Miles; Joyce, Linda; Kessler, Steve; McNair, Ranotta; Peterson, George; Shaw, Charles G.; Stine, Peter; Twery, Mark; Walter, Jeffrey. 2003b. The Science Consistency Review: A Tool To Evaluate the Use of Scientific Information in Land Management Decisionmaking. Publication FS-772. Washington, D.C.: U.S. Department of Agriculture, Forest Service, Washington Office. 32 p.

Part II—Individual Reports from the Science Consistency Review Panel

Review of Sequoia National Monument Plan 2nd Round Vegetation Sections

Written Statement Prepared by Malcolm North

In general the document contains more information than the 1st draft and much of this helps explain how the alternatives were weighed. However, although the document has been revised, a core problem with the first draft is still largely present—the lack of citations. Both Chapters 3 and 4 refer to science citations being consulted but they are not directly cited. Many citations provided by the previous science review do appear in the Literature section but for the vegetation sections, with the exception of adding a few references (ex. York's studies on regeneration), the remaining references are not linked to or cited in the text. Many of those citations would support the text but in their absence the reader is left to wonder whether the content is speculative or well supported. To give one example, the sections on Giant Sequoia Regeneration in Chapters 3 and 4 are largely accurate however there are few citations and reliance on photographs and observation (the Chapter 3 section contains only 3 citations, two of which are from more than 40 years ago). Some stakeholders have suggested sequoia regenerates fine without fire or

canopy openings. Yet neither section cites Meyer and Safford (2011), a recent study conducted in groves in the southern Sierra. Their study documents the importance of high light environments and the need for fire. In Chapter 4 the content is fairly consistent with current science regarding the emphasis on resilience as an appropriate goal of forest restoration. There's extensive literature supporting this approach most of which is not cited. This absence may be problematic for some readers because, for example, its suggested pre-1875 conditions are synonymous with resilient conditions. Forests cannot be moved back to a past condition given many anthropogenic changes but there are still valuable lessons to be learned from historic conditions. Some further discussion of this use of past conditions without slavishly adhering to them would help explain the use of historical information for informing resilience objectives. The climate change section in the appendix has a nice discussion of how conditions are changing and this would help the reader understand why the past cannot be recreated. The Chapter 4 content could direct the reader toward its discussion of this topic.

Chapter 2 has information about the relative prioritization of treatments (i.e., the decision tree on p. 62—wildland fire use, than prescribed burning, than mechanical). The alternatives also list diameter limits for different trees and conditions. I could not find any documentation as to why these diameter limits were used other than reference to the Clinton proclamation. If that is the directive, then the lack of any scientific justification is understandable.

Figure 3 on page 162 (Sequoia tpa by grove) seems to be in error as I don't know of any stands that have more than 400 tpa of >40" dbh trees (Y axis should be basal area?). Figure 4 on p.163 also may be in error—should the y-axis be tpa rather than basal area? X-axis label should delete tpa? Perhaps the y-axis labels need to be swapped between the two figures?

The lack of citations persists, and the disjointed, repetitive sections can make it difficult to collate what information was used and how. Overall, however, the content is accurate with the current state of vegetation science relevant to the southern Sierra Nevada.

Literature Cited

Meyer, M.D. and H.D. Safford. 2011. Giant Sequoia Regeneration in Groves Exposed to Wildfire and Retention Harvest. Fire Ecology 7: 2-16.

Science Consistency Review Comments, Giant Sequoia National Monument FEIS

Prepared by

Kevin L. O'Hara, Department of Environmental Science, Policy and Management, University of California, Berkeley, CA

Silviculture/Vegetation Management

This review addresses silviculture and related vegetation management issues in the Giant Sequoia National Monument (GSNM) FEIS. My review comments focuses on the same questions as my GSNM DEIS review. In general, the descriptions of silviculture and vegetation management issues in the FEIS are considerably reduced from the DEIS.

1) Has applicable and available scientific information been considered?

Giant sequoia regeneration:
The FEIS includes a new section on gaps and light environments for developing seedlings/saplings of giant sequoia. The section on gaps on page 165 includes more information and the recommended citation from York et al. for the Sierra Nevada. On this issue, the FEIS is adequate.

Sugar pine regeneration and management:
Sugar pine was mentioned in my DEIS comments as a critical species in the GSNM because it is threatened by the invasive pathogen white pine blister rust. The FEIS includes less information on sugar pine restoration than the DEIS. The references recommended in my comments on the DEIS are not generally included in volume 1 of the FEIS. They are included in volume 2, but apparently only because of inclusion of the Science Consistency Review of the DEIS in Appendix F. Additionally, the important role of gaps in regenerating relatively intolerant species (other than giant sequoia) is not discussed even though the cited work by York et al. included all the primary Sierran mixed-conifer species.

Stand density management – even-aged and multiaged stands:
My comments on the DEIS suggested more detail on stand density management. As indicated in the FEIS, managing density of trees is a critical management activity to improve resilience of stands, enhance regeneration, stand health, and other important factors related to meeting directives on the GSNM. However, I find less detail in the FEIS than the DEIS. This involves less information on density management of even-aged and multiaged regimes, but also less support from the scientific literature. I see some of the recommended citations from my DEIS comments in the literature cited in Volume 1, but I cannot find them actually cited in the document. This is a critical omission in any scientific document.

Oak regeneration:
There is relatively little information on ways to enhance oak composition in the FEIS.

Carbon sequestration:
The treatment of issues related to carbon sequestration on the GSNM is improved in the FEIS. On this issue, the FEIS is adequate.

2) Is the scientific information interpreted reasonably and accurately?

In my comments on the DEIS, I noted that the tendency in these Science Consistency Review documents was probably to emphasize short-comings in the analysis rather than positive aspects of the document. I also noted that the silviculture/vegetation management plans in the DEIS were "basically sound, but difficult to evaluate because of the lack of specifics and few citations from which to gain a better understanding of the intent." This statement is also true in the FEIS: however, the silviculture/vegetation management plans are presented in the most general sense and it is not possible – and less possible than in the DEIS – to evaluate the scientific basis for plans.

3) Are the uncertainties associated with the scientific information acknowledged and documented?

Giant sequoia regeneration:
In my comments on the DEIS I noted that the uncertainty and urgency of sequoia regeneration may be over-stated. This is not addressed in great detail in the FEIS. There is a section "Stand Structure in Sequoia Groves" beginning on page 162 that presents data on abundance of trees or basal area of different sizes. It notes that "intermediate sized trees are underrepresented" (p 163). It also seems to imply that "the common inverse relationship of size and number of trees" should be followed. Yet there is no cited research to support this point and only one paper – a paper by Piirto and Rogers (1999) – is cited in this entire section.

Sugar pine regeneration and management:
I noted in my comments on the DEIS that "the maintenance of sugar pine in these Sierra Nevada ecosystems may be a more critical problem than maintenance of giant sequoia." I did not find that the great uncertainty related to the future sugar pine and blister rust on the GSNM was either acknowledged or documented.

4) Have the relevant management consequences, including risks and uncertainties, been identified and documented?

Compared to the DEIS, there is substantially less detail provided in the FEIS related to risks and uncertainties related to silviculture and vegetation management. Perhaps this was the intention, but the lack of specifics on this important aspect of management of the GSNM makes it very difficult to assess the actual stand management that will occur.

Analysis of Use of Multi-Criteria Decision Support to Support the Planning Process for the Giant Sequoia National Monument

Written Statement Prepared by
Keith M Reynolds, USDA Forest Service, PNW Research Station

Introduction

The science consistency review (SCR) being applied to the GSNM planning process is following a process that is now fairly well standardized as documented in Guldin et al. (2003). In particular, and as illustrated in Table 5 of Guldin et al. (2003, p. 16), the SCR panel is asked to evaluate four scientific criteria concerning each element being addressed in the planning process.

As a member of the GSNM SCR panel, I was asked to review the Final Environmental Impact Statement (FEIS), and associated supporting documents specifically with respect to how multi-criteria decision support (MCDS) was employed to support the Monument planning process. Assessment of the application of MCDS to the planning process does not fit neatly into the standard SCR format by which reviewers assess scientific criteria with respect to elements addressed in the plan, because the relevant questions about application of MCDS are more about a scientific process than meeting scientific criteria.

With the latter mismatch in mind, this report is provided as an addendum to the standard SCR report being prepared by the Review Administrator. Paralleling the standard questions addressing scientific criteria for assessing how the Monument Plan addresses plan elements, relevant questions about the application of MCDS to the planning process include:

- Is MCDS used appropriately?
- Is MCDS used effectively?
- Are the MCDS process and results adequately documented in appropriate planning documents?

My original comments on the draft EIS can be found in volume 2 of the FEIS, Appendix F, p. 375. Those comments include a brief overview of MCDS. The following three sections address the questions posed above, with answers updated, based on revisions in the FEIS documents.

Is MCDS Used Appropriately?

Yes.

Chapters 1 and 2 of the FEIS provide a brief but good overview of how MCDS has been implemented over the planning process. Based on this and other supporting documents provided to me previously for review of the Draft EIS, I believe that the planning team has used the MCDS methods appropriately throughout the overall planning process.

Part of the question of appropriate use relates to how well the public was informed about the concepts and principles behind application of MCDS in the Monument Planning process, especially because use of this type of technology is still very novel in public planning, and therefore probably quite unfamiliar to most interested publics initially. The document, DaylightDecisions_GSNM_Tools Descriptions.docx, is a positive indicator of the effort made by the planning team to be sure that interested publics were well informed about MCDS. Other documents produced by the Sequoia Monument Recreation Council (an independent citizen group) and provided to the planning team as recommendations on recreation elements to be considered, provide further evidence that interested publics had been given sufficient training in MCDS to have a practical grasp on its use in the planning process. Two documents, 2009_GSNM_Rating_and_DEIS_Plan_Alternatives_v6_4.pdf and 2009_GSNM_Rating_and_DEIS_Plan_Alternatives_v6.3_2009_6_19_ALL.doc, did a good job of clearly defining the rating scales to be applied to the attributes of the alternatives. The final MCDS model of the decision framework developed by the planning team remains available on the Sequoia National Forest website at (http://gsnm.ecr.gov/dhroot/dhowners/GSNM/VIBED/WP_Welcome.asp?QSST=M323A0U190 17), and thus can continue to be run interactively by interested publics upon release of the FEIS. This version includes the ratings assigned by the planning team for the attributes of all alternatives, and provides abbreviated documentation on the rationale for each rating. More comprehensive statements of rationale are presented in chapter 4 of the FEIS, but linkage of this material back to the decision framework is rather loose.

Is MCDS Used Effectively?

Yes.

The Monument Plan is so large and detailed that few if any readers can effectively trace the reasoning for selection of the preferred alternative. I suspect that this accounts for much of the suspicion and frustration that planning teams frequently encounter from the public. The Monument planning team, however, has taken the novel and rather bold step of applying a formal MCDS process to support their planning effort. Full disclosure of all model details allows interested parties to quickly zero in on specific points of disagreement, at least promoting the opportunity for a much more focused and constructive discussion.

Application of the overall MCDS process seems to have been effective at engaging the public, and guiding evolution of the decision framework structure

in terms of identifying and organizing the criteria and subcriteria that the Plan addresses, and in terms of clearly defining the rating scales of attributes of the alternatives. Results from the VIBE process as well as the subsequent evolution of the decision framework seem to be well documented as to how they have influenced the structure and presentation of issues in many places throughout chapter 4. These are further indicators of effective use of MCDS in the planning process.

Are the MCDS Process and Results Adequately Documented in Appropriate Planning Documents?

Yes.

The role of MCDS in public participation and the Monument planning process in general is explained in numerous places throughout Chapters 1, 2, and 4 of the FEIS (Volume 1). During review of the earlier DEIS, I was provided with an additional 15-20 supporting documents, which I presume are part of the public record, and these documents shed additional light on how MCDS was used to support the process. So, in terms of documenting the MCDS process, this is done well in the FEIS.

The primary outstanding issue is whether or not the decision framework itself, including criteria, subcriteria, weights, ratings on attributes of alternatives, and consequent results are adequately documented either in the FEIS itself or by alternative means. In my previous review of the DEIS, I had recommended including this information in an appendix. This was not done. Appendix J (volume 2) presents an overview of the MCDS process, but this is mostly a rehash of material presented in chapters 1, 2, and 4, and could in fact be eliminated as redundant; it really does not add anything.

As mentioned above, the interactive version of the decision framework remains available at http://gsnm.ecr.gov/dhroot/dhowners/GSNM/VIBED/WP_Welcome.asp?QSST=M323A0U1901 7. In lieu of including this material directly in the FEIS, this web access is a perfectly acceptable alternative to inclusion in the FEIS. In fact, such an online interactive presentation of the decision framework is probably preferable in some respects.

As noted in my previous review, and to the best of my knowledge, a formal MCDS process has never been an integral part of a Forest-level planning process, and there is certainly no NEPA requirement to do so. Now, in retrospect, it seems that MCDS has performed reasonably well in terms of facilitating the planning process for the Monument, and perhaps ultimately enhancing public acceptance of the Monument plan, which I admit still remains to be seen.

References

Guldin, James M., David Cawrse, Russell Graham, Miles Hemstrom, Linda Joyce, Steve Kessler, Ranotta McNair, George Peterson, Charles G. Shaw, Peter Stine, Mark Twery, and Jeffrey Walter. 2003. The Science Consistency Review: A Tool To Evaluate the Use of Scientific Information in Land Management Decisionmaking. FS-772. Washington, DC: United States Department of Agriculture, Forest Service.

Social Science Consistency Review Comments

Final Review of GSNM EIS Documents

January 11, 2012

Title: "Designing and facilitating a public participation strategy for Sequoia National Forest and Giant Sequoia National Monument for a Science Review Panel that is involved in developing a final Environmental Impact Statement and subsequent Management Plan for the Monument"

Social Science Review Team: San Francisco State University, Department of Recreation, Parks, & Tourism

Nina S. Roberts, Ph.D., Associate Professor and Lead Investigator

Jackson Wilson, Ph.D., Assistant Professor and Co-Investigator

Introduction

This report reflects the final review stage in collaboration with this important Science Consistency Review (SCR) team. The SCR group was convened by the Pacific Southwest Research Station in Davis, CA in April 2010 to evaluate the Draft Environmental Impact Statement (DEIS) for the Great Sequoia National Monument (GSNM). Our social science report was later completed and submitted on May 7, 2010.

A directive was put forth by Forest Supervisor, Kevin Elliott, to conduct a second and final review on the FEIS and Monitoring Plan. Pursuant to requested areas of focus, this current report is based on the same Human Uses segments as reviewed in 2010. Comments are provided to determine if the forest included and correctly interpreted relevant science. As before, we did not compare the alternatives nor select any "best" alternative. Hence, the comments provided in this review are, again, fair and impartial; we have not imposed our values or preferences into the judgments made herein. This report, based on the following sections, provides a response regarding whether the relevant scientific information was considered and correctly interpreted in their analysis of the alternatives for the FEIS.

Volume 1: Final EIS "Amendment/Abstract"; Summary; Chapter 1 (all); Chptr 2 (all "Alternatives" regarding anything pertaining to Human Use); Chptr 3/Affected Environment: "Human Use" and all sub-sections pp 268-351; Chptr 4/Environmental Consequences: "Effects on Human Use and all related sub-sections pp. 544-579. "Effects on Trails and Motorized Recreation, p. 618. All related Figures/ Graphs and text/narrative that accompanies each were all reviewed again as well.

Volume 2: Appendices related to Human Uses with specific emphasis on Appendix D.

Although beyond the scope of our general expertise, we took a cursory look at Cultural Resources and Transportation Systems as we did in 2010. We are not fully qualified in these areas hence is not a core component of our assessment as presented in this report.

For this FEIS, we were asked to respond to the following science consistency evaluation criteria:

1. **Is the relevant scientific information considered?**
2. **Is the scientific information reasonably interpreted and accurately presented?**
3. **Are the uncertainties associated with the scientific information acknowledged and documented?**
4. **Are the relevant management consequences identified and documented, including associated risks and uncertainties?**

2012 Second Review Summary of FEIS (Human Uses)

There have been many improvements to the document since the draft was reviewed last year. This includes our judgment that the social/human use science components are sufficiently accurate. However, our primary concern continues to relate to a single key issue: The overall purpose (environmental impact of various management decisions regarding recreation use) is unclear in that the content and goals as stated do not fully support the intent of the FEIS. There needs to be a better link between human uses and the environmental impact. That is, in order to inform decisions relating to the Alternatives, a stronger association must be made between use and impact on protecting the "objects of interest" within the Monument.

It appears as if the primary purpose of the *Human Use*/recreation section is as follows: To discuss the issue of how continued and projected levels of outdoor recreation will impact the *objects of interest* and other protected resources (e.g., "unique features"). Subsequently, there continues to be a failure to support assumptions stated about what this recreation impact really is, or will be, with sufficient citations on related research/key experts to assist with management decisions.

The number and quality of citations to relevant research literature have improved since the DEIS. However, this is an area that where further development could improve the EIS. For example, recreation (e.g., sustainable use, conservation/ education, tourism) needs to be linked better to relevant management consequences and actions and second, Recreation Demand Analysis needs to be connected to actual changes in demand and potential resource impacts. And although it has improved since our original review, some sections continue to suffer from having no in-text citations to support the claims.

We provided a lengthy list of research references in response to the 2010 DEIS review that also appear in the current FEIS (page 360 & 386 in volume 2), yet it

seems that few of these recommended resources were incorporated into the FEIS. The findings in many of those studies would help justify statements made in the EIS and better connect recreation use with issues associated with protection (e.g., lacks connection to "Issue 1"). The Recreation Demand Analysis section in Appendix D needs a bibliography.

Many factors have been incorporated such as social effects of lifestyle and demographic trends. Examples include research results regarding race/ethnicity, gender, income, age, family structure, effect of crowding and activity preferences, satisfaction, etc. yet a connection to how this affects the objects of interest and subsequent management alternatives is still lacking.

Overall responses to the four evaluation questions provided are summarized below with greater detail and specific examples that follow:

Response to Evaluation Criteria

1. Relevant Scientific Information Considered?

Statement of purpose: There is a seeming conflict between recreation use (and user conflicts) and preservation of the Monument (e.g., giant sequoia groves, ecosystems, wildlife habitat). It is still unclear what the exact impact of different levels of recreation use are, and/or would be (future), by visitor activity. This is a critical question that was previously raised in our 2010 review. On page 574 of the Appendices (vol. 2) it states that the effects of such activities are analyzed in Alternative A; however, pages 73-74 fail to adequately do so in the actual FEIS (vol. 1). While the literature review has improved, points made do not clearly defend how GSNM staff plan to address this.

Examples: Chapter 1, p.40: Issue 1 states there is "competition between different types of public use and a greater need to protect the objects of interest." However, there is only competition if there actually is an impact on the objects of interest. Some user groups may have a much lighter negative impact or a positive impact on the objects of interest and other resources. The different impacts by user group are not clearly described and therefore fail to adequately inform policy. For example, which has less impact per user, dispersed camping along roads or concentrated camping? There is some speculation throughout (including Chapter 4, p. 565), yet there is little to no research cited.

a. Recreation, Scenery, and Socioeconomics – Chapter 3, p.268: Need more information either about these internal USFS studies or citations to outside publications. Currently, the only external source is NAARRP, 2009.

1. User Groups (starting bottom of p. 273) – A list of 11 user groups are indicated in this section. Are all of these from USDA Forest Service 2008 citation? (noted on p. 276). If so, this is potentially unfavorable that such detailed typologies would be obtained through a single-source. This detail would indisputably be enhanced by including additional studies.
2. The document should further discuss how recreation helps reinforce the environmental protection goals. On page 281, for example, it is stated that volunteers are a significant source of labor for some projects. There is a discussion of stewardship in the document, but it could be more clearly connected, and more empirically developed, regarding how recreation helps foster this sense of stewardship.
3. Additional research that links recreational activity and impacts on the environment needs to be cited. Page 306 states that "Dispersed recreation could potentially degrade natural resources that contribute to scenic quality as demand for these activities rises in the future." However, there are no in-text citations to research supporting this claim. This leads to the conclusion that certain recreational impacts are assumed without any scientific evidence.

b. Appendix D (vol. 2) – Recreation Demand Analysis: Does not have a list of "Literature Cited" like the other Appendices. It mentions such "list" throughout this section and in the vol. 1 FEIS binder, but a list does not appear (potential oversight?).

1. What is included has improved yet essential sources (provided in 2010 as examples) are not included in general. For example, GSNM definitely needs to be aware of both recreation user trends as well as demographic shifts across race/ethnicity, for example.

2. The few references cited are not based on the most relevant research to help make a better connection. For example, neither Chavez, Floyd, Sasidharan, nor Shinew are cited regarding Latino/Hispanic visitors and/or user patterns of ethnic minorities, in general.
3. The recent Chavez study was cited (p. 281 and 289) yet speaks of "research being conducted in 2011" which was last year. What information and results can be provided from her work by now for this FEIS?
4. There is an overuse of a few limiting citations (e.g., Cordell, Sheffield, CA State Parks) throughout with some, but minimal, reference to other excellent sources that could have substantiated various claims.
5. CA State Parks surveys provide excellent user information, recreation participation preferences, satisfaction measures, travel patterns, etc. How is all this connected to resource protection based on the goals of the FEIS and the need to protect the objects of interest?
6. NVUM research (p. 297) is perhaps some of the most significant data provided that has direct application to the issues and concerns of interest. This includes effects on the natural resources more than other studies provided and summarized.
7. The Crano (n.d.) L.A. phone survey (p. 301-302) also has some clear use and projection information that has great applicability to GSNM challenges and possible connection to management alternatives. Not made explicitly in a way that could assist with this FEIS and subsequent management actions. The detail and results are good and very interesting yet how could all that data be connected to the Alternatives proposed?

2. Reasonable Interpretation and Accurate Representation?

Many statements in the FEIS are definitely interpreted in a way that is unquestionably 'reasonable' and are accurately presented. Many improvements have been made in the FEIS since we first reviewed the DEIS. For example, inclusion of various theoretical contexts was missing in the DEIS to support analyses. The FEIS more clearly presents this information. Second, the FEIS has significantly improved the interpretation and presentation of scientific information about Recreation Opportunities. Third, as previously mentioned, the information in the Scenery Resources Affected Environment is accurately presented and reasonable interpreted. The social science in the FEIS is generally more validated by various frameworks and is presented in a stronger way connecting data to management concerns yet less so connected to actual Alternatives. However, a few key issues remain for further consideration:

a. Lack of visitor/user data. The information has improved from the DEIS; however, it is important to continue to collect data about users to understand who the users are. This is acknowledged by the Science Advisory Board (p. 544) as "lacking". One major area where it is important to understand users, for example, is in the domain of race/culture, especially given the multiple references to "changing demographics and growing Hispanic population".

Note: Chapter three (FEIS, vol. 1) discussed the race of users. This chapter discusses the issue of *culture* while failing to explicitly mention White/Euro-American culture, unless that is what is meant by "ranchers" or "backpackers"? (e.g., adventure-seekers or traditional users as noted on p. 277). This fails to recognize that **all** people have culture. It is important to understand that public land agencies need to manage for all cultures; the dominant middle-class, well-educated, and able-bodied Euro-American culture has traditionally been the most prominent in previous management plans. A failure to provide explicit mention of the various dominant White cultures, fails to recognize this history of preference and privilege. Language needs to be changed to specifically indicate that certain sections are discussing cultures other than the dominant White/Euro-American culture (e.g., with 'underrepresented populations' sub-section) or it perpetuates only minority groups have "culture."

b. "Connection to Place" and "Recreation Niche" (p. 272-273): These are two valuable sections in Chapter 3. Review comments in the DEIS indicated additional information would help

authenticate these claims; for this FEIS, sufficient detail is now included to support concepts and assumptions. Who evaluated the "Niche" detail and where the "criteria" came from was not clear during the prior review and is greatly improved in this FEIS.

c. Facilities/Affected Environment - Chapter 3, p. 279: States recreation facilities need to be updated due to modern use patterns and ADA accessibility. However, the limits to this development appear to be based on funding rather than conservation constraints. Although the document suggests that the constraints to these facility changes tend to be financial rather than environmental, it is possible that requirements for ADA accessibility and facilities can come into direct conflict with environmental protection (e.g., widening a trail for wheelchair access can destroy habitat).

d. Ongoing Activities/Affected Environment – Chapter 3, p. 306: There is a statement that says: "Dispersed recreation could potentially degrade natural resources that contribute to scenic quality as demand for these activities rises in the future." Important assertion yet there is no research cited in-text establishing this connection. Throughout this section, there are valuable specifications noted yet this includes many assumed impacts (e.g., landscapes being susceptible to large scale disturbances and degradation of scenery resources) yet there is no cited data to back up claims thereby possibly misrepresenting what may be going on.

e. Indirect Effects/Environmental Consequences - Chapter 4

1. At the bottom of page 547, in reference to Alternative A, it notes that effects *resulting from recreation uses* will continue to occur such as "soil compaction and erosion; threats to plants, wildlife species, riparian areas, and water quality; littering; sanitation issues; the potential for wildfire starts from unattended/abandoned campfires and vehicle exhaust systems; damage to cultural resources; and the spread of undesirable plants." It further states that such impacts would be exacerbated by high levels of use and low levels of maintenance. There is a paucity of citations to research showing any evidence of these connections to recreational use and impacts.
2. One of the few citations is a statement on page 583 including reference to a 1989 Army Corps of Engineers study linking vandalism and crowding. More such citations of recreational impacts on the environment are needed to strengthen the plausibility of the arguments and provide more data for managerial decisions.

f. Appendix D – The Recreation Demand Analysis, as noted in response to Criteria #1 (see p. 2 of this report), has a variety of societal and demographic trends and user patterns noted. Details are provided in relation to some historical aspects, a few current recreation preferences, and a terse selection of recreation projections. The fact public lands are seeing an increasing number of outdoor recreation enthusiasts from diverse cultural backgrounds are appropriately cited. However, there is a lack of connection to explicitly why much of that matters in relation to any of the proposed Alternatives.

