1/18/08

Randy Moore, Regional Forester
1323 Club Dr.
Vallejo, CA 94592

Dear Mr. Moore,

I am the director of the John Muir Project, and have a Ph.D. in Ecology from UC Davis, with a research emphasis on forest and fire ecology. On behalf of the John Muir Project, I am submitting the following appeal of the Champs project Final EA (FEA) and Decision Notice (DN) in the interest of ensuring greater scientific integrity and greater incorporation of ecological science in environmental analysis documents:

1) The FEA states, on p. 10, that stand density, as a matter of policy on Sierra Nevada national forests, must be reduced to a level that would result in, at most, 60% of SDI-Max 20 years after thinning, which means that the stands in the project area would be reduced to 35-50% of SDI-Max immediately after thinning. The FEA cites a 2004 letter from the USFS Regional Office as the source of this requirement. This letter has never been analyzed through an EIS, or an EA, and the environmental impacts and scientific validity of the letter's mandates have not been assessed or divulged. This is a violation of NEPA, which requires environmental analysis for de facto policies, plans, and procedures that may significantly affect the environment. Site-specific plans, such as this one, which seek to implement such an illegal regional policy/plan, are also in violation of NEPA. WE INCORPORATE BY REFERENCE INTO THIS APPEAL THE 7/14/04 LETTER FROM THE REGIONAL FORESTER REFERENCED ABOVE. IF A COPY OF THIS DOCUMENT IS NEEDED FOR THE APPEAL DETERMINATION, WE CAN SUPPLY SUCH A COPY.

2) The FEA fails to ensure scientific accuracy and integrity, as required by NEPA (40 C.F.R. 1502.24; see also *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147 (9th Cir. 2006)), and fails to adequately divulge reliable methodology and hard data (40 C.F.R. 1502.9), for the following reasons:

    a) <u>The FEA demonstrably misrepresents, and overstates, existing basal area and SDI in the project area</u>: In my comments on the draft EA, I included an analysis of basal area per stand, using the USFS's stand exam data for the Champs project area (which you previously sent to me). Your description of your methodology (which you emailed me) was not sufficiently clear and, as a result, I used incorrect plot radii for my calculations. USFS personnel have since clarified their methodology for me and I have re-analyzed the stand examination data for the Champs project using their own methodology, and found that the FEA dramatically exaggerates the basal area density per acre and, therefore, the SDI, in the Champs project area. The Forest Service used a fixed-radius plot of .01 acres in size for live trees less than 5 inches in diameter and, for live trees 5 inches in diameter and greater, the USFS used a Basal Area Factor (BAF) of 20, which corresponds to a Plot Radius Factor (PRF) of 1.944 (see Champs Response to Public Comments). In this system, the radius of the plot increases for larger trees, and the plot radius for a tree of a given size is found by multiplying the PRF by the tree diameter. The plot radius (in feet, in this case) is then used to calculate the plot area for a tree of a given size (plot area equals the square of the plot radius times Pi, which will yield a figure in square feet; this is divided by the total square footage in an acre (43,560) to determine the plot area in acres). I used the midpoint dbh of each size class (one-inch size classes for live trees under 5 inches dbh, and two-inch size classes for live trees 5 inches dbh and larger) for these calculations (e.g., for the size class 10-12 inches, I used 11 inches, or .92 feet, for the calculation). To determine the number of trees per acre in each size class, I: i) counted the number of live trees in each size class from the USFS's stand examination field data sheets for a given stand; ii) divided this number by the number of plots in that stand; and iii) divided the resulting number by the area (in acres) of the plot for a tree in that dbh class. Once I determined the number of trees per acre in each size class in each stand, I then calculated the total basal area of the trees in that size class in that stand by multiplying the number of trees by the area (in square feet) of basal area represented by a single tree of that size (the basal area, in square feet, of a tree of a given size is represented by the square of the radius of the tree (in feet) multiplied by Pi). For a given stand, I then added the total basal area in each size class together to determine the total basal area in that stand. Some stands were pure eastside pine, while others were a mixture of eastside pine and eastside mixed-conifer forest. In the latter case, I calculated total basal area within the stand separately for eastside pine and eastside mixed-conifer, based upon the number of plots of each of these two forest types found within the stand. My method for distinguishing eastside pine stands/plots from eastside mixed conifer stands/plots is described in appeal point #28 below. I determined that the average basal area in the eastside pine stands was 125.0 square feet per acre (range = 88.7-154.3), and that the average basal area in eastside mixed-conifer stands was 128.5 square feet per acre (range = 99.4-162.0) (Table 1a-e and Table 2a-e below). This is far lower than the Champs Silviculture Report (which is incorporated into, and summarized in, the FEA) erroneously claims. The Champs Silviculture Report (pp. 35-36) claims that, based upon the stand examination data, in the Champs project area, there is an average basal area of 186 square feet per acre in eastside pine, and 223 square feet per acre in eastside mixed-conifer. Thus, the FEA exaggerates basal area density by 49% in eastside pine and 74% in eastside mixed-conifer. The exaggeration of existing basal area density resulted in a similar exaggeration in existing SDI. The Silviculture Report (pp. 35-36) erroneously claims that eastside pine is currently at 83% of SDI-Max and that eastside mixed-conifer is currently at 139% of SDI-Max in the project area. When the correct basal area densities are used, the current SDIs for eastside pine and eastside mixed-conifer are both below 60% of SDI-Max currently (and both could be brought down to 40-50% of SDI-Max with a 12-inch diameter limit, if most of these small trees were removed—see Tables 1a-e and 2a-e below). THE STAND EXAMINATION FIELD DATA SHEETS FROM THE CHAMPS STAND EXAMINATION, REFERENCED ABOVE,

ARE HEREBY INCORPORATED BY REFERENCE IN THEIR ENTIRETY INTO THIS APPEAL. IF, FOR SOME REASON, A FULL COPY OF THIS DOCUMENT IS NOT MADE AVAILABLE TO THE APPEAL REVIEWING OFFICER AND/OR THE APPEAL DECIDING OFFICER, PLEASE CONTACT US AND WE WILL PROVIDE YOU WITH A HARD COPY.

b) The draft EA, Final EA, and Silvicultural Report all fail to adequately describe the methodology used by the Forest Service to determine the existing density of live and dead trees in each size class, and SDI, in the project area. It took several email exchanges and phone calls with USFS personnel to get a clear and complete account of the methodology used for the stand examination data on this project. Even so, I had to track down forestry texts not cited in the draft EA or Silvicultural Report. The USFS violated its duty to present clear and complete methodology to the public for key analyses, and this stand exam data was the most fundamentally important analysis in the EA.

c) <u>The FEA demonstrably misrepresents, and overstates, existing density of live trees per acre over 12 inches dbh in the project area</u>: The FEA states (p. 12) that there are currently 60-80 trees per acre over 12 inches in diameter in the Champs project area. However, as the USFS's own stand examination data shows (Tables 1a-e and 2a-e below), the current density of live trees over 12 inches in diameter is only 49.4, 56.0, 47.3, 39.2, and 64.6 per acre, respectively, in the five eastside pine forest stands. The average density of trees over 12 inches in diameter in these stands is only 51.3/acre. In the five eastside mixed-conifer forest stands, the current density of trees over 12 inches dbh is only 34.1, 42.8, 37.5, 37.1, and 45.0 per acre, respectively, and the average is only 39.3/acre.

