Comments on the Draft Management Plan and Draft Environmental Impact Report for Jackson Demonstration State Forest

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1 Introductory Note

These comments are supplemented by comments that I made on the 2002 Draft EIR for Jackson State Forest and by the Final EIR for Jackson State Forest issued in 2002. These materials are an integral part of my present comments. Copies of these materials have been submitted under separate cover.

2 Qualifications As an Expert

I am presenting my testimony on economics and estimates of forest inventories and growth as a qualified expert.

I have a Ph.D. in economics from the Massachusetts Institute of Technology. My area of specialization was in mathematical economics and statistical analysis. I performed quantitative analysis of complex systems for over twenty years for the Rand Corporation, Santa Monica, and as a private consultant to a number of organizations specializing in policy analysis. I have extensive experience in computer-based data analysis and statistical analysis.

Although the inventory estimates in question deal with timber and a forest, the issues involved in determining the accuracy of the estimates are analytical and statistical. No special knowledge of forestry or silviculture, beyond that which I have acquired through reading and discussing the issues with foresters, is required. Conversely, knowledge of forestry is not a qualification for judging the accuracy of the inventory estimates.

3 The EIR Fails To Consider The Use Of Revenue Generated By The Forest

A fatal flaw in the EIR is the lack of any consideration of the use of revenue generated in different alternatives.

One aspect of the project (for all except Alternative A) is the generation of revenue from timber harvesting and other forest activities. This revenue goes into the Forest Resources Improvement Fund (FRIF). CDF controls the allocation of FRIF funds. Legislative approval of CDF budget allocations of FRIF has historically been pro forma. The use of the revenue generated by the project is under control of the agency that manages the project; thus the revenue generated by the project is as much a part of the project as the timber harvesting activities that generate the revenue.

How the revenue generated is spent will have a very marked effect on the net environmental impact of the project. Yet, the EIR completely ignores exploring alternatives for the use of the funds. This prevents the decisionmakers, who could direct CDF to spend the funds generated in certain ways, from having the information necessary for informed decisionmaking, and it prevents the EIR from adequately considering alternatives that would reduce the environmental impacts of the project.

This is not an abstract problem. For example, the alternative that comes closest to what I would like to see for the forest is Alternative E, which is termed "Exclusive Late Seral Development." In my proposals for management of the forest, I have emphasized late seral development, but I've also recommended that funds generated by timber activities be spent only within the forest on:

1) repairing and decommissioning roads (to reduce stream sedimentation), and other environmental restoration projects,
2) research on issues related to restoration of forest health and demonstration of timber practices compatible with restoring and maintaining healthy forest ecology, and that a portion of the forest be devoted to conducting scientific experiments on a broad range of forestry questions, including even-age management research on a small scale,
3) expanding recreation opportunities, and
4) adequately operating and maintain the forest.

If the alternatives analysis had integrated the spending aspects of my forest recommendations, including limiting timber harvesting to the amount needed to fund the programs conducted in the forest, a much different alternatives comparison would have resulted. Call the alternative with my funding/research aspects included "Alternative E-X" (the "X" alluding to eXpenditures). If this were to be developed as a management plan, actual levels of revenue and expenditure by purpose would be specified in the alternative, together with quantitative measures of environmental benefits.

Under Alternative E-X:

1) All of the important aspects of the stated mission for the forest would be fulfilled.

2) The major cause of stream degradation, sub-standard roads, would be aggressively remedied.
3) Research activities would be guaranteed funding.
4) Forest operation and maintenance would be guaranteed adequate funding.
5) Timber harvesting, with its potentially negative environmental impacts, would be limited to the amount needed to finance forest activities and programs.

In contrast, under Alternative C-1, the EIR's "proposed project:

1) There is no consideration of how funds generated will be spent. The project provides **no guarantee that any of the funds generated by the forest will be spent within the forest.**
2) Although the current, inadequate operating budget is likely to be maintained, that is not guaranteed.
3) Even in the critical area of road repair and decommissioning, the plan has no fixed schedule. All that is scheduled is 5 years for a "road inventory," with no commitment to fixing problems on any time schedule or at any expenditure rate.
4) Research activities are not funded by forest revenues; thus the level of research is unspecified and not amenable to evaluation.
5) Timber activities would be many times (perhaps 5 or more times) larger than needed to pay for the forest budget, with commensurate negative environmental impacts.

A valid CEQA alternatives analysis would find Alternative E-X to be environmentally superior to Alternative C, no matter what mitigations are proposed, along every axis of measurement.

The BOF has the authority to control the expenditure of funds generated within a state forest, because CDF operates under its oversight. It has historically ceded this authority, without review, to CDF. This does not excuse the Board from its statutory obligation to consider all aspects of projects on state forests, including the generation and use of revenue. Because the present EIR does not present the Board with information needed to decide on the environmental effects of alternative revenue expenditures, it fails to meet CEQA at a fundamental level.

3 Alternatives Analysis Fails to Report Significantly Different Impacts

The alternatives analysis in the present EIR are so poorly constructed, though, that even if the EIR had considered Alternative E-X, it would probably have concluded that there were no significant differences between Alternative E-X and Alternative C-2.

Consider: in the Executive Summary, the first impact treated in Table 1.2 is "Even-aged timber harvests would have a substantial adverse effect on scenic vistas." Table 1.2 says that this impact in C-2, which uses even-age management on 29% of the forest area, will have the same "less than significant" impact as Alternative E, which has NO even-age management.

This example illustrates a fundamental flaw that pervades the Alternatives analysis summarized in Table 1.2. Charitably, the EIR uses impact categories that are so gross in scale that they lump significantly different impacts into the same category, denying decisionmakers important information. Less charitably but more likely, it appears that the constructors of the EIR made subjective judgments, unsupported by any quantitative measures, about the environmental impacts of the alternatives, always concluding that CDF's preferred alternative, C-2, had less-than significant environmental impacts.

To continue the example, Alternative E should be credited, at the least, with "no impact," and more reasonably, "beneficial" impact, because it would allow past even-age operations to heal. The type of bias shown in the cited example pervades the EIR summary tables, creating the illusion that there is little difference in the environmental impacts of the alternatives. That the environmental impacts of C-2 and E are indistinguishable is prima facie false. The EIR fails to provide the information required for informed decisionmaking.

4 Inventory Data Deficiencies

The forest inventory and growth data presented in the DFMP and DEIR are erroneous, seriously misleading, and wholly inadequate in detail and organization.

The deficiencies in the data and its presentation and analysis cause the DEIR to fail to meet the minimum obligations under CEQA to provide a basis for informed decisionmaking and public participation in the development of the Management Plan.

The DEIR is deficient in the following ways:

1. The lack of inventory data at the planning watershed level;
2. The lack of any measurements of **inventory growth** since the new inventory system was introduced in 1989. All growth estimates used in the EIR and DFMP are derived from mathematical models, using parameter values that are not derived from actual measurements of timber growth in JDSF;
3. The inventory **data** on which the EIR relies is out of date;
4. The inventory **estimates** on which the EIR relies are inconsistent with 25 years of prior estimates and significantly in error. These deficiencies and their implications are considered in a Section 6. The errors in the recent inventory estimates are so large that the estimates cannot serve as a basis for policy or analysis. The forest has no valid current inventory, making it impossible create a valid management plan or perform a valid CEQA analysis.