3. Acknowledgment and Documentation of Uncertainties Associated with the Science?

This has considerably improved over the DEIS reviewed in 2010. Sample affirming segments:

a. Chapter 3/Affected Environment (p. 282) is explicit in conveying the following:

1. "Despite what the science indicates, predicting the future is uncertain"
2. The Recreation Demand Analysis is not a "needs assessment" comparing demand with existing supply of recreation opportunities and use patterns. Authors note a "gap analysis" was not performed with explanation that this would provide "simplistic results not reflective of the complexities inherent in predicting human behavior". It is noted that this particular *Demand Analysis* therefore explores participation trends and social/lifestyle factors affecting participation.

   Note 1: This exact statement is also repeated in the Appendix D/Recreation Demand Analysis, vol. 2, p. 287.

   Note 2: As previously mentioned there is a variety of social science research that exists in outdoor recreation and resource management that could help understand future recreation use

and social-psychology of predicted behaviors in order to help inform management alternatives.

b. Chapter 4/Environmental Consequences (p. 376): There is recognition of how and where cumulative effects of "past actions" can and cannot be included in the current analyses. For example, explicit statements discuss what is possible (i.e., looking at existing conditions), versus what is stated as 'less accurate' or 'impractical' such as focusing on individual actions over several decades that have contributed to current conditions.

c. Science Considered (p. 545): As rightfully noted, "no one information source provides recreation participation information for the entire Monument."

4. Relevant management consequences identified/ documented (inclusive of associated risks and uncertainties)?

Overall, effects on human use is greatly improved from the prior DEIS review. For example, the Multi-Criteria Decision Support (MCDS) Framework is a valuable tool and effectively informs management consequences. The following details, however, are noted for this current review of the FEIS for the Monument:

a. In order to guide critical decisions, managers must be able to understand the impacts on the objects of interests inherent in the different recreation management strategies. The organization of the document needs to be more closely tied to this central purpose (i.e., what is the conflict between providing recreational opportunity and the impact on the natural environment). Hence, the FEIS needs to more clearly establish a significant link between recreational use, environmental impact, and ultimately management decisions and consequences of those decisions.

b. As noted in evaluation criteria #1, the FEIS fails to organize the document around the statement of purpose. The implicit purpose is that the section on human use/recreation in the FEIS should focus on the conflict between providing recreation opportunity and preserving the natural environment/Monument ecosystems and unique features. This conflict is explicitly stated in Chapter 1 (p. 40): "There is a competition between different types of public use and a greater need to protect the objects of interest." However, there is a failure to consistently make this the guiding principle around the discussion of human uses/ outdoor recreation in the FEIS overall. Additional information is necessary to understand how different management decisions about particular recreation uses and user groups will affect the environment/natural resources.

c. One of the conflicts between recreational users and the environment that is alluded to is the trade-off between the environment and human users' safety.

   1. Chapter 2, p. 60 states that trees will be removed if they are a public safety hazard or 'attractive nuisance' (e.g., liability if visitors are tempted to climb on them or fall off logs). This is one area where the need to keep recreationalists safe could impact the environment and the objects of interest. Important to consider what Alternative(s) would enable a balance.

   2. Public access is one issue that could, therefore, impact environmental protection. Page 61 states that trees could require felling when they threaten public access.

d. The major recreational differences between the Management Alternatives (see Chapter 2, page 115) appear to be *transportation issues*. There are some minimal differences in motorized transportation access (see p. 120 Table 55, Strategy 9, 10, 11, 14, & 16 and Table 56, Strategy 3, 4, & 5). All this suggests that the primary conflict of concern between recreation use and preservation of the objects of interest is transportation. Similarly, Chapter 3, p. 364 notes "driving for pleasure is the single largest recreation use of Forest Service-managed lands." If indeed transportation is considered a core component of pursuing major recreational activities that pose an impact on the environment, then it seems that the recreation section should focus on the relation to transportation than other recreational activities (e.g., dispersed camping).

e. The *management challenges* section as noted in relation to Hume Lake (Chapter 3, p. 293) starts to discuss some of the issues that could be essential components of Human Uses segments in the

FEIS. For instance, the catchphrase "unmanaged or concentrated recreation activity that could lower scenic integrity in areas that do not provide facilities" is used to suggest recreation-based impacts on the environment. There are also some references to litter, safety, and the potential for wildfires. Whether or not this latter context refers to human induced wildfires is unclear. Furthermore, this phrase seems contradictory to need to protect objects of interest (also p. 293): "Visitors have higher expectations for scenery, and scenic integrity needs to be improved in overstocked forests, especially in areas that have missed burn cycles or in plantations." This statement seems to be used to suggest how visitors/forest users may pressure management to take action that benefits their recreational experience rather than protection of the natural and cultural resources.

f. Mitigating user conflicts to increase enjoyment for everyone is important, generally, yet should take precedent when there is an impact on the objects of interest. Some user groups may have a much lighter negative impact or a positive impact on the objects of interest and other natural/cultural resources. The different impact by user group is not clearly described and therefore fails to adequately inform policy. For example, which has less impact per user, dispersed camping along roads or concentrated camping? There is some speculation throughout (including Chapter 4, p. 565), but there is little to no research cited.

g. Recreation Demand Analysis / Summary in the FEIS/vol. 1 versus Appendix D/vol. 2: As noted before in the previous review, a great deal of this material is redundant and repeated verbatim. In vol. 1/FEIS, for example, starting on p. 281 a broad spectrum of that content is noted as a "summary" yet is verbatim from what is in Appendix D. This is not very effective when the Appendix is positioned throughout the FEIS as a true "analysis" designed to help inform decisions. Instead it appears as if a series of 11 categories are presented as considerations/suggestions to meet the needs of the 2000 Proclamation. The details in either instance (analysis and/or summary) should have a stronger connection to the Management Alternatives as reflected in the current FEIS.

Review of Giant Sequoia National Monument Final Environmental Impact Statement from a Wildland Fire, Vegetation, and Climate Change Perspective

Scott L. Stephens, Department of Environmental Science, Policy and Management, University of California, Berkeley, CA

After reviewing the document I have decided to focus my attention to the following sections: 1) Giant sequoia ecology (Vol. 1, pages 158-168), 2) Effects on vegetation, including giant sequoia (Vol. 1, pages 387-399), 3) Fire and fuels (Vol. 1, pages 169-176), 4) Effects on fire and fuels (Vol. 1, pages 401-418), and 5) Trends in climate change (Vol. 2, pages 267-284). These are the same sections that I reviewed in the Draft EIS.

My comments follow. In many cases I will address comments to specific paragraphs in the Final Environmental Impact Statement.

1) Giant sequoia ecology

I believe this section reads well but includes very few citations to the literature. I believe including more citations is very important and believe many people from the public and from environmental groups will be looking for more citations.

Pg 159, 2nd paragraph on left column. This is a nice summary of the main threats to giant sequoia health but needs a citation or two.

3rd paragraph, text reads 'Clearing land, burning, or even growing too many trees above a grove may have a similar effect on water available to the giant sequoia.' Needs a citation.

Pg 160, 2nd paragraph in left column. Text reads 'Vegetation that has higher amounts of heterogeneity in various major characteristics tend to me resilient and able to adapt to change and to withstand and respond to stresses caused by such events as insect attacks, extended droughts, diseases, and wildfire.' This is a big statement and needs several citations. I actually agree with it but such a statement needs to be grounded in the literature.

Pgs 161-162. Last sentence that begins on Pg 161 and ends in the first paragraph of Pg 162. I agree that

the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.

Pg 162, 2nd paragraph on right column. Text reads 'These two species, which were not as common when humans burned the groves more frequently…'

It is not possible to separate the influence of past Native American ignitions from those of lightning. This sentence points to the influences of past human ignitions, I would add in lightning as well. Both were important in this ecosystem.

Right column, last paragraph. Here it is written that the primary disturbance regime pre 1875 was a high frequency, low intensity fire regime. I would write low-moderate intensity. Not all fires were low intensity, some killed groups of trees and others killed vegetation over larger areas. Today I think we recognize that these fire regimes were more complex than only low intensity in mixed conifer forests.

Next sentence reads 'This fire regime typically created a mosaic of vegetation and gaps, with the gaps ranging in size from < ¼ acre to two acres in size.' This sentence needs a citation. It is a very concise statement and I don't know if the literature will back it up.

The next sentence on the production of larger gaps of possibly several hundred acres in size also needs a citation.

Pg 163, top paragraph in right column. I am very familiar with Piirto and Rogers 1999. It is a solid publication with good information. However it seems that this section of the EIS uses it too much and does not connect to the broader giant sequoia literature.

Pg 164, first sentence on page. My comment on giant sequoia regeneration applies here as well. The comment is I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.

Figure 5. Where does your desired % basal area and desired % of trees come from? Needs to be documented.

Pg 164, right paragraph. Sentence reads 'With a lack of adequately disturbed soils and canopies, giant sequoia only averages about 1 seedling per acre.' My comment above on sequoia regeneration applies here as well. Where did this data come from? (1seedling/acre)? Sentence is same paragraph mentions the desirability of 44 giant sequoia seedlings per acre? Where does this number come from? 10% of total??

Pg 165-166. Last sentence of page 165 to first sentence of Pg 166. I agree that a ballpark width of at least twice the edge tree height provides a basis for opening sizes but this is not needed for successful giant sequoia regeneration. Smaller gaps have worked well too. Rob York's recent publications have pointed this out from Whitiker's Forest.

Pg 166-167. Last sentence that begins on Pg 166 and ends on Pg 167. You list several aspects of trees that can offer resistance to fire effects. I would add a citation or two to this line.

Pg 167 3rd paragraph in right column. Sentence reads 'Fire return intervals in giant sequoia ecosystems may have ranged from a few years to several hundred depending on the location and size.' I commented on this sentence in the Draft EIS and wrote I have not seen information on return intervals of several hundred years in giant sequoia groves expect possibly the last 100 years because of fire exclusion. Tom Swetnam's work is the best in this area. He has one recent paper, it is

> Swetnam, T.W., C. Baisan, A. Caprio, P. Brown, R. Touchan, R.S. Anderson, and D. Hallett. 2009. Multi-millennial fire history of the Giant Forest, Sequoia National park, California, USA. Fire Ecology 5: 120-150.

The text on fire return intervals of up to 100 years needs to be removed or supported with a citation.

Pg 167, last sentence in left hand column. Should add a citation to support this sentence.

First paragraph on right hand column, text on why giant sequoia regeneration has been low in the last several decades. My previous comment applies here too. I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.

2nd paragraph in right hand column. Text included again on the effects of human ignitions. My previous comment applies. It is not possible to separate the influence of past Native American ignitions from those of lightning. This sentence points to the influences of past human ignitions, I would add in lightning as well. Both were important in this ecosystem.

Last sentence of this paragraph. My previous comment on sequoia regeneration applies here too, cant expect it if you only create mineral soil and openings.

Pg 168. 2nd paragraph in left column. Where are human caused fires more frequent than lighting caused in giant sequoia groves? In a recreation area? This line is not clear.

Next sentence. Yes I agree that newly established giant sequoia seedlings would need some time to develop resistance to fire. However fires could still burn quite frequently in the groves but discontinuous surface fuels would allow fire to miss many newly established areas. Areas underneath the drip line of existing trees would burn regularly from fine fuel production.

However areas in gaps could be missed by some fires until local fuels accumulated enough to carry fire.

3rd paragraph in same column. Sentence that says the greatest concern to giant sequoia ecosystems is not low regeneration but heavy build up of ladder and surface fuels. I would probably agree with this for the short term but a citation should be added.

Last paragraph in left column. Sentence reads 'Young giant sequoia seedlings, however, can tolerate and may even needs some shade until their root systems are established.' The line needs a citation.

2) Effects on vegetation, including giant sequoia

Pg 389. Hazard section. Should add topography to this section.

Pg 392, 3rd paragraph in left column. Sentence reads 'No "downsides" were signaled out for mechanical treatments since these treatments generally accomplished surface and ladder fuels reductions.' There are challenges to mechanical only treatments too. First many of these systems leave activity fuels in place after treatments which increased fire hazards. Mechanical only treatments are also not true surrogates of fire since there is no burning included. Processes such as regeneration and nutrient cycling

would be quite different than what happened during fire treatments. A citation for this is

> Schwilk, D.W., J.E. Keeley, E.E. Knapp, J. McIver, J.D. Bailey, C.J.Fettig, C.E. Fiedler, R.J. Harrod, J.J. Moghaddas, K.W. Outcalt, C.N.Skinner, S.L. Stephens, T.A. Waldrop, D.A. Yaussy, and A. Youngblood. 2009. The national Fire and Fire Surrogate study: effects of fuel reduction methods on forest vegetation structure and fuels. Ecological Applications 19: 285-304.

Pg 394, first paragraph on left column. Not sure what 'limited fire spread lightning strikes' are?

Pg 395, first paragraph in left column. Sentence reads 'Activities that create openings for regeneration, reductions in ground and ladder fuels, …..' Should change ground, surface, and ladder fuels..

Last paragraph in the left column of Pg 395. My previous comment applies here. I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.

2nd paragraph in right column. Again a seed source will also be needed for successful sequoia regeneration. Demetry and Duriscoe 1996 had many fires of moderate intensity and this opened the cones of adjacent giant sequoia trees. I saw this in the groves during many visits.

Pg 396, 1st paragraph on right column. Sentence reads 'Where fire is the only disturbance in the last 20 years, patches of sequoia regeneration area rare in most groves.' There are so few groves in the Monument that have been burned over this time, most of the groves burned are in the National Parks. The parks have been generally successful in regenerating sequoia in the groves with burning alone. Where is the citation that supports this statement? I think it will probably need to be removed.

Pg 397, top paragraph on left column, last sentence. Yes planting giant sequoia seedlings is one way to regenerate groves but so is the use of appropriate prescribed fire. As I wrote above, the National Parks have been successful in regenerating sequoia with a burning only program. The key is to have some moderate intensity fire in this program, not all low intensity. There is no doubt that such a program would also promote sequoia regeneration.

2nd paragraph in right column. Sentence states 'Research has been done over the past several years to help determine the effects of gap size for the regeneration of giant sequoia and other species.' Need to add the citations to this sentence.

Resiliency paragraph in right column. Sentence reads 'These alternatives rely mainly on fire and would have a reduced chance to positively affect resiliency.' This statement would have to be supported by citations. There is no doubt that appropriate fire only treatments used multiple times will increase resiliency of these forest ecosystems.

3) Fire and fuels

I believe this section has been improved during revision.

Pg 175, last sentence of left column to first sentence of right column. The staff of the Sequoia Forest and Monument should be congratulated for the management of the Sheep and Lion fires. I think this type of fire management will be critically important part of any land management strategy adopted in the Sierra Nevada.

4) Effects on fire and fuels

This section has been improved during revision.

Pg 403, first paragraph in left column, last sentence reads 'In areas with heavy fuel accumulations, mechanical means such as hand cutting or

self-propelled maybe necessary before fire is reintroduced.' Since the National Parks have been burning for decades and don't use mechanical methods (I realize that they did use some mechanical methods in giant sequoia groves early in their program) I think this sentence may be better with a small revision: In areas with heavy fuel accumulations, mechanical means such as hand cutting or self-propelled could be used before fire is reintroduced.

5) Trends in climate change

This section has been significantly expanded and improved during revision.

Page 275, first sentence under Forest Structure reads 'Fire suppression has been practiced as a federal policy since 1935.' I suggest adding a citation here. Mary authors have pointed to an earlier date regarding the beginning of fire suppression in federal lands in the western US.

Science Consistency Review Comments, Giant Sequoia National Monument FEIS

Craig M. Thompson, Wildlife Research Ecologist, USDA Forest Service, Pacific Southwest Research Station
18 January 2012

I was asked to replace Dr. Bill Zielinski on the GSNM Final Environmental Impact Statement (FEIS) Science Consistency Review Panel. Therefore my review is separated into three sections. First, I tried to evaluate whether Dr. Zielinski's comments on the Draft EIS (DEIS) were incorporated into the FEIS. Second, I provided an independent review of the FEIS with respect to the application of science to evaluating the potential impacts of the GSNM Management Plan on the conservation of fishers, marten, and other old-growth/late-seral dependant wildlife and their habitat. Where our comments overlapped, I expanded upon Dr. Zielinski's comments. Third, I concluded with the four questions that reviewers were asked to address. I have focused my review on three areas: Chapter 3 pages 187-195, Chapter 4 pages 433-495 emphasizing fishers and marten, and Appendix M.

Summary of DEIS comments by Dr. Zielinski

Scientific Study and Adaptive Management: Dr. Zielinski recommended that, given the focus on integrating science into GSNM management, more emphasis be placed on developing a rigorous monitoring plan. He expressed concern that "so little attention is dedicated to the scientific aspects of developing a monument-specific monitoring plan" and recommended that "There should be discussions about thresholds that will trigger changes, consideration of how monitoring data will feedback into decision making, and what statistical designs will be used." The monitoring details he requested were not incorporated into the FEIS, and while the Lake Tahoe Basin monitoring plan which he recommended be used as a template was added to the Literature Cited section, I can find no reference to it in the text. A number of monitoring objectives were added to the document with the inclusion of additional tables in Ch. 2.

Tools for Evaluating the Effects of Projects on Fisher Habitat: Dr. Zielinski noted that the DEIS anticipated using models to "evaluate and forecast the effects of projects on fisher habitat", and highlighted the potential misuse of models as well as the lack of detail presented. He recommended several more appropriate models for examining changes in fisher habitat at multiple scales. Reference to these models has been added to the text, though no details on how the models will be applied were included. Additional models for evaluating the impacts of project-level management on American marten and CA spotted owls are also available. One excellent example is Cushman and McGarigal (2007). The authors incorporate both spatial and temporal variability in an assessment of the changes in landscape pattern over time that result from four timber harvest scenarios. Lee and Irwin (2005) conducted a simpler, though similar analysis of the effect of overstory reduction on spotted owl occupancy and reproduction.

Models are only as good as the data that is used to generate them. Nowhere in the FEIS or the fisher BE is a description of what data would be used to estimate project-level impacts on fisher habitat. In my experience working with Sequoia National Forest and GSNM staff, the available vegetation data

is insufficient and too coarse-grained for adequate pre- and post-treatment comparisons. In particular, questions relating to habitat fragmentation require fine-scale vegetation maps. Therefore one of the first priorities for the Monument should be the development of an accurate, fine-scale baseline vegetation dataset, including understory and structural diversity, with which habitat change for any species can be carefully evaluated.

Size of Trees that Can be Removed: Dr. Zielinski expressed concern regarding Alternative F and the lack of a dbh limit. He listed numerous ecological, economic, and social reasons why the removal of trees over 20" dbh was inappropriate, and asked for more scientific justification for why trees > 20" dbh should be removed in the name of ecological restoration. Given the clear guidance in the Clinton proclamation, "Removal of trees, except for personal use fuel wood, from within the monument may take place only for ecological restoration and maintenance or public safety" (Vol. 1, Ch. 2, p. 66), the scientific consensus that the removal of trees >20" dbh does not affect fire severity (North et al. 2009), and the historical clumping of large trees in the Sierras, it is difficult to envision why the removal of trees > 20" dbh would be needed. The justification for this choice, the need for enhanced ecological restoration capacity, is not adequately explained.

Den Site Buffers: In his comments, Dr. Zielinski highlighted a disconnect between the use of a 'den buffer strategy' to protect reproductive habitat and the lack of guidance regarding identifying den site locations. He stressed that without a companion monitoring program tasked with identifying den sites, a den buffer strategy is not only ineffective but misleading. I cannot find any acknowledgement of this concern in the FEIS.

Missing References to Important Literature: Much of the additional research data and literature recommended by Dr. Zielinski has been incorporated into the FEIS, particularly the results from forest carnivore work conducted on the GSNM, literature on the impact of habitat fragmentation on American marten, and the conclusions from a Joint Fire Science-funded project on the impact of fuel reduction on fisher habitat.

However, several research syntheses have been recently published and their conclusions should be addressed with respect to the consequences of the different alternatives. Most notably, in 2010 and 2011 the USFWS released several volumes of the Interagency Fisher Conservation Assessment for the western states (Lofroth et al. 2010, Lofroth et al. 2011, Naney et al. 2012, Finley et al. in review). Among other recommendations, the authors highlight the need to assess impacts at multiple scales and the importance of accounting for the temporal scale of the ecological processes that create old growth/late seral habitat. They identify threats by geographic region and discuss how these threats may best be addressed. It is important to note that while severe wildfire is considered a high threat in the southern Sierra region, it is balanced by the risk of excessive overstory and understory reduction through vegetation management (Naney et al. 2012, p. 37). And habitat fragmentation through misguided vegetation management is considered a greater threat than the mortality or fragmentation associated with roads (Naney et al. 2012, p. 31). These documents were only cited once in the FEIS, to support the idea that severe wildland fire is a threat to fisher populations (Vol. 1, Ch. 4, p. 474). Given the breadth of the issues addressed, the documentation across disciplines and species, and the relevancy to GSNM management, the conclusions presented in these volumes need to be more carefully considered and fully incorporated into the FEIS.

Other recent, important references include a regional meta-analysis of fisher habitat requirements which synthesized data from across the western United States (Buskirk et al. 2010), a critical genetics manuscript bringing into question many of the previous assumptions regarding fisher in the Southern Sierras (Knaus et al. 2011), and a research paper from British Columbia linking thresholds in vegetation change to the probability of occupancy by fishers (Weir and Corbould 2010). The conclusions of these documents are highly relevant to GSNM management and should be incorporated.

Learning from Sequoia-Kings Canyon National Park: Dr. Zielinski recommended that, if a management alternative (Alternative C) was going to be based on emulating the management of Sequoia Kings Canyon National Park (SEKI), then a critical

examination of the success or failure of that model should be incorporated. Given that a model for that type of management is available nearby, it would be a relatively simple task to evaluate to what degree SEKI has achieved the stated goals for GSNM. I can find no indication in the FEIS that such an analysis was conducted, or that published literature regarding the ecological integrity of SEKI was considered.

Lack of Citations, in General: Throughout the document, references to published literature continue to be used sporadically. Dr. Zielinski identified a number of statements where conclusions were drawn without appropriate references. In many cases, these sections have been rewritten and supporting documents cited. However there are still many unsubstantiated statements, leaving the reader unable to independently verify the authors' conclusions. For example, the section on Burned Forest Habitat (Vol. 1, Ch. 3, p 188) contains no citations despite the fact that that there are numerous statements about the impacts of fire on wildlife habitat. In the fisher BE, the author states "Research literature suggests that the loss and fragmentation of suitable habitat by roads may have played a role in the reduction of Pacific fisher from the central Sierra Nevada and its failure to colonize there" (Vol. 2, p. 667) yet fails to cite the literature. Also in the fisher BE (Vol. 2, p. 668) – "Following wildfire, prey species abundance and community composition will shift. An initial increase in abundance of disturbance-adapted prey species may occur at the expense of species diversity with a gradual reversal of this trend as succession occurs. Although prey abundance may increase, prey availability will not necessarily follow due to fisher reluctance to enter open areas." Any statement describing an effect or predicting a response requires an appropriate citation.

Habitat Calculations Consider only Amount, not Configuration: In his comments, Dr. Zielinski highlighted the need to consider not only the amount of habitat impacted by management actions, but also the configuration and connectivity. He cited a number of studies, particularly with respect to the American marten, which describe martens' sensitivity to landscape pattern. This concept has been well incorporated into the BE for marten and fisher, as well as several other species. However it does not appear to have been considered in the main FEIS document defining affected environment and environmental consequences (Vol. 1, Ch. 3 & 4).

As Dr. Zielinski noted, there is a rapidly growing acknowledgement among conservation-oriented scientists that habitat configuration is potentially as important as composition. The US Fish and Wildlife Service is currently considering expanding their criteria for fisher habitat conservation plans on state and private land to include spatial analyses (L. Finley & S. Yaeger, USFWS, personal comm). The fisher conservation assessment states "To be successful, conservation measures must recognize … how landscape patterns, including those from past and current timber management, may affect the size of areas needed to support not only individuals but populations." (Lofroth et al. 2010, vol. 1, p. 121). As mentioned above, the authors of the conservation assessment describe habitat fragmentation, whether a result of wildfire, fire suppression, vegetation management, or road construction, as a threat to the Southern Sierra fisher population (Naney et al. 2012, p. 22). Yet it is notable that despite the fact that maintaining a "Diverse Array of Wildlife and Their Habitats" is highlighted as a primary issue in the FEIS Purpose and Need (Vol. 1, Ch. 1, p. 41), the variables used to address this issue do not include a single configuration-based metric. Several research studies identifying suitable metrics, such as edge density, contagion, or core area, were included in the marten and fisher BE (Appendix M), however these concepts have not been incorporated into the main FEIS document.