d) <u>The FEA demonstrably misrepresents, and overstates, existing density of live trees per acre over 20 inches dbh in the project area</u>: The FEA claims (p. 66) that, based upon the stand examination data, there are currently an average of 16 trees per acre over 20 inches dbh, including about 10 trees per acre 20-24 inches dbh, 5 trees per acre 24-30 inches dbh, and 1 per acre over 30 inches dbh. However, the Champs stand examination data shows that, in the five eastside pine stands, there are currently only: i) 7.1, 11.3, 9.1, 3.9, and 3.0 trees per acre 20-24 inches dbh, respectively (average = 6.9/acre); ii) 4.2, 2.9, 2.0, 2.4, and 3.3 trees per acre 24-30 inches dbh, respectively (average = 3.0/acre); and iii) .8, 1.7, 1.0, .8, and 1.0 trees per acre over 30 inches dbh, respectively (average = 1.1/acre). In the five eastside mixed-conifer stands, there are currently only: i) 3.2, 3.7, 2.2, 1.0, and 3.8 trees per acre 20-24 inches dbh, respectively (average = 2.8/acre); ii) .5, 3.0, .7, 2.6, and 2.1 trees per acre 24-30 inches dbh, respectively (average = 1.8/acre); and iii) .3, 1.1, 0, 1.5, and 1.0 trees per acre over 30 inches dbh, respectively (average = .8/acre). Thus, rather than having an average of 16 trees per acre over 20 inches in diameter currently, as the FEA erroneously claims, the Champs project area currently has an average of only 11.0 trees per acre over 20 inches dbh in eastside pine stands and only 5.4 trees per acre over 20 inches dbh in eastside mixed-conifer stands. The overall combined average number of trees over 20 inches dbh in the Champs project area is about 9 per acre, which is about half of the density of large trees over 20 inches in diameter erroneously claimed by the FEA.

e) The FEA demonstrably misrepresents, and understates, the intensity of removal of large, live old growth trees in the project area: As stated above, the FEA erroneously claims that there are currently an average of 16 trees per acre over 20 inches dbh in the Champs project area. The Champs Silviculture Report (p. 22), which was incorporated into, and summarized by, the FEA (see FEA, p. 66), states that an average of 4 trees per acre will be removed in the Champs project area in DFPZ units, and an average of 8 trees per acre will be removed in group selection units. Because the FEA incorrectly claims that there are currently an average of 16 trees per acre over 20 inches in diameter in the project area, it claims that only about 25% of the trees over 20 inches in diameter will be removed (FEA, p. 66; Silviculture Report, p. 22). By exaggerating the current density of large trees over 20 inches in diameter, the Champs FEA concealed the true extent and intensity of removal of large, old trees in the project area. Because there are, in reality, only about 9 trees per acre over 20 inches dbh in the project area, removal of 4 per acre in DFPZs and 8 per acre in group selection units results in removal of about 50% of the large, old trees in the project area.

f) The FEA demonstrably misrepresents, and understates, the average age of live trees over 20 inches dbh in and around the project area, and provides no scientific citations to support its contention that only a small number of live trees over 20 inches dbh are old growth trees (over 200 years old): The Champs Silviculture Report (p. 21), which was incorporated into and relied upon by the FEA, states that "[o]nly a small number of the existing trees 20 inches and greater dbh are 200 years and older". The Silviculture Report offers no citation to any data source to support this claim. The data from USFS research on the Blacks Mountain Experimental Forest (submitted with our scoping comments and incorporated herein by reference), which is adjacent to the proposed Champs project area, shows that the mean age for pines 20-24.9 inches in diameter is over 200 years old (i.e., old growth trees). Pines 25-30 inches in diameter are even older. Incense cedars 25-29.9 inches in diameter are also over 200 years old on average, though the sample size was very small for this size class of incense cedar. These tree ages for eastside trees are consistent with the 2001 Framework FEIS, which stated that eastside pines 21-30 inches in diameter are 150-300 years old on productive sites and are 200-300 years old on non-productive sites. See 2001 Framework FEIS, Vol. 2, Chpt. 3, part 3.2, p. 114, Table 3.2a. Most of the Champs project area is non-productive (Dunning classes 4-6). Most of these trees are old growth trees, according to the data, and they are the very type of trees that the QLG FEIS identifies as being far too scarce on the eastside forests of the QLG project area. In fact, since the Champs proposed project area is 3-10 miles further east of the Blacks Mountain area, trees of a given diameter would likely be somewhat older than the Blacks Mountain Experimental Forest trees. Given that the Champs project would remove about half of the existing trees over 20 inches in diameter, much of the existing old growth structure would be removed—a fact that the Champs FEA and Silviculture Report attempt to conceal. In fact, the Silviculture Report acknowledges that the adjacent Blacks Mountain data set shows that incense cedars over 24 inches in diameter are over 200 years old, but fails to acknowledge that pines over 24 inches in diameter are considerably older on average. Most of the mature trees that would be removed in the Champs project (i.e., exclusing sapling and pole-sized trees) are pines.

g) The FEA demonstrably misrepresents, and understates, the historic density of large trees over 20 inches in diameter in and around the project area, and fails to provide any scientific citation or source for its claim that there was only 1 tree per acre over 20 inches in diameter historically within the areas currently proposed for thinning: The FEA (p. 12) states that, in the area proposed for thinning, there was only about 1 tree per acre over 20 inches in diameter historically. This statement was also made in the draft EA, and was emphasized in italics. However, no citation to any source is included to support this claim, no methodology is divulged to explain how this conclusion was derived, no hard data was presented, and the FEA fails to explain the discrepancy between this claim and the data contained in the Champs Eastside Historical Assessment ("Historical Report"). The Historical Report contains data from two historical eastside data sets regarding historic densities specifically of trees over 20 inches in diameter. These data sets show that there were 15-20 and 8-20 trees per acre over 20 inches in diameter historically in eastside forests asserted to be comparable to, and representative of, historic conditions in the Champs project area (see Historical Report, p. 5, Table 1, Pine Creek North Unit data set and Butte Creek/Hat Creek area data set). The Historical Report also references another data set from near the Champs project area in which there were about 20-30 trees per acre over 12 inches dbh, but the average dbh of these trees was over 25 inches, thus, mathematically, the majority of these trees (i.e., at least 10-15 per acre) would almost certainly have been over 20 inches in diameter.

h) The FEA provides erroneous information regarding historic basal area density in eastside areas close to, and comparable to, the Champs project area: The Champs Eastside Historical Assessment (p. 9, Table5) provides data from a mid-twentieth century survey of an unlogged eastside forest area near the Champs project area. The Champs Eastside Historical Report extrapolates this data to the Champs project area and claims that, based upon this data, the average historic basal area density of trees over 12 inches in diameter in the Champs project area would have been about 79 square feet per acre, and that smaller trees (less than 12 inches dbh) would have comprised an additional 5 square feet or so of basal area. However, this assessment is erroneous for two reasons. First, the left column of Table 5 of the Eastside Historical Assessment reveals the location of each transect, and all but two of the transects are northeast of the Champs project area, which means that they are much farther east when the northwest orientation of the Sierra Nevada is taken into account. On the eastside, the farther toward the extreme eastern edge of the forest one goes, the less and less productive the forest is, which corresponds to much lower densities of forest vegetation. The only two transects which are comparable to the Champs project area are 14th and 19th ones listed, which had basal areas of trees over 12 inches in diameter of 125.1 and 180.0 square feet per acre, respectively. The Eastside Historical Assessment also states that this same data set showed that there were about 70 trees per acre total (on average across all 19 transects) over 2 inches in diameter, including 20-30 over 12 inches in diameter. This means that there were at least 50 trees per acre 2-12 inches in diameter (and likely considerably more in the two transect areas comparable to the Champs area). Given the basal areas per tree in this size class shown in Tables 1 and 2 below, under any likely distribution of the 50 trees per acre from 2 to 12 inches in diameter, these 50 trees would necessarily have comprised at least an additional 12 square feet per acre of basal area. Thus, the historic transects comparable to, and representative of, the Champs project area show that historic basal area density in the Champs project area would have been roughly 137-192 square feet per acre, not 84 square feet per acre as the Eastside Historical Assessment (and by extension the FEA, which incorporated it) erroneously claims.