   Because it relied on erroneously high values for inventory and forest growth rate, the DFMP set harvest rates that would exceed forest growth rates. The DFMP does not, therefore, meet the Forest Practice Rules requirement for maximum sustained production.

4.1 Inventory Data Are Deficient Under CEQA

A cumulative impacts analysis is one of the cornerstones of the EIR project analysis required under CEQA. For the JDSF EIR, the project is a Draft Forest Management Plan (DFMP) that envisions large-scale harvesting of timber across the landscape of Jackson State Forest. Accurate and adequate data on current timber inventories and growth, as well as data on past harvests, is the essential foundation for a valid analysis of the cumulative impacts of future harvesting activities:

- Sound analysis of cumulative environmental impacts requires that the analyses be done by management compartment (unit). Because of the variability of terrain, trees, streams, botanicals, and wildlife within a single watershed, management units are generally sub-watershed units. The impacts of the timber harvests in the DFMP will occur in the sub-watersheds, and those combined sub-watershed impacts will constitute cumulative impacts. For example, impacts of timber harvest in the DFMP on spotted owls, marbled murrelets, or water quality all occur at the sub-waterhed level. The project's impacts on these environmental values cannot be known without baseline timber stand data within individual watershed planning units. The local impacts must then be combined to get the overall plan impact. The DFMP and DEIR provide inventory and growth data only for the forest as a whole, thereby precluding determining the DFMP's local and overall impacts.

- The DFMP projects timber harvests, timber growth, and timber inventories one-hundred years in the future. Initial errors in inventory and growth rates translate into a multiple of these errors in the projected values, as compound growth rates expand their magnitude. The cumulative impacts of proposed harvest plans would be much different if actual initial inventories and growth differed from those used in the analysis. Informed decisionmaking requires current data and confidence in the accuracy of the initial estimates.

Following sections detail the legally fatal deficiencies in the presentation of data in the DEIR and DFMP.

4.2 Failure To Provide Forest Stand Characteristics By Management Unit

The DFMP and EIR fail to present timber stand characteristics by management unit. This failure would make the DFMP ineligible for approval under the California Forest Practice Rules (FPRs) for Non-Industrial Timber Management Plans (CCR 1090.5).

Legally adequate environmental evaluation of Jackson Forest certainly should meet or exceed the standards for Non-Industrial Timber Management Plans (NTMPs). The Board of Forestry set these standards to ensure that it was provided the information required to determine whether a plan would conform to the rules of the Board. The requested information relates to evaluating the environmental impact of the NTMP to determine if it conforms to Board rules. If this information is necessary for an NTMP, it is necessary for a legally sufficient EIR.

Forest Practice Rules, Section 1090.5, states the rationale for the information required to be included in an NTMP:

> The plan shall serve three functions: **1)** to provide information the Director needs to determine whether the proposed NTMP conforms to the rules of the Board; **2)** to provide information and direction for timber management so it complies with the rules of the Board and the management objectives of the landowner; and **3)** to disclose the potential effects of timber management to the public. **For the plan to serve these functions, it shall, as a minimum, contain the following information:**

Among the information required in the plan are:

> **(g)** A description by management unit(s) of the timber stand characteristics including species composition, age classes, projected growth, present stocking level, present volume per acre, size class distribution, stand management history, and potential pest or protection problems. The description shall provide the basis for the information provided.
>
> **(h)** A description by management unit(s) of the proposed management objectives, including a discussion of projected timber volumes and sizes available for timber harvesting.
>
> **(i)** A description by management unit(s) of proposed activities to achieve the management objectives. This must include: 1) projected frequencies of harvest, 2) silvicultural prescriptions for harvesting, 3) type of yarding systems to be used for each area; 4) anticipated interim management activities which may result in rule compliance questions (i.e. erosion control maintenance).

[Emphasis added]

The emphasized text shows that all information on forest stand characteristics and management activities are required to be by management unit in an NTMP.

The DFMP (Chapter 3, pp. 49 to 55) discusses the establishment of management units within JDSF, with uniform silvicultural methods to be applied within each management unit. There are 25 management units enumerated in the DFMP.

It seems incredible, but the DFMP and DEIR for Jackson Forest contain no forest stand information by management unit. The only information on timber stand characteristics in the DFMP is presented in Appendix V. Estimated volumes of timber are given only for two species classes (conifers and hardwoods) and two geographical regions (east and west ends of the forest). No information is provided on age or size distributions, even for the forest as a whole.

Registered Professional Forester, Roger Sternberg, in commenting on the 2002 DEIR for JDSF, identified the lack of detailed information by management unit. He noted the requirement for this information in NTMPs and said, "… [T]his is basic information needed by present and future forest managers to guide their actions and for the public to understand how the Plan is going to be implemented."1 Mr. Sternberg's complete letter is attached (Attachment VT-1)

The lack of this information is particularly egregious because CDF and the Board of Forestry, have had over three years to correct the deficiency identified by Mr. Sternberg, but they have done absolutely nothing. The current DEIR contains no additional data on forest stand characteristics by management unit. The DFMP is unchanged for 2002.

Perhaps CDF deceived itself into believing such information is not required by its response to Mr. Sternberg: "The level of detail presented in the DEIR, as well as the DFMP and Alternative "A" [Option A?], is appropriate for the program level DEIR... Providing the level of detail requested is not reasonable given the size of JDSF and the policy level direction provided in the DFMP."[2] But, the level of detail in question is what is needed for adequate ecological management of the forest and to perform an adequate cumulative environmental impacts analysis for the management plan.

The lack of forest stand information by management unit is in itself enough to reject the DEIR for failing to meet the CEQA requirement to provide the information needed for informed decisionmaking.

4.3 Failure to Relate Timber Management Activities to Planning Watersheds

The DFMP and DEIR fail to show how projected harvest activities in management units would cumulatively impact the biological values in planning watersheds.

4.3.1 Failure To Provide Stand Characteristics By Planning Watershed

The DEIR and DFMP fail to provide detailed timber stand data by planning watershed. The DEIR's analysis of cumulative biological effects is done within a framework of

planning watersheds. For example, the discussion of *Aquatic Resources* in Chapter VII.6.1 is conducted in terms of planning watersheds, identifying 17 planning watersheds in JDSF. Chapter VII.10, *Hydrology and Water Quality,* states that a cumulative watershed effects assessment area has been delineated for this EIR that contains 32 planning watersheds, 17 of which contain some part of JDSF. Chapter VIII, *Cumulative Effects,* presents information on past and planned timber harvesting activities by planning watershed. See for example, Tables VIII.3, VIII.4, VIII.9, and VIII.10.

The initial description of the forest characteristics by planning watershed is an essential foundation for a cumulative impacts analysis of the proposed management plan. This is true for all biological impacts, but especially so for habitat impacts. The impact of a given harvest plan on habitat depends upon the stand structure, tree ages, and density. The absence of this description makes a meaningful analysis impossible.