Cumulative Effects Analysis: In his comments, Dr. Zielinski highlighted the failure of the DEIS to outline a rigorous approach to cumulative effects analyses (CEA). He described the attempt to account for all past actions by characterizing "existing conditions" as a cop-out and suffering from "shifting baseline syndrome" (Pauly 1995), ultimately leading to gradual declines in environmental conditions. While the details of a CEA may not be necessary in a programmatic document such as the GSNM FEIS, a programmatic document such as this will set the tone and the bar for how such analyses are conducted in the future.

The purpose and need for the FEIS states clearly, the document must "create a management plan that

will protect and preserve the unique features of the Monument" (Vol. 1, Ch. 1, p.11). Given the scale of habitat use by marten and fisher, as well as many other species considered in Appendices M and N, a project-by-project approach to impact assessment is inappropriate. And given the temporal scale of the ecological processes that create old growth/late seral habitat and the critical structures within that habitat matrix that are used by marten and fishers, as well as other species (Lofroth et al. 2010, Weir et al. 2012, Raley et al. 2012), a more comprehensive approach to CEA is needed. Female fishers are obligate cavity users for reproductive dens (Lofroth et al. 2010), and Davis (2009) calculated the average age of den trees as 372 years for Douglas fir, 177 years for lodgepole pine, and 96 years for trembling aspen. A 20 year CEA timeframe is insufficient for protecting habitat elements created at this rate.

While it may not be appropriate, or even possible, to describe all the management actions and disturbances that have occurred over the past 50-100 years, it is possible and highly relevant to describe how the vegetation and habitat has changed over that timeframe. Species distribution changes in relation to habitat change, however there is often a lag time before the changes in species abundance or occupancy are observed (With 2007). These legacy effects or "ghosts of landscapes past" are particularly relevant to landscapes undergoing large-scale shifts such as those seen following decades of fire suppression efforts. Examining whether current species distributions best match current or historical habitat conditions can give clues to imminent conservation problems (Lindborg and Eriksson 2004). Furthermore, adopting a historical perspective can provide better insight as to where and how restoration-based management should be applied.

Additional concerns

Interactions between WUI, TFETA, and Habitat Conservation: The interactions and overlap between different management emphasis areas is not fully explained. The statement on page 435 (Vol. 1, Ch. 4) that "No more than 10 percent of the late seral habitat is in wildland urban intermix (WUI) defense zones. Therefore, the effects of fuel reduction treatments on this habitat type are expected to be minimal" is misleading because it fails to incorporate the acreage in WUI Threat and TFETA zones. With respect to fisher, the document states that no more than 14% of suitable habitat is within defense zones under any alternative. Yet under the determination (Vol. 1, Ch. 4, p. 474), the document fails to explicitly state that under Alternatives A, B, E and F, an additional 40% of suitable habitat is included in WUI threat zones, and under Alternatives B and F an additional 16% of suitable habitat is included in the TFETA zone. So cumulatively, under the preferred Alternative B, 70% of the suitable fisher habitat on the Monument is in zones where fire and fuel management is given priority over habitat conservation. This effectively nullifies many of the implied conservation strategies, such as the use of den buffers.

Presumably, all alternatives considered reflect reasonable, acceptable approaches to GSNM management. Therefore the reason for including large amounts of acreage in the WUI defense and threat zones is unclear. If a 200 or 300 foot WUI defense zone is acceptable (as outlined in Alternatives C and D), why extend that to the ¼ mile defense and 1 ½ mile threat zones described in the remaining alternatives? Instead, why not outline a scientifically-based strategy designed to promote resiliency and heterogeneity, such as that promoted by North et al. (2009), and allow that to guide management actions over the bulk of the GSNM, limiting more intensive treatments to where the threat to health and human safety requires it? This would seem to be a more appropriate approach given the statement: "The best available science needs to be used to protect wildlife and the wide array of habitats in the Monument" (Vol. 1, Ch. 1, p. 41). Otherwise, a table clearly outlining how much acreage is exposed to what kind treatment under each scenario is needed in each of the biological evaluations. And if the WUI limits presented in Alternatives C and D are not acceptable, the reasons need to be clearly stated and justified.

Understory Management: Much attention is focused on diameter limits and the need to protect and promote large trees, yet understory management is potentially a far greater source of conflict between fuel reduction and fisher/marten habitat conservation. Coarse woody debris, shrubs, and suppressed trees are viewed as either undesirable surface and ladder fuels or critical elements of habitat diversity depending on your perspective. North et al. (2009) recognizes that treating surface and ladder fuels is the most effective

way to reduce the risk of uncharacteristically severe wildland fire. At the same time, the USFWS Fisher Conservation Assessment states that "Management activities that reduce or remove understory vegetation may, among other things, decrease prey availability, disrupt daily movement patterns of fishers, and increase vulnerability of fishers to predation" (Lofroth et al. 2010) and "A successful conservation strategy must include measures that recognize the importance of understory vegetation to support abundant prey populations and provide adequate fisher cover, and the contribution of diverse native vegetation to fisher habitat and in the maintenance of resilient landscapes" (Naney et al. 2012). In addition, two published studies from in and around GSNM have identified the basal area of small trees to be an important predictor of fisher rest site habitat quality (Zielinski et al. 2006, Purcell et al. 2009) and there are indications that fisher use of areas with reduced canopy cover may be contingent on understory density (Lofroth et al. 2010).

Balancing these factors and achieving landscape heterogeneity requires a spatially-explicit approach. North et al. (2009) suggest "creating landscape heterogeneity in the Sierra Nevada by mimicking the forest conditions that would be created by the fire behavior and return interval associated with different slope position, aspect, and slope steepness." Habitat conservation and fire management may be compatible if the juxtaposition of different elements is taken into consideration (i.e. landscape configuration). While I am not familiar with the SPECTRUM model, a quick review of Appendix B suggests that it is not a spatially-explicit model and therefore not an appropriate choice for quantifying forest heterogeneity and project-level or cumulative effects analyses.

Effects of Riparian Conservation Areas (Alternative E): Under Alternative E, standards and guidelines for riparian area conservation from the 2001 and 2004 SNFPA are not included. The effect of this exclusion on wildlife is not sufficiently analyzed. Fisher in the GSNM exist at the southern extent of their range and are likely to be highly influenced by thermal conditions (Raley et al. 2012). Riparian areas offer cooler microclimates than upland areas, and this is likely reflected in fishers' preferential use of these areas (Lofroth et al. 2011). Riparian areas also likely serve as travel corridors, providing access between high quality habitat patches (Zielinski et al. 2004, C. Thompson, USFS, personal observation). Fishers are not the only species for whom riparian areas form critical habitat and habitat linkages; Relictual slender salamanders, Foothill and Mountain yellow-legged frogs, Southwestern pond turtles, Bald eagles, and Western red bats all may be impacted by changes in riparian conservation measures.

The determination that Alternative E may affect individuals of the species listed above but not populations is questionable due to the lack of any relevant analysis. Fuel management in riparian areas may be an appropriate management action. While these areas were historically thicker and burned less often than upland areas, the enhanced growing conditions and history of fire suppression means that they are likely currently overstocked and at risk of high-intensity fire (North et al. 2009). However any such action requires far more careful consideration than is apparent in the current FEIS.

"Big, sick, and rotten trees": Historically, forest managers have removed sick, deformed, or damaged trees from the forests. Over time this has left a deficit of these types of structures on the landscape. Research on the habitat preferences of fisher as well as many other old growth/late seral dependant species has identified these structures as critical to the functionality of habitat (Weir et al. 2012, Raley et al. 2012). In fact, recent work on fisher habitat use has indicated that fishers are less constrained to old growth habitat than previously thought; instead they are constrained by the presence of specific structural elements (rest and den sites) most often found in old growth habitat (Raley et al. 2012). Elements such as broken-top trees, mistletoe or rust brooms, lightening scars, heart-rot cavities, or other indicators of deformed or decadent trees form the majority of rest and den sites used throughout the western United States (Lofroth et al. 2010, 2011, Naney et al. 2012).

It is not sufficient to claim that "modeling has shown increases in old growth habitat and in large trees (>30 inches dbh) in the future for all of the alternatives" (Vol. 1, Ch. 4, p. 475). In the fisher conservation assessment, Naney et al. (2012) state that "Reduction in structural elements was the highest ranked and geographically most consistent threat. Conservation measures must address this critical element of fisher reproductive and resting habitat

throughout the Assessment Area to assure suitable denning and resting structures are available and well distributed across the landscape. Where structural elements are deficient in abundance and distribution, conservation measures must include provisions for the recruitment of large trees that will develop the type of microstructures used by fishers for reproduction and resting." Lofroth et al. (2010) states "Fishers rely on a complex web of ecological processes including disturbances, diseases, and the activities of other organisms, that create and maintain important forest structures such as large live and dead trees with cavities for reproductive dens. Furthermore, many decades are required for forests to develop structural complexity. Many of the structures important to fishers develop via infection of trees by organisms typically considered undesirable pathogens in forest management. To be successful, conservation efforts must recognize the importance of various ecological processes in creating and maintaining forest structures that are important to fishers and their prey, and the temporal and spatial scales at which these processes operate. They may also, at times, require consideration of management intervention to promote processes that develop important structures." These forest elements need to be actively identified, protected, and recruited, to insure the maintenance of functional fisher, marten, and other wildlife habitat.

Miscellaneous comments

1. The terms "resilient" and "resiliency" are used many times throughout the document to describe desired conditions. However these terms often mean different things to different people. A clear definition of the term would help avoid misinterpretation.
2. Hazard tree removal has the potential to impact LS/OG species due the preferential removal of snags and decadent or damaged trees; however this activity is rarely directly addressed. Hazard tree removal should be included under the Assumptions for Alternative A (Vol. 1, Ch. 4, p. 434)
3. Vol. 1, Ch. 4, p. 434 clearly states that direct monitoring of sensitive LS/OG species is preferential to the monitoring of habitat. While logical, this misses the fact that suitable habitat is often uninhabited at any given time due to natural processes. Relying solely on the presence or absence of a species at a particular time risks the gradual degradation of habitat as unoccupied but suitable habitat is altered. Instead, some combination of species and habitat monitoring would be the most effective conservation approach.
4. The statement "The long-term resiliency of [*insert species XX*] habitat to stand replacing events such as fire, insects and disease may be improved following treatments for ecological restoration." is used frequently throughout Chapter 4. How is resiliency defined and why should we expect it to be improved for that particular species?
5. Bats are likely to be highly sensitive to the reduction of surface and ladder fuels within their habitat, and may benefit from it (Leput 2004). This attribute is not discussed within the BE for Pallid, Townsend's big-eared, and Western red bats.
6. Vol. 2, App. M, p. 656 state that 36% of the rest sites used by marten within the GSNM were in trees. Where were the remaining 64%?
7. Vol. 2, App. M, p. 719 states that the impact of fuels management on Pacific fisher habitat will be assessed using models *appropriate to the scale of the project*. The scale of a management project does not necessarily correlate to the scale of the impacts. Assessment should focus on the scale of the potential impacts instead.
8. Two vegetation management alternatives, one limiting tree removal to <10" dbh and one limiting removal to trees < 12" dbh were considered and eliminated because they would "not meet the purpose and need" and retaining trees >12" would "have the effect of increasing fuels buildup on the forest floor, instead of reducing it" (Vol. 1, Ch. 2, p. 135). Where is the scientific rationale for this decision?
9. On p. 654 (Vol. 2, App. M), a study by Cablk and Spaulding (2002) is presented as a counterpoint to the idea that marten require contiguous canopy. I fear that study is misrepresented; marten habitat in a ski resort will be extremely fragmented due to the network of ski runs. Animals living there must be willing to cross the runs in order to survive. My understanding is that the study referenced used snowtracking, a technique from which it is impossible to determine how much time was spent in a particular area. Averaging canopy cover

along a movement path in a highly fragmented environment, with no data on how long an animal spent in a certain area, risks over-representing the use of avoided habitats and under-representing preferred habitat.

Conclusions

Is the relevant scientific information considered?

No. In the initial review, Dr. Zielinski highlighted a number of problems with how scientific information was being used and presented. Several of his suggestions, including the inclusion of local data and the consideration of habitat fragmentation studies have greatly improved Appendix M. However there are still a number of problems.

1. References to published literature continue to be used sporadically. Examples highlighted during the first review have been changed, but the entire document needs to be carefully reviewed. Any time a conclusion is stated, an effect is predicted, or a response is described, a reference must be included.
2. References and discussion on the impacts of habitat fragmentation, while added to the wildlife biological evaluations, do not appear to have been considered in any relevant analysis or description of environmental consequences. In fact any mention or discussion of fragmentation or connectivity-based metrics is conspicuously absent from Volume 1 with the exception of several table references.
3. The single most important piece of literature currently available regarding fisher conservation in the western United States, the Interagency Fisher Conservation Assessment, is not adequately considered. The single reference given to it indicates that the authors are aware of it, but no consideration is given to the summary of habitat requirements, the evaluation of threats, or the conservation recommendations. All 4 volumes of the assessment can be obtained through the USFWS office in Yreka, CA.
4. Volume IV of the USFWS fisher conservation assessment (Finley et al. *in review*), defines a multi-scale strategy for conserving extant fisher populations and planning for landscape-level habitat connectivity. While document contains far more detail than is necessary here, it has been rigorously reviewed, field tested, and accounts for the need for vegetation management and multiple priorities in fisher habitat. I recommend that the authors of the wildlife components of the FEIS review the document and consider incorporating appropriate sections into the GSNM monitoring plan.
5. Other relevant scientific information regarding fishers may have only recently become available, however it requires consideration. In particular, the authors need to review and incorporate Buskirk et al. 2010, Weir and Corbould 2010, Knaus et al. 2011, and Raley et al. 2012).

Is the scientific information reasonably interpreted and accurately presented?

In general, yes. Most of the information regarding wildlife habitat use and their response to disturbance is accurately presented though more references are needed. A couple exceptions are described above. Of greater concern is the fact that information on the risks and consequences of habitat fragmentation has not been incorporated into the primary FEIS document.

Are the uncertainties associated with the scientific information acknowledged and documented?

Somewhat. Much of the uncertainty associated with wildlife impacts stems from the lack of recent survey data and unknown population status within the Monument. Where occupancy status is unknown, CWHR habitat is used as a surrogate for species presence. Far less clear is how the species listed will respond to disturbance and habitat change through vegetation management. For many species, there is simply no information available on how they respond to overstory thinning or understory removal. In these cases, compiling a list of data needs would both acknowledge the relevant uncertainties and provide guidance for future Monument research projects.

Are the relevant management consequences identified and documented, included associated risks and uncertainties.

No. By relying on a non-spatially explicit modeling framework to evaluate treatment impacts numerous potential consequences were ignored. Reporting the impacts of management actions as the number

of acres treated, the average canopy cover across the landscape, or the miles of roads built or decommissioned may be the status quo but it does not capture the Monument's stated desire to rely upon the "best available science". For years, average conditions have been used to describe landscapes despite the fact that average landscapes rarely exist. Stephens et al. (2007) found that only 15-20% of stands in an active fire, conifer ecosystem could be described as 'average' and forest structure within 0.25 ac plots varied by an order of magnitude. Instead, emphasis should be placed on capturing the variability, both spatial and temporal, resulting from management actions and determining whether that variability exceeds acceptable thresholds. If increased forest heterogeneity is truly a goal, then appropriate techniques and metrics for assessing heterogeneity need to be applied. Examples of models using the range of variation to predict the impacts of management actions include Lee and Irwin (2005), Cushman and McGarigal (2007), and Thompson et al. (2011). Furthermore, there is no indication of a serious attempt at either conducting an appropriate cumulative effects analysis or at defining a process to insure that appropriate, project-level CEAs are done in the future.

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Science Consistency Review Supplementary Comments, Giant Sequoia National Monument FEIS

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21 March 2012

On January 18, 2012, I submitted a science consistency review of the Giant Sequoia National Monument EIS focusing on wildlife habitat, old-forest dependant species, and forest heterogeneity. I commented on several aspects of the document, however the bulk of my substantive comments hinged on 2 factors: 1) the concept of habitat heterogeneity needed to be more explicitly incorporated into the primary document, and 2) the approach to cumulative effects analyses was insufficient to insure population persistence.

Following my comments, GSNM staff requested a conference call and subsequent meeting so that they could better understand my comments and resolve the concerns Dr. Zielinski and I raised. Following these discussions, the staff made several changes to the document. Most notably, they modified the "Wildlife

and Plant Habitat Desired Conditions" to explicitly recognize that configuration is an important aspect of habitat quality. They also expanded the description of cumulative effects analysis, acknowledging recent advances in modeling population and landscape trajectories as well as demonstrating that future project-level analyses will be expected to employ improved techniques. Given their willingness to address my concerns and the changes that were subsequently made to the document, I agreed to reevaluate my answers to the four primary questions.

1) Is the relevant scientific information considered?

Yes. Following our discussions, GSNM staff reviewed and incorporated the USFWS Interagency Fisher Conservation Assessment and several other recommended documents. Information on the impacts of habitat fragmentation, already incorporated into the biological evaluations, was added to the primary document. Additional information on the treatment of understory vegetation, including the importance of promoting spatial heterogeneity, was added.

2) Is the scientific information reasonably interpreted and accurately presented?

Yes.

3) Are the uncertainties associated with the scientific information acknowledged and documented?

Yes. As stated earlier, much of the uncertainty associated with wildlife impacts stems from the lack of recent survey data and CWHR habitat is often used as a surrogate. I still believe a table summarizing data needs would be a useful way to acknowledge relevant uncertainties; however such a table may not belong in a programmatic document.

4) Are the relevant management consequences identified and documented, including associated risks and uncertainties?

Yes. By defining a more explicit, forward-thinking framework for cumulative effects analysis, including providing examples of how such analyses can be conducted, the authors have greatly improved the document. The examples they present demonstrate how to move beyond a historic reliance on 'average conditions' and how to incorporate spatial variation. By setting a higher, more appropriate standard for future cumulative effects analyses, the authors have created an atmosphere where improved, spatiallyexplicit modeling will be expected for individual projects. Furthermore, where appropriate the biological evaluations were modified such that the total percentage of habitat in each treatment category was clearly stated.

Table 70 Responses to Science Review Panel Comments

#	SRP Comment	Location of Response in FEIS, Monument Plan, ROD, or Other Documents	FS Response
1	Malcolm North, p. II-2: Both Chapters 3 and 4 refer to science citations being consulted but they are not directly cited. Many citations provided by the previous science review do appear in the Literature section but for the vegetation sections, with the exception of adding a few references (ex. York's studies on regeneration), the remaining references are not linked to or cited in the text. Many of those citations would support the text but in their absence the reader is left to wonder whether the content is speculative or well supported. To give one example, the sections on Giant Sequoia Regeneration in Chapters 3 and 4 are largely accurate however there are few citations and reliance on photographs and observation (the Chapter 3 section contains only 3 citations, two of which are from more than 40 years ago). Some stakeholders have suggested sequoia regenerates fine without fire or canopy openings. Yet neither section cites Meyer and Safford (2011), a recent study conducted in groves in the southern Sierra. Their study documents the importance of high light environments and the need for fire.	FEIS, Volume 1, Chapter 3, Vegetation, Giant Sequoia Regeneration FEIS, Volume 1, Chapter 4, Effects on Vegetation, Giant Sequoia Regeneration	Citations were added to the Giant Sequoia Regeneration sections of Chapters 3 and 4. For example, this paragraph in Chapter 3… White fir and incense cedar do not always require the open condition of early seral stage habitat that is typical of areas of high intensity burns or openings created by harvesting. In these conditions, there is substantial sunlight and available moisture for seed dispersal, germination, and growth. White fir and incense cedar can regenerate under many diverse conditions of light, forest floor cover, and soil moisture found in groves. …was modified to read: White fir and incense cedar regeneration is highly adapted to shade-tolerant conditions but can also grow successfully in open canopy conditions typical of high intensity burned or harvested areas (Zald et al. 2008, Meyer and Safford 2011b). In these conditions, there can be sufficient sunlight and available moisture for seed dispersal, germination, and growth. White fir and incense cedar can regenerate under many diverse conditions of light, forest floor cover, and soil moisture found in groves (Meyer and Safford 2011b) (FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Regeneration).
2	Malcolm North, p. II-2: In Chapter 4 the content is fairly consistent with current science regarding the emphasis on resilience as an appropriate goal of forest restoration. There's extensive literature supporting this approach most of which is not cited. This absence may be problematic for some readers because, for example, its suggested pre-1875 conditions are synonymous with resilient conditions.	FEIS, Volume 1, Chapter 4, Effects on Vegetation, Assumptions and Methodology, Use of Science, Scientific Advisory Board (SAB) Advisories, Advisory III. Desired Conditions	Citations and links to the Climate Change Report in Appendix C were added to the Resiliency section of Chapter 4. For example, this paragraph in Chapter 4… The current growing conditions for vegetation ecosystems have been altered from that which existed prior to 1875. For example, current atmospheric CO_2 concentration is the highest it has been in at least 420,000 years (Scientific Advisory Board 2003, Advisory III). Global temperature is rising, and the 1990s was probably the warmest decade in the last 1,000 years (Mann et al. 1998; IPCC, 2001). In the Sierra Nevada, current

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2	Forests cannot be moved back to a past condition given many anthropogenic changes but there are still valuable lessons to be learned from historic conditions. Some further discussion of this use of past conditions without slavishly adhering to them would help explain the use of historical information for informing resilience objectives. The climate change section in the appendix has a nice discussion of how conditions are changing and this would help the reader understand why the past cannot be recreated. The Chapter 4 content could direct the reader toward its discussion of this topic.	FEIS, Volume 1, Chapter 4, Effects on Vegetation, Assumptions and Methodology, Assumptions for All Alternatives, Resiliency FEIS, Volume 1, Chapter 4, Effects on Vegetation, Indirect Effects, Resiliency	temperatures are also rising, and are among the warmest of the last millennium (Graumlich 1993). …was modified to read: The current growing conditions for vegetation ecosystems have been altered from that which existed prior to 1875. For example, current atmospheric CO2 concentration is the highest it has been in at least 420,000 years (Scientific Advisory Board 2003, Advisory III). Global temperature is rising, and the 1990s was probably the warmest decade in the last 1,000 years (Mann et al. 1998; IPCC, 2001). In the Sierra Nevada, current temperatures are also rising, and are among the warmest of the last millennium (Graumlich 1993). Rising temperatures, especially the average annual minima, are also apparent in the southern Sierra Nevada in the past century (Meyer and Safford 2011; see Appendix C) (FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Assumptions and Methodology; Use of Science; Scientific Advisory Board (SAB) Advisories; Advisory III. Desired Conditions).
3	Malcolm North, p. II-2: Chapter 2 has information about the relative prioritization of treatments (i.e., the decision tree on p. 62—wildland fire use, than prescribed burning, than mechanical). The alternatives also list diameter limits for different trees and conditions. I could not find any documentation as to why these diameter limits were used other than reference to the Clinton proclamation. If that is the directive, then the lack of any scientific justification is understandable.	FEIS, Volume 1, Chapter 2, Alternatives Considered in Detail, Alternative A, Fire and Fuels, Management Direction for Ecological Restoration, etc.	The diameter limits are based on public comments and values and not based on biological science.
4	Malcolm North, p. II-2: Figure 3 on page 162 (Sequoia tpa by grove) seems to be in error as I don't know of any stands that have more than 400 tpa of >40" dbh trees (Y axis should be basal area?).	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia	This table is mislabeled and inaccurate and has been removed from the FEIS.