i) <u>The FEA provides misleading and contradictory information about the existing density of medium-sized and large snags in the project area regarding the FEA's claim that the proposed logging is needed to counter a "forest health" crisis due to high tree mortality:</u> The FEA claims, or implies, that there is a "forest health" crisis in the Champs project area due, supposedly, to overly-dense forest and resulting high mortality. Yet the stand examination data shows that there is only about .9 medium-sized (15-24 inches dbh) snags per acre in the project area; and there is only about .1 large (over 24 inches dbh) snag per acre in the project area (see Table 3 below). In other words, there is less than one large snag per TEN acres in the project area, and is less than one medium snag per acre in the area. The 2004 Framework ROD recommends a MINIMUM of 3 large snags per acre in eastside forests for wildlife needs (snags are critical nesting/denning and foraging habitat for numerous imperiled wildlife species). The FEA fails to explain this discrepancy, and fails to make clear the methodology used to determine the levels of mortality above and below which the <u>ecological</u> health of the forest is threatened (the QLG Act and FEIS/ROD specifically require evaluation and protection of the "ecological health" of forest ecosystem; it is unclear how the FEA intends the term "forest health" to be used relative to the term "ecological health" in the QLG Act and FEIS/ROD).

j) <u>The FEA fails to adequately divulge and explain methodology, or use reliable methodology, and fails to divulge hard data with regard to the procedure that will be used to identify and retain (and avoid logging) old growth trees</u>: The Champs Silviculture Report (p. 21), rather than relying upon the existing data for the eastside of the Sierra Nevada (and adjacent data on the Blacks Mountain Experimental Forest) regarding tree age for trees over 20 inches in diameter, instead states that, with regard to the marking of trees for removal or retention, the Dunning tree classification system from 1928 would be used to indentify trees that are a "priority" for retention, "focusing" on Dunning "overmature" tree classes 5 and 7 first, and then mature classes 3 and 4. The Silviculture Report and the FEA fail to explain or adequately define this methodology for identifying and retaining old growth trees. Nor is the hard data, if any, upon which this methodology is based identified or divulged. This is a violation of NEPA, which requires the methodology to be divulged, as well as the hard data upon which it is based. 40 C.F.R. 1502.9. NEPA also requires that the data and methodology be reliable and tested, as opposed to speculative or arbitrary. 40 C.F.R. 1502.9; 40 C.F.R. 1502.24.

k) <u>The Champs Terrestrial BE overstates snag density in eastside mixed-conifer forest</u>: The Champs Terrestrial BE (p. 18), which is incorporated into and relied upon by the FEA, states that there are currently 1-7 snags per acre 15-24 inches dbh in eastside mixed-conifer forest in the project area. However, the stand examination data shows that there are only 0-4 snags per acre in this size class in eastside mixed-conifer forest (see Table 3 below).

3) Because the FEA: i) fails to divulge and explain the methodology that would be used to identify and retain old growth trees; ii) fails to provide hard data upon which this methodology is based; iii) fails to provide evidence of the reliability, and error rate, of this methodology; and iv) erroneously downplays both the average age of trees over 20 inches in diameter in the project area and the intensity of removal of such trees that would occur, the FEA fails to adequately analyze both the impacts of the Champs project on rare eastside old growth trees and the cumulative effects on eastside old growth when considered in conjunction with past, present, and reasonably forseeable future logging. Not only does this render the FEA inadequate under NEPA, it also necessitates preparation of an EIS.

4) The HFGLG Final EIS (QLG FEIS) states on page 3-58 that the eastside forests of the QLG project area are seriously deficient in mature and old growth forest habitat, and have too many openings relative to historic times. As such, the QLG FEIS states for eastside forests:

"Due to the existing condition, it is probable that stands having mid-seral size class and density attributes (seral stages…H-3B/C, H-4A) would be adversely impacted by group selection because these areas would be targeted for treatment and not protected by interim direction for California spotted owl. In addition to changes to the tree size class attribute of mid-seral to late-seral stands is the effect of openings. In contrast to the west slope of the planning areas, mid-seral and uneven-aged eastside mixed conifer and pine stands have far more and larger anthropogenic openings (wildfire burns, regeneration cuts, roads, skid trails, landings) today than those cause by adaphic [sic] and stochastic factors (rock outcrops, insect patches, patch burns, windthrow) in the past. As eastside fir and mixed conifer mid-seral stands increase their late-seral values the creation of more openings and removal of the larger trees would increase earlier seral attributes creating a further imbalance in the quantity of land now occupied by the various seral stages. As for eastside pine, thinning would promote later seral values, but group selection would reverse the trend for mid-seral stands."

Seral stage H-3B/C is defined as having trees 12-23.9 inches in diameter and canopy cover of more than 40% (with H-3C being the highest canopy cover), while seral stage H-4A is defined as having trees >24 inches in diameter and canopy cover less then 40%. Plumas Forest Plan, Appendix E, pp. 1-2. Seral stage H-3B/C is equivalent to CWHR 4M and 4D, while seral stage H-4A is equivalent to CWHR 5S and 5P. These are the seral stages for which the QLG FEIS itself recommends against group selection in eastside forests because it will further reduce late seral qualities and will take eastside forests further away from the balance of seral stages and age classes sought by the QLG FEIS. In light of this, and in light of the fact that the current Champs project proposes group selection in CWHR 4M, 4D, 5S, and 5P eastside forests, the current Champs proposal fails to demonstrate the effectiveness of group selection pursuant to the QLG Act and QLG FEIS and ROD, as well as the 2004 revised Framework FEIS and ROD.

5) The QLG FEIS, on page 3-59, states for eastside forests the following:

"Desired condition for defensible fuel profile zones is defined as open stands, dominated by larger trees of fire tolerant species, where the most fire resilient condition would be achieved by thinning the smallest diameter trees. This definition fits biodiversity goals because these forest conditions mimic late-seral stand structure…Considering the current forest health status of the eastside forests within the analysis area, large trees would need to be selected for harvest to make the defensible fuel treatment economically feasible. Defensible fuel profile zones could impact mid-seral and late-seral stage retention in three ways: (1) by removing trees more than 21 inches DBH, (2) by reducing canopy cover to less than 50 percent, and (3) by removing snags, down logs, and forest litter to levels below the historic range of variability across the landscape. If some retention is not considered either by subwatershed, management area, or site-specific project, defensible fuel profile zone treatments would likely compromise attributes that promote later seral values".

Since the proposed Champs project, as currently described, would log trees up to 30 inches in diameter, and has NO canopy cover retention requirements, it would compromise later seral values, and fails to demonstrate the effectiveness of DFPZs pursuant to the QLG Act, the QLG FEIS and ROD, and the 2004 revised Framework FEIS and ROD. The fact that the project proposes to remove the most fire-tolerant species (ponderosa pine and Jeffrey pine), including pine trees described as being "large" on the eastside (>21" dbh), is inconsistent with the desired condition described in the QLG FEIS, and thus also fails to demonstrate the effectiveness of DFPZs under the QLG Act, FEIS, and ROD, and 2004 Framework FEIS and ROD.