4.3.2 Failure To Relate Management Units To Planning Watersheds

If an initial description of forest stands by planning watershed were provided, the impact of proposed harvest activities within each planning watershed would the next step in a cumulative impacts analysis. Unfortunately, planning watersheds do not coincide with the DFMP's management units. An examination of Figure 7 in the DFMP, *Timber Management Areas*, shows that some management units span several watersheds, while some watersheds are spanned by several management units. Because the DEIR does not show the relationship between management units and planning watersheds, the impacts of harvesting activities in management units cannot be allocated to the appropriate planning watersheds, and sub-watershed-specific impacts that contribute to overall cumulative impacts of the plan cannot be determined. This failure to address the Plan's proposed timber harvest at a sub-waterhsed level results in an inadequate impact assessment – an assessment so coarse that it fails to identify most of the project's actual impacts. Because the plan includes numerous specific THPs, as identified in the EIR's cumulative impacts assessment, the baseline conditions in each of those THP areas must be described in order for an adequate assessment of the project's impacts can be prepared.

4.4 Failure To Provide Information Provided In Prior Management Plans

The forest stand information in the current DFMP does not provide even the degree of detail given in past management plans. Every previous JDSF management plan, going all the way back to 1964, presented tables and charts showing inventory estimates (volume and growth) and trends by forest compartment (not necessarily management units) and tree type, distribution of acreage by age-class of trees, stems per acre for each diameter class, amount of inventory in each diameter class, inventory of trees by species, sawtimber growth by merchantability class and diameter class. The DFMP does not present any of these charts and tables.

Although the detail of past information might not suffice for a valid Plan and cumulative impacts analysis, continuing these series in the current DFMP would have allowed the public and decisionmakers to see trends in the composition and totals of the forest inventory. Their absence prevents informed decisionmaking.

4.5 Inventory Data Are Out Of Date

The timber stand information in the DEIR is not only fatally deficient in detail, but is also out of date. The starting point for analyzing environmental effects of timber harvesting in the EIR must be current timber inventory data.

Even for the much more limited task of setting the "allowable cut", Board of Forestry policies require that for state forests: "Allowable cut levels must be derived from pertinent current inventory and growth data."[3] [Emphasis added.]

The DFMP and DEIR are based on forest inventory data that is now 16+ years old. The inventory data reported in the DFMP and in the DEIR was derived primarily from the initial, 1989 plot measurements made under a new "Intensive Forest Inventory" (IFI) system. Under no reasonable interpretation could this inventory data be considered "current."

The DFMP inventory data is outdated according to the design of the system under which it was collected. The design of the IFI system called for measuring 10% of the plots each year; thus no plot data would be more than 10 years old, and the average inventory data would be 5 years old.[4] Thus, by the IFI's design criteria, the 1989 inventory plot data are at least 7 years out of date and on average they are 12 years outdated. (CDF did install and measure some new plots in 1997, but these amounted to less than 20% of total plots. See discussion later in this section).

Allowing inventory data to age to 17 years without remeasurements is also outside of the normal standards followed by industrial timber companies. The two largest timber companies in Mendocino County, Mendocino Redwood Company and Campbell Management Company, both work on their inventory measurement continuously. The Campbell company measure 10% of their inventory plots each year, and the Mendocino Redwood Company measures some plots each year and redoes the assignment of vegetation strata in their plots every 10 years .[5]

I forewarned the Board of Forestry about the inadequacy of the inventory data and the need to base the EIR on an updated inventory at the scoping hearings for the EIR held in March, 2004. I followed this up with a detailed letter on March 18, 2004. I concluded my letter by saying, "Accurate inventory estimates are a prerequisite for legally adequate consideration of cumulative impacts. Delaying the preparation of a new inventory will merely delay the time at which a legally adequate EIR can be prepared."[6]

According to information provided by CDF, a new set of inventory measurements was made in 2004-2005. None of these data are reported in the DEIR. Reliance for project description on 16+ year-old inventory data is especially unacceptable when current data was available or would have been available very soon.

4.5.1 Deficiencies In 1997 Inventory Remeasurements

Recognizing the impact of logging on inventory composition, CDF reviewed the set of inventory plots in 1996. They deleted over 548 of the original 2054 plots established in 1989, primarily because the plots had been logged and "therefore no longer represented

the new conditions," but also because some plots could not be located (DEIR, Appendix 7A, p. 4).

To address the loss of data samples, CDF installed and measured 390 new plots in 1997. **The surviving 1,506 plots established in 1989 were not remeasured in 1997.**[7] Although CDF refers to the "1997 update of the inventory," it is important to understand that this "update" had 1997 plot data only on the 390, non-randomly placed new sample plots. The remaining plots were "grown" from 1989 to 1997 using standard industry computer growth models.

Thus; the so-called "1997 IFI inventory" is in actuality no such thing. It is primarily a computer projection of 1989 data forward to 1997. The parameters used in the computer projection have never been validated against measured growth data for JDSF collected since 1989 (see below); thus it is impossible to know the degree of accuracy of the projections..

Furthermore, the non-random deletion and replacement of plots destroyed the statistical usefulness of the overall plots for estimating total forest inventory. If the original plots were a representative sample initially, they no longer were after the plot replacement. Thus, any estimates of forest inventory based on the modified set of plots could not be analyzed for statistical reliability.

4.6 Forest Growth Rates Not Reliable

CDF has never published any data for a re-measurement of the 308 "permanent plots" in the IFI system that were among the total of 2054 plots set up in 1989. These permanent plots were intended to provide statistically reliable estimates of forest growth rates (as contrasted with the detailed "vegetation" strata to be provided by the larger sample of replaceable plots). Thus, the new IFI inventory system has not provided any estimates of forest growth based on actual measurements of trees.[8]

Therefore, all "growth estimates" in the Draft Forest Management Plan (DFMP) and EIR are based on computer forest-growth models whose results have never been calibrated against actual JDSF inventory growth data collected since 1989. Such non-validated, parameter-driven estimates could be significantly in error. Because no data are available for calibration, there is no way that decisionmakers can estimate the reliability or the extent of possible errors in the growth estimates.

The lack of reliable, measured growth estimates makes future projections highly uncertain. The DFMP looks at forest conditions 100 years in the future. An overestimate of the annual growth rate by one percentage point would lead to overestimating ending forest inventories by 170%. Future inventories might actually be lower when the (erroneous) projected inventories show an increase. Accurate and reliable growth rates are essential for determining Long Term Sustained Yields.

4.7 DFMP Erroneous and Misleading Growth Estimate

The DFMP cites as "the most reliable evidence of forest growth on JDSF. … an unconstrained [before harvests] estimate of annual growth of approximately 65 million board feet, or approximately 1300 board feet per acre per year."[9]

The DFMP states that the cited timber growth estimate was actual measured growth: "The plot system was measured in 1989 and again in 1999. The difference between the measurements, accounting for harvest, produced [the figure cited]."[10]

As shown in the next section, the statement made above is erroneous. The most likely possibility is that the figure of 65 million board feet did not come from actual measurements, but from a computer growth model, uncalibrated with JDSF data. Alternatively, the figure was derived incorrectly, by adding harvest volume to calculated growth.

Stating that the estimate reflects actual measurements is an especially egregious misstatement, because it lends unjustified credence to a growth estimate that is hugely greater than any other estimate of Jackson Forest growth made by CDF over the years. From 1956 through 1984, gross conifer volume was estimated to grow about 33-35 million board feet per year.[11] Growth was estimated at 42.9 million board feet in 1993, based on the analysis of 1989 inventory system and data. Its import is further heightened by its placement at the beginning of the section in the DFMP on *Growth and Harvest* (DFMP, p. 48).