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		Ecology; Historic Harvesting in Giant Sequoia Groves	
5	Malcolm North, p. II-2: Figure 4 on p.163 also may be in error—should the y-axis be tpa rather than basal area? X-axis label should delete tpa? Perhaps the y-axis labels need to be swapped between the two figures?	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves	This table was mislabeled and has been corrected. The X axis is now labeled "Diameter Class (inches dbh)" and the Y axis is now labeled "Trees per Acre."
6	Malcolm North, p. II-2: The lack of citations persists, and the disjointed, repetitive sections can make it difficult to collate what information was used and how. Overall, however, the content is accurate with the current state of vegetation science relevant to the southern Sierra Nevada.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias FEIS; Volume 1; Chapter 4; Effects on Vegetation, including Giant Sequoias	Several parts of the Vegetation sections in Chapters 3 and 4 were rewritten, and many citations added, to help improve readability and more clearly link the content to supporting literature.
7	Kevin O'Hara, p. II-4: **Giant sequoia regeneration:** The FEIS includes a new section on gaps and light environments for developing seedlings/saplings of giant sequoia. The section on gaps on page 165 includes more information and the recommended citation from York et al. for the Sierra Nevada. On this issue, the FEIS is adequate.	FEIS, Volume 1, Chapter 3, Vegetation, Giant Sequoia Ecology, Gaps	The new section on gaps in the FEIS reads: The findings of York et al. (2003) are consistent with well-established research on gap size in forest ecosystems across the nation. Small gaps may not provide enough light for shade intolerant species. They found that giant sequoia seedlings compared to other tree seedlings responded best to increases in light. For small gap or group sizes less than 2 acres, the study demonstrated that ample light was lacking in southern portions of the opening for trees that need more light for growth, mainly sequoia and pines. York et al. (2004) found that height growth suppression was greatly reduced in openings greater than about 1.5 acres where the opening diameter was 2.6 times the height of the edge trees. The increases in growth rates due

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			to increases in opening sizes were not linear. York at al. (2009) found that growth rates of young giant sequoia seedlings and sugar pine increased rapidly when openings were increased from 0.1 acres to 0.5 acres. The rate of increase was less in openings from 0.5 to 1 acre in size. However, seedlings of both tree species had similar growth rates in the center of gaps that varied between 0.2 and 2 acres in size. None of the above studies were designed to determine the optimal opening size, but silvicultural designs where opening widths are at least twice the edge tree heights provide a basis to start from that is directly related to the quantity of sunlight and easy to measure in the field. In many forest types across the country, growth of shade intolerant trees can be expected to benefit from increases in sunlight.
8	Kevin O'Hara, p. II-4: **Sugar pine regeneration and management:** Sugar pine was mentioned in my DEIS comments as a critical species in the GSNM because it is threatened by the invasive pathogen white pine blister rust. The FEIS includes less information on sugar pine restoration than the DEIS. The references recommended in my comments on the DEIS are not generally included in volume 1 of the FEIS. They are included in volume 2, but apparently only because of inclusion of the Science Consistency Review of the DEIS in Appendix F. Additionally, the important role of gaps in regenerating relatively intolerant species (other than giant sequoia) is not discussed even though the cited work by York et al. included all the primary Sierran mixed-conifer species.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Gaps	The following discussion has been added to the Vegetation Affected Environment section in Chapter 3: Due to the uncertainty of sugar pine regeneration, due to the effects of white pine blister rust, more attention needs to be placed on the artificial regeneration of more rust-resistant sugar pine to help assure its important role in mixed conifer ecosystems, including giant sequoia groves. In the Monument, it is anticipated that up to 10 percent of tree planting mixes will include sugar pine, a major species in mixed conifer communities, including giant sequoia groves, that is threatened by the blister rust disease. In order to better manage this species, it will be important to assure ample sunlight in gaps where sugar pine is desired. This will help assure favorable growth and improve resistance to drought, bark beetles, and other factors in addition to the threat that blister rust poses in managing this species. Larger openings in the upper canopy will provide conditions that sequoia and pines need to keep up with or outgrow shrubs, white fir, and incense cedar.
9	Kevin O'Hara, p. II-4: **Stand density management** – even-aged and multi-aged stands: My comments on	FEIS; Volume 1; Chapter 4; Effects on Vegetation,	Stand density management is discussed in general terms in several sections of the FEIS, including Vegetation, Watershed, and Wildlife. For example, the Resiliency analysis in the

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	the DEIS suggested more detail on stand density management. As indicated in the FEIS, managing density of trees is a critical management activity to improve resilience of stands, enhance regeneration, stand health, and other important factors related to meeting directives on the GSNM. However, I find less detail in the FEIS than the DEIS. This involves less information on density management of even-aged and multiaged regimes, but also less support from the scientific literature. I see some of the recommended citations from my DEIS comments in the literature cited in Volume 1, but I cannot find them actually cited in the document. This is a critical omission in any scientific document.	including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Effects Assumptions; Resiliency	Vegetation section of Chapter 4 discusses how reducing stand density increases tree resilience, and many citations have been added to this section. Due to the wide range of desired conditions and values, including stand health, fire, wildlife habitat, watershed effects, and scenery management, specific decisions regarding changes to stand density will be made in project-level analysis.
10	Kevin O'Hara, p. II-4: **Oak regeneration:** There is relatively little information on ways to enhance oak composition in the FEIS.	FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired Conditions, Strategies, and Objectives; Vegetation Strategies/ Objectives.	The FEIS contains strategies that discuss the protection of black oaks, encouraging oak species, keeping the acreage of blue oak stable, but nothing particular to enhancing oak composition.
11	Kevin O'Hara, p. II-4: Carbon sequestration: The treatment of issues related to carbon sequestration on the GSNM is improved in the FEIS. On this issue, the FEIS is adequate.	FEIS, Volume 1, Chapter 3/Chapter 4, Climate Change/ Effects from Climate Change	No response necessary.

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12	Kevin O'Hara, p. II-5: **Giant sequoia regeneration:** In my comments on the DEIS I noted that the uncertainty and urgency of sequoia regeneration may be over-stated. This is not addressed in great detail in the FEIS. There is a section "Stand Structure in Sequoia Groves" beginning on page 162 that presents data on abundance of trees or basal area of different sizes. It notes that "intermediate sized trees are underrepresented" (p 163). It also seems to imply that "the common inverse relationship of size and number of trees" should be followed. Yet there is no cited research to support this point and only one paper – a paper by Piirto and Rogers (1999) – is cited in this entire section.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves	The Stand Structure in Sequoia Groves section in Chapter 3 has been modified and citations added to clarify the available data on number and sizes of trees in the groves. The text referred to has been modified to read: Across all groves, in most tree size classes, the average species size distribution follows the common inverse relationship of size and number of trees, where the larger the tree, the fewer the number, especially in groves where fire has been excluded (York et al. 2012). Trees in the large to intermediate size classes are underrepresented, especially in the 20- to 28-inch size class, as shown in the following table and figure.
13	Kevin O'Hara, p. II-5: **Sugar pine regeneration and management:** I noted in my comments on the DEIS that "the maintenance of sugar pine in these Sierra Nevada ecosystems may be a more critical problem than maintenance of giant sequoia." I did not find that the great uncertainty related to the future sugar pine and blister rust on the GSNM was either acknowledged or documented.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Gaps	The following discussion has been added to the Vegetation Affected Environment section in Chapter 3: Due to the uncertainty of sugar pine regeneration, due to the effects of white pine blister rust, more attention needs to be placed on the artificial regeneration of more rust-resistant sugar pine to help assure its important role in mixed conifer ecosystems, including giant sequoia groves. In the Monument, it is anticipated that up to 10 percent of tree planting mixes will include sugar pine, a major species in mixed conifer communities, including giant sequoia groves, that is threatened by the blister rust disease. In order to better manage this species, it will be important to assure ample sunlight in gaps where sugar pine is desired. This will help assure favorable growth and improve resistance to drought, bark beetles, and other factors in addition to the threat that blister rust poses in managing this species. Larger openings in the upper canopy will provide conditions that sequoia and pines need to keep up with or outgrow shrubs, white fir, and incense cedar.

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14	Keith Reynolds, p. II-6: Chapters 1 and 2 of the FEIS provide a brief but good overview of how MCDS has been implemented over the planning process. Based on this and other supporting documents provided to me previously for review of the Draft EIS, I believe that the planning team has used the MCDS methods appropriately throughout the overall planning process.	FEIS, Volume 1, Chapter 3, Human Use, Recreation, Public Involvement FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Assumptions and Methodology, Organization of the Analysis FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Transportation, Effects on Trails and Motorized Recreation, Assumptions and Methodology, Organization of the Analysis	MCDS is also referred to in Chapter 3, Recreation, Public Involvement; Chapter 4, Effects on Recreation, Assumptions and Methodology, Organization of the Analysis; and Chapter 4, Effects on Trails and Motorized Recreation, Assumptions and Methodology, Organization of the Analysis.
15	Keith Reynolds, p. II-7: The Monument Plan is so large and detailed that few if any readers can effectively trace the reasoning for selection of the preferred alternative. I suspect that this accounts for much of the suspicion and frustration that planning teams frequently encounter from the public. The Monument planning team, however, has taken the novel and rather bold	FEIS, Volume 1, Chapter 4, Assumptions and Methodology, Multi-Criteria Decision Support (MCDS) FEIS, Volume 1, Chapter 4, Effects on Human Use,	Application of the MCDS is discussed in the FEIS, and Appendix J to the FEIS presents an overview of the MCDS process. A separate Monument Management Plan will be published with the Monument FEIS, focusing only on the selected alternative. Two of the analyses in Chapter 4, Effects on Recreation and Effects on Trails and Motorized Recreation, are organized around the subcriteria for the criterion, “Increase Enjoyment of the Monument.”

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	step of applying a formal MCDS process to support their planning effort. Full disclosure of all model details allows interested parties to quickly zero in on specific points of disagreement, at least promoting the opportunity for a much more focused and constructive discussion. Application of the overall MCDS process seems to have been effective at engaging the public, and guiding evolution of the decision framework structure in terms of identifying and organizing the criteria and subcriteria that the Plan addresses, and in terms of clearly defining the rating scales of attributes of the alternatives. Results from the VIBE process as well as the subsequent evolution of the decision framework seem to be well documented as to how they have influenced the structure and presentation of issues in many places throughout chapter 4. These are further indicators of effective use of MCDS in the planning process.	Effects on Recreation, Assumptions and Methodology, Organization of the Analysis FEIS, Volume 2, Appendix J	
16	Keith Reynolds, pp. II-7 to II-8: The role of MCDS in public participation and the Monument planning process in general is explained in numerous places throughout Chapters 1, 2, and 4 of the FEIS (Volume 1). During review of the earlier DEIS, I was provided with an additional 15-20 supporting documents, which I presume are part of the public record, and these documents shed additional light on how MCDS was used to support the process. So, in terms of documenting the MCDS process, this is done well in the FEIS. The primary outstanding	FEIS, Volume 1, Chapter 3, Human Use, Recreation, Public Involvement	MCDS is also referred to in the Recreation section of Chapter 3 under the subheading of Public Involvement.

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	issue is whether or not the decision framework itself, including criteria, subcriteria, weights, ratings on attributes of alternatives, and consequent results are adequately documented either in the FEIS itself or by alternative means. In my previous review of the DEIS, I had recommended including this information in an appendix. This was not done. Appendix J (volume 2) presents an overview of the MCDS process, but this is mostly a rehash of material presented in chapters 1, 2, and 4, and could in fact be eliminated as redundant; it really does not add anything.		
17	Nina Roberts & Jackson Wilson, p. II-10: There have been many improvements to the document since the draft was reviewed last year. This includes our judgment that the social/human use science components are sufficiently accurate.		No response necessary.
18	Nina Roberts & Jackson Wilson, p. II-10: The overall purpose (environmental impact of various management decisions regarding recreation use) is unclear in that the content and goals as stated do not fully support the intent of the FEIS. There needs to be a better link between human uses and the environmental impact. That is, in order to inform decisions relating to the Alternatives, a stronger association must be made between use and impact on protecting the "objects of interest" within the Monument.	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Alternative A, Increasing Numbers of Recreationists, Protects Resources FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect	The assumption of the primary purpose of the recreation section is incorrect. The Recreation section of Chapter 4 is intended to analyze the Effects ***on*** Recreation, not the effects ***of*** recreation on the objects of interest and other resources. The effects of recreation on other resources, such as cultural resources, wildlife, scenery, socioeconomics, and transportation are captured in those resource sections, although the Effects on Recreation section does have some discussion of interactions with other resources. Chapter 4, Effects on Recreation, Indirect Effects, discusses interactions among recreation opportunities and other multiple uses in the Protects Resources section under the Increasing Numbers of Recreationists heading, the Effects on Recreation from Management Activities section under the Connects People to the Land (Places) heading, the Day Use and Camping section under the Promotes Diversity of Uses heading,

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		Effects, Alternative A, Connects People to the Land (Places), Effects on Recreation from Management Activities FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Alternative A, Promotes Diversity of Uses, Day Use and Camping FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Alternative A, Connects People to Others and Across Generations, Interpretation and Education Programs (Conservation Education) FEIS, Volume 2, Appendix L, Recreation, PC #372	Connects People to Others and Across Generations and Interpretation and Education Programs (Conservation Education) sections, and in the Cumulative Effects section (also see Volume 2., Appendix L, response to PC #372). In the Protects Resources section under the Increasing Numbers of Recreationists heading in Chapter 4, the text notes that the standards and guidelines included in Appendix A (Volume 2) are designed to minimize the effect of recreation on other resources. During site-specific project planning in the future, mitigations (including best management practices) are expected to be identified for project implementation. Being able to analyze "what this recreation impact really is, or will be" is not possible at this time, but will be analyzed in the future as recreation demand changes and site-specific environmental analysis is conducted.

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19	Nina Roberts & Jackson Wilson, p. II-10: The number and quality of citations to relevant research literature have improved since the DEIS. However, this is an area that where further development could improve the EIS. For example, recreation (e.g., sustainable use, conservation/education, tourism) needs to be linked better to relevant management consequences and actions and second, Recreation Demand Analysis needs to be connected to actual changes in demand and potential resource impacts. And although it has improved since our original review, some sections continue to suffer from having no in-text citations to support the claims.	FEIS, Volume 1, Chapter 4	The recreation section of Chapter 4 analyzes the Effects on Recreation, not the effects of recreation on the objects of interest and other resources. The effects of recreation on other resources, such as cultural resources, wildlife, scenery, socioeconomics, and transportation, are captured in those resource sections. The intent of the Recreation Demand Analysis is to predict future demand; actual changes in that demand are unknown at this time. The purpose of Chapter 4 is to analyze potential resource effects; effects from recreation are analyzed in other resource sections (such as cultural resources, wildlife, scenery, socioeconomics, and transportation). Site-specific project planning in the future will analyze effects in more detail.
20	Nina Roberts & Jackson Wilson, p. II-10: We provided a lengthy list of research references in response to the 2010 DEIS review that also appear in the current FEIS (page 360 & 386 in volume 2), yet it seems that few of these recommended resources were incorporated into the FEIS. The findings in many of those studies would help justify statements made in the EIS and better connect recreation use with issues associated with protection (e.g., lacks connection to "Issue 1").	FEIS, Volume 1, Literature Cited FEIS, Volume 2, Appendix D	The list of references in the DEIS review did not yield additional information that would change the analysis. In some cases, although the particular articles were not cited, the information cited in those articles has been used in the analysis. For example, Crano et al. 2008 was on the list provided; in this case, the article provided a synopsis of a study; the larger, more detailed study report (Crano et al. n.d.) was cited, rather than the article. As another example, some items on the list used the National Survey on Recreation and the Environment (NSRE) as an information source; a number of references using information from NSRE were cited; the list provided included articles less appropriate to the Monument (e.g., the Monument has very little wilderness) or included information that was duplicative of other references already cited using NSRE data. Many references were not useful for this programmatic level FEIS, but would be more applicable to site-specific project planning and/or designing research studies.
21	Nina Roberts & Jackson Wilson, p. II-10: The Recreation Demand Analysis section in Appendix D needs a bibliography.	FEIS, Volume 2, Appendix D FEIS, Volume 1, Literature Cited	The references used are included in the large Literature Cited section at the end of Volume 1. Also, a separate literature cited section has been added to the end of Appendix D.

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22	Nina Roberts & Jackson Wilson, p. II-10: Many factors have been incorporated such as social effects of lifestyle and demographic trends. Examples include research results regarding race/ethnicity, gender, income, age, family structure, effect of crowding and activity preferences, satisfaction, etc. yet a connection to how this affects the objects of interest and subsequent management alternatives is still lacking.	FEIS, Volume 2, Appendix D FEIS, Volume 1, Chapter 4	These factors all have the potential to affect recreation demand. Predicted recreation demand does not vary between alternatives. As stated in the first paragraph in Volume 2, Appendix D, what does vary by alternative is how well the alternative responds to the predicted recreation demand; that variation is discussed in the Effects on Recreation section in Chapter 4. Other resource sections in Chapter 4 discuss the effect of recreation on those resources, including the objects of interest.
23	Nina Roberts & Jackson Wilson, p. II-11: There is a seeming conflict between recreation use (and user conflicts) and preservation of the Monument (e.g., giant sequoia groves, ecosystems, wildlife habitat). It is still unclear what the exact impact of different levels of recreation use are, and/or would be (future), by visitor activity. This is a critical question that was previously raised in our 2010 review. On page 574 of the Appendices (vol. 2) it states that the effects of such activities are analyzed in Alternative A; however, pages 73-74 fail to adequately do so in the actual FEIS (vol. 1). While the literature review has improved, points made do not clearly defend how GSNM staff plan to address this.	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Alternative A, the Baseline	The effect of recreation on other resources (such as cultural resources, wildlife, scenery, socioeconomics, and transportation) is analyzed in those other resource sections in Chapter 4. The "exact impact" of different use levels, by activity, cannot be determined in this programmatic level FEIS, but is more appropriately analyzed in site-specific project planning in the future. The Volume 2 page noted is the response to PC #370, regarding the effects of ongoing activities. The Volume 1 pages noted are part of the description of Alternative A in Chapter 2; Chapter 2 does not include effects analyses. The analysis of the effects of ongoing activities is in Chapter 4, Effects on Recreation, Indirect Effects, Alternative A, the Baseline.
24	Nina Roberts & Jackson Wilson, p. II-11: Chapter 1, p.40: **Issue 1** states there is "competition between different types of public use and a greater need to protect the objects of interest". However, there is only competition if there actually is an impact on the objects of interest. Some user groups	FEIS, Volume 1, Chapter 4 FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Scenery Resources, Indirect	The issue statement and description only discuss the concern expressed by the public. The effects of recreation on the objects of interest and other resources (such as cultural resources, wildlife, scenery, socioeconomics, and transportation) are analyzed in those other resource sections of Chapter 4. Citations were added and descriptions modified for clarification. Some of the statements referred to are based on personal

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	may have a much lighter negative impact or a positive impact on the objects of interest and other resources. The different impacts by user group are not clearly described and therefore fail to adequately inform policy. For example, which has less impact per user, dispersed camping along roads or concentrated camping? There is some speculation throughout (including Chapter 4, p. 565), yet there is little to no research cited.	Effects, Effects of Recreation Management on Scenic Integrity	observation, so that was identified where appropriate. For example, these paragraphs in Chapter 4: Recreation development and use in the Monument have the potential to affect scenery resources. Projected increases in visitation (see the effects on recreation section in this chapter and the recreation demand analysis in Appendix D in the final EIS) are expected to increase these effects on scenery resources. Recreation use, especially concentrated use without facilities to mitigate the effects of that use, is expected to degrade scenic quality by erosion, compaction, removal of vegetation, accumulation of litter, and increases in sanitation issues. Restroom facilities help to protect popular areas from sanitation issues. Visitor information stations can encourage responsible use of the natural environment and lessen effects to scenery. In these ways, developed facilities can mitigate effects of visitor use on resources and improve scenic integrity in all of the alternatives. …were modified to read: Recreation development and use in the Monument have the potential to affect scenery resources. Visitation is projected to increase in the future (see the effects on recreation section in this chapter and the recreation demand analysis in Appendix D) and this use is expected to increase effects on scenery resources. Based on personal observation recreation use, especially use without facilities to mitigate the effects of that use, can degrade scenic quality by erosion, damage or absence of vegetation, accumulation of litter, and sanitation issues. These environmental conditions lower scenic integrity (USDA Forest Service 1995c). The Forest Service provides recreation facilities to the public not only for visitor convenience but also for resource protection. Restroom facilities help to protect popular areas from sanitation issues. Designated pathways and parking protect soil resources

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			and vegetation from trampling. Visitor information stations encourage responsible use. In these ways, developed facilities can mitigate effects of visitor use on resources that contribute to scenery improving scenic integrity in all of the alternatives. Studies support the strategy of minimizing recreation use impact by concentrating use. In heavily used areas increasing use is likely to have few negative effects. Where use is widely dispersed, more area will be disturbed unless use levels are very low. Most studies report the amount of impact increases rapidly with initial increases in the amount of use in areas with relatively low levels of use (Cole, 1993). Identification of user groups and impacts will be described in project-level analysis.
25	Nina Roberts & Jackson Wilson, p. II-11: Recreation, Scenery, and Socioeconomics–Chapter 3, p.268: Need more information either about these internal USFS studies or citations to outside publications. Currently, the only external source is NAARRP, 2009.	FEIS, Volume 1, Literature Cited	The full citation for these documents is in the Literature Cited section at the end of Volume 1.
26	Nina Roberts & Jackson Wilson, p. II-11: User Groups (starting bottom of p. 273) – A list of 11 user groups are indicated in this section. Are all of these from USDA Forest Service 2008 citation? (noted on p. 276). If so, this is potentially unfavorable that such detailed typologies would be obtained through a single-source. This detail would indisputably be enhanced by including additional studies.	FEIS, Volume 1, Chapter 3, Human Use, Recreation, Connection to Place, User Groups	The source is USDA Forest Service 2008a, which was compiled from multiple sources, although a bibliography was not included in that document.
27	Nina Roberts & Jackson Wilson, p. II-11: The document should further discuss how recreation helps reinforce the environmental protection goals. On page 281, for example, it is stated that volunteers are a significant source of labor for some projects. There is a	FEIS, Volume 1, Chapter 3, Human Use, Recreation, Partnerships FEIS, Volume 1, Chapter 4,	The page noted is in Chapter 3, Recreation, Partnerships, which is only intended to convey how useful volunteers and other partnerships are for the Monument. The Recreation effects analysis in Chapter 4 explores the connection between volunteers and stewardship.

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	discussion of stewardship in the document, but it could be more clearly connected, and more empirically developed, regarding how recreation helps foster this sense of stewardship.	Effects on Human Use, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreation, Protects Resources and Connects People to Others and Across Generations, Public Outreach Programs (Partnerships)	
28	Nina Roberts & Jackson Wilson, p. II-11: Additional research that links recreational activity and impacts on the environment needs to be cited. Page 306 states that "Dispersed recreation could potentially degrade natural resources that contribute to scenic quality as demand for these activities rises in the future." However, there are no in-text citations to research supporting this claim. This leads to the conclusion that certain recreational impacts are assumed without any scientific evidence.	FEIS, Volume 1, Chapter 3, Human Use, Scenery Resources, Ongoing Activities	Citations have been added and the text revised for clarification. For example, these paragraphs in Chapter 3: Activities and conditions that will continue into the future in Alternative A include dispersed and developed recreation. Dispersed recreation could potentially degrade natural resources that contribute to scenic quality as demand for these activities rises in the future. Landscapes in areas of high public concern that have missed natural fires (fire return interval departure) may experience a degradation of scenery resources as they become overstocked, dense with vegetation, and have large amounts of dead and down wood, all conditions that people do not prefer to view. These landscapes are more susceptible to large scale disturbances and in areas that experience large scale disturbances, such as moderate or severe fire or exhibit large areas of dead and dying vegetation from competition for limited resources, pests or disease, the scenery resources will be degraded. This vulnerability leads to lower scenic stability. …were modified to read: Activities and conditions that will continue into the future in Alternative A include dispersed and developed recreation. Studies support the strategy of minimizing recreation use on

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			impact by concentrating use (Cole 1993). Dispersed recreation could potentially degrade natural resources that contribute to scenic quality (USDA Forest Service 1995c) as demand for these activities rises in the future. As demand for dispersed use in undisturbed areas rises, the greater the risk of lowering the scenic integrity in undisturbed areas of the Monument. As use increases in heavily used areas, impacts will not increase significantly. Developed recreation sites protect scenery by concentrating use and by providing amenities such as restrooms, hardened walkways, designated parking areas, and visitor information stations. Alternative A allows for the development of more recreation sites as visitor demand increases and can protect the scenery resources in both developed and undeveloped areas of the Monument. Landscapes in areas of high public concern that have missed natural fires (see effects on fire and fuels in Chapter 4) will experience a continued degradation of scenery resources as they become increasingly overstocked, dense with vegetation, and have increasing amounts of dead and down wood, all conditions that people do not prefer (Ryan 2005) potentially lowering scenic integrity. These landscapes are more susceptible to large scale disturbances and in areas that experience large scale disturbances, such as moderate or severe fire (see the effects Fire and Fuels section in Chapter 4) or exhibit large areas of dead and dying vegetation from competition for limited resources, pests or disease, the scenery resources will be degraded (Ryan 2005). This vulnerability leads to lower scenic stability.
29	Nina Roberts & Jackson Wilson, pp. II-11 to II-12: Appendix D (vol. 2) - Recreation Demand Analysis: Does not have a list of “Literature Cited” like the other Appendices. It mentions such “list” throughout this section and in the	FEIS, Volume 2, Appendix D FEIS, Volume 1, Literature Cited	The references used are included in the large Literature Cited section at the end of Volume 1. In addition, a separate literature cited section has been added at the end of Appendix D. 1. The list of references did not yield additional information that would change the analysis.