6) The data from USFS research on the Blacks Mountain Experimental Forest (submitted with our scoping comments and incorporated herein by reference), which is adjacent to the proposed Champs project area, shows that the mean age for

ponderosa and Jeffrey pines 20-24.9 inches in diameter is over 200 years old. Pines 30 inches in diameter would likely be about 300 years old or older, on average. Incense cedars 25-29.9 inches in diameter are also over 200 years old on average, though the sample size was very small for this size class of incense cedar. These tree ages for eastside trees are consistent with the 2001 Framework FEIS, which stated that eastside pines 21-30 inches in diameter are 150-300 years old on productive sites and are 200-300 years old on non-productive sites. See 2001 Framework FEIS, Vol. 2, Chpt. 3, part 3.2, p. 114, Table 3.2a. Most of the Champs project area is non-productive (Dunning classes 4-6). These are old growth trees, and they are the very type of trees that the QLG FEIS identifies as being far too scarce on the eastside forests of the QLG project area. In fact, since the Champs proposed project area is 3-10 miles further east of the Blacks Mountain area, trees of a given diameter would likely be somewhat older than the Blacks Mountain Experimental Forest trees. Removal of mature trees in this project area cannot be justified in DFPZs or group selection, ecologically or legally, and is contrary to the QLG Act and QLG FEIS and ROD.

7) The FEA/DN provide no reliable, verifiable, or scientifically tested way to avoid logging old growth trees 20-30 inches in diameter. Given that most of the pines 20-30 inches in diameter are old growth trees, this provision will likely allow most of such trees to be logged, and there is no provision for non-pines that are old growth. Many old growth pines do not show all three (or in some cases any) of the characteristics outlined in the scoping notice.

5) Given the information contained in items #1-4 above, the enormous size and intensity of the project, and given that the proposed project would also log within the *biological* home ranges (which are considerably larger than HRCAs) of goshawks and spotted owls (which are known to be in decline in the northern Sierra Nevada), this proposed project would have a potentially significant impact on the environment and an EIS must be prepared. An EA will not suffice.

6) The site productivity map sent to me by the Forest Service for the Champs project area, in combination with the site productivity definitions in the document entitled "Soil Survey of Lassen National Forest Area, California", shows that most of the logging would occur on non-productive eastside forest sites with Dunning ratings of 4, 5, or 6 (non-commercial). This is especially problematic for group selection, due to the fact that low site productivity and low seedling survival ratings could mean permanent or very long-term loss of forest in such groups. The most prevalent site category on the map is 105. This category, according to the Soil Survey (referenced above), contains three subclasses: Trojan; Inville; and Patio. Inville only applies to sites with 5-35% slopes and over 20 inches of annual precipitation, which is higher precipitation than the Champs project area, and much of the project area is less than 5% slope. The precipitation and slope descriptions of the Trojan and Patio classes of Category 105 fit the project area. Both of these are Dunning site class 4 (non-productive), according to the Soil Survey (see Roman numerals in parentheses following the Forest Site Class rating). Further, the seedling survival rating for these

is low to moderate, according to the Soil Survey. Thus, group selection is inappropriate in Category 105 areas. The applicable classes within Category 104 are even worse, with this category being generally non-commercial (Dunning site class 6 for one of the two potentially applicable classes within 104). The map shows two group selection units within a 104 area in map section 27 toward the center of the project area, and many groups within a large 104 area which comprises most of the middle of the project area (portions of map sections 16, 15, 19, 20, 21, 22, 25, 30, 29, 28, 32, and 33). This large 104 area can easily be identified on the map, as it has smaller inclusions of Categories 55, 112, and 113 within it. One of the classes of Category 17 is productive (DeMasters), but the other can be non-productive (Klicker), and the map doesn't distinguish between them. Category 108 is very non-productive, according to the Soil Survey, and is Dunning site class 5. Several groups are in 108 areas in the eastern portion of the project area. Category 55 is also non-commercial, yet there is a group in this category in map section 28 on the southwestern edge of the project area. No groups should be planned in any non-productive areas (Dunning 4, 5, or 6), and the DEIS should include a map showing the Dunning categories across the project area, since the Forest Site Classes have subcategories with variable productivities. Your proposal to place groups in non-productive sites is also a reason why an EIS must be prepared.

7) You respond to the issue of group selection in low productivity areas by simply dismissing this concern out of hand, claiming that the Eagle Lake Ranger District has extensive experience and success in establishing plantations within low productivity areas. However, you do not adequately cite to scientific studies or hard data to support this.

8) The FEA fails to adequately analyze and meaningfully respond to the following studies, which indicate that severe fire could be prevented with an 8-10" dbh limit, and fails to acknowledge that the science indicates that severe fire can be effectively mitigated by felling only very small trees, followed by prescribed burning or mastication, or explain in detail why these studies do not apply:

Perry, D.A., et al. 2004. Forest Structure and Fire Susceptibility in Volcanic Landscapes of the Eastern High Cascades, Oregon. Conservation Biology 18: 913-926 (crown fire potential prevented--even under the most extreme conditions--through thinning of trees less than 20 cm dbh (8 inches dbh) and subsequent controlled burning of slash).

Omi, P.N., and E.J. Martinson. 2002. Effects of fuels treatment on wildfire severity. Final report. Joint Fire Science Program Governing Board, Western Forest Fire Research Center, Colorado State University, Fort Collins, CO. Available from http://www.cnr.colostate.edu/frws/research/westfire/finalreport.pdf .
(found that precommercial thinning of trees under 8 to 10 inches in diameter reduced potential for severe fire (email communication with the authors confirmed that trees removed were of this small size class)).

More specifically, on page 921 of Perry et al. (2004), it is stated that, for three of the plots, there was approximately 20 square meters per hectare (about 87 square feet per acre) in trees over 55-60 cm dbh (i.e., over 22-24 inches in diameter). This equates to about 27 trees per acre 24 inches in diameter in these three plots. Even if basal area in trees over 55-60 cm dbh was somewhat smaller, say 75 square feet per acre, this would still equate to at least 18-22 trees per acre 24 inches in diameter or larger, conservatively estimated. This project does not likely have a significantly greater density of trees >24 inches dbh than this. Perry et al. (2004) found that, on ALL fourteen plots (including the three plots described above), "thinning trees of <20 cm dbh [8 inches dbh], coupled with controlled burning to reduce logging slash, would prevent torching (fire moving from the ground into the crowns) on all plots, even under extreme fire conditions (low fuel moisture and 80-kph winds)". Why is it necessary to remove trees 30" dbh on the project DFPZs in order to reduce severe fire potential, in light of this?

Similarly, the Omi and Martinson (2002) study, found that precommercial thinning reduced stand damage (a measure of fire severity generally related to stand mortality) in both of the two thinned study sites, Cerro Grande and Hi Meadow (the authors reported that the Hi Meadow site was marginally significant, p<.1, perhaps due to small sample size), each with several plots.

9) Omi and Martinson (2002) found that crown bulk density was not strongly correlated to fire severity in actual fires. Rather, height to live crown, which pertains mainly to very small trees (since larger trees have higher crowns), was found to be strongly correlated to severity. The FEA fails to adequately respond to this.

10) Moreover, the FEA assumes that mechanical thinning, as you propose, will reduce, rather than increase, potential for severe fire. There is ample evidence to contradict this. One recent study of a mechanically thinned area in SW Oregon, which happened to burn in the Biscuit Fire of 2002, found that the thinned area had significantly higher fire severity than the unthinned area (Raymond and Peterson. 2005. Canadian Journal of Forest Research 35: 2981-2995) (The study also included analysis of a mechanically thinned area that was underburned post-thinning, but was not burned in the wildland fire). Also, research that I recently conducted in the Sierra Nevada found the same thing. See Hanson and Odion 2006 (attached). Even in an area (Eldorado National Forest) that was mechanically thinned very shortly before the fire, and was masticated (material <10" diameter) mere months before the fire, had higher combined mortality from thinning and fire than the adjacent unthinned area (Hanson and Odion 2006). Another recent study found the following: "Compared with the original conditions, a closed canopy would result in a 10 percent reduction in the area of high or extreme fireline intensity. In contrast, an open canopy [from fuel treatments] has the opposite effect, increasing the area exposed to high or extreme fireline intensity by 36 percent. Though it may appear counterintuitive, when all else is equal open canopies lead to reduced fuel moisture and increased midflame windspeed, which increase potential fireline intensity" (Platt et al. 2006. Annals of the Assoc. Amer. Geographers 96: 455-470). You have not analyzed, or adequately analyzed, this type of evidence from actual wildland fires burning through areas mechanically thinned. Instead, your documents make assumptions or rely upon

modeling results, which are based upon assumptions that may not reflect actual real-world fire behavior. Increased fire severity could result from: a) increased mid-flame windspeeds due to a reduction in the buffering effect of mature tree boles; b) slash debris (even if you make efforts to reduce slash, this is never totally effective, and much slash remains—enough to perhaps increase overall surface fuels relative to current levels, which the current analysis does not adequately discuss); c) accelerated brush growth due to increased sun exposure; and d) desiccation of surface fuels due to increased sun and wind exposure. The FEA fails to adequately analyze and meaningfully respond to this information.