Although the DFMP does not rely on the 65 million board foot figure for setting future harvest plans, it adds credence to the statement in the DFMP that it used a "conservative estimate of growth" as the starting basis for determining the annual harvest.

The starting figure used in the DFMP is an annual harvest of 39 million board feet to achieve long term sustained yield. This does seem greatly less than the 65 million board feet cited previously. It is not conservative, however, when compared to the IFI growth estimate of 42 million board feet per year (gross), because harvest are presented on a net basis, and net volume is about 10% lower than gross volume; thus the 42.9 million board foot gross estimate would, in itself, just support an annual harvest of 39 million board feet – there would be no "conservative" margin in the harvest amount.

The DFMP recognizes that an initial growth figure needs to be adjusted downward by various other factors before determining an annual harvest that will not cause declining inventories within the areas of the forest where harvesting is permitted. More will be said about this later in the comments.

The point to be made here is the careless way in which CDF presented an erroneous and outrageously exaggerated figure as a confirmed, measured, actual figure. Given this, how can any of the data presented in the DFMP be considered reliable? Without reliable data, supportable estimates of environmental impact are impossible.

4.7.1 Not Measured Growth Or an Erroneously Calculated Value

The assertion that the DFMP growth figure of 65 million board feet per year is based on measurement is erroneous and very seriously misleading. The figure could have been derived from one of two analyses, one a computer projection and the other involving a major error in elementary algebra.

1. An internal document from JDSF files show that the cited growth estimate could have been developed from a computer-based model that *projected* the growth,

rather than from actual measured differences in tree volumes between the two dates:

> This model [CRYPTOS] allows the user to grow a stand … for one or more five year increments…. In this case, each stand was simply grown for 5 years and the mortality function in the model was allowed to operate. The default values in the model were used – that is, no growth calibration factors were added to the run. [12]

Note that default values were used. No actual growth data were used to calibrate the model. These calculations are highly dependent on the values of parameters used in the model, and these parameters were not based on empirical data from JDSF.

In its response to comments on the 2002 DEIR, CDF denied that its estimate came from a computer model.[13] It reiterated that it was derived from measurements. If so, the details of the calculations leading to this result should be included in the EIR, to allow the public to determine the validity of this incredible estimate.

2. A second internal (draft) document from JDSF files suggests how, if the cited estimate was based on actual measurements, it was calculated erroneously.[14] The document describes the methodology used to calculate the growth in inventory between 1988 and 1998. It calculates the inventories in the CFI sample of plots for 1988 and 1998 excluding any trees that were harvested in the period. It provides summary tables for estimated harvests in the period and estimated volume growth excluding harvested trees.

   The table of estimated growth gives the figure of 45,490,671 board feet as "Gross Annual Total Forest Growth (trees present during both inventories plus ingrowth during the period)." A previous table estimated average annual harvest in the period 1989-98 to be 25 million board feet.[15] The table calculates the "Total" growth by **adding** the harvest rate to the growth rate, obtaining a value of 70 million board feet. This is an elementary error in logic and or algebra.

   Harvests subtract from **inventory** not add to growth. By the logic used by CDF, the bigger the harvests, the bigger the forest growth. But this is absurd. The unharvested trees will grow at the same rate (all else being equal), regardless of the harvest. The bigger the harvest, the fewer unharvested trees left to grow, and the smaller will be the forest growth.

   The estimated forest growth, <u>before</u> allowing for harvests, equals the first figure given, 45+ million board feet per year. Estimated forest growth, allowing for harvests, is calculated by **subtracting** the harvest rate.

   There are serious questions about the reliability of the estimate of 45+ million board feet. They relate to the questionable nature of the inventory estimates from which it was derived. These questions are addressed at a later point.

   The table that I have is marked "Draft." It's growth estimate of 70 million board feet is somewhat higher than the cited figure of 65 million board feet but almost

certainly explains how the latter figure was obtained. I request that the summary tables for the analysis that yielded the cited figure be included in the Final EIR.

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[1] Roger Sternberg, letter to Chris Rowney commenting on the 2002 DEIR for JDSF, July 16, 2002, p. 2. Sternberg's letter in its entirety is attached as VT-1A

[2] *Letter RS-249,* "Response to Comment 249.1," *Final Environmental Impact Report for Jackson Demonstration State Forest*, September 2002, p. IV-297.

[3] *Policies of the Board of Forestry and Fire Protection,* Section 0351.4 A.

[4] John Griffen, internal JDSF memo to Hal Slack, December 1, 1993: "The original plan allowed for remeasuring one tenth of the plots every year so that no data would be older than ten years…"

[5] Paul Ederer (Campbell) verbal communication, summer 2005, confirmed by email, February 22, 2003; John Nickerson (Mendocino Redwood Company), verbal communication, June 10, 2005.

[6] Letter to George Gentry from Vince Taylor, March 14, 2004, attached at VT-3.

[7] The only remeasurements made since 1989 was of the approximately 140 plots corresponding to the earlier CFI inventory plots. The CFI system was to be replaced by the IFI system because the CFI system was deemed inadequate for providing the level of detail needed for watershed planning.

[8] It seems incomprehensible that at least this small subset of plots was not remeasured prior to preparing the EIR; but if so, the results have never been published.

[9] *DFMP*, *op. cit.,* p. 48.

[10] *Ibid.*

[11] Exhibit VT-IN-5, in Vince Taylor, *Comments on the Draft Management Plan and Draft Environmental Impact Report for Jackson Demonstration State Forest*, July 18, 2002 (hereafter, *Taylor Comment 2000*).

[12] *NOTES ON AND RESULTS FROM FOREST GROWTH CALCULATIONS,* no author, from JDSF files, 11/30/2000, reproduced as Exhibit VT-IN-6 in *Taylor Comment 2002.*

[13] Final Environmental Impact Report, op. cit., p. IV-269.

[14] The document is headed by a sheet with the title *SUMMARIES TO BE CALCULATED – MARC'S REQUEST.* The summary table is dated 6/22/00 and is marked Draft. It is attached as VT-2

[15] This estimate is substantially less than the harvests reported by JDSF for this period, which averaged 32 million board feet (gross). The discrepancy between actual reported harvests and those estimated from sampled inventory data is evidence that the inventory data is unreliable and untrustworthy.

5 Erroneous and Unreliable Inventory Estimates

The inventory and growth estimates used in the DEIR are seriously in error. Irrefutable evidence shows that the DFMP and DEIR cited inventory and forest growth values are substantial overestimates.

The overestimates of inventory and growth, coupled with inadequate consideration of constraints on harvesting within areas of the forest, lead to the DFMP proposing harvest levels that may well exceed the constrained growth of the forest. The possibility of these overestimates is sufficiently high that the DEIR should have considered their implications for environmental impacts. By failing to consider the possibility that the DFMP could lead to declining inventories, forest density, and tree ages on a substantial portion of the forest, the DEIR fails to adequately describe the environmental impacts of the Plan.

This section provides evidence that the estimates of inventory and growth in the DFMP are seriously overstated. Section 7 analyzes the setting of the harvest level (allowable cut) in JDSF and shows that the harvest level in the DFMP likely exceeds the growth that is available for harvesting.