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	vol. 1 FEIS binder, but a list does not appear (potential oversight?). 1. What is included has improved yet essential sources (provided in 2010 as examples) are not included in general. For example, GSNM definitely needs to be aware of both recreation user trends as well as demographic shifts across race/ethnicity, for example. 2. The few references cited are not based on the most relevant research to help make a better connection. For example, neither Chavez, Floyd, Sasidharan, nor Shinew are cited regarding Latino/Hispanic visitors and/or user patterns of ethnic minorities, in general. 3. The recent Chavez study was cited (p. 281 and 289) yet speaks of "research being conducted in 2011" which was last year. What information and results can be provided from her work by now for this FEIS? 4. There is an overuse of a few limiting citations (e.g., Cordell, Sheffield, CA State Parks) throughout with some, but minimal, reference to other excellent sources that could have substantiated various claims. 5. CA State Parks surveys provide excellent user information, recreation participation preferences, satisfaction measures, travel patterns, etc. How is all this connected to resource protection based on the goals of the FEIS and the need to protect the objects of interest?	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreationists, Protects Resources FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Assumptions and Methodology/ Indirect Effects, Promotes Diversity of Users	2. The recommended literature listed in the panel's review of the DEIS included one reference for Chavez, which was read before it was recommended by the panel. Although it was interesting, it did not yield any additional information that was useful in predicting recreation demand for the Monument, so it was not cited. Floyd was listed as one of the authors for two items on that list (not primary author); Shinew was listed as one of the authors for one item on that list (not primary author); although the articles were interesting, they did not yield any additional information that was useful for the analysis or in predicting recreation demand for the Monument, so they were not cited. Sasidharan was not included on the recommended literature list. 3. The results from the 2009-2010 survey were received in March 2011. The results are specific to the day use sites surveyed and are not useful in this programmatic level FEIS. Those survey results will be useful for site-specific project planning in the future. The results from the 2011 survey have not yet been received. 4. The authors noted have published numerous documents; several were included in the analysis and are listed in the literature cited. 5. The purpose of the recreation demand analysis is to help predict future recreation demand, which does not vary between alternatives, nor is the demand analysis used to specify resource protection measures. Other resource sections in Chapter 4 discuss the effect of recreation on those resources, including the objects of interest. The standards and guidelines in Volume 2, Appendix A are designed to minimize the effect. During site-specific project planning in the future, mitigations (including best management practices) are expected to be identified for project implementation. 6. No response necessary. 7. That portion of the demand analysis states, "Using the results of this L.A. County phone survey (Crano et al. n.d.) may allow

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	6. NVUM research (p. 297) is perhaps some of the most significant data provided that has direct application to the issues and concerns of interest. This includes effects on the natural resources more than other studies provided and summarized. 7. The Crano (n.d.) L.A. phone survey (p. 301-302) also has some clear use and projection information that has great applicability to GSNM challenges and possible connection to management alternatives. Not made explicitly in a way that could assist with this FEIS and subsequent management actions. The detail and results are good and very interesting yet how could all that data be connected to the Alternatives proposed?		the Forest Service to more carefully target its messages, using media that are more likely to be effective with particular groups and emphasizing activities that are more likely to be of interest to those groups." These communication needs are noted in Chapter 4 in the Promotes Diversity of Users sections.
30	Nina Roberts & Jackson Wilson, p. II-12: Many statements in the FEIS are definitely interpreted in a way that is unquestionably 'reasonable' and are accurately presented. Many improvements have been made in the FEIS since we first reviewed the DEIS. For example, inclusion of various theoretical contexts was missing in the DEIS to support analyses. The FEIS more clearly presents this information. Second, the FEIS has significantly improved the interpretation and presentation of scientific information about Recreation Opportunities. Third, as previously mentioned, the information in the Scenery Resources Affected Environment is accurately presented and reasonable interpreted. The social science in the FEIS is generally more validated by various frameworks and is presented in a stronger way connecting		No response necessary.

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	data to management concerns yet less so connected to actual Alternatives.		
31	Nina Roberts & Jackson Wilson, p. II-12: Lack of visitor/user data. The information has improved from the DEIS; however, it is important to continue to collect data about users to understand who the users are. This is acknowledged by the Science Advisory Board (p. 544) as "lacking". One major area where it is important to understand users, for example, is in the domain of race/culture, especially given the multiple references to "changing demographics and growing Hispanic population". Note: Chapter three (FEIS, vol. 1) discussed the race of users. This chapter discusses the issue of culture while failing to explicitly mention White/Euro-American culture, unless that is what is meant by "ranchers" or "backpackers"? (e.g., adventure-seekers or traditional users as noted on p. 277). This fails to recognize that **all** people have culture. It is important to understand that public land agencies need to manage for all cultures; the dominant middle-class, well-educated, and able-bodied Euro-American culture has traditionally been the most prominent in previous management plans. A failure to provide explicit mention of the various dominant White cultures, fails to recognize this history of preference and privilege. Language needs to be changed to specifically indicate that certain sections are discussing cultures other than the dominant White/Euro-American culture (e.g., with	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Assumptions and Methodology, Use of Science, Scientific Advisory Board (SAB) Advisories, Advisory XIX. Visitor Data FEIS, Volume 1, Chapter 3, Human Use, Recreation FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Promotes Diversity of Users	We recognize the need and value of visitor data; see Volume 1, Chapter 4, Effects on Recreation, Assumptions and Methodology, Use of Science, Scientific Advisory Board (SAB) Advisories, XIX. Visitor Data, describing ongoing efforts to address that need. The Recreation section of Chapter 3 has been clarified to acknowledge that the majority of users are from White/Euro-American cultures. The original text: The forest/Monument sees a great deal of diversity in its visitors. Use by culturally diverse user groups is prevalent and growing (although still underrepresented, compared to the overall population)... …has been revised to read: The forest/Monument sees a great deal of diversity in its visitors, although the majority of users continue to be from White/Euro-American cultures. Use by other culturally diverse user groups is prevalent and growing (although still underrepresented, compared to the overall population)..." The Promotes Diversity of Users section in Chapter 4 has also been updated to acknowledge that the majority of users are from White/Euro-American cultures. The original text: Use of the Monument by culturally diverse user groups, especially Hispanics and Asians, is prevalent and growing… …has been revised to read; Use of the Monument by culturally diverse user groups, especially Hispanics and Asians, is prevalent and growing, although the majority of users continue to be from White/Euro-American cultures…

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	'underrepresented populations' sub-section) or it perpetuates only minority groups have "culture."		
32	Nina Roberts & Jackson Wilson, p. II-13: "Connection to Place" and "Recreation Niche" (p. 272-273): These are two valuable sections in Chapter 3. Review comments in the DEIS indicated additional information would help authenticate these claims; for this FEIS, sufficient detail is now included to support concepts and assumptions. Who evaluated the "Niche" detail and where the "criteria" came from was not clear during the prior review and is greatly improved in this FEIS.		No response necessary.
33	Nina Roberts & Jackson Wilson, p. II-13: Facilities/Affected Environment - Chapter 3, p. 279: States recreation facilities need to be updated due to modern use patterns and ADA accessibility. However, the limits to this development appear to be based on funding rather than conservation constraints. Although the document suggests that the constraints to these facility changes tend to be financial rather than environmental, it is possible that requirements for ADA accessibility and facilities can come into direct conflict with environmental protection (e.g., widening a trail for wheelchair access can destroy habitat).	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreationists, Protects Resources	In this programmatic level FEIS, this section recognizes that the limiting factor in accommodating accessibility for individuals with disabilities has been and continues to be financial. Without available financial resources, no projects can be undertaken. The specifics of how to accommodate accessibility for individuals with disabilities, while addressing environmental concerns, are analyzed in site-specific project planning and site design/ mitigations. The Effects on Recreation section of Chapter 4 discusses that all of the alternatives are designed to minimize the effect of development on the surrounding ecosystem. Accessibility is not specifically mentioned, as that is only one aspect of development and is required to be addressed by accessibility standards.
34	Nina Roberts & Jackson Wilson, p. II-13: Ongoing Activities/Affected Environment – Chapter 3, p. 306: There is a statement that says: "Dispersed recreation could potentially degrade natural resources that contribute to scenic quality as demand for these activities rises in the future." Important assertion yet	FEIS, Volume 1, Chapter 3, Human Use, Scenery Resources, Ongoing Activities	See the response to #28 above.

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	there is no research cited in-text establishing this connection. Throughout this section, there are valuable specifications noted yet this includes many assumed impacts (e.g., landscapes being susceptible to large scale disturbances and degradation of scenery resources) yet there is no cited data to back up claims thereby possibly misrepresenting what may be going on.		
35	Nina Roberts & Jackson Wilson, p. II-13: **Indirect Effects/Environmental Consequences**—Chapter 4 1. At the bottom of page 547, in reference to Alternative A, it notes that effects resulting from recreation uses will continue to occur such as "soil compaction and erosion; threats to plants, wildlife species, riparian areas, and water quality; littering; sanitation issues; the potential for wildfire starts from unattended/ abandoned campfires and vehicle exhaust systems; damage to cultural resources; and the spread of undesirable plants." It further states that such impacts would be exacerbated by high levels of use and low levels of maintenance. There is a paucity of citations to research showing any evidence of these connections to recreational use and impacts. 2. One of the few citations is a statement on page 583 including reference to a 1989 Army Corps of Engineers study linking vandalism and crowding. More such citations of recreational impacts on the environment are needed to strengthen the plausibility of the arguments and provide more data for managerial decisions.	1. FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Alternative A, the Baseline, Increasing Numbers of Recreationists, Protects Resources 2. FEIS, Volume 1, Chapter 4, Effects on Cultural Resources, Indirect Effects, All Alternatives, Recreation Activities	1. In the Effects on Recreation section of Chapter 4, the Alternative A analysis has been clarified to note that these effects are based on visual observation or monitoring. The original wording: The effects resulting from these uses will continue to occur, such as soil compaction and erosion; threats to plants, wildlife species, riparian areas, and water quality; littering; sanitation issues; the potential for wildfire starts from unattended/ abandoned campfires and vehicle exhaust systems; damage to cultural resources; and the spread of undesirable plants. Effects are particularly heightened in areas that are overused or abused and by limited resources available for maintenance. Social effects also occur, due to overcrowding and user conflicts between users who have different expectations than other users for their recreation experiences." Chapter 4, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreationists, Protects Resources, notes that site restoration for already affected sites is expected to occur in all alternatives; mitigations would be determined during site-specific project planning. …has been revised to read: The effects resulting from these uses will continue to occur, such as soil compaction and erosion; threats to plants, wildlife species, riparian areas, and water quality; littering; sanitation issues; the potential for wildfire starts from unattended/ abandoned campfires and vehicle exhaust systems; damage

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			to cultural resources; and the spread of undesirable plants. Effects are particularly heightened in areas that are overused or abused and by limited resources available for maintenance. Social effects also occur, due to overcrowding and user conflicts between users who have different expectations than other users for their recreation experiences. The noted effects are based on visual observation and monitoring." 2. The noted page is in the Effects on Cultural Resources section of Chapter 4, and is an example of the effects from recreation being analyzed in other resource sections.
36	Nina Roberts & Jackson Wilson, p. II-13: Appendix D – The Recreation Demand Analysis, as noted in response to Criteria #1 (see p. 2 of this report), has a variety of societal and demographic trends and user patterns noted. Details are provided in relation to some historical aspects, a few current recreation preferences, and a terse selection of recreation projections. The fact public lands are seeing an increasing number of outdoor recreation enthusiasts from diverse cultural backgrounds are appropriately cited. However, there is a lack of connection to explicitly why much of that matters in relation to any of the proposed Alternatives.	FEIS, Volume 2, Appendix D FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, etc.	The demand analysis is alternative independent, as stated in the first paragraph of Appendix D: …predicted recreation demand does not change by alternative. What does vary by alternative is how well the alternative responds to the predicted recreation demand. That variation is discussed in the effects on recreation section in Chapter 4… The effects of recreation on other resources, such as cultural resources, wildlife, scenery, socioeconomics, and transportation, are captured in those resource sections in Chapter 4.
37	Nina Roberts & Jackson Wilson, p. II-13: ***Acknowledgment and Documentation of Uncertainties Associated with the Science?*** This has considerably improved over the DEIS reviewed in 2010.		No response necessary.
38	Nina Roberts & Jackson Wilson, p. II-14: In order to guide critical decisions, managers must be able to understand the impacts	FEIS, Volume 1, Chapter 4, Effects on Human	The Recreation section in Chapter 4 is intended to analyze the Effects on Recreation, not the effects of recreation on the objects of interest and other resources. The effects of recreation on

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	on the objects of interests inherent in the different recreation management strategies. The organization of the document needs to be more closely tied to this central purpose (i.e., what is the conflict between providing recreational opportunity and the impact on the natural environment). Hence, the FEIS needs to more clearly establish a significant link between recreational use, environmental impact, and ultimately management decisions and consequences of those decisions.	Use, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreationists, Protects Resources FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Connects People to the Land (Places), Effects on Recreation from Management Activities FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Promotes Diversity of Uses, Day Use and Camping; Connects People to Others and Across Generations, Interpretation and Education Programs (Conservation Education)	other resources, such as cultural resources, wildlife, scenery, socioeconomics, and transportation are captured in those resource sections, although the Effects on Recreation section does have some discussion of interactions with other resources. The Effects on Recreation section of Chapter 4 discusses interactions among recreation opportunities and other multiple uses in the Protects Resources, Effects on Recreation from Management Activities, Day Use and Camping, Connects People to Others and Across Generations, Interpretation and Education Programs (Conservation Education), and Cumulative Effects sections in Effects on Recreation (also see Volume 2, Appendix L, response to PC #372). In the Protects Resources section under the Increasing Numbers of Recreationists heading in Chapter 4, the text notes that the standards and guidelines included in Appendix A (Volume 2) are designed to minimize the effects of recreation on other resources. During site-specific project planning in the future, mitigations (including best management practices) are expected to be identified for project implementation.

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		FEIS, Volume 2, Appendix L, Recreation, PC #372	
39	Nina Roberts & Jackson Wilson, p. II-14: As noted in evaluation criteria #1, the FEIS fails to organize the document around the statement of purpose. The implicit purpose is that the section on human use/recreation in the FEIS should focus on the conflict between providing recreation opportunity and preserving the natural environment/Monument ecosystems and unique features. This conflict is explicitly stated in Chapter 1 (p. 40): "There is a competition between different types of public use and a greater need to protect the objects of interest." However, there is a failure to consistently make this the guiding principle around the discussion of human uses/outdoor recreation in the FEIS overall. Additional information is necessary to understand how different management decisions about particular recreation uses and user groups will affect the environment/natural resources.	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Increasing Numbers of Recreationists, Protects Resources FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Connects People to the Land (Places), Effects on Recreation from Management Activities FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Promotes Diversity of Uses, Day Use and Camping	The Recreation section of Chapter 4 is intended to analyze the Effects ***on*** Recreation, not the effects ***of*** recreation on the objects of interest and other resources. The effects of recreation on other resources, such as cultural resources, wildlife, scenery, socioeconomics, and transportation are captured in those resource sections, although the Effects on Recreation section does have some discussion of interactions with other resources. The Effects on Recreation section of Chapter 4 discusses interactions among recreation opportunities and other multiple uses in the Protects Resources, Effects on Recreation from Management Activities, Day Use and Camping, Connects People to Others and Across Generations, Interpretation and Education Programs (Conservation Education), and Cumulative Effects sections in Effects on Recreation (also see Volume 2, Appendix L, response to PC #372). In the Protects Resources section under the Increasing Numbers of Recreationists heading in Chapter 4, the text notes that the standards and guidelines included in Appendix A (Volume 2) are designed to minimize the effects of recreation on other resources. During site-specific project planning in the future, mitigations (including best management practices) are expected to be identified for project implementation.

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		FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Connects People to Others and Across Generations, Interpretation and Education Programs (Conservation Education) FEIS, Volume 2, Appendix L, Recreation, PC #372	
40	Nina Roberts & Jackson Wilson, pp. II-14 to II-15: One of the conflicts between recreational users and the environment that is alluded to is the trade-off between the environment and human users' safety. 1. Chapter 2, p. 60 states that trees will be removed if they are a public safety hazard or 'attractive nuisance' (e.g., liability if visitors are tempted to climb on them or fall off logs). This is one area where the need to keep recreationalists safe could impact the environment and the objects of interest. Important to consider what Alternative(s) would enable a balance.	FEIS, Volume 1, Chapter 2, Alternatives Considered in Detail, Reader's Guide Alternative Descriptions, Ecological Restoration, Removal of Trees from Within the Monument/Tree Felling	1. The noted page describes the criteria for determining a clear need for removing trees from the Monument; the circumstances are alternative independent and would be subject to site-specific project analysis. 2. The noted page describes the circumstances under which trees may be felled in the Monument, which would be subject to site-specific project analysis.

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	2. Public access is one issue that could, therefore, impact environmental protection. Page 61 states that trees could require felling when they threaten public access.		
41	Nina Roberts & Jackson Wilson, p. II-15: The major recreational differences between the Management Alternatives (see Chapter 2, page 115) appear to be transportation issues. There are some minimal differences in motorized transportation access (see p. 120 Table 55, Strategy 9, 10, 11, 14, & 16 and Table 56, Strategy 3, 4, & 5). All this suggests that the primary conflict of concern between recreation use and preservation of the objects of interest is transportation. Similarly, Chapter 3, p. 364 notes "driving for pleasure is the single largest recreation use of Forest Service-managed lands." If indeed transportation is considered a core component of pursuing major recreational activities that pose an impact on the environment, then it seems that the recreation section should focus on the relation to transportation than other recreational activities (e.g., dispersed camping).	FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired Conditions, Strategies, and Objectives; Transportation System FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Provides Access FEIS, Volume 1, Chapter 3, Transportation System FEIS, Chapter 4, Effects on Human Use, Effects on Recreation, Assumptions and Methodology, Organization of the Analysis	The noted tables in Chapter 2 are strategies and objectives for Transportation, not for Recreation. The page noted in Chapter 3 is in the Transportation section, not the Recreation section. Transportation is only one facet of the recreation issue (see Chapter 4, Effects on Human Use, Effects on Recreation, Indirect Effects, Provides Access); other aspects affecting recreation are reflected in the other headings in Effects on Recreation (see Chapter 4, Effects on Human Use, Effects on Recreation, Assumptions and Methodology, Organization of the Analysis, for a list of those headings and subheadings).

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42	Nina Roberts & Jackson Wilson, p. II-15: The *management challenges* section as noted in relation to Hume Lake (Chapter 3, p. 293) starts to discuss some of the issues that could be essential components of Human Uses segments in the FEIS. For instance, the catchphrase "unmanaged or concentrated recreation activity that could lower scenic integrity in areas that do not provide facilities" is used to suggest recreation-based impacts on the environment. There are also some references to litter, safety, and the potential for wildfires. Whether or not this latter context refers to human induced wildfires is unclear. Furthermore, this phrase seems contradictory to need to protect objects of interest (also p. 293): "Visitors have higher expectations for scenery, and scenic integrity needs to be improved in overstocked forests, especially in areas that have missed burn cycles or in plantations." This statement seems to be used to suggest how visitors/forest users may pressure management to take action that benefits their recreational experience rather than protection of the natural and cultural resources.	FEIS, Volume 1, Chapter 3, Human Use, Scenery Resources, Landscape Character Descriptions, Rivers and Lakes, Hume Lake	This paragraph was modified and citations added for clarification. The original wording: Management challenges include risks associated with wildfire and the interface with the Hume Lake Christian Camps and Kings Canyon and Sequoia National Parks; and unmanaged or concentrated recreation activity which has the potential to lower scenic integrity in areas that do not provide facilities. Visitors have higher expectations for scenery, and scenic integrity needs to be improved in overstocked forests, especially in areas that have missed burn cycles or in plantations. …was modified to read: Management challenges include risks associated with: 1. Wildfire, 2. Recreation interface with the Hume Lake Christian Camps and Kings Canyon and Sequoia National Parks, 3. Dispersed recreation activity which has the potential to lower scenic integrity in areas that do not provide facilities (Cole 1993, USDA Forest Service 1995c), and 4. Improvement of scenic resource in overstocked forests especially in areas that have missed burn cycles or in plantations (Ryan 2005).
43	Nina Roberts & Jackson Wilson, p. II-15: Mitigating user conflicts to increase enjoyment for everyone is important, generally, yet should take precedent when there is an impact on the objects of interest. Some user groups may have a much lighter negative impact or a positive impact on the objects of interest and other natural/cultural resources. The different impact by user group is not	FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Scenery Resources, Effects of Recreation Management on Scenic Integrity	Citations were added and descriptions modified for clarification. Some of the statements referred to are based on personal observation, so that was identified where appropriate. For example, this paragraph in Chapter 4: Recreation development and use in the Monument have the potential to affect scenery resources. Projected increases in visitation (see the effects on recreation section in this chapter and the recreation demand analysis in Appendix D in the final EIS) are expected to increase these effects on scenery

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	clearly described and therefore fails to adequately inform policy. For example, which has less impact per user, dispersed camping along roads or concentrated camping? There is some speculation throughout (including Chapter 4, p. 565), but there is little to no research cited.		resources. Recreation use, especially concentrated use without facilities to mitigate the effects of that use, is expected to degrade scenic quality by erosion, compaction, removal of vegetation, accumulation of litter, and increases in sanitation issues. Restroom facilities help to protect popular areas from sanitation issues. Visitor information stations can encourage responsible use of the natural environment and lessen effects to scenery. In these ways, developed facilities can mitigate effects of visitor use on resources and improve scenic integrity in all of the alternatives. …has been modified to read: Recreation development and use in the Monument have the potential to affect scenery resources. Visitation is projected to increase in the future (see the effects on recreation section in chapter 4 and the recreation demand analysis in Appendix D in the final EIS) and this use is expected to increase effects on scenery resources. Based on personal observation recreation use, especially use without facilities to mitigate the effects of that use can degrade scenic quality by erosion, damage or absence of vegetation, accumulation of litter, and sanitation issues. These environmental conditions lower scenic integrity (USDA Forest Service 1995c). The Forest Service provides recreation facilities to the public not only for visitor convenience but also for resource protection. Restroom facilities help to protect popular areas from sanitation issues. Designated pathways and parking protect soil resources and vegetation from trampling. Visitor information stations encourage responsible use. In these ways, developed facilities can mitigate effects of visitor use on resources that contribute to scenery improving scenic integrity in all of the alternatives. Studies support the strategy of minimizing recreation use impact by concentrating use. In heavily used areas increasing use is likely to have few negative effects. Where use is widely

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			dispersed, more area will be disturbed unless use levels are very low. Most studies report the amount of impact increases rapidly with initial increases in the amount of use in areas with relatively low levels of use (Cole, 1993). Alternatives that allow or encourage more dispersed use could have negative impacts on natural resources that contribute to scenic quality. Alternatives that allow for the development of more recreation facilities could protect scenery resources as use and visitation increases. Identification of user groups and impacts will be described at project level analysis.
44	Nina Roberts & Jackson Wilson, p. II-15: Recreation Demand Analysis / Summary in the FEIS/vol. 1 versus Appendix D/vol. 2: As noted before in the previous review, a great deal of this material is redundant and repeated verbatim. In vol. 1/FEIS, for example, starting on p. 281 a broad spectrum of that content is noted as a "summary" yet is verbatim from what is in Appendix D. This is not very effective when the Appendix is positioned throughout the FEIS as a true "analysis" designed to help inform decisions. Instead it appears as if a series of 11 categories are presented as considerations/ suggestions to meet the needs of the 2000 Proclamation. The details in either instance (analysis and/or summary) should have a stronger connection to the Management Alternatives as reflected in the current FEIS.	FEIS, Volume 2, Appendix D FEIS, Volume 1, Chapter 3, Human Use, Recreation, Recreation Demand Analysis Summary/Public Involvement FEIS, Volume 1, Chapter 4, Effects on Human Use, Effects on Recreation, etc.	The intent of the Recreation Demand Analysis Summary in Chapter 3 is to extract key points from the longer analysis in Appendix D for the benefit of many readers who may not be interested in the level of detail presented in Appendix D and to help "set the stage" for the analysis in Chapter 4. Only if readers are interested in more detailed information would they need to consult Appendix D. Appendix D is only an analysis to predict demand. The 11 categories mentioned were derived from a 1½-year collaborative public involvement process (this information is also used as one source of information in the recreation demand analysis). Through that collaborative process, the public identified what is important to them for recreation in the Monument. The Chapter 4 analysis of the Effects on Recreation is organized around those topics, so that people can compare the alternatives to see how well they address predicted demand and the topics they identified as important to them. Predicted demand and the items of public concern are alternative independent. As stated in the first paragraph of Appendix D: "…predicted recreation demand does not change by alternative. What does vary by alternative is how well the alternative responds to the predicted recreation demand. That variation is discussed in the effects on recreation section in Chapter 4…" The effects of recreation on other resources, such as cultural resources, wildlife, scenery,

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			socioeconomics, and transportation, are captured in those resource sections in Chapter 4.
45	Scott Stephens, p. II-16: 1) **Giant sequoia ecology** I believe this section reads well but includes very few citations to the literature. I believe including more citations is very important and believe many people from the public and from environmental groups will be looking for more citations.	FEIS, Volume 1, Chapter 3, Vegetation, Giant Sequoia Ecology, Historic Harvesting in Giant Sequoia Groves	Citations were added and the discussion clarified in the Giant Sequoia Ecology section of Chapter 3. For example, this paragraph in Chapter 3… Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which exposes mineral soils and allows light to reach the ground, has resulted in many groves lacking natural sequoia regeneration less than thirty years old. Sequoia planted during this time have survived and established well in the limited openings available for regeneration projects. …was modified to read: Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which create canopy gaps and expose mineral soils, has resulted in many groves lacking significant natural sequoia regeneration less than thirty years old (e.g., Stephenson 1994; Meyer and Safford 2011b; York et al. 2012). The lack of more favorable summer rains or soil moisture during the summer and fall has likely been an additional factor in poor survival and growth of new seedlings (e.g., Stephens et al. 1999, York et al. 2010). Sequoia seedlings planted during this time have survived and established well in the limited openings available for regeneration projects.
46	Scott Stephens, p. II-16: Pg 159, 2nd paragraph on left column. This is a nice summary of the main threats to giant sequoia health but needs a citation or two.	FEIS, Volume 1, Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Environmental	This sentence has been modified and a citation added for clarification and support. The original wording: The main threats to giant sequoia health are root diseases, wind storms, wildfire, and a changing climate. ...has been modified to read; The main threats to giant sequoia health are altered fire