11) Your response to the issue of the tendency of mechanical thinning to increase fire severity is inadequate. The Fire/Fuels Report, on p. 18, merely points out that the fire model predicts that your proposed action will reduce fire severity. You fail to mention, however, that the model's assumption in this regard (i.e., that a mechanical thin up to 30" dbh which removes the majority of the basal area of mature trees) has not been validated with field data, and no scientific studies in peer-reviewed journals recommend such a prescription for the goal of reducing potential fire severity. A model can be made to conclude essentially anything, depending upon the assumptions built into the model, regardless of whether those assumptions have any basis in fact or evidence. As pointed out above, in real-world circumstances wherein mechanical thinning timber sale areas have later burned in wildland fires, such areas have tended to burn at high severity, and have tended to burn at higher severity than adjacent untreated areas. Please directly address this issue.

12) The FEA fails to divulge or explain that, while you propose a 30" dbh limit for mechanical thinning in the context of a fire/fuels management proposal, no peer-reviewed, published scientific literature recommends such a prescription as being necessary or effective in the context of fire/fuels management. The FEA fails to adequately divulge unknown risks and uncertainty on this issue.

13) In our comments, we asked for a cost estimate for a 30"-limit mechanical thin, including, at a minimum, the following: a) administrative costs pertaining to analysis and appeals; b) costs of sale preparation and administration; c) PER ACRE costs of slash piling and burning; d) PER ACRE costs of brush maintenance following the mechanical thinning as a result of canopy reduction (this cost must be included, regardless of whether brush maintenance is required only 3-5 years after mechanical thinning or 10-15 years after mechanical thinning; and no similar cost would be applied to non-commercial thinning since essentially no measurable canopy reduction would occur); and e) the administrative costs pertaining to analysis and planning for the slash clean-up and brush maintenance projects following the mechanical thinning. Please include citations to actual projects for all estimates. The FEA fails to adequately analyze the issue of cost offsets, and fails to provide adequate analysis to determine whether the proposed removal of large, old growth trees makes the project more economically efficient.

14) The FEA indicates (e.g., p. 10 and p. 50) that when stand density reaches more than 60% of SDI-Max for the forest type in question, significant “forest health” problems occur. The FEA, however, fails to provide adequate citations to scientific studies relied upon for this, and fails to adequately explain the methodology for making the determination that the ecological health of the forest is somehow compromised at >60% of SDI-Max (see, e.g., FEA pp. 163-166). For example, we know that the Framework forest plan recommends that a bare minimum of 3 large snags per acre be maintained in eastside pine forest types, and 4 large snags per acre in mixed conifer types, in order to provide the minimum habitat quality for wildlife. The FEA fails to adequately explain the methodology for determining the density of large snags at which the ecological health of the forest is, overall, adversely affected, and how it would be adversely affected by the presence of larger snags, which are vitally important to wildlife. The FEA also fails to explain the scientific basis and methodology for determining that the threshold at which adverse impacts to the ecological health of the forest ecosystem and its associated wildlife is 60% of SDI-Max in all sites as a matter of policy.

15) Your decision to restrict the alternatives to be fully considered to ones that meet your criteria of having stands that will be less than 60% of SDI-Max for at least 20 years is totally arbitrary and has no basis whatsoever in ecological science. It also appears that you totally fail to comprehend the ecological value of abundant snags on the landscape, given that the FEA assumes that significant snag presence is a sign of poor “forest health” (see, e.g., FEA pp. 10, 50, 163-166). This indicates an ignorance of forest ecology, and a general lack of scientific integrity in the analysis of this project.

16) There was not sufficient information in project documents stating the current SDI, and post-logging SDI, for EACH UNIT OR STAND proposed for mechanical thinning in the project area. We earlier requested such information. Without such information, it is impossible to verify the claims made in the FEA or evaluate the impacts of the proposal.

17) The FEA, and Eastside Historical Assessment (e.g., pp. 19-22), are misleading where they claim that more native biodiversity depends upon low canopy cover areas. Many of the species included in this conclusion are not rare or imperiled in any way. And, of the species that are imperiled and/or rare which depend upon areas with low canopy cover, most of these are species that depend upon the habitat types created by patches of higher severity fire, e.g., snag forest patches (where most trees are fire-killed within the patch) and post-fire shrub habitat. This must be made clear, especially given that the FEA implies that fire is a destructive force that must be prevented.

18) Table 8 of the Champs Eastside Historical Assessment (p. 21) shows that there is currently LESS CWHR 5S, 5P, 5M, 5D, and 4M than there was in the 1940s, and the amount of CWHR 4D is slightly higher than it was in the 1940s but remains extremely scarce (about one half of one percent of the forested landscape). There is no remaining CWHR 5 strata, and CHWR 4M/4D have been reduced by about half

since the 1940s. No logging should occur in these areas. DFPZs and group selection should be planned for CWHR 3D, 3M, and 3P strata, which are much more prevalent now than they were historically. This would also allow these areas to mature into CWHR 4S, and 4P strata soon. Failure to do so violates the QLG FEIS and ROD.

19) The only data in the Champs Eastside Historical Assessment regarding the historic density of trees >20" dbh in comparable sites indicates 15-20 trees per acre >20" dbh in the Pine Creek North Unit and 8-20 trees per acre >20" dbh in the Butte Cr/Hat Cr area (see Table 1, p. 5). Therefore, the current average density of about 9 trees per acre >20" dbh in the Champs project area (see discussion above in item #2) is already LESS THAN historic range, and the current density of such large trees should not be further reduced, especially given that they are generally old growth trees on the eastside. Doing so violates the QLG Act and FEIS/ROD.

20) The FEA fails to analyze a reasonable range of alternatives. We requested that the USFS fully evaluate an alternative as follows: a) eliminate forest density targets based upon SDI-Max and replace them with targets based upon ensuring ample—NOT MINIMAL—average density of large snags >20" dbh (e.g., 8-10 per acre on average), and heterogeneity in large snag density such that some patches have even higher densities of large snags for the benefit of woodpecker species; b) 16" diameter limit in DFPZs; c) 20" diameter limit in group selection units; no group selection in low productivity sites. Such an alternative would have been consistent with the QLG FEIS and ROD, but was not fully analyzed.

21) We requested that the USFS also fully evaluate an alternative that restricts all DFPZs and group selection to CWHR strata 3D, 3M, and 3P, which are the strata that are far more prevalent now than historically, and which comprise most of the eastside pine region in the Eagle Lake Ranger District. No further restrictions would occur except those required by the 2004 Framework forest plan (e.g., retention of live trees >30" dbh, etc.). No such alternative was fully analyzed, and the FEA failed to analyze a reasonable range of alternatives.