5.1 Serious Errors in Inventory Estimates

In my comments on the 2002 DEIR for Jackson State Forest, I provided substantial evidence that estimates of inventory in Jackson Forest based on the 1988-89 plot measurement and IFI estimating equations are very much greater than the true values.[16]

My 2002 comments are included as part of these comments. Here I will emphasize the main points of 2002 comments, add to them where I have more information or clarifications, and, where appropriate, respond to CDF's responses to my comments in the 2002 Final EIR. In all other respects, the 2002 comments are an intrinsic part of these comments.

Since 2002, I have performed additional analyses that demonstrate, beyond any doubt, that the IFI inventory and growth estimates are seriously in error. These analyses are presented later in this section.

The inventory estimation errors are so great that the description of the setting of the project used in the DFMP and DEIR is fatally deficient. The errors are responsible for setting harvest levels that seem likely to significantly degrade the areas of the forest where timber harvesting is not prohibited or restricted. The environmental consequences of such harvesting more than forest growth are nowhere considered in the DEIR. The overharvesting also violates the Forest Practice Rules for Long Term Sustained Yield; thus the DFMP is legally invalid.

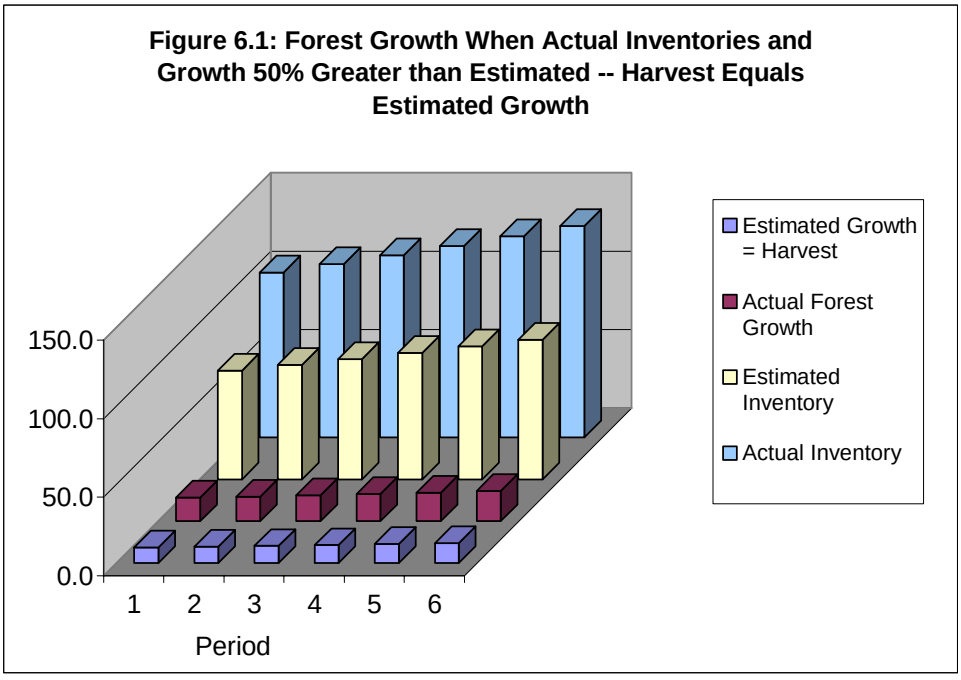
Background: JDSF installed a new inventory system (IFI or Intensive Forest Inventory system) in 1989-90 to replace the former CFI (Continuous Forest Inventory) system. The new system estimated 1990 inventories approximately 50% higher than the 1984 CFI estimate. The corresponding estimate of forest growth was 34 percent greater.

5.2 IFI Estimates Incompatible with Self-Consistent CFI Estimates

CDF has made various attempts to justify the higher estimates as more accurate than the previous, 1984 estimate. None of these attempts succeed in answering a fundamental challenge to the credibility of the new estimates: "How can the vastly higher recent estimates of forest inventory and growth be reconciled with the much lower, stable, **self-consistent** estimates that were produced over 25 years by the previous inventory system?"

- The previous CFI inventory system was in operation for 25 years, with remeasurements made every 5 years.
- During this entire period, JDSF policy was to cut in a 5-year period all of the growth estimated for that period, based on measured inventory and growth rates.
- If harvest amounts equal growth amounts, the inventory will remain constant. This was roughly the case in JDSF from 1959-1984. Thus, the CFI growth, harvest, and inventory numbers were generally ***self-consistent***[17].
- The first IFI inventory estimate, made just 5 years after the last CFI inventory, was 50% higher than the last CFI estimate, and the estimated forest growth rate was approximately the same as the CFI growth rate. But forest growth greater than the CFI estimate is **inconsistent** with the estimated constant inventory over time between 1959-1984.
- If actual growth had been higher than estimated growth during the CFI period, only part of the growth would have been cut, and so inventories would have increased significantly from period to period. This result is shown graphically in Figure 6.1.

Figure 6.1: Forest Growth When Actual Inventories and Growth 50% Greater than Estimated -- Harvest Equals Estimated Growth



Even though in this illustrative projection, the policy is to cut estimated growth, estimated inventories keep growing because actual growth is greater than the cut.

Estimated inventories keep growing because they are the same percentage of the growing inventory level. This example uses numbers that approximate the percentage difference between the IFI and CFI inventory estimates.

As long as actual inventories are greater than estimated inventories, estimated inventories will increase over time when harvest is set equal to estimated growth. But, **in JDSF estimated inventories actually declined from 1969 to 1984, by 4 million board feet per year, or more than 10% of the average annual harvest. This fact supports an argument that CFI inventory and growth estimates were higher than actual forest values. There is no credible way that this decline in inventories could have occurred if actual growth and inventory values during this period were those estimated by the IFI system.**

5.3 CDF Responses Do Not Refute My Analysis

In the 2002 Final Draft EIR, CDF responded to my analysis, but never addressed it directly; thus the conclusion was uncontested. Instead, CDF made numerous irrelevant assertions, none of which are germane to the analytical point made in the previous section. Below are quoted excerpts from their responses, followed by my comment

- *This comment, and other related comments…presents no analysis of the actual inventory data… This speculative line of theorizing about likely problems with JDSF's inventories are groundless. They are also wholly irrelevant because the inventory data are hard facts, not subjective opinions.*[18]

In this and other comments, CDF makes irrelevant and erroneous assertions. It does not argue that my analysis contains any errors in logic or computation.

The comparison of the CFI and IFI results is not speculative theorizing, but logical analysis of the data.

What the analysis shows is that the two sets of estimates cannot both be correct, and that the 25 year history of the CFI estimates supports the accuracy of CFI estimates. The IFI estimates have no history to support their validity. Only one set of whole-forest inventory measurements has been done under the IFI system. It's self-consistency over time has not been evaluated. Nor, has CDF ever published any information that evaluates its accuracy by looking at actual and predicted harvest data. That the IFI estimates are wrong is consistent with the entire history of JDSF inventory measurements.

What is obviously the case is that the "inventory estimates" are not "hard facts." Rather they are derived through a very complex process of measurement, recording, transcription, statistical methodology, and data processing. There is room for error in many of these steps, and the results are very dependent on the estimation model and the statistical estimation of the parameters. Apparently, somewhere in the IFI process, errors of data processing or statistical analysis occurred, causing inventories to be overestimated.