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		Threats to Giant Sequoia	regimes, emergent disease complexes, changes in land use and fragmentation, invasive species, air pollution, and a changing climate (York et al. 2012)
47	Scott Stephens, p. II-16: 3rd paragraph, text reads 'Clearing land, burning, or even growing too many trees above a grove may have a similar effect on water available to the giant sequoia.' Needs a citation.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Environmental Threats to Giant Sequoia FEIS, Volume 1, Chapter 4, Effects on Groundwater, Assumptions and Methodology, Cumulative Effects Analysis and Assumptions	This sentence has been modified and citations added for clarification and support. The original wording: Clearing land, burning, or even growing too many trees above a grove may have a similar effect on water available to the giant sequoia. ...has been modified to read; Clearing land, burning, or even growing too many trees within a grove may also influence water availability to giant sequoia (Meyer and Safford 2011) and other tree species in mixed conifer forests (Zald et al. 2008). Effects on groundwater, including areas above groves, are discussed in the Effects on Groundwater section of Chapter 4: Numerous studies have been conducted demonstrating that changes in forest density can cause changes in water yield (Trundel et al. 2010).
48	Scott Stephens, p. II-16: Pg 160, 2nd paragraph in left column. Text reads 'Vegetation that has higher amounts of heterogeneity in various major characteristics tend to be resilient and able to adapt to change and to withstand and respond to stresses caused by such events as insect attacks, extended droughts, diseases, and wildfire.' This is a big statement and needs several citations. I actually agree with it but such a statement needs to be grounded in the literature.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Heterogeneity and Resiliency	This paragraph was edited and a citation added for clarification and support. The paragraph which read: Vegetation that has higher amounts of heterogeneity in various major characteristics tends to be more resilient and able to adapt to change and to withstand and respond to the stresses caused by such events as insect attacks, extended droughts, diseases, and wildfire. This ability to withstand and respond to these events is considered the resiliency of the vegetation. This section discusses the key characteristics of vegetation age (seral stages), species composition, and forest structure as a reflection of overall heterogeneity and the resiliency of vegetation. …was modified to read: The amount of change or disturbance impact that can be

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			absorbed by an ecosystem before it is redefined by a different set of ecosystem processes and structures is considered the resilience of an ecosystem. Forest ecosystems that are resilient to disturbances such as Vegetation that has higher amounts of heterogeneity in various major characteristics tends to be more resilient and able to adapt to change and to withstand and respond to the stresses caused by such events as insect attacks, extended droughts, diseases, and wildfire, tend to exhibit high structural heterogeneity (North et al. 2009). This ability to withstand and respond to these events is considered the resiliency of the vegetation. This section discusses the key characteristics of vegetation age (seral stages), species composition, and forest structure as a reflection of overall heterogeneity and the resiliency of vegetation.
49	Scott Stephens, p. II-16: Pgs 161-162. Last sentence that begins on Pg 161 and ends in the first paragraph of Pg 162. I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Historic Harvesting in Giant Sequoia Groves/ Giant Sequoia Regeneration	This paragraph was moved from the Historic Harvesting in Giant Sequoia Groves section to the Giant Sequoia Regeneration section, edited, and multiple citations added, including Stephens et al. 1999. The paragraph which read: Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which expose mineral soils, has resulted in many groves lacking natural sequoia regeneration less than thirty years old. Sequoia planted during this time have survived and established well in the limited openings available for regeneration projects. …was modified to read; Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which create canopy gaps and exposes mineral soils and allows light to reach the ground, has resulted in many groves lacking significant natural sequoia regeneration less than thirty years old (e.g., Stephenson 1994; Meyer and Safford 2011b; York

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	Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.		et al. 2012). The lack of more favorable summer rains or soil moisture during the summer and fall has likely been an additional factor in poor survival and growth of new seedlings (e.g., Stephens et al. 1999, York et al. 2010). Sequoia seedlings planted during this time have survived and established well in the limited openings available for regeneration projects.
50	Scott Stephens, pp. II-16 to II-17: 1. Pg 162, 2nd paragraph on right column. Text reads 'These two species, which were not as common when humans burned the groves more frequently…' It is not possible to separate the influence of past Native American ignitions from those of lightning. This sentence points to the influences of past human ignitions, I would add in lightning as well. Both were important in this ecosystem. 2. Right column, last paragraph. Here it is written that the primary disturbance regime pre 1875 was a high frequency, low intensity fire regime. I would write low-moderate intensity. Not all fires were low intensity, some killed groups of trees and others killed vegetation over larger areas. Today I think we recognize that these fire regimes were more complex than only low intensity in mixed conifer forests. 3. Next sentence reads 'This fire regime typically created a mosaic of vegetation and gaps, with the gaps ranging in size from < ¼ acre to two acres in size.' This sentence needs a citation. It is a very concise statement and I don't know if the literature will back it up. The next sentence on the production of larger gaps of possibly several hundred acres in size also needs a citation.	1. FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Historic Harvesting in Giant Sequoia Groves 2. FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves 3. . FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves 4. . FEIS; Volume 1; Chapter 3; Vegetation,	1. This paragraph, which read: White fir and incense cedar are often abundant. These two species, which were not as common when humans burned the groves more frequently, make up about 75 percent of the seedling-sized trees in groves, with black oak and sugar pine being the next most abundant (see Appendix I in the FEIS). …has been modified, and citations added, to read: White fir and incense cedar are well-adapted to low understory light conditions with relatively moist soils, and are often highly abundant in closed-canopied coniferous stands (Gray et al. 2005; Zald et al. 2008). These two species, which were not as common when the groves burned more frequently, make up about 75 percent of the seedling-sized trees in groves, with black oak and sugar pine being the next most abundant (see Appendix I in the FEIS). 2. This paragraph, which read: The structure of the regeneration that has become established in the last 120 years is very different from regeneration established prior to that time. The primary disturbance agent in the 1000-year period up until 1875 was a regime of low-intensity, high frequency fires... …has been modified to read: The structure of the regeneration that has become established in the last 120 years is very different from regeneration established prior to that time. The primary disturbance agent in the 1000-year period up until 1875 was a regime of low to moderate intensity, high frequency fires...

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		including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves	3. These sentences, which read: This fire regime typically created a mosaic of vegetation and gaps, with the gaps ranging in size from <1/4 acre to two acres in size… Larger gaps were more infrequent, although intense wildfires were observed that were possibly several hundred acres in size. ...have been modified, and a citation added, to read: This fire regime typically created a mosaic of vegetation and gaps, with the gaps typically less than 0.5 acre in size… Larger gaps were more infrequent, although intense wildfires were observed that were possibly several hundred acres in size...as described by Piirto and Rogers (1999).
51	Scott Stephens, p. II-17: Pg 163, top paragraph in right column. I am very familiar with Piirto and Rogers 1999. It is a solid publication with good information. However it seems that this section of the EIS uses it too much and does not connect to the broader giant sequoia literature.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves	This section has been modified and multiple citations added for clarification and support. For example, the paragraph in question, which read: The approximately 1,000 acres of openings average 10 to 15 acres in size, and many of these openings were re-planted predominantly to pines and lesser amounts of other species such as white fir, sugar pine, and giant sequoia. Field inventories and field observations indicate that other species are becoming more common through natural succession, however these openings are still dominated by the planted trees and the average gap sizes are outside the range of natural variability (Piirto & Rogers 1999). ...has been modified, and citations added, to read: The approximately 1,000 acres of openings average 10 to 15 acres in size, which is often outside the estimated natural range of variability for giant sequoia groves (Bonnickson and Stone 1981, Demetry 1995, Piirto & Rogers 1999) and Sierra Nevada mixed conifer forests (North et al. 2004, Knapp et al. 2012). Many of these canopy openings were re-planted predominantly to pines and lesser amounts of other species such as white fir, sugar pine, and giant sequoia. Although shade-tolerant tree species are becoming more common in giant sequoia groves

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			due to the absence of fire, mechanically-created canopy openings may still retain substantial densities of both planted and naturally regenerated giant sequoia and other shade-intolerant trees (York et al. 2010, Meyer and Safford 2011b).
52	Scott Stephens, p. II-17: Pg 164, first sentence on page. My comment on giant sequoia regeneration applies here as well. The comment is I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Historic Harvesting in Giant Sequoia Groves/ Giant Sequoia Regeneration	This paragraph was replaced with an edited version from the Historic Harvesting in Giant Sequoia Groves section, and multiple citations added, including Stephens et al. 1999. The paragraph which read: Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which expose mineral soils, has resulted in many groves lacking natural sequoia regeneration less than thirty years old. Sequoia planted during this time have survived and established well in the limited openings available for regeneration projects. …was modified to read; Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which create canopy gaps and exposes mineral soils and allows light to reach the ground, has resulted in many groves lacking significant natural sequoia regeneration less than thirty years old (e.g., Stephenson 1994; Meyer and Safford 2011b; York et al. 2012). The lack of more favorable summer rains or soil moisture during the summer and fall has likely been an additional factor in poor survival and growth of new seedlings (e.g., Stephens et al. 1999, York et al. 2010). Sequoia seedlings planted during this time have survived and established well in the limited openings available for regeneration projects.
53	Scott Stephens, p. II-17: Figure 5. Where does your desired % basal area and desired % of trees come from? Needs to be documented.	FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired	The vegetation desired conditions are based on local knowledge, LANDFIRE simplified models available at www.landfire.gov, USDA Forest Service Vegetation Type Mapping (VTM) available at vtm.berkeley.edu, and Teakettle Experimental Forest

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		Conditions, Strategies, and Objectives; Vegetation Desired Conditions	presettlement size class distributions (North et al. 2007). These sources have been cited in the Chapter 2 discussion of Vegetation Desired Conditions.
54	Scott Stephens, p. II-17: Pg 164, right paragraph. Sentence reads 'With a lack of adequately disturbed soils and canopies, giant sequoia only averages about 1 seedling per acre.' My comment above on sequoia regeneration applies here as well. Where did this data come from? (1seedling/acre)? Sentence is same paragraph mentions the desirability of 44 giant sequoia seedlings per acre? Where does this number come from? 10% of total??	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Stand Structure in Sequoia Groves FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired Conditions, Strategies, and Objectives; Vegetation Desired Conditions	The current number of seedlings per acre is from the giant sequoia grove inventory data (see Appendix I in Volume 2). The vegetation desired conditions are based on local knowledge, LANDFIRE simplified models available at www.landfire.gov, USDA Forest Service Vegetation Type Mapping (VTM) available at vtm.berkeley.edu, and Teakettle Experimental Forest presettlement size class distributions (North et al. 2007). These sources have been cited in the Chapter 2 discussion of Vegetation Desired Conditions.
55	Scott Stephens, pp. II-17 to II-18: Pg 165-166. Last sentence of page 165 to first sentence of Pg 166. I agree that a ballpark width of at least twice the edge tree height provides a basis for opening sizes but this is not needed for successful giant sequoia regeneration. Smaller gaps have worked well too. Rob York's recent publications have pointed this out from Whitiker's Forest.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Gaps	This sentence has been modified and information added from additional York publications for clarification and support. This paragraph, which read: York at al. (2009) found that growth rates of young giant sequoia seedlings increased rapidly when openings were increased from 0.1 acres to 0.5 acres. The rate of increase was less in openings from 0.5 to 1 acre in size. None of the above studies were designed to determine the optimal opening size, but silvicultural designs where opening widths are at least twice the edge tree heights provide a basis to start from that is directly related to the quantity of sunlight and easy to measure in the field. In many forest types across the country, growth of shade intolerant trees can be expected to benefit from increases in sunlight.

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			...has been modified, and citations added, to read: York at al. (2009) found that growth rates of young giant sequoia seedlings and sugar pine increased rapidly when openings were increased from 0.1 acres to 0.5 acres. The rate of increase was less in openings from 0.5 to 1 acre in size. However, seedlings of both tree species had similar growth rates in the center of gaps that varied between 0.2 and two acres in size. In addition, in an experimental canopy gap study in Redwood Mountain Grove, York et al. (2010) demonstrated that planted giant sequoia seedling growth rates more than doubled as gap size increased from 0.1 acre to 0.6 acre, even though seedling mortality rates did not vary with gap size. These combined experimental studies demonstrate that even relatively small canopy gaps (i.e., 0.4 to 0.7 acre) can significantly increase the growth rates of giant sequoia seedlings and other tree species, such as sugar pine (e.g., York et al. 2004).
56	Scott Stephens, p. II-18: Pg 166-167. Last sentence that begins on Pg 166 and ends on Pg 167. You list several aspects of trees that can offer resistance to fire effects. I would add a citation or two to this line.	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Fuel Loadings	This sentence, which read: The resistance of the tree in terms of physics and tree physiology depends on many factors such as species, bark thickness (insulation), intensity of heat at the base of the stem, and the duration of the heating event. ...has been modified, and citations added, as follows: Tree mortality resulting from the effects of fire depends on many factors such as bark thickness (insulation), tree diameter, crown damage, intensity of heat at the base of the stem, duration of the heating event, surface and ground fuel consumption, and weather (Ryan and Reinhardt 1988, Ryan and Amman 1996, Stephens and Finney 2002).
57	Scott Stephens, p. II-18: Pg 167 3rd paragraph in right column. Sentence reads 'Fire return intervals in giant sequoia ecosystems may have ranged from a few years to several hundred depending on	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant	This sentence, which read: Fire return intervals in giant sequoia ecosystems may have ranged from a few years to several hundred years depending on the location and size.

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	the location and size.' I commented on this sentence in the Draft EIS and wrote I have not seen information on return intervals of several hundred years in giant sequoia groves expect possibly the last 100 years because of fire exclusion. Tom Swetnam's work is the best in this area. He has one recent paper; it is Swetnam, T.W., C. Baisan, A. Caprio, P. Brown, R. Touchan, R.S. Anderson, and D. Hallett. 2009. Multi-millennial fire history of the Giant Forest, Sequoia National park, California, USA. Fire Ecology 5: 120-150. The text on fire return intervals of up to 100 years needs to be removed or supported with a citation.	Sequoia Ecology; Fuel Loadings	...has been modified to read: Historically, the mean fire return intervals in giant sequoia ecosystems typically ranged between 10 and 20 years (Swetnam et al. 2009, Van de Water and Safford 2011), depending on the topography and scale of analysis.
58	Scott Stephens, p. II-18: 1. Pg 167, last sentence in left hand column. Should add a citation to support this sentence. 2. First paragraph on right hand column, text on why giant sequoia regeneration has been low in the last several decades. My previous comment applies here too. I agree that the lack of recent disturbance over the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Ecology; Fuel Loadings FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Regeneration	1. This sentence, which read: Sequoia ecosystems are highly variable in moisture and topography and have adapted to fire return intervals that are irregular in both location and length of time. ...has been modified, and a citation added, to read: Nearly all groves in the Monument have missed several maximum fire return intervals, resulting in negative impacts to sequoia ecosystems (e.g., increased insect and disease risk, reduced sequoia regeneration) and increased risk of large high-severity wildfires (York et al. 2012). 2. This paragraph was edited and multiple citations added, including Stephens et al. 1999. The paragraph which read: Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which expose mineral soils, has resulted in many groves lacking natural sequoia regeneration less than thirty years old. Sequoia planted during this time have survived and established well in the limited openings available for regeneration projects.

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	relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95. 3. 2nd paragraph in right hand column. Text included again on the effects of human ignitions. My previous comment applies. It is not possible to separate the influence of past Native American ignitions from those of lightning. This sentence points to the influences of past human ignitions, I would add in lightning as well. Both were important in this ecosystem. 4. Last sentence of this paragraph. My previous comment on sequoia regeneration applies here too, can't expect it if you only create mineral soil and openings.		…was modified to read; Many groves currently have scattered trees or groups of small sequoia trees 30 to 100 years old in small openings or other disturbed areas. The lack of recent disturbances, such as fire and harvesting over the last decade or more which create canopy gaps and exposes mineral soils and allows light to reach the ground, has resulted in many groves lacking significant natural sequoia regeneration less than thirty years old (e.g., Stephenson 1994; Meyer and Safford 2011b; York et al. 2012). The lack of more favorable summer rains or soil moisture during the summer and fall has likely been an additional factor in poor survival and growth of new seedlings (e.g., Stephens et al. 1999, York et al. 2010). Sequoia seedlings planted during this time have survived and established well in the limited openings available for regeneration projects. 3. This paragraph, which read: White fir and incense cedar are often abundant. These two species, which were not as common when humans burned the groves more frequently, make up about 75 percent of the seedling-sized trees in groves, with black oak and sugar pine being the next most abundant (see Appendix I in the FEIS). …has been modified, and citations added, to read: White fir and incense cedar are well-adapted to low understory light conditions with relatively moist soils, and are often highly abundant in closed-canopied coniferous stands (Gray et al. 2005; Zald et al. 2008). These two species, which were not as common when the groves burned more frequently, make up about 75 percent of the seedling-sized trees in groves, with black oak and sugar pine being the next most abundant (see Appendix I in the FEIS). 4. The last part of this paragraph, which read: Giant sequoia seedlings and saplings may be abundant in occasional openings, but are rare under mature canopies.

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			Giant sequoia does not normally regenerate naturally without adequately disturbed soils and openings in canopies. ...has been modified, and citations added, to read: Giant sequoia seedlings and saplings may be abundant in occasional openings, but are rare under mature canopies. Giant sequoia does not normally regenerate naturally without adequately disturbed soils and openings in canopies. Sugar pine regeneration often requires a combination of adequate soil moisture and litter cover, but seedlings can be found under variable canopy cover conditions (Gray et al. 2005). Sugar pine, ponderosa pine and Jeffrey pine seedlings can benefit from prescribed fire and mechanical treatments that increase understory light and available soil moisture (York et al. 2004; Moghaddas et al. 2008, Zald et al. 2008).
59	Scott Stephens, pp. II-18 to II-19: Pg 168. 2nd paragraph in left column. Where are human caused fires more frequent than lighting caused in giant sequoia groves? In a recreation area? This line is not clear. Next sentence. Yes I agree that newly established giant sequoia seedlings would need some time to develop resistance to fire. However fires could still burn quite frequently in the groves but discontinuous surface fuels would allow fire to miss many newly established areas. Areas underneath the drip line of existing trees would burn regularly from fine fuel production. However areas in gaps could be missed by some fires until local fuels accumulated enough to carry fire. 3rd paragraph in same column. Sentence that says the greatest concern to giant sequoia ecosystems is not low regeneration but heavy	FEIS; Volume 1; Chapter 3; Vegetation, including Giant Sequoias; Giant Sequoia Regeneration	These paragraphs have been updated and many citations added to this section for clarification and support. For example, this paragraph: Young sequoias must grow large enough to survive the effects of fires, especially when human-caused fires are more frequent than natural fires sparked by lightning. It is also likely that one or more decades are required between burning to enable a young sequoia to grow large enough to withstand the heat at the base of the stem. Sporadic regeneration of the species in clusters of a few trees or small even-aged patches up to an acre is more an ecological trait and an adaptation to periodic fires than an environmental concern. Even- aged cohorts greater than an acre are rare, but may be found as a result of past stand replacement events like a wildfire or mechanical harvest. ...has been modified to read: Although young sequoias must grow large enough to survive the effects of repeated fires, sequoia regeneration may benefit from repeated prescribed burning. In the Sequoia and Kings Canyon National Parks, giant sequoia regeneration increased following singe-entry prescribed burns, and increased again

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	build up of ladder and surface fuels. I would probably agree with this for the short term but a citation should be added. Last paragraph in left column. Sentence reads 'Young giant sequoia seedlings, however, can tolerate and may even needs some shade until their root systems are established.' The line needs a citation.		following second-entry burns (York et al. 2011). In a related study, giant sequoia regeneration was detected following second-entry burns but not first-entry burns (Webster and Halpern 2010). These results emphasize that repeated prescribed burning in sequoia groves can have beneficial effects on giant sequoia regeneration. Patches of giant sequoia regeneration in clusters of a few trees or small even-aged patches frequently occur in canopy gaps of up to an acre (Demetry and Duriscoe 1996; Stephenson 1996). Even-aged cohorts greater than approximately an acre are relatively uncommon, but may be found as a result of past stand-replacing wildfire or mechanical harvest (Bonnickson and Stone 1982; Stephenson 1996).
60	Scott Stephens, p. II-19: Pg 389. Hazard section. Should add topography to this section.	FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Use of Science; Scientific Advisory Board (SAB) Advisories; Advisory V. Prioritizing Areas of Land	This section is quoted from the Scientific Advisory Board (SAB) Advisory V, Prioritizing Areas of Land.
61	Scott Stephens, p. II-19: Pg 392, 3rd paragraph in left column. Sentence reads 'No "downsides" were signaled out for mechanical treatments since these treatments generally accomplished surface and ladder fuels reductions.' There are challenges to mechanical only treatments too. First many of these systems leave activity fuels in place after treatments which	FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Trade-offs	This paragraph refers to this citation (Schwilk et al. 2009) as a source for this discussion.

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	increased fire hazards. Mechanical only treatments are also not true surrogates of fire since there is no burning included. Processes such as regeneration and nutrient cycling would be quite different than what happened during fire treatments. A citation for this is Schwilk, D.W., J.E. Keeley, E.E. Knapp, J. McIver, J.D. Bailey, C.J.Fettig, C.E. Fiedler, R.J. Harrod, J.J. Moghaddas, K.W. Outcalt, C.N.Skinner, S.L. Stephens, T.A. Waldrop, D.A. Yaussy, and A. Youngblood. 2009. The national Fire and Fire Surrogate study: effects of fuel reduction methods on forest vegetation structure and fuels. Ecological Applications 19: 285-304.		
62	Scott Stephens, p. II-19: Pg 394, first paragraph on left column. Not sure what 'limited fire spread lightning strikes' are?	FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Resiliency	This sentence, which originally read: Large wildfires and periodic multi-year droughts, with associated bark beetle infestations, have been the most easily recognized, although more subtle effects are brought about by windthrow, root disease, and limited fire spread lightning strikes. ...has been modified to read: Large wildfires and periodic multi-year droughts, with associated bark beetle infestations, have been the most easily recognized, although more subtle effects are brought about by windthrow, root disease, and small lightning fires."
63	Scott Stephens, p. II-19: 1. Pg 395, first paragraph in left column. Sentence reads 'Activities that create openings for regeneration, reductions in ground and ladder fuels, …..' Should change ground, surface, and ladder fuels. 2. Last paragraph in the left column of Pg 395. My previous comment applies here I agree that the lack of recent disturbance over	1. FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Heterogeneity	1. This sentence, which originally read: Activities that create openings for regeneration, reductions in ground and ladder fuels, growing space and nutrition for featured trees, and access for management and recreation are likely to lead to sustainable ecosystems that are resilient. ...has been modified to read: Activities that create openings for regeneration; reductions in ground, surface, and ladder fuels; growing space and nutrition

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	the last decades which exposes mineral soil and allows light to reach the ground has been a factor in low giant sequoia regeneration. However having these two things does not guarantee successful regeneration of giant sequoia. In Stephens et al. 1999 we did a study at Mt. Home State Forest that created many opening with bare mineral soil and high light but we still had very low sequoia regeneration. One of the reasons was the fires that we used did not scorch cones in the adjacent giant sequoia canopy and it was a relatively dry period. My point is just creating these openings with bare mineral soil does not guarantee successful regeneration of this species. You also need a significant seed source. Stephens, S.L, D. Dulitz, and R.E. Martin, 1999. Giant Sequoia regeneration in group selection openings in the Southern Sierra Nevada. Forest Ecology and Management 120: 89-95. 2nd paragraph in right column. Again a seed source will also be needed for successful sequoia regeneration. Demetry and Duriscoe 1996 had many fires of moderate intensity and this opened the cones of adjacent giant sequoia trees. I saw this in the groves during many visits.	2. FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Giant Sequoia Regeneration	for featured trees; and access for management and recreation are likely to lead to sustainable ecosystems that are resilient. 2. The Giant Sequoia Regeneration section referred to in this comment has been modified and multiple citations added for clarification and support. Citations added include the Stephens et al 1999 and the Demetry and Duriscoe 1996.
64	Scott Stephens, p. II-20: Pg 396, 1st paragraph on right column. Sentence reads 'Where fire is the only disturbance in the last 20 years, patches of sequoia regeneration area rare in most groves.' There are so few groves in the Monument that have been burned over this	FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology;	The sentence commented on, which originally read: Where fire is the only disturbance in the last twenty years, patches of sequoia regeneration are rare in most groves. ...has been modified to read: Where low-severity fire is the only disturbance in the last twenty years, patches of sequoia regeneration are rare in most groves (Mutch and Swetnam 1995; Meyer and Safford 2011b).