22) We requested that the USFS fully evaluate an alternative as follows: a) achieve 50% of SDI-Max, or as close as possible, in units wherein current density of large snags >20" dbh exceeds 6-8 per acre, and do so with a 16" diameter limit in DFPZs, removing proportionally more trees under 16" per acre than the proposed action envisions where necessary; b) in units where current large snag (>20" dbh) density is 4-6 trees per acre, achieve 60% of SDI-Max, or as close as possible, with a 16" diameter limit in DFPZs, removing proportionally more small trees per acre than the proposed action envisions; c) in units wherein current large snag (>20" dbh) density is less than 4 per acre, use a 12" diameter limit in DFPZs; and d) apply a 20" diameter limit in group selection units, avoiding CWHR 4M and 4D stands and Dunning Site Class 5 and 6 soil areas. No such alternative was fully analyzed, and the FEA failed to analyze a reasonable range of alternatives.

23) The proposed alternatives described above, which proposed smaller diameter limits than proposed by the USFS in this project, were dismissed, and were not fully considered, due to the Forest Service's argument that, while they would meet the fire/fuels objectives, they would not meet the objectives regarding the reduction of basal area and SDI (see FEA, pp. 51, 53). However, as shown above (and in Tables 1-3 below): a) the current basal area and SDI in the Champs project area is already approximately as low as the target density stated in the Silviculture Report (p. 36 of Silviculture Report, see table); and b) the current density of medium and large snags is currently FAR below the minimum levels required by native wildlife and recommended by the 2004 Framework ROD, and any additional mortality that might occur in future years or decades would be a benefit, not a detriment, to the ecological health of the forest (see QLG Act and FEIS/ROD language regarding "ecological health"). Moreover, a 12" dbh limit (if about 80% of the trees up to 12 inches dbh were removed) would reduce the existing basal area by approximately 20-25% in eastside pine (with corresponding reductions in SDI) and by about 50% in eastside mixed-conifer (see Tables 1a-e and 2a-e below). There is no legitimate reason not to have fully analyzed these alternatives.

24) The FEA (pp. 49-54) rejects proposed alternatives with 12" and 20" diameter limits on the basis that the Forest Service could not achieve its arbitrary goal of reducing SDI to a level that will remain below 60% of SDI-Max for at least 20 years. Unnecessarily and arbitrarily restricting the purpose and need, and therefore the range of alternatives, is a violation of NEPA. You could easily set a goal of maintaining, on average, density below 80% of SDI-Max for at least 10 years, and embrace the potential for some additional large snags that may result from competition, and the benefits that additional large snags would have for numerous imperiled wildlife species which may currently have only minimal, or sub-minimal, densities of such snags in the project area and in the Eagle Lake Ranger District. Instead you have restricted the purpose and need in such a way that conveniently requires removal of many mature trees in forest types (4M and 4D) that have become increasingly scarce relative to historic levels, and in a Ranger District in which large live trees and snags are scarce overall. While this may advance your goal of maximizing timber sales receipts for your budget, it is not consistent with science and will do nothing but further degrade eastside forest habitat.

25) This project would harm some MIS and SAR species for which annual population monitoring is required by App. E of the 2001 Framework, but for which no such monitoring has been conducted. As such, the project cannot proceed unless either the required monitoring is conducted, or it is substantially redesigned such that it will not harm habitat for these MIS and SAR species.

The 2004 Framework ROD specifically incorporated the population monitoring requirements of Appendix E of the 2001 Framework FEIS. The MIS and SAR species which have a check mark under the column heading "Population Monitoring" are required to have their populations monitored. *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147, 1173-1176 (9th Cir. 2006). These include numerous species dependent upon dense, mature forest—species that would or could be harmed by the proposed project. The Forest Service has failed to conduct this monitoring, and thus cannot continue to log the habitat of these species without risking a threat to their viability. *Earth Island Institute v. U.S. Forest Service*, 442 F.3d 1147, 1173-1176 (9th Cir. 2006). Such species include, but are not limited to, the following:

a) Olive-sided Flycatcher. This species is highly vulnerable to the "ecological trap" created by logging, which results in open habitat that can superficially appear to be suitable, but which does not sustain populations. See Altman and Sallabanks (2000); Hutto (1995). The Sierra Nevada is the core and heart of this species' North American range (Altman and Sallabanks 2000, Hutto 1995). The 2001 Framework FEIS, App. E, lists this species as having moderate vulnerability in terms of viability, but most of the scientific literature places the vulnerability at high currently.

b) Swainson's Thrush. This species depends, for nesting and foraging, on dense mature forest with dense understories. See 2001 Framework FEIS, Vol. 3, Chpt. 3, part 4.5, pp. 65-68. The 2001 Framework, App. E, lists this species as having high vulnerability in terms of viability.

c) Black Bear.

d) Pileated Woodpecker (relies upon closed-canopy forest with abundant snags).

e) Red-breasted Sapsucker (relies upon dense forests, often in or near riparian zones, and is threatened by logging). See, e.g., Fix and Bezener 2000, Kaufman 1996. The 2001 Framework, App. E, lists this species as having moderate vulnerability in terms of viability.

f) Williamson's Sapsucker (is associated with mature closed-canopy forest with abundant snags, and now appears to be very rare in Sierra Nevada forests).

26) In the Silvicultural Report, Fig. 8 shows tree densities in each 2-inch size class. Using the basic formula for calculating surface area for a circle (radius squared times Pi) to determine the basal area per tree in a given size class, and then multiplying such figures by the number of trees in each size class, I was able to estimate density. There is currently about 100-110 square feet of basal area per acre in trees 16" dbh or smaller, and roughly 45-65 square feet per acre of basal area in trees greater than 16" dbh (this includes trees >20" dbh too). Also, based upon this figure, there currently appears to be roughly 25-40 square feet per acre of basal area in trees >20" dbh. These figures indicate clearly that removal of proportionally more trees <16" dbh, or <20" dbh, than the proposed action envisions could achieve even the Forest Service's arbitrary goal of reducing density to levels that will ensure SDI less than 60% of SDI-Max for 20 years. This contradicts the claims made in the FEA that formed the justification for not fully considering alternatives with lower diameter limits (e.g., 16", or 20") (see FEA, pp. 49-54). For example, if 80% of the basal area in trees less than 16" dbh were removed, and no trees >16" dbh were removed, this would result

in basal area of 60-90 square feet per acre—well below the target range identified by the FEA (or, at a minimum, well within this range). This was not adequately analyzed or meaningfully responded to.

27) The Champs Terrestrial Biological Evaluation, on p. 18, states that in eastside pine stands in the Champs project area there are generally less than 1 snag per acre 15-24" dbh and less than 1 snag per acre >24" dbh. It also states that in eastside mixed conifer stands there are 1-7 snags per acre 15-24" dbh and less than 1 per acre >24" dbh. In reality, density of snags 15-24" dbh in eastside mixed-conifer is 0-4 per acre, contrary to the statement in the BE (Table 3 below). This information contradicts the assertion in the FEA that the Champs project area is in need of mechanical thinning to reduce basal area and competition in order to address a claimed "forest health" crisis, the evidence of which is stated to be dead trees. When the density of large snags in the Champs project area is FAR lower than the MINIMUM density of large snags identified in the 2001 and 2004 Sierra Nevada Forest Plan Amendment EISs as being necessary for wildlife, the EA's claims about the need to reduce basal area to prevent tree mortality cannot be considered ecologically credible. As stated elsewhere in this appeal, to the extent that reduction of potential fire severity is a goal, this can effectively be addressed using a 10" or 12" dbh limit. The trees above this limit, which comprise the great majority of the total basal area, should be left to grow larger (since there are far too few large live trees as well), and to compete and hopefully provide some additional mortality to meet minimum wildlife habitat needs. The alarming lack of large snags in the Champs project area is evidence of a serious problem with the ecological health of the forest. There are simply far too FEW medium and large dead trees to support wildlife, particularly cavity nesting species, many of which are MIS and/or SAR species, as discussed in our earlier comments. The FEA fails to adequately analyze or meaningfully respond to this issue. Instead, the FEA essentially ignores ecology and continues to state that the presence of dead trees (even, apparently, at the minimum level set by the Framework forest plan) is a negative indicator of forest health, without explaining why this is so ecologically (FEA, pp. 163-166).