- *The most recent 1999 CFI remeasurement supports the IFI inventory results.*

Several points are to be made:

1. The analysis of the 1999 CFI remeasurement has never been published; so it is impossible for the public and decisionmakers to know to what extent it validates the 1989 IFI estimates. The assertion made by CDF is unsupported.
2. Information supplied to me by CDF shows that the same volume estimating equations were used on the 1989 IFI and 1999 CFI inventory data, but different parameter values were used in the equation. These different parameters produce significantly different estimates of volume: the volume estimates, *from the same set of tree measurements*, differ by 16 percentage points. The 1984 CFI estimates used an entirely different set of estimating equations, and these in turn produce volume estimates that are about 16% lower than the lower IFI equation estimates.[19] See later discussion.
3. With so much variation between the variously derived statistical estimating equations, little confidence can be placed in the correctness of any one of the statistical results. One needs to look at the **self-consistency** of harvest, growth, and inventory measurements over time. Only the earlier CFI estimates pass this test.
4. In any event, the analysis presented later in this section shows beyond a doubt that the IFI estimates are seriously in error.

- *They[the IFI and CFI inventory estimates] are not directly comparable…It would be unreasonable to expect them to give the exact same results.*

  The IFI and the CFI estimates attempting to measure exactly the same thing: the inventory of the forest, albeit five years apart in time. They are comparable.

  I am not asserting that the two estimates should be exactly the same. That would indeed be unreasonable.

- *The underlying premise that a lack of close correspondence in estimates between previous generations of CFI data and recent IFI data in and of itself is indicative of an error in the IFI, CFI or both, is intrinsically invalid.*

  CDF is attacking a straw man. This is not my premise. Rather, the data show that the CFI growth, inventory, and harvest estimates were internally **self-consistent** over 25 years, and I have further demonstrated that this result could not have occurred if the CFI significantly underestimated inventory and growth. This is an analytical result based on CDF's own data.

In none of their responses to my comments does CDF provide any refutation of my analysis showing that the CFI estimates are, if anything, overestimates of the actual inventory and growth and, therefore, that the much larger IFI estimates must be erroneous.

5.4 None of the Difference in CFI and IFI Estimates Is Due to Statistical Errors

The publication that CDF cites as the one that "resolves the issues" I have raised,[20] proposes two explanatory factors for the difference between the CFI and IFI volume estimates: 1) statistical error, and 2) changes over time in the relation between tree

diameter (which is measured during inventories) and tree volume (which is for the most part calculated as a function of tree diameter). [21]

Mr. Henry states that about 15 percentage points of the 40+ percent difference in the estimates is due to revised diameter-volume relations. He relies on possible sampling errors to "explain" the unexplained 25 percent difference between the 1984 and 1990 inventory estimates. He uses the statistical concepts of sampling errors and confidence levels to argue that the unexplained difference of 25 percent is within normally accepted statistical probabilities. Essentially, this is an argument that the much smaller CFI sample was unrepresentative of the forest, but that the much larger IFI sample was statistically much more reliable.

However, there is no need for statistical arguments about possible sampling error. The 2050 IFI sample plots included all of the CFI sample plots; thus rather than resorting to statistical arguments, one need only to compare the results calculated for the CFI subset with those for all of the IFI plots using the same diameter-volume relations. This will provide a direct, unequivocal answer to question of whether sample differences account for the discrepancy in estimates.

This calculation was performed at my request by Norm Hill of CDF in 1998. Mr. Hill found that the estimated inventory calculated using only the CFI subset of plots was nearly identical to that estimated using all of the IFI plots.[22] ***This demonstrates that there was no significant difference between the CFI and the IFI plots in terms of total forest inventory***.

Sample differences do not account for any of the difference between the CFI and IFI estimates. The entire 40-50% difference (depending upon the IFI estimate being considered) requires another explanation.

5.5 Data Refute CDF Explanation for Increasing Volume-Diameter Ratio

The only other explanation for the difference in estimates proposed by CDF was a trend toward increasing volume-height relations over time. Mr. Henry showed plots that purported to compare the diameter-height relations used by the IFI and CFI systems to estimate timber volumes. He presents an analysis of data that found a 14% increase in volume growth in a small sample of plots "just due to differences in diameter relationships…" This still leaves 25-35 percentage points of the increase unexplained. I will have more to say about this later, but the underlying explanation for 14% of the difference is not supported by the data.

In my 2002 comments, I showed that the data published by CDF over 25 years contradicted CDF's "explanation" of why the volume of wood for a given diameter of tree should be greater in 1989 than in 1959.[23]

In its responses, CDF failed to address the empirical data and its implications, but instead said that the data concerned only "one of several factors" affecting the diameter-height (and therefore diameter-volume) relationships. But, in the publication that CDF cites as the one that "resolves the issues" I have raised[24], the only factor given as an explanation for an increase in height relative to diameter over time is the increase density of tree stands "as the young forest aged:"

> *Height growth appears to not be greatly affected within a wide range of stand densities for most species. Diameter growth, on the other hand, is relatively sensitive to changes in stand density. As stands become more dense, diameter growth per tree is reduced. The likely result is that as the young growth stands grew older and denser during this forty year period…diameter growth decreased relatively disproportionate to height growth…*[25]

The data presented showed that, rather than increasing, stand density steadily and significantly **decreased** throughout the period. CDF did not dispute the data. Thus, they present no grounds to dispute my conclusion:

> To the extent that stand-density changes were affecting the accuracy of CFI measurements, they should have caused a growing overestimation of inventory...[26]

CDF's tree-stand-density theory supports the view that the CFI system **overestimated rather than underestimated** inventory and growth in the later years. Rather than supporting CDF's position, it works against it.

5.6 Empirical Analysis of the 1984, 1989, and 1999 Volume Estimating Equations.

None of the explanations that CDF has given for the difference in the 1984 and 1989 inventory estimates are supportable by data or logic. After the 2002 Final EIR was published, with no meaningful refutation of my arguments, I was left not knowing what could have accounted for the difference. Certainly, sampling errors were not responsible. Although, according to CDF, 14 percentage points of the difference could be explained by newly estimated height-diameter relations, the decreasing density of forest stands made this explanation suspect. According to CDF's reasoning, decreasing stand density should have lowered height and volume relative to tree diameter, the opposite of what CDF said was the case.

Because CDF was unable to provide an explanation, I decided to analyze the 1984 and 1989 inventory data and estimating equations myself. CDF agreed to provide me with electronic files containing the inventory data for the 1984 CFI inventory and for the IFI-CFI plots[27] measured in 1989 and 1999. The basic data provided were for tree diameters by specie, and the plots were assigned a site index class. CDF also provided the estimating equations used to derive volume from tree diameter. Each of the three inventories (1984, 1989, 1999) used a different estimating equation.

With the help of a programmer, volume estimates were made by specie for the 1984 and 1989 inventory using each of the three different estimating equations.[28] The inventory data analyzed for 1984 is the entire CFI inventory sample. The data analyzed for 1989 is the subset of the IFI inventory plots that were located within the earlier-established CFI plots.