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	time, most of the groves burned are in the National Parks. The parks have been generally successful in regenerating sequoia in the groves with burning alone. Where is the citation that supports this statement? I think it will probably need to be removed.	Assumptions for All Alternatives; Giant Sequoia Regeneration	
65	Scott Stephens, p. II-20: 1. Pg 397, top paragraph on left column, last sentence. Yes planting giant sequoia seedlings is one way to regenerate groves but so is the use of appropriate prescribed fire. As I wrote above, the National Parks have been successful in regenerating sequoia with a burning only program. The key is to have some moderate intensity fire in this program, not all low intensity. There is no doubt that such a program would also promote sequoia regeneration. 2. 2nd paragraph in right column. Sentence states 'Research has been done over the past several years to help determine the effects of gap size for the regeneration of giant sequoia and other species.' Need to add the citations to this sentence. 3. Resiliency paragraph in right column. Sentence reads 'These alternatives rely mainly on fire and would have a reduced chance to positively affect resiliency.' This statement would have to be supported by citations. There is no doubt that appropriate fire only treatments used multiple times will increase resiliency of these forest ecosystems.	1. FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Giant Sequoia Regeneration 2. FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Assumptions and Methodology; Assumptions for All Alternatives; Giant Sequoia Regeneration 3. FEIS; Volume 1; Chapter 4; Vegetation, including Giant Sequoias; Indirect Effects, Resiliency	1. This sentence reflects on the chances of survival, based on field observations, and recommends planting for higher survival rates. 2. This sentence, which originally read: Research has been done over the past several years to help determine the effects of gap size for the regeneration of giant sequoia and other species. ...has been modified to read: Canopy gap size directly influences the growth and density of giant sequoia and other conifer regeneration (York et al. 2004, Meyer and Safford 2011b). Growth rates of giant sequoia regeneration increases with greater light availability associated with increased gap size (0.1 to 1 acre) and greater distance from gap edge (York et al. 2010). 3. This sentence is an estimate of the effects of these alternatives, comparing these alternatives that rely mainly on fire to others that use a combination of treatments.

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66	Scott Stephens, p. II-20: **Fire and fuels** I believe this section has been improved during revision. Pg 175, last sentence of left column to first sentence of right column. The staff of the Sequoia Forest and Monument should be congratulated for the management of the Sheep and Lion fires. I think this type of fire management will be critically important part of any land management strategy adopted in the Sierra Nevada.	FEIS, Volume 1, Chapter 3, Fire and Fuels, Restoration and Maintenance, Maintaining Fire as an Ecological Process	No response necessary. The comment refers to the following text in the FEIS: In the summer of 2010, the Sequoia National Forest managed the Sheep Fire with the Sequoia and Kings Canyon National Parks covering over 9,000 acres in the Monument and national parks. This fire was allowed to burn into the Monarch Giant Sequoia Grove, effectively reintroducing fire and lowering hazardous fuel loading on fifty-two acres of giant sequoia trees.
67	Scott Stephens, p. II-20: **Effects on fire and fuels** This section has been improved during revision. Pg 403, first paragraph in left column, last sentence reads 'In areas with heavy fuel accumulations, mechanical means such as hand cutting or self-propelled maybe necessary before fire is reintroduced.' Since the National Parks have been burning for decades and don't use mechanical methods (I realize that they did use some mechanical methods in giant sequoia groves early in their program) I think this sentence may be better with a small revision In areas with heavy fuel accumulations, mechanical means such as hand cutting or self-propelled could be used before fire is reintroduced.	FEIS, Volume 1, Chapter 4, Effects on Fire and Fuels, Assumptions and Methodology, Trade-offs Between Types of Treatments	The FEIS has been revised as recommended. This sentence in Chapter 4 has been modified to read: In areas with heavy fuel accumulations, mechanical treatments such as hand cutting or self-propelled equipment could be used before fire is re-introduced.
68	Scott Stephens, pp. II-20 to II-21: **Trends in climate change** This section has been significantly expanded and improved during revision. Page 275, first sentence under Forest Structure reads 'Fire suppression has been	FEIS, Volume 2, Appendix C, II. Regional trends over the last century linked to climate change, Forest Structure	The FEIS has been revised as recommended. This sentence in Appendix C: Fire suppression has been practiced as a federal policy since 1935. …has been modified to read: Fire suppression has been practiced as a federal policy on

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	practiced as a federal policy since 1935.' I suggest adding a citation here. Mary authors have pointed to an earlier date regarding the beginning of fire suppression in federal lands in the western US.		national forests since the early 20th century (Stephens and Ruth 2005).
69	Craig Thompson, p. II-22: **Scientific Study and Adaptive Management:** Dr. Zielinski recommended that, given the focus on integrating science into GSNM management, more emphasis be placed on developing a rigorous monitoring plan. He expressed concern that "so little attention is dedicated to the scientific aspects of developing a monument-specific monitoring plan" and recommended that "There should be discussions about thresholds that will trigger changes, consideration of how monitoring data will feedback into decision making, and what statistical designs will be used." The monitoring details he requested were not incorporated into the FEIS, and while the Lake Tahoe Basin monitoring plan which he recommended be used as a template was added to the Literature Cited section, I can find no reference to it in the text. A number of monitoring objectives were added to the document with the inclusion of additional tables in Ch. 2.	Monument Plan, Part 3-Design Criteria, Monitoring and Evaluation	The monitoring plan developed for the Monument, as described in Part 3, Design Criteria, of the Monument Plan, contains implementation, effectiveness, validation, and status and trend monitoring for Ecosystem Analysis.
70	Craig Thompson, pp. II-22 to II-23: **Tools for Evaluating the Effects of Projects on Fisher Habitat:** Dr. Zielinski noted that the DEIS anticipated using models to "evaluate and forecast the effects of projects on fisher habitat", and highlighted the potential misuse of models as well as the lack of detail	FEIS, Volume 2, Appendix A, All Action Alternatives, Wildlife and Plant Habitat, Wildlife Habitat, Southern Sierra Fisher	The appropriate model will be selected and utilized as part of a project-level analysis of direct, indirect, and cumulative effects, at various scales appropriate to the species and project prescription and objectives. It is recognized that there are a variety of models currently available and more are likely to be developed during the life of this plan. See the addendum to the Science Consistency Review Report in the previous section of this appendix.

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	presented. He recommended several more appropriate models for examining changes in fisher habitat at multiple scales. Reference to these models has been added to the text, though no details on how the models will be applied were included. Additional models for evaluating the impacts of project-level management on American marten and CA spotted owls are also available. One excellent example is Cushman and McGarigal (2007). The authors incorporate both spatial and temporal variability in an assessment of the changes in landscape pattern over time that result from four timber harvest scenarios. Lee and Irwin (2005) conducted a simpler, though similar analysis of the effect of overstory reduction on spotted owl occupancy and reproduction. Models are only as good as the data that is used to generate them. Nowhere in the FEIS or the fisher BE is a description of what data would be used to estimate project-level impacts on fisher habitat. In my experience working with Sequoia National Forest and GSNM staff, the available vegetation data is insufficient and too coarse-grained for adequate pre- and post-treatment comparisons. In particular, questions relating to habitat fragmentation require fine-scale vegetation maps. Therefore one of the first priorities for the Monument should be the development of an accurate, fine-scale baseline vegetation dataset, including understory and structural diversity, with which habitat change for any species can be carefully evaluated.	Conservation Area (SSFCA)/Furbearer Den Sites, S&G #61, etc.	t is recognized that site-specific, detailed vegetation information is not currently available for much of the Monument. Development of “an accurate, fine-scale baseline vegetation dataset” would be a goal for the Monument, given available funding. The National Environmental Policy Act requires that the best available science be considered, but recognizes that there may be uncertainties due to a lack of complete data.

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71	Craig Thompson, p. II-23: **Size of Trees that Can be Removed:** Dr. Zielinski expressed concern regarding Alternative F and the lack of a dbh limit. He listed numerous ecological, economic, and social reasons why the removal of trees over 20" dbh was inappropriate, and asked for more scientific justification for why trees > 20" dbh should be removed in the name of ecological restoration. Given the clear guidance in the Clinton proclamation, "Removal of trees, except for personal use fuel wood, from within the monument may take place only for ecological restoration and maintenance or public safety" (Vol. 1, Ch. 2, p. 66), the scientific consensus that the removal of trees >20" dbh does not affect fire severity (North et al. 2009), and the historical clumping of large trees in the Sierras, it is difficult to envision why the removal of trees > 20" dbh would be needed. The justification for this choice, the need for enhanced ecological restoration capacity, is not adequately explained.		There are limited, very specific circumstances where removal of trees over 20" dbh would be a valuable tool for restoration. For example, in an aspen stand where fire suppression has led aspen to be outcompeted by conifers. The removal of some large conifers may release the aspen from competition, restore the stand and benefit the overall ecology of the area. Another example would be a plantation of trees greater than 20" dbh where the removal of some trees would benefit the stand, reduce the risk of insect and disease, and lead to larger, healthier trees in the long term.
72	Craig Thompson, p. II-23: **Den Site Buffers:** In his comments, Dr. Zielinski highlighted a disconnect between the use of a 'den buffer strategy' to protect reproductive habitat and the lack of guidance regarding identifying den site locations. He stressed that without a companion monitoring program tasked with identifying den sites, a den buffer strategy is not only ineffective but misleading. I cannot find any acknowledgement of this concern in the FEIS.	FEIS, Volume 2, Appendix A, All Action Alternatives, Wildlife and Plant Habitat, Wildlife Habitat FEIS, Volume 2, Appendix M FEIS, Volume 2, Appendix L,	Fisher den site buffers are but one part of the management strategy to protect fisher habitat, including key reproductive habitat. In Alternatives B and F, all suitable habitat for Pacific fisher in the Monument is within the Southern Sierra Fisher Conservation Area, which requires the retention of habitat structures (canopy cover and large trees) important to Pacific fishers (see Wildlife Habitat standards and guidelines for all action alternatives in Appendix A). These standards and guidelines also require that management "minimize old forest habitat fragmentation", "assess the potential impact of projects on the connectivity of habitat for old forest associated species" and

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		Wildlife and Plant Habitat, Wildlife Habitat, PC #294	"consider forested linkages." Several other land allocations also protect Pacific fisher habitat by maintaining canopy cover, large trees, and down woody debris. These areas include: spotted owl PACs, goshawk PACs, riparian conservation areas, critical aquatic refuges, and old forest emphasis areas (see Wildlife Biological Evaluation).
73	Craig Thompson, pp. II-23 to II-24: Missing References to Important Literature: Much of the additional research data and literature recommended by Dr. Zielinski has been incorporated into the FEIS, particularly the results from forest carnivore work conducted on the GSNM, literature on the impact of habitat fragmentation on American marten, and the conclusions from a Joint Fire Science-funded project on the impact of fuel reduction on fisher habitat. However, several research syntheses have been recently published and their conclusions should be addressed with respect to the consequences of the different alternatives. Most notably, in 2010 and 2011 the USFWS released several volumes of the Interagency Fisher Conservation Assessment for the western states (Lofroth et al. 2010, Lofroth et al. 2011, Naney et al. 2012, Finley et al. in review). Among other recommendations, the authors highlight the need to assess impacts at multiple scales and the importance of accounting for the temporal scale of the ecological processes that create old growth/late seral habitat. They identify threats by geographic region and discuss how these threats may best be addressed. It is important to note that while severe wildfire	FEIS, Volume 2, Appendix M, Environmental Effects, Pacific Fisher-Effects, Pacific Fisher, Habitat Preferences and Biology FEIS, Volume 2, Appendix M, Environmental Effects, Pacific Fisher-Effects, Pacific Fisher, Habitat Preferences and Biology, Threats to Fishers in the Southern Sierra Nevada	Volume III of the Conservation Assessment (Naney et al. 2012) was not available at the time the DEIS was prepared. This document has now been reviewed and information from it is cited in the Wildlife BE. Included is a new discussion of the risks of understory vegetation reduction to fishers: A threat assessment for fishers in the Southern Sierra Nevada by a panel of experts rated uncharacteristically severe wildfire as a high threat. There were nine categories ranked as moderate threats, including: forest roads, wildfire suppression and rehabilitation activities, overstory reduction, understory reduction, reduction of structural elements, reduction in vegetation diversity, fragmentation, climate change, and uncharacteristic forest insect and disease (Naney et al. 2012). The other recommended documents have been reviewed, and citations to Knaus et al. 2011 and Weir and Corbould 2010 were added to the Wildlife BE. See the addendum to the Science Consistency Review Report in the previous section of this appendix.

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	is considered a high threat in the southern Sierra region, it is balanced by the risk of excessive overstory and understory reduction through vegetation management (Naney et al. 2012, p. 37). And habitat fragmentation through misguided vegetation management is considered a greater threat than the mortality or fragmentation associated with roads (Naney et al. 2012, p. 31). These documents were only cited once in the FEIS, to support the idea that severe wildland fire is a threat to fisher populations (Vol. 1, Ch. 4, p. 474). Given the breadth of the issues addressed, the documentation across disciplines and species, and the relevancy to GSNM management, the conclusions presented in these volumes need to be more carefully considered and fully incorporated into the FEIS. Other recent, important references include a regional meta-analysis of fisher habitat requirements which synthesized data from across the western United States (Buskirk et al. 2010), a critical genetics manuscript bringing into question many of the previous assumptions regarding fisher in the Southern Sierras (Knaus et al. 2011), and a research paper from British Columbia linking thresholds in vegetation change to the probability of occupancy by fishers (Weir and Corbould 2010). The conclusions of these documents are highly relevant to GSNM management and should be incorporated.		

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74	Craig Thompson, p. II-24: **Learning from Sequoia-Kings Canyon National Park:** Dr. Zielinski recommended that, if a management alternative (Alternative C) was going to be based on emulating the management of Sequoia Kings Canyon National Park (SEKI), then a critical examination of the success or failure of that model should be incorporated. Given that a model for that type of management is available nearby, it would be a relatively simple task to evaluate to what degree SEKI has achieved the stated goals for GSNM. I can find no indication in the FEIS that such an analysis was conducted, or that published literature regarding the ecological integrity of SEKI was considered.	FEIS; Volume 1, Chapter 4; Effects on Wildlife and Plant Habitat; Effects on Wildlife; Effects on Threatened, Endangered, or Proposed Species/ Effects on Forest Service Sensitive Species/Effects on Management Indicator Species	The effects analysis for wildlife habitat discusses the potential effects from Alternative C management direction on federally threatened, endangered, or proposed species; Forest Service sensitive species; and management indicator species, and compares these potential effects to those that would be expected from the other alternatives. Analyzing the potential effects from Alternative C, which was designed to emulate SEKI management as much as possible, is the extent to which this analysis should go in examining national park management for this programmatic-level document.
75	Craig Thompson, p. II-24: **Lack of Citations, in General:** Throughout the document, references to published literature continue to be used sporadically. Dr. Zielinski identified a number of statements where conclusions were drawn without appropriate references. In many cases, these sections have been rewritten and supporting documents cited. However there are still many unsubstantiated statements, leaving the reader unable to independently verify the authors' conclusions. For example, the section on Burned Forest Habitat (Vol. 1, Ch. 3, p 188) contains no citations despite the fact that that there are numerous statements about the impacts of fire on wildlife habitat. In the fisher BE, the author states "Research literature suggests that the loss and	FEIS, Volume 1, Chapter 3, Wildlife and Plant Habitat, Wildlife Habitat, Burned Forest Habitat FEIS, Volume 2, Appendix M, Pacific Fisher – Effects, Pacific Fisher, Risk Factors	Citations have been added to the FEIS as recommended. Multiple citations have been added to the Burned Forest Habitat section. The fisher section of the Wildlife BE begins with the following paragraph: The USFWS (2004) identified major threats to fishers in the West Coast Distinct Population Segment, discussed relative to specified factors for listing under Section 4 of the Endangered Species Act. Only those threats deemed by USFWS (2004) to be "important" to the entire West Coast DPS are summarized in this section. The reader is referred to the Federal Register for the complete USFWS 2004 discussion.

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	fragmentation of suitable habitat by roads may have played a role in the reduction of Pacific fisher from the central Sierra Nevada and its failure to colonize there" (Vol. 2, p. 667) yet fails to cite the literature. Also in the fisher BE (Vol. 2, p. 668) – "Following wildfire, prey species abundance and community composition will shift. An initial increase in abundance of disturbance-adapted prey species may occur at the expense of species diversity with a gradual reversal of this trend as succession occurs. Although prey abundance may increase, prey availability will not necessarily follow due to fisher reluctance to enter open areas." Any statement describing an effect or predicting a response requires an appropriate citation.		
76	Craig Thompson, pp. II-24 to II-25: **Habitat Calculations Consider only Amount, not Configuration:** In his comments, Dr. Zielinski highlighted the need to consider not only the amount of habitat impacted by management actions, but also the configuration and connectivity. He cited a number of studies, particularly with respect to the American marten, which describe martens' sensitivity to landscape pattern. This concept has been well incorporated into the BE for marten and fisher, as well as several other species. However it does not appear to have been considered in the main FEIS document defining affected environment and environmental consequences (Vol. 1, Ch. 3 & 4).	FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired Conditions, Strategies, and Objectives; Wildlife and Plant Habitat Desired Conditions	Since the Monument FEIS is a programmatic-level document, a quantitative assessment of the effects on habitat configuration and connectivity is neither appropriate nor feasible. However, we feel it is important to address these factors and, after meeting with Dr. Thompson on February 16, 2012 (see the addendum to the Science Consistency Review Report in the previous section of this appendix), we agreed to add language to the FEIS regarding the value of habitat configuration in providing connectivity and heterogeneity. For example, the desired conditions for Wildlife and Plant Habitat have been modified to include: …Old forest habitat is in suitable quality, and quantity, and distribution to support viable populations of late successional dependent species, including Pacific fishers, American martens, California spotted owls, northern goshawks, and great gray owls. The configuration of habitat in the Monument provides connectivity and heterogeneity…

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	As Dr. Zielinski noted, there is a rapidly growing acknowledgement among conservation-oriented scientists that habitat configuration is potentially as important as composition. The US Fish and Wildlife Service is currently considering expanding their criteria for fisher habitat conservation plans on state and private land to include spatial analyses (L. Finley & S. Yaeger, USFWS, personal comm). The fisher conservation assessment states "To be successful, conservation measures must recognize … how landscape patterns, including those from past and current timber management, may affect the size of areas needed to support not only individuals but populations." (Lofroth et al. 2010, vol. 1, p. 121). As mentioned above, the authors of the conservation assessment describe habitat fragmentation, whether a result of wildfire, fire suppression, vegetation management, or road construction, as a threat to the Southern Sierra fisher population (Naney et al. 2012, p. 22). Yet it is notable that despite the fact that maintaining a "Diverse Array of Wildlife and Their Habitats" is highlighted as a primary issue in the FEIS Purpose and Need (Vol. 1, Ch. 1, p. 41), the variables used to address this issue do not include a single configuration-based metric. Several research studies identifying suitable metrics, such as edge density, contagion, or core area, were included in the marten and fisher BE (Appendix M), however these concepts have not been incorporated into the main FEIS document.		The effects of management activities on these factors will be assessed at the site-specific project level, particularly in cumulative effects analyses.

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77	Craig Thompson, pp. II-25 to 26: **Cumulative Effects Analysis:** In his comments, Dr. Zielinski highlighted the failure of the DEIS to outline a rigorous approach to cumulative effects analyses (CEA). He described the attempt to account for all past actions by characterizing "existing conditions" as a cop-out and suffering from "shifting baseline syndrome" (Pauly 1995), ultimately leading to gradual declines in environmental conditions. While the details of a CEA may not be necessary in a programmatic document such as the GSNM FEIS, a programmatic document such as this will set the tone and the bar for how such analyses are conducted in the future. The purpose and need for the FEIS states clearly, the document must "create a management plan that will protect and preserve the unique features of the Monument" (Vol. 1, Ch. 1, p.11). Given the scale of habitat use by marten and fisher, as well as many other species considered in Appendices M and N, a project-by-project approach to impact assessment is inappropriate. And given the temporal scale of the ecological processes that create old growth/late seral habitat and the critical structures within that habitat matrix that are used by marten and fishers, as well as other species (Lofroth et al. 2010, Weir et al. 2012, Raley et al. 2012), a more comprehensive approach to CEA is needed. Female fishers are obligate cavity users for reproductive dens (Lofroth et al. 2010), and Davis (2009)	FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Assumptions and Methodology, Methods and Measurements, Determining Cumulative Effects FEIS, Volume 2, Appendix M/ Appendix N, Environmental Effects, Analysis Assumptions and Methodology, Methodology, Determining Cumulative Effects	The Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. After further discussion, an agreement was made between the USFS biologists and Dr. Thompson to include specific language regarding cumulative effects analysis that was co-written by both parties. This specific language has been added to Chapter 4 and the wildlife specialist reports, as follows: The Forest Service recognizes that significant scientific advances in evaluating landscape conditions have been made in the past decade and will employ improved cumulative effects analysis techniques as they become available. For example, Forest Inventory and Analysis plots may provide reference points of forest conditions over time, and landscape trajectory analyses can be used to evaluate trends in habitat quality without requiring detailed analysis of past actions. Where appropriate and based on available data, this cumulative effects analysis for site-specific projects will consider whether proposals exacerbate or moderate habitat trends. Dr. Thompson revised his initial determination and included his updated response in the addendum to the Science Consistency Review Report in the previous section of this appendix. The cumulative effects timeframe was limited to 20 years in the future. The life of the Monument Plan is only expected to be 10-15 years and predicting potential future actions beyond this timeframe with any accuracy is not feasible.

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	calculated the average age of den trees as 372 years for Douglas fir, 177 years for lodgepole pine, and 96 years for trembling aspen. A 20 year CEA timeframe is insufficient for protecting habitat elements created at this rate. While it may not be appropriate, or even possible, to describe all the management actions and disturbances that have occurred over the past 50-100 years, it is possible and highly relevant to describe how the vegetation and habitat has changed over that timeframe. Species distribution changes in relation to habitat change, however there is often a lag time before the changes in species abundance or occupancy are observed (With 2007). These legacy effects or "ghosts of landscapes past" are particularly relevant to landscapes undergoing large-scale shifts such as those seen following decades of fire suppression efforts. Examining whether current species distributions best match current or historical habitat conditions can give clues to imminent conservation problems (Lindborg and Eriksson 2004). Furthermore, adopting a historical perspective can provide better insight as to where and how restoration-based management should be applied.		
78	Craig Thompson, p. II-26: **Interactions between WUI, TFETA, and Habitat Conservation:** The interactions and overlap between different management emphasis areas is not fully explained. The statement on page 435 (Vol. 1, Ch. 4) that "No	FEIS, Volume 1, Chapter 4, Effects on Fire and Fuels, Assumptions and Methodology, Assumptions for	The size of the WUI varies between alternatives. Alternatives A, B, E, and F follow the 2001 SNFPA prescriptions of generally a ¼-mile-wide defense zone and about 1¼-wide threat zone. Alternative C includes a WUI defense zone approximately 300 feet wide, and Alternative D about 200 feet wide. Only Alternatives B and F include the TFETA. Different amounts

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	more than 10 percent of the late seral habitat is in wildland urban intermix (WUI) defense zones. Therefore, the effects of fuel reduction treatments on this habitat type are expected to be minimal" is misleading because it fails to incorporate the acreage in WUI Threat and TFETA zones. With respect to fisher, the document states that no more than 14% of suitable habitat is within defense zones under any alternative. Yet under the determination (Vol. 1, Ch. 4, p. 474), the document fails to explicitly state that under Alternatives A, B, E and F, an additional 40% of suitable habitat is included in WUI threat zones, and under Alternatives B and F an additional 16% of suitable habitat is included in the TFETA zone. So cumulatively, under the preferred Alternative B, 70% of the suitable fisher habitat on the Monument is in zones where fire and fuel management is given priority over habitat conservation. This effectively nullifies many of the implied conservation strategies, such as the use of den buffers. Presumably, all alternatives considered reflect reasonable, acceptable approaches to GSNM management. Therefore the reason for including large amounts of acreage in the WUI defense and threat zones is unclear. If a 200 or 300 foot WUI defense zone is acceptable (as outlined in Alternatives C and D), why extend that to the ¼ mile defense and 1 ½ mile threat zones described in the remaining alternatives? Instead, why not outline a scientifically-based strategy designed to promote resiliency and heterogeneity, such	All Alternatives, Wildland Urban Intermix (WUI) FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Assumptions and Methodology FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Wildlife Species Considered in Detail, Indirect Effects/Vegetation Management sections by species FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Wildlife Species Considered in Detail, Effects on Forest Service Sensitive Species, Northern Goshawk, Determination	of these fuel reduction areas are considered in each of the alternatives to respond to public issues, to address the different alternative themes, to show a range of alternatives, and to analyze the potential effects of each proposal. Throughout the Monument, even in WUI zones and the Tribal Fuels Emphasis Treatment Area (TFETA), mechanical treatments will be limited or prohibited: • in wilderness (existing and proposed) • in wild and scenic river corridors • in inventoried roadless areas • in research natural areas • in riparian conservation areas • on slopes exceeding 35 percent • in areas greater than 9,000 feet in elevation • in areas more than ¼ mile from a road Based on these constraints, approximately 23 percent of the 328,315 acres of National Forest System land in the Monument could be considered for mechanical treatments (alone or in conjunction with fire treatments), compared to about 77 percent that could be considered for fire treatments. Within the WUI defense zone, approximately 30 percent of the area could be considered for mechanical treatments and 24 percent within the WUI threat zone. Within the TFETA, approximately 15 percent of the 56,643 acres could be considered for mechanical treatments, compared to about 85 percent that could be considered for fire and hand treatments. Of the 85 percent, 48 percent is within roadless areas. Specific types of vegetation management, or its location and size (acres), are not determined in this programmatic-level FEIS. Site-specific vegetation management will be analyzed at the project level.