28) Based upon your response to my email message dated 7/20/07, tree densities were determined using a variable radius plot system for dead trees. Plot size was 1/8-acre for snags 1-19.9 inches in diameter at breast height, and plot size was ¼-acre for snags ≥20 inches in diameter at breast height. I have evaluated the stand examination data that you faxed to me on this basis. I calculated the density per acre of snags 15-24" dbh and >24" dbh for each stand, based upon the stand exam and variable radius data that you sent me. I classified each stand as being either eastside pine (EP) or eastside mixed conifer (EMC). If there was more than one fir or cedar tree represented in the data for the stand, I classified the stand as eastside mixed conifer. In some cases, your stand exam data sheets combined more than one stand into a section such that multiple stands were grouped in the data and could not be clearly distinguished. In such cases, I listed all of the stands, but only included two lines of data entry: one for all eastside pine plots in the group; and one for all eastside mixed conifer plots in the group (if a plot had one or more fir or cedar tree, it was classified

as eastside mixed conifer). The data is presented in Table 3 below. It shows that the snags densities >24" dbh are not merely "less than 1 per acre", but, rather, are FAR less than one per acre in density. And snags 15-24" dbh are also much lower in density than the BE indicates, averaging FAR less than 1 per acre in eastside pine. Density of snags 15-24" dbh in eastside mixed conifer is also less than the BE indicates. The BE and FEA failed to adequately divulge the extreme scarcity of medium and large dead trees in the project area.

Sincerely,

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Additional References

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Table 1a. Live trees in Stand 130099 (eastside pine, 16 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	2	.01	12.5	.1
2-3	.03	1	.01	6.3	.2
3-4	.07	1	.01	6.3	.4
4-5	.11	1	.01	6.3	.7
5-6	.16	1	.009	6.9	1.1
6-8	.27	6	.014	26.8	7.2
8-10	.44	7	.022	19.9	8.8
10-12	.66	11	.033	20.8	13.7
12-14	.92	6	.046	8.2	7.5
14-16	1.23	10	.062	10.1	12.4
16-18	1.58	16	.079	12.7	20.1
18-20	1.97	10	.099	6.3	12.4
20-22	2.41	8	.121	4.1	9.9
22-24	2.89	7	.145	3.0	8.7
24-26	3.41	9	.171	3.3	11.3
26-28	3.98	3	.199	.9	3.6
28-30	4.59	0	.230	0	0
30-32	5.24	1	.262	.2	1.0
32-34	5.94	1	.297	.2	1.2
34-36	6.68	1	.334	.2	1.3
36-38	7.47	0	.374	0	0
38-40	8.30	0	.415	0	0
40-42	9.17	0	.456	0	0
42-44	10.09	0	.505	0	0
44-46	11.04	1	.553	.1	1.1
46-48	12.05	0	.603	0	0
48-50	13.10	0	.655	0	0
50-52	14.19	0	.709	0	0
52-54	15.32	0	.766	0	0
54-56	16.50	1	.825	.1	1.7

Stand Basal Area = 124.4 square feet/acre

Table 1b. Live trees in Stand 130011 (eastside pine, 11 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	2	.01	18.2	.2
2-3	.03	3	.01	27.3	.8
3-4	.07	1	.01	9.1	.6
4-5	.11	0	.01	0	0
5-6	.16	2	.009	20.2	3.2
6-8	.27	4	.014	26.0	7.0
8-10	.44	6	.022	24.8	10.9
10-12	.66	10	.033	27.5	18.2
12-14	.92	5	.046	9.9	9.1
14-16	1.23	9	.062	13.2	16.2
16-18	1.58	10	.079	11.5	18.2
18-20	1.97	6	.099	5.5	10.8
20-22	2.41	5	.121	3.8	9.2
22-24	2.89	12	.145	7.5	21.7
24-26	3.41	3	.171	1.6	5.5
26-28	3.98	2	.199	.9	3.6
28-30	4.59	1	.230	.4	1.8
30-32	5.24	3	.262	1.0	5.2
32-34	5.94	0	.297	0	0
34-36	6.68	2	.334	.5	3.3
36-38	7.47	1	.374	.2	1.5
38-40	8.30		.415		
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 147.0 square feet/acre

Table 1c. Live trees in Stands 130028, 130040-130043 (eastside pine, 24 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	2	.01	8.3	.1
2-3	.03	3	.01	12.5	.4
3-4	.07	1	.01	4.2	.3
4-5	.11	2	.01	8.3	.9
5-6	.16	1	.009	4.6	.7
6-8	.27	4	.014	11.9	3.2
8-10	.44	9	.022	17.0	7.5
10-12	.66	12	.033	15.2	10.0
12-14	.92	9	.046	8.2	7.5
14-16	1.23	13	.062	8.7	10.7
16-18	1.58	22	.079	11.6	18.3
18-20	1.97	16	.099	6.7	13.1
20-22	2.41	17	.121	5.9	14.2
22-24	2.89	11	.145	3.2	9.2
24-26	3.41	3	.171	.7	2.4
26-28	3.98	2	.199	.4	1.6
28-30	4.59	5	.230	.9	4.1
30-32	5.24	2	.262	.3	1.6
32-34	5.94	1	.297	.1	.6
34-36	6.68	3	.334	.4	2.7
36-38	7.47	1	.374	.1	.7
38-40	8.30	1	.415	.1	.8
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 110.6 square feet/acre

Table 1d. Live trees in Stands 120391, 130230-130233 (eastside pine, 35 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	2	.01	5.7	.1
2-3	.03	2	.01	5.7	.2
3-4	.07	2	.01	5.7	.4
4-5	.11	0	.01	0	0
5-6	.16	2	.009	6.3	1.0
6-8	.27	6	.014	12.2	3.3
8-10	.44	9	.022	11.7	5.1
10-12	.66	19	.033	16.5	10.9
12-14	.92	18	.046	11.2	10.3
14-16	1.23	19	.062	8.8	10.8
16-18	1.58	19	.079	6.9	10.9
18-20	1.97	18	.099	5.2	10.2
20-22	2.41	9	.121	2.1	5.1
22-24	2.89	9	.145	1.8	5.2
24-26	3.41	6	.171	1.0	3.4
26-28	3.98	3	.199	.4	1.6
28-30	4.59	8	.230	1.0	4.6
30-32	5.24	2	.262	.2	1.0
32-34	5.94	3	.297	.3	1.8
34-36	6.68	1	.334	.1	.7
36-38	7.47	0	.374	0	0
38-40	8.30	0	.415	0	0
40-42	9.17	0	.456	0	0
42-44	10.09	1	.505	.1	1.0
44-46	11.04	1	.553	.1	1.1
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 88.7 square feet/acre