5.7 Comparisons of Three Estimating Equations Applied to 1989 Data

Table 5.1 shows the results of applying three different volume-estimating equations to 1989 inventory data. The three estimating equations were the three different equations applied to the 1984, 1989, and 1999 inventory data.

Some observations about the data in Table 5.1:

- The three volume estimates are derived from the same set of data (1989 inventory). The differences entirely reflect the differences in the volume-estimating equations . It is important to keep this in mind. In the table and the following discussion, the different years mentioned don't refer to different years of data but to year in which a given estimating equation was used to analyze inventory data, e.g., the 1989 equations were used in estimating inventory from sample data for the 1989 inventory. Here we apply all three equations to one year of data in order to isolate the effect of the differences in the estimating equations.
- The estimated whole-forest conifer volume using the 1989 estimating equation (2.0 billion board feet) is in the middle of the range of estimates put forth for this value by CDF. This gives some comfort that the data sample and data processing reasonably reproduce the data and analysis used originally by CDF.
- The comparative estimates for minor conifers are not reliable. The species codes used for the 1989 and 1999 inventories differed from those used for the 1984 inventory. There was not available a cross-reference table; thus 1984 equations could not be accurately applied to the 1989 data, and vice versa. As these were a relatively small component of the total, the problems in this category were accepted without being resolved. Nothing should be inferred from the difference in the estimates for minor conifers. Therefore, totals excluding minor conifers are used to compare the volume estimates produced by the three different estimating equations.
- The volume estimating equations have a much bigger influence on the volume estimates than Mr. Henry said and that CDF cited as correct (14%). The 1989 estimating equations, which are the equations used in making the 1989 inventory estimates, produce a whole-forest conifer volume estimate that is 31.6% greater than the one produced using the 1984 equations.

1. The results using the 1989 and 1999 estimating equations differ substantially– yielding respectively estimates that are 131.3% and 116.6% of the 1984-equation estimate. It is important to note is that these significantly different volume-estimating equations were derived only 10 years apart. Changes in forest stand age and structure could not explain this difference. The difference must reflect differences in statistical estimations of parameters. But, no reliance can be put on a methodology that yields such significant differences as these.

Table 5.1 Summary 1989 IFI-CFI Plot Data, gross volume estimates with estimating equations from '84, '89, and '99

		Volume Estimates from 1989 Inventory Data		
		1989 Equations	**1984 Equations**	**1999 Equations**
Young Growth Redwood	***Plot Total YG RW (1/5 acre/plot)***	707,166	532,089	603,716
	Total/acre	25,438	19,140	21,716
	Forest totals (48,682 acres)	**1,238,353,698**	**931,768,384**	**1,057,197,189**
	Ratio of volume to 84 equation volume	132.9%	100.0%	113.5%
Young Growth Douglas Fir	***Plot Total YG DF (1/5 acre/plot)***	325,478	256,617	305,041
	Totals per acre	11,708	9,231	10,973
	Forest totals (48,682 acres)	**569,961,133**	**449,375,977**	**534,173,139**
	Ratio of volume to 84 equation volume	126.8%	100.0%	118.9%
YG RW & DF Subtotals				
	Plot totals (1/5 acre/plot)	1,032,644	788,707	908,757
	Total/acre	37,145	28,371	32,689
	Forest totals (48,682 acres)	**1,808,314,832**	**1,381,144,361**	**1,591,370,328**
	Ratio of volume to 84 equation volume	130.9%	100.0%	115.2%
Old Growth Redwood and Douglas Fir	Plot totals (1/5 acre)	90,430	64,570	86,036
	Total/acre	3,253	2,323	3,095
	Forest totals (48,682 acres)	**158,357,187**	**113,071,212**	**150,662,577**
	Ratio of volume to 84 equation volume	140.1%	100.0%	133.2%
Minor Conifers	Plot totals (1/5 acre/plot)	36,374	10,001	15,140
	Total/acre	1,308	360	545
	Total forest (48,682 acres)	**63,696,632**	**17,513,174**	**26,512,340**
	Ratio of volume to 84 equation volume	363.7%	100.0%	151.4%

AllConifers[1]

Plot totals (1/5 acre/plot)	1,159,448	863,277	1,009,933
Total/acre	41,707	31,053	36,329
Forest Total (48,682 acres)	**2,030,368,651**	**1,511,728,748**	**1,768,545,245**
Ratio of volume to 84 equation volume	134.3%	100.0%	117.0%

All Except Minor Conifers

Forest Total (48,682 acres)	**1,966,672,019**	**1,494,215,573**	**1,742,032,906**
Ratio of volume to 84 equation volume	131.6%	100.0%	116.6%

1. The Minor Conifer Volume comparisons are not reliable.

2. The volume estimating equations are those used by CDF. The 1989 and 1999 equations are in Attachment VT-4. The 1984 equations are in Attachment VT-5.

3. The data used was supplied by CDF to me in the summer of 2005. The data are for 139 of the plots in the IFI inventory system that were established within the original CFI plots (2 of the original plots were missing data in 1989). The data are from the 1989 measurement of these plots. The electronic form of the data used in the 1990 analysis of these data was lost. The current data were reentered in 2005 by CDF personnel.

4. The processing of the data to produce volume estimates was done by Larry Bednar, Bednar Consulting, Portland, Oregon.

- The 1989 and 1999 relations for old growth redwood and douglas fir are suspect. The 1989 equations show 40% more volume than the 1984 equations. But, the 1984 equations were developed in 1959, when the forest had a substantial inventory of old growth trees. Now the inventory is much smaller, and height data were available for only a few old growth redwood (only 5 data points in 1999). There was also no reason to discard the 1984 equations for old growth, as the diameter-volume relations for trees hundreds of years old would not have changed in 40 years. Statistically unreliable estimates were used when a better alternative was available. This is evidence that the estimates were made by people lacking statistical expertise.

5.8 Comparisons of Three Estimating Equations Applied to 1984 Data

Table 5.2 is similar to Table 5.1, except that it is based on the 1984 CFI data instead of the 1989 data. Again, the three estimating equations are applied to the same, 1984 data.

Observations:

- The comparative estimates for minor conifers are not reliable and should not be ignored (see the observations under Table 5.1).
- The conifer volume estimate for 1984 data using the 1984 estimating equation (1,347 million board feet) is very close to the value reported by CDF for the 1984 inventory (1,368 million). This gives some comfort that the data sample and data processing reasonably reproduce the data and analysis used originally by CDF.
- The differences in volume estimates for the different estimating equations is about the same as with 1989 data. More on this later.

The data in Table 5.1 and 6.2 allow us to compare the estimated volume growth between 1984 and 1989 absent any changes in estimating equations. **The comparison leaves no doubt that the 1989 inventory was very seriously in error.**

Using the 1989 estimating equations, which CDF claims are more accurate than the 1984 equations, for both 1984 and 1989, the estimated conifer volumes are: 1,747 million board feet in 1984 and 2,011 million board feet in 1989. These values imply that net forest growth after harvest equaled 264 million board feet. Timber harvests for the five-year period beginning in 1985 were equivalent to 214 million of standing volume.[29] These results are summarized in Table 5.3.