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	as that promoted by North et al. (2009), and allow that to guide management actions over the bulk of the GSNM, limiting more intensive treatments to where the threat to health and human safety requires it? This would seem to be a more appropriate approach given the statement: "The best available science needs to be used to protect wildlife and the wide array of habitats in the Monument" (Vol. 1, Ch. 1, p. 41). Otherwise, a table clearly outlining how much acreage is exposed to what kind treatment under each scenario is needed in each of the biological evaluations. And if the WUI limits presented in Alternatives C and D are not acceptable, the reasons need to be clearly stated and justified.	FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Assumptions and Methodology, Burned Forest Habitat, Indirect Effects, Vegetation Management, Occurrence of Large Stand-replacing Fires FEIS, Volume 1, Chapter 4, Effects on Fire and Fuels, Indirect Effects, Wildland Urban Intermix (WUI) Zones, Alternative C/Alternative D	The assumption for the effects analysis was that, in all of the alternatives, WUI defense zones would be the highest priority for fuels reduction activities. WUI threat zones and the TFETA would be lesser priority areas. Because this is a programmatic FEIS, it doesn't specify vegetation treatment locations or treatment prescriptions, it merely identifies priority areas. The effects of vegetation treatments on habitat suitability would be determined in site-specific project analyses of effects. However, for several sensitive species, the percent of their habitat in the Monument that would be in one of the priority areas for fuels reduction is included, for example: Only 11 percent of suitable habitat for northern goshawks in the Monument is within WUI defense zones, which are the areas where vegetation treatments are most likely. See the addendum to the Science Consistency Review Report in the previous section of this appendix. This paragraph in the Wildlife analysis of Chapter 4 describes the potential effects of more narrow WUI defense zones in Alternatives C and D: Alternatives A, B, E, and F propose more areas for fuels reduction activities in areas of moderate and high susceptibility and potentially reduce the possibility of large, severe fires more than Alternatives C and D. ...as well as these paragraphs in the Fire and Fuels analysis of Chapter 4: Alternative C is expected to include fewer acres of fuel reduction activities in the WUI defense zone, and offer a smaller buffer between developed areas and the wildlands designed to protect human communities from severe fire…Alternative D is expected to prompt the fewest acres of fuels reduction activities in the WUI defense zone of all of the alternatives, and provide the smallest buffer between developed areas and the wildlands to protect human communities from the threat of severe fire.

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79	Craig Thompson, pp. II-26 to II-27: **Understory Management:** Much attention is focused on diameter limits and the need to protect and promote large trees, yet understory management is potentially a far greater source of conflict between fuel reduction and fisher / marten habitat conservation. Coarse woody debris, shrubs, and suppressed trees are viewed as either undesirable surface and ladder fuels or critical elements of habitat diversity depending on your perspective. North et al. (2009) recognizes that treating surface and ladder fuels is the most effective way to reduce the risk of uncharacteristically severe wildland fire. At the same time, the USFWS Fisher Conservation Assessment states that "Management activities that reduce or remove understory vegetation may, among other things, decrease prey availability, disrupt daily movement patterns of fishers, and increase vulnerability of fishers to predation" (Lofroth et al. 2010) and "A successful conservation strategy must include measures that recognize the importance of understory vegetation to support abundant prey populations and provide adequate fisher cover, and the contribution of diverse native vegetation to fisher habitat and in the maintenance of resilient landscapes" (Naney et al. 2012). In addition, two published studies from in and around GSNM have identified the basal area of small trees to be an important predictor of fisher rest site habitat quality (Zielinski et al. 2006, Purcell et al. 2009) and there are indications that fisher use of areas	FEIS, Volume 2, Appendix M, Environmental Effects, Pacific Fisher-Effects, Pacific Fisher, Habitat Preferences and Biology FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Wildlife Species Considered in Detail, Effects on Forest Service Sensitive Species, Pacific Fisher, Cumulative Effects, Wildfires	Volume III of the Conservation Assessment (Naney et al. 2012) was not available at the time the DEIS was prepared. This document has now been reviewed and information from it is cited in the Wildlife BE. Included is a new discussion of the risks of understory vegetation reduction to fishers: A threat assessment for fishers in the Southern Sierra Nevada by a panel of experts rated uncharacteristically severe wildfire as a high threat. There were nine categories ranked as moderate threats, including: forest roads, wildfire suppression and rehabilitation activities, overstory reduction, understory reduction, reduction of structural elements, reduction in vegetation diversity, fragmentation, climate change, and uncharacteristic forest insect and disease (Naney et al. 2012). Uncharacteristically severe fire has been identified in multiple threat assessments as the most significant threat to the Southern Sierra fisher population. Much of the discussion in the effects analysis focuses on the balance between reducing this risk with short-term reductions in fisher habitat quality (understory, ladder fuels reductions) and the long-term gain in suitable fisher habitat resilient to severe wildfire. We recognize the importance of vegetation heterogeneity across the landscape. However, for this programmatic level FEIS, it is neither appropriate nor feasible to measure or model this factor. The SPECTRUM model is not intended to be used for quantifying forest heterogeneity and project-level or cumulative effects analysis. The appropriate model will be selected and utilized as part of a project-level analysis of direct, indirect, and cumulative effects at various scales appropriate to the species and project prescription and objectives. See the addendum to the Science Consistency Review Report in the previous section of this appendix.

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	with reduced canopy cover may be contingent on understory density (Lofroth et al. 2010). Balancing these factors and achieving landscape heterogeneity requires a spatially-explicit approach. North et al. (2009) suggest "creating landscape heterogeneity in the Sierra Nevada by mimicking the forest conditions that would be created by the fire behavior and return interval associated with different slope position, aspect, and slope steepness." Habitat conservation and fire management may be compatible if the juxtaposition of different elements is taken into consideration (i.e. landscape configuration). While I am not familiar with the SPECTRUM model, a quick review of Appendix B suggests that it is not a spatially-explicit model and therefore not an appropriate choice for quantifying forest heterogeneity and project-level or cumulative effects analyses.		
80	Craig Thompson, p. II-27: **Effects of Riparian Conservation Areas (Alternative E):** Under Alternative E, standards and guidelines for riparian area conservation from the 2001 and 2004 SNFPA are not included. The effect of this exclusion on wildlife is not sufficiently analyzed. Fisher in the GSNM exist at the southern extent of their range and are likely to be highly influenced by thermal conditions (Raley et al. 2012). Riparian areas offer cooler microclimates than upland areas, and this is likely reflected in fishers' preferential use of these areas (Lofroth et al. 2011). Riparian areas also likely serve as travel corridors,	FEIS; Volume 2; Appendix M; Environmental Effects; Relictual Slender Salamander-Effects, Relictual slender salamander, Determination; Foothill Yellow-legged Frog-Effects, Foothill yellow-legged frog, Determination;	The determinations for several species takes the differences in standards and guidelines into account and concludes: Alternative E would have the greatest risk for loss in habitat quality… because the riparian guidelines are less restrictive. The effects analyses also take into account that riparian areas are low priorities for fuels treatment and vegetation management. The lack of standards and guidelines does not mean that riparian areas are likely to be greatly altered under this alternative in the Monument FEIS. Additionally, if fuel treatments are proposed in riparian areas, the effects would be analyzed appropriately at the project-level scale. A discussion of how the standards and guidelines differ in Alternative E has been added to the effects analyses for bald eagles, martens, and fisher:

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	providing access between high quality habitat patches (Zielinski et al. 2004, C. Thompson, USFS, personal observation). Fishers are not the only species for whom riparian areas form critical habitat and habitat linkages; Relictual slender salamanders, Foothill and Mountain yellow-legged frogs, Southwestern pond turtles, Bald eagles, and Western red bats all may be impacted by changes in riparian conservation measures. The determination that Alternative E may affect individuals of the species listed above but not populations is questionable due to the lack of any relevant analysis. Fuel management in riparian areas may be an appropriate management action. While these areas were historically thicker and burned less often than upland areas, the enhanced growing conditions and history of fire suppression means that they are likely currently overstocked and at risk of high-intensity fire (North et al. 2009). However any such action requires far more careful consideration than is apparent in the current FEIS.	Southwestern Pond Turtle-Effects, Southwestern Pond Turtle, Determination FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Wildlife Species Considered in Detail, Effects on Forest Service Sensitive Species; Bald Eagle/ American Marten/ Pacific Fisher, Management Areas.	Management of riparian areas would follow the 1988 Forest Plan and 1990 MSA. There would be no RCAs, CARs, or riparian conservation objectives. Alternative E would have the least protection of riparian habitat. This is intended to better recognize the increased risk to riparian habitat, which is important to these species.
81	Craig Thompson, pp. II-27 to II-28: **"Big, sick, and rotten trees":** Historically, forest managers have removed sick, deformed, or damaged trees from the forests. Over time this has left a deficit of these types of structures on the landscape. Research on the habitat preferences of fisher as well as many other old growth / late seral dependant species has identified these structures as critical to the functionality of habitat (Weir et	FEIS, Volume 2, Appendix A, All Action Alternatives, Wildlife and Plant Habitat, Wildlife Habitat, Southern Sierra Fisher Conservation Area (SSFCA)/Furbearer Den Sites	The FEIS recognizes the importance of these habitat features to fishers. The standards and guidelines for Alternatives B and F include the following: Prior to vegetation treatments, identify important wildlife structures, such as large diameter snags and coarse woody material within the treatment unit. For prescribed fire, use firing patterns, lines around snags and large logs, and other techniques to minimize effects on snags and large logs. Depending on the alternative, there are a number of standards and guidelines in place intended to protect the most important

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	al. 2012, Raley et al. 2012). In fact, recent work on fisher habitat use has indicated that fishers are less constrained to old growth habitat than previously thought; instead they are constrained by the presence of specific structural elements (rest and den sites) most often found in old growth habitat (Raley et al. 2012). Elements such as broken-top trees, mistletoe or rust brooms, lightening scars, heart-rot cavities, or other indicators of deformed or decadent trees form the majority of rest and den sites used throughout the western United States (Lofroth et al. 2010, 2011, Naney et al. 2012). It is not sufficient to claim that "modeling has shown increases in old growth habitat and in large trees (>30 inches dbh) in the future for all of the alternatives" (Vol. 1, Ch. 4, p. 475). In the fisher conservation assessment, Naney et al. (2012) state that "Reduction in structural elements was the highest ranked and geographically most consistent threat. Conservation measures must address this critical element of fisher reproductive and resting habitat throughout the Assessment Area to assure suitable denning and resting structures are available and well distributed across the landscape. Where structural elements are deficient in abundance and distribution, conservation measures must include provisions for the recruitment of large trees that will develop the type of microstructures used by fishers for reproduction and resting." Lofroth et al. (2010) states "Fishers rely on a complex web of	FEIS, Volume 2, Appendix A, All Action Alternatives, Wildlife and Plant Habitat, Wildlife Habitat	habitat features for old-growth-dependent species (see the Wildlife Habitat standards and guidelines).

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	ecological processes including disturbances, diseases, and the activities of other organisms, that create and maintain important forest structures such as large live and dead trees with cavities for reproductive dens. Furthermore, many decades are required for forests to develop structural complexity. Many of the structures important to fishers develop via infection of trees by organisms typically considered undesirable pathogens in forest management. To be successful, conservation efforts must recognize the importance of various ecological processes in creating and maintaining forest structures that are important to fishers and their prey, and the temporal and spatial scales at which these processes operate. They may also, at times, require consideration of management intervention to promote processes that develop important structures." These forest elements need to be actively identified, protected, and recruited, to insure the maintenance of functional fisher, marten, and other wildlife habitat.		
82	Craig Thompson, p. II-28: The terms "resilient" and "resiliency" are used many times throughout the document to describe desired conditions. However these terms often mean different things to different people. A clear definition of the term would help avoid misinterpretation.	FEIS, Volume 1, Glossary of Terms, Resiliency	Resiliency is defined as: the ability of an ecosystem to return to its original state after being disturbed.
83	Craig Thompson, p. II-28: Hazard tree removal has the potential to impact LS/OG species due the preferential removal of snags and decadent or damaged	FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat,	Hazard tree removal has been added to the list of ongoing activities expected to continue in Alternative A and the action alternatives.

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	trees; however this activity is rarely directly addressed. Hazard tree removal should be included under the Assumptions for Alternative A (Vol. 1, Ch. 4, p. 434)	Effects on Wildlife Habitat, Assumptions and Methodology, Assumptions for Alternative A	
84	Craig Thompson, p. II-28: Vol. 1, Ch. 4, p. 434 clearly states that direct monitoring of sensitive LS/OG species is preferential to the monitoring of habitat. While logical, this misses the fact that suitable habitat is often uninhabited at any given time due to natural processes. Relying solely on the presence or absence of a species at a particular time risks the gradual degradation of habitat as unoccupied but suitable habitat is altered. Instead, some combination of species and habitat monitoring would be the most effective conservation approach.	FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Assumptions and Methodology, Use of Science, Scientific Advisory Board (SAB) Advisories, Advisory XII. Wildlife Monument Plan, Part 3-Design Criteria, Monitoring and Evaluation, Part 1 Monitoring, Wildlife	The Scientific Advisory Board recommended direct monitoring of late seral/old growth species in addition to monitoring habitat. Both of these methods provide valuable information to managers and will be incorporated into project level design and analysis.
85	Craig Thompson, p. II-28: The statement “The long-term resiliency of [insert species XX] habitat to stand replacing events such as fire, insects and disease may be improved following treatments for ecological restoration.” is used frequently throughout Chapter 4. How is resiliency defined and why should we expect it to be improved for that particular species?	FEIS, Volume 1, Glossary of Terms, Resiliency	Resiliency is defined as: the ability of an ecosystem to return to its original state after being disturbed. The assumption was made that resilient vegetation communities would benefit wildlife species in the Monument.

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86	Craig Thompson, p. II-29: Bats are likely to be highly sensitive to the reduction of surface and ladder fuels within their habitat, and may benefit from it (Leput 2004). This attribute is not discussed within the BE for Pallid, Townsend's big-eared, and Western red bats.		The study referenced, Leput 2004, was conducted in the South Carolina piedmont for eastern bat species and is therefore not necessarily applicable to the situation in the Monument.
87	Craig Thompson, p. II-29: Vol. 2, App. M, p. 656 state that 36% of the rest sites used by marten within the GSNM were in trees. Where were the remaining 64%?	FEIS, Volume 2, Appendix M, American Marten-Effects, American marten, Habitat Preferences and Biology	The study found rest sites in rocks, shrubs, down logs, and piles. The report stated: Marten use of non-arboreal rest sites appears to be more common than reported for marten elsewhere in North America.
88	Craig Thompson, p. II-29: Vol. 2, App. M, p. 719 states that the impact of fuels management on Pacific fisher habitat will be assessed using models *appropriate to the scale of the project*. The scale of a management project does not necessarily correlate to the scale of the impacts. Assessment should focus on the scale of the potential impacts instead.	FEIS, Volume 2, Appendix M, Description of Alternatives, Common to All Alternatives, Pacific Fisher Habitat Management	The assessment of cumulative impacts at the project level will be conducted at the scale of potential impacts for each species analyzed in the BE or BA.
89	Craig Thompson, p. II-29: Two vegetation management alternatives, one limiting tree removal to <10" dbh and one limiting removal to trees < 12" dbh were considered and eliminated because they would "not meet the purpose and need" and retaining trees >12" would "have the effect of increasing fuels buildup on the forest floor, instead of reducing it" (Vol. 1, Ch. 2, p. 135). Where is the scientific rationale for this decision?	FEIS, Volume 1, Chapter 2, Alternatives Considered and Eliminated from Detailed Study	These two suggested alternatives are discussed in Chapter 2 of the FEIS. The alternatives are described and then the rationale for elimination from detailed study is discussed for each of them. For both of these two alternatives, where feasible, their suggested components were brought into one or more of the alternatives considered in detail. Part of this suggestion, the diameter limits for tree felling, was included in Alternatives C and D for ecological restoration activities. However, an alternative that retained all felled trees larger than 8 to 12 inches in diameter as down woody debris would not meet the purpose and need in terms of protecting

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			the objects of interest and restoring ecosystems. The Clinton proclamation addresses the need to reduce fuels buildup. Leaving all downed trees greater than 12 inches in diameter, regardless of the circumstance, would have the effect of increasing fuels buildup on the forest floor, instead of reducing it. The alternatives considered in detail in this FEIS provide balanced approaches to address fuels reduction while still maintaining most felled trees as down logs where feasible. The rationale discusses the result of leaving downed trees, not standing trees. The rationale is required to: Briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14)
90	Craig Thompson, p. II-29: On p. 654 (Vol. 2, App. M), a study by Cablk and Spaulding (2002) is presented as a counterpoint to the idea that marten require contiguous canopy. I fear that study is misrepresented; marten habitat in a ski resort will be extremely fragmented due to the network of ski runs. Animals living there must be willing to cross the runs in order to survive. My understanding is that the study referenced used snowtracking, a technique from which it is impossible to determine how much time was spent in a particular area. Averaging canopy cover along a movement path in a highly fragmented environment, with no data on how long an animal spent in a certain area, risks over-representing the use of avoided habitats and under-representing preferred habitat.	FEIS, Volume 2, Appendix M, American Marten-Effects, American marten, Habitat Preferences and Biology	The point of including this statement was merely to recognize that martens have been found to utilize an area with low canopy cover. There is no question that the preponderance of the literature finds that marten prefer high canopy cover and that the situation at a ski resort is less than ideal.
91	Craig Thompson, p. II-29: *Is the relevant scientific information considered?*		The document has been reviewed and references have been added where appropriate to background information and the analysis of alternatives. Refer to Comment #s 74, 80, and 94-96.

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	1) References to published literature continue to be used sporadically. Examples highlighted during the first review have been changed, but the entire document needs to be carefully reviewed. Any time a conclusion is stated, an effect is predicted, or a response is described, a reference must be included.		
92	Craig Thompson, p. II-29: *Is the relevant scientific information considered?* 2) References and discussion on the impacts of habitat fragmentation, while added to the wildlife biological evaluations, do not appear to have been considered in any relevant analysis or description of environmental consequences. In fact any mention or discussion of fragmentation or connectivity-based metrics is conspicuously absent from Volume 1 with the exception of several table references.		Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. The USFS biologists discussed with Dr. Thompson where further information regarding habitat fragmentation could be found in the standards and guidelines for the action alternatives (see examples below). It was also explained that the Monument FEIS is a programmatic level document, therefore a quantitative assessment of the impacts of habitat fragmentation is neither appropriate nor feasible. The standards and guidelines for all the action alternatives include: Minimize old forest habitat fragmentation. Assess potential impacts of fragmentation on old forest associated species. Assess the potential impact of projects on the connectivity of habitat for old forest associated species. A spatially explicit analysis of habitat fragmentation is not possible in this programmatic FEIS.
93	Craig Thompson, p. II-30: *Is the relevant scientific information considered?* 3) The single most important piece of literature currently available regarding fisher conservation in the western United States, the Interagency Fisher Conservation Assessment, is not adequately considered. The single reference given to it indicates that the authors	FEIS, Volume 2, Appendix M, Environmental Effects, Pacific Fisher-Effects, Pacific Fisher, Habitat Preferences and Biology	Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. The USFS biologists discussed with Dr. Thompson that Volume III of the Conservation Assessment (Naney et al. 2012) was not available at the time the DEIS was prepared. This document has now been reviewed and information from it is cited in the Wildlife BE. Volume IV of the USFWS fisher conservation assessment (Finley et al. *in review*) is not currently available to us.

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	are aware of it, but no consideration is given to the summary of habitat requirements, the evaluation of threats, or the conservation recommendations. All 4 volumes of the assessment can be obtained through the USFWS office in Yreka, CA.		See the addendum to the Science Consistency Review Report in the previous section of this appendix.
94	Craig Thompson, p. II-30: *Is the relevant scientific information considered?* 4) Volume IV of the USFWS fisher conservation assessment (Finley et al. in review), defines a multi-scale strategy for conserving extant fisher populations and planning for landscape-level habitat connectivity. While document contains far more detail than is necessary here, it has been rigorously reviewed, field tested, and accounts for the need for vegetation management and multiple priorities in fisher habitat. I recommend that the authors of the wildlife components of the FEIS review the document and consider incorporating appropriate sections into the GSNM monitoring plan.		Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. The USFS biologists discussed with Dr. Thompson that Volume IV of the USFWS fisher conservation assessment (Finley et al. *in review*) is not currently available to us.
95	Craig Thompson, p. II-30: *Is the relevant scientific information considered?* 5) Other relevant scientific information regarding fishers may have only recently become available, however it requires consideration. In particular, the authors need to review and incorporate Buskirk et al. 2010, Weir and Corbould 2010, Knaus et al. 2011, and Raley et al. 2012).	FEIS, Volume 2, Appendix M, Environmental Effects, Pacific Fisher-Effects, Pacific Fisher, Habitat Preferences and Biology	The recommended documents have been reviewed and considered. A couple of these sources were incorporated and cited in the BE.

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96	Craig Thompson, p. II-30: *Is the scientific information reasonably interpreted and accurately presented?* In general, yes. Most of the information regarding wildlife habitat use and their response to disturbance is accurately presented though more references are needed. A couple exceptions are described above. Of greater concern is the fact that information on the risks and consequences of habitat fragmentation has not been incorporated into the primary FEIS document.	FEIS; Volume 1; Chapter 2; Alternatives Considered in Detail; Desired Conditions, Strategies, and Objectives; Wildlife and Plant Habitat Desired Conditions FEIS, Volume 2, Appendix A, All Action Alternatives, Wildlife and Plant Habitat, Wildlife Habitat	Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. The value of habitat configuration in providing connectivity and heterogeneity was added to the desired conditions for Wildlife and Plant Habitat (see Comment #77). The USFS biologists discussed with Dr. Thompson where further information regarding habitat fragmentation could be found in the standards and guidelines for the action alternatives (see Comment #93). It was also explained that the Monument FEIS is a programmatic-level document; therefore a quantitative assessment of the impacts of habitat fragmentation is neither appropriate nor feasible.
97	Craig Thompson, p. II-30: *Are the uncertainties associated with the scientific information acknowledged and documented?* Somewhat. Much of the uncertainty associated with wildlife impacts stems from the lack of recent survey data and unknown population status within the Monument. Where occupancy status is unknown, CWHR habitat is used as a surrogate for species presence. Far less clear is how the species listed will respond to disturbance and habitat change through vegetation management. For many species, there is simply no information available on how they respond to overstory thinning or understory removal. In these cases, compiling a list of data needs would both acknowledge the relevant uncertainties and provide guidance for future Monument research projects.		Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. The USFS biologists discussed with Dr. Thompson that there is a lack of specific, detailed monitoring information available on how species respond to various vegetation treatments. It was agreed by both parties that future research investigating these relationships would be a goal for the Monument, given available funding.

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98	Craig Thompson, pp. II-30 to II-31: *Are the relevant management consequences identified and documented, included associated risks and uncertainties.* No. By relying on a non-spatially explicit modeling framework to evaluate treatment impacts numerous potential consequences were ignored. Reporting the impacts of management actions as the number of acres treated, the average canopy cover across the landscape, or the miles of roads built or decommissioned may be the status quo but it does not capture the Monument's stated desire to rely upon the "best available science". For years, average conditions have been used to describe landscapes despite the fact that average landscapes rarely exist. Stephens et al. (2007) found that only 15-20% of stands in an active fire, conifer ecosystem could be described as 'average' and forest structure within 0.25 ac plots varied by an order of magnitude. Instead, emphasis should be placed on capturing the variability, both spatial and temporal, resulting from management actions and determining whether that variability exceeds acceptable thresholds. If increased forest heterogeneity is truly a goal, then appropriate techniques and metrics for assessing heterogeneity need to be applied. Examples of models using the range of variation to predict the impacts of management actions include Lee and Irwin (2005), Cushman and McGarigal (2007), and Thompson et al. (2011). Furthermore, there is no indication of a serious attempt at either conducting an appropriate cumulative effects	FEIS, Volume 1, Chapter 4, Effects on Wildlife and Plant Habitat, Effects on Wildlife, Assumptions and Methodology, Methods and Measurements, Determining Cumulative Effects FEIS, Volume 2, Appendix M/ Appendix N, Environmental Effects, Analysis Assumptions and Methodology, Methodology, Determining Cumulative Effects	A spatially explicit model is neither appropriate nor possible for a programmatic FEIS. The effects of future projects will be evaluated and cumulative impacts to habitat quality will be assessed at that stage of the planning process. Sequoia National Forest wildlife biologists met with Dr. Thompson on February 16, 2012 to address this comment. After further discussion, an agreement was made between the USFS biologists and Dr. Thompson to include specific language regarding cumulative effects analysis that was co-written by both parties. This specific language has been added to Chapter 4 and the wildlife specialist reports. Dr. Thompson revised his initial determination and included his updated comments in the addendum to the Science Consistency Review Report in the previous section of this appendix.

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	analysis or at defining a process to insure that appropriate, project-level CEAs are done in the future.		