Table 1e. Live trees in Stands 130071-130076 (eastside pine, 30 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	17	.01	56.7	.6
2-3	.03	14	.01	46.7	1.4
3-4	.07	11	.01	36.7	2.6
4-5	.11	5	.01	16.7	1.8
5-6	.16	5	.009	18.5	3.0
6-8	.27	16	.014	38.1	10.3
8-10	.44	32	.022	48.5	21.3
10-12	.66	29	.033	29.3	19.3
12-14	.92	38	.046	27.5	25.3
14-16	1.23	34	.062	18.3	22.5
16-18	1.58	20	.079	8.5	13.4
18-20	1.97	9	.099	3.0	5.9
20-22	2.41	9	.121	2.5	6.0
22-24	2.89	2	.145	.5	1.4
24-26	3.41	8	.171	1.6	5.5
26-28	3.98	5	.199	.8	3.2
28-30	4.59	6	.230	.9	4.1
30-32	5.24	3	.262	.4	2.1
32-34	5.94	2	.297	.2	1.2
34-36	6.68	2	.334	.2	1.3
36-38	7.47	0	.374	0	0
38-40	8.30	1	.415	.1	.8
40-42	9.17	0	.456	0	0
42-44	10.09	0	.505	0	0
44-46	11.04	0	.553	0	0
46-48	12.05	0	.603	0	0
48-50	13.10	1	.655	.1	1.3
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 154.3 square feet/acre

Table 2a. Live trees in Stand 110011 (eastside mixed-conifer, 10 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	8	.01	80	.8
2-3	.03	11	.01	110	3.3
3-4	.07	6	.01	60	4.2
4-5	.11	7	.01	70	7.7
5-6	.16	10	.009	111.1	17.8
6-8	.27	9	.014	64.3	17.4
8-10	.44	13	.022	59.1	26.0
10-12	.66	9	.033	27.3	18.0
12-14	.92	3	.046	6.5	6.0
14-16	1.23	9	.062	14.5	17.8
16-18	1.58	4	.079	5.1	8.1
18-20	1.97	4	.099	4.0	7.9
20-22	2.41	3	.121	2.5	6.0
22-24	2.89	1	.145	.7	2.0
24-26	3.41	0	.171	0	0
26-28	3.98	1	.199	.5	2.0
28-30	4.59	0	.230	0	0
30-32	5.24	0	.262	0	0
32-34	5.94	0	.297	0	0
34-36	6.68	1	.334	.3	2.0
36-38	7.47		.374		
38-40	8.30		.415		
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 147.0 square feet/acre

Table 2b. Live trees in Stand 190098 (eastside mixed-conifer, 12 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	13	.01	108.3	1.1
2-3	.03	36	.01	300.0	9.0
3-4	.07	17	.01	141.7	9.9
4-5	.11	12	.01	100.0	11.0
5-6	.16	7	.009	64.8	10.4
6-8	.27	6	.014	35.7	9.6
8-10	.44	9	.022	34.1	15.0
10-12	.66	14	.033	35.4	23.4
12-14	.92	8	.046	14.6	13.4
14-16	1.23	8	.062	10.8	13.3
16-18	1.58	6	.079	6.3	10.0
18-20	1.97	4	.099	3.3	6.5
20-22	2.41	2	.121	1.4	3.4
22-24	2.89	4	.145	2.3	6.6
24-26	3.41	3	.171	1.5	5.1
26-28	3.98	2	.199	.8	3.2
28-30	4.59	2	.230	.7	3.2
30-32	5.24	1	.262	.3	1.6
32-34	5.94	0	.297	0	0
34-36	6.68	0	.334	0	0
36-38	7.47	2	.374	.4	3.0
38-40	8.30	2	.415	.4	3.3
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 162.0 square feet/acre

Table 2c. Live trees in Stands 130028, 130040-130043 (eastside mixed-conifer, 7 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	3	.01	42.9	.4
2-3	.03	1	.01	14.3	.4
3-4	.07	1	.01	14.3	1.0
4-5	.11	1	.01	14.3	1.6
5-6	.16	2	.009	31.7	5.1
6-8	.27	4	.014	40.8	11.0
8-10	.44	6	.022	39.0	17.2
10-12	.66	4	.033	17.3	11.4
12-14	.92	6	.046	18.6	17.1
14-16	1.23	1	.062	2.3	2.8
16-18	1.58	6	.079	10.8	17.1
18-20	1.97	2	.099	2.9	5.7
20-22	2.41	1	.121	1.2	2.9
22-24	2.89	1	.145	1.0	2.9
24-26	3.41	0	.171	0	0
26-28	3.98	1	.199	.7	2.8
28-30	4.59		.230		
30-32	5.24		.262		
32-34	5.94		.297		
34-36	6.68		.334		
36-38	7.47		.374		
38-40	8.30		.415		
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 99.4 square feet/acre

Table 2d. Live trees in Stands 120391, 130230-130233 (eastside mixed-conifer, 7 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	1	.01	14.3	.1
2-3	.03	2	.01	28.6	.9
3-4	.07	1	.01	14.3	1.0
4-5	.11	1	.01	14.3	1.6
5-6	.16	1	.009	15.9	2.5
6-8	.27	3	.014	30.6	8.3
8-10	.44	4	.022	26.0	11.4
10-12	.66	5	.033	21.6	14.3
12-14	.92	3	.046	9.3	8.6
14-16	1.23	3	.062	6.9	8.5
16-18	1.58	5	.079	9.0	14.2
18-20	1.97	4	.099	5.8	11.4
20-22	2.41	0	.121	0	0
22-24	2.89	1	.145	1.0	2.9
24-26	3.41	2	.171	1.7	5.8
26-28	3.98	0	.199	0	0
28-30	4.59	3	.230	1.9	8.7
30-32	5.24	2	.262	1.1	5.8
32-34	5.94	0	.297	0	0
34-36	6.68	1	.334	.4	2.7
36-38	7.47		.374		
38-40	8.30		.415		
40-42	9.17		.456		
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 108.7 square feet/acre

Table 2e. Live trees in Stands 130071-130076 (eastside mixed-conifer, 33 plots).

DBH (inches)	Basal area (BA) per tree (sq ft)	# trees	Plot area (acres)	# trees/acre	BA/acre
1-2	.01	16	.01	48.5	.5
2-3	.03	21	.01	63.6	1.9
3-4	.07	13	.01	39.4	2.8
4-5	.11	12	.01	36.4	4.0
5-6	.16	6	.009	20.2	3.2
6-8	.27	18	.014	39.0	10.5
8-10	.44	19	.022	26.2	11.5
10-12	.66	34	.033	31.2	20.6
12-14	.92	23	.046	15.2	14.0
14-16	1.23	24	.062	11.7	14.4
16-18	1.58	21	.079	8.1	12.8
18-20	1.97	10	.099	3.1	6.1
20-22	2.41	12	.121	3.0	7.2
22-24	2.89	4	.145	.8	2.3
24-26	3.41	6	.171	1.1	3.8
26-28	3.98	4	.199	.6	2.4
28-30	4.59	3	.230	.4	1.8
30-32	5.24	7	.262	.8	4.2
32-34	5.94	0	.297	0	0
34-36	6.68	0	.334	0	0
36-38	7.47	1	.374	.1	.7
38-40	8.30	0	.415	0	0
40-42	9.17	1	.456	.1	.9
42-44	10.09		.505		
44-46	11.04		.553		
46-48	12.05		.603		
48-50	13.10		.655		
50-52	14.19		.709		
52-54	15.32		.766		
54-56	16.50		.825		

Stand Basal Area = 125.6 square feet/acre

Table 3. Density of larger snags in the Champs project area.

Stand	Forest type	Snags/acre 15-19.9” dbh	Snags/acre 20-24” dbh	Snags/acre 15-24” dbh	Snags/acre >24” dbh
110011	EMC	0	0	0	0
130099	EP	0	0	0	0
190098	EMC	2.7	0	2.7	0
130011	EP	0	0	0	0
130028 130040 130043	EP	0	0	0	.17
130028 130040 130043	EMC	0	0	0	0
120391 130230 130231 130232 130233	EP	.24	0	.24	0
120391 130230 130231 130232 130233	EMC	3.4	.57	3.97	.57
130071 through 130076	EP	0	.14	.14	0
130071 through 130076	EMC	1.4	0	1.4	0