Table 5.2 Summary 1984 CFI Plot Data, volume estimates with estimating equations from '84, '89, and '99

		Volume Estimates from 1984 Inventory Data		
		1989 Equations	**1984 Equations**	**1999 Equations**
Young Growth Redwood	*Plot Total YG RW (1/2 acre/plot)*	1,605,509	1,219,621	1,381,332
	Total/acre	22,773	17,300	19,593
	Forest totals (48,682 acres)	**1,108,643,721**	**842,178,823**	**953,843,779**
	Ratio of volume to 84 equation volume	131.6%	100.0%	113.3%
Young Growth Douglas Fir	*Plot Total YG DF (1/2 acre/plot)*	681,171	538,913	637,947
	Totals per acre	9,662	7,644	9,049
	Forest totals (48,682 acres)	**470,365,394**	**372,132,997**	**440,517,915**
	Ratio of volume to 84 equation volume	126.4%	100.0%	118.4%
YG RW & DF Subtotals				
	Plot totals (1/2 acre/plot)	2,286,680	1,758,535	2,019,278
	Total/acre	32,435	24,944	28,642
	Forest totals (48,682 acres)	**1,579,009,115**	**1,214,311,820**	**1,394,361,693**
	Ratio of volume to 84 equation volume	130.0%	100.0%	114.8%
Old Growth Redwood and Douglas Fir	Plot totals (1/2 acre)	190,987	141,534	187,966
	Total/acre	2,709	2,008	2,666
	Forest totals (48,682 acres)	**131,881,036**	**97,732,443**	**129,795,258**
	Ratio of volume to 84 equation volume	134.9%	100.0%	132.8%

Minor Conifers	Plot totals (1/2 acre/plot)	21,215	51,534	27,712
	Total/acre	301	731	393
	Total forest (48,682 acres)	**14,649,781**	**35,585,561**	**19,135,513**
	Ratio of volume to 84 equation volume	41.2%	100.0%	53.8%
All Conifers	Plot totals (1/2 acre/plot)	2,498,882	1,951,602	2,234,956
	Total/acre	35,445	27,682	31,702
	Forest Total (48,682 acres)	**1,725,539,933**	**1,347,629,825**	**1,543,292,464**
	Ratio of volume to 84 equation volume	128.0%	100.0%	114.5%
All Except Minor Conifers				
	Forest Total (48,682 acres)	**1,725,539,632**	**1,347,629,094**	**1,543,292,071**
	Ratio of volume to 84 eq. volume	128.0%	100.0%	114.5%

1. The Minor Conifer Volume comparisons are not reliable.
2. The volume estimating equations are those used by CDF. The 1989 and 1999 equations are
in Attachment VT-4. The 1984 equations are in Attachment VT-5.

3.. The data used was supplied by CDF to me in the summer of 2005. The data are for the 141 original 1/2-acre CFI plots. The data were reentered in electronic form in 2005 by CDF personnel.

4. The processing of the data to produce volume estimates was done by Larry Bednar, Bednar Consulting, Portland, Oregon.

Table 5.3. Estimated 1984-1989 Inventory Growth, using 1989 estimating equations (millions of board feet gross)			
	1984 Inventory	1989 Inventory	Estimated Growth 1984-89
All Conifers	1,747	2,011	264
Harvest 1985-89			214
Total Forest Growth			480

The estimated net growth plus harvests (total forest growth) in the five years 1984-89 equaled 480 million board feet! The exclamation point is appropriate. This is an outlandish figure. It amounts to 96 million board feet per year, 5.5% per year. It is more than double the 42 million board feet per year that CDF uses as the basis for estimating the allowable cut in the DFMP, a figure that is extremely questionable itself. It is ***triple*** the most reliable estimate of volume growth: 32 million board feet per year estimated by the 1984 CFI inventory.

I emphasize that the results in Table 5.3 reflect inventory estimates made with one set of estimating equations. None of the difference is due to change in the estimating equations between the two inventory years. The difference reflects differences in the basic tree data collected in the two different years. Something went seriously wrong with the 1989 inventory data collection and processing.

This result, together with 25 years of **self-consistent** estimates of forest growth, harvest and inventory under the CFI system (see prior section), proves beyond any doubt that the IFI estimates are far greater than the true forest inventory values. There is no way that the CFI estimates of inventories could have declined by 4 million board feet per year from 1964 to 1984 (which they did) if actual forest growth had equaled the IFI estimate of 480 million board feet per year. The IFI estimates are seriously in error.

The most reliable estimates of forest inventory and growth are those produced by the CFI inventory plots and estimating equations. But these estimates are now over 20 years old and not reflective of current forest conditions. JDSF is without a valid current inventory. A legally valid EIR or management plan is impossible without a valid current inventory.

The IFI whole forest estimates exceed the most credible (CFI) estimates by nearly 50%. This degree of error is far outside of acceptable bounds. For instance, for SYPs, FPR 14 CCR 1991,4,5(c)(4) limits the statistical probable error for each major vegetation type to 15%, a fraction of the actual error in the IFI estimates.

5.9 CDF Knew the IFI Estimates Were Impossibly High in 1991

Paul Ederer was an aide at JDSF and worked on the data processing of the 1989 article. He wrote about his experiences in a 1992 JDSF Newsletter article, attached.[30] I also interviewed Mr. Ederer in the summer of 2005.[31] Mr. Ederer reported in the article that he and his colleagues were concerned about the discrepancies between the new and old volume estimates. They did an even more careful comparison than I was able to do.

Using tree tags, they found the trees in the 1984 data that were within the 1/5-acre circular IFI-CFI plots. They then "processed the data sets identically."[32] He says in his article, in an extreme understatement, "The results were not what we expected…" The 1989 volume estimates were 37 percent greater than the 1984 estimates. The people doing the analysis knew that this was an impossibly great difference.

I asked Mr. Ederer, if an effort was made to determine the source of error that led to this impossible increase. He said, "No." I asked why not. He replied, "It was a hot potato, and no one wanted to touch it." In reviewing his remarks, he added, " There were probably other more valid reasons but I was blissfully unaware of the politicking going on within the agency and with other state departments."

The bottom line is that in 1991, CDF knew that the 1989 inventory estimates were impossibly high, but no one in the organization has been willing in the intervening 15 years to require that the impossibly high estimate be explained. Since 1998, I have been providing the department with analyses demonstrating the inconsistency of the 1984 and 1989 estimates and urging them to provide an explanation.[33] The only response was the analysis published by Mr. Henry[34], which itself was erroneous. CDF never went back and examined the underlying data in detail.

As Mr. Ederer said in his article, "The gain [in estimated inventory of about 500 million board feet] is every managers dream…" It was such a wonderful dream, and has been the basis for so much self-congratulatory PR about "taking a cut-over, burned-over forest and quadrupling the inventory," that management has preferred to remain in denial.

5.10 What Went Wrong with the IFI Estimates?

The public does not have to determine the source of errors that led the IFI to overestimate inventories. It is enough to demonstrate beyond a doubt that they are seriously overestimated.

For CDF's benefit, I make the following observations:

- The volume estimating equations are undoubtedly the most important source of error (though not the only one). The underlying equations were developed by Wensel and Krumland of UC and calibrated for JDSF using a 1983 Fall and Buck study. This is a good set of credentials for accuracy, but some cursory analyses suggests that the underlying equations (before including the effects of estimating diameter-height relations) contribute to the erroneously high estimates.
- Almost certainly there are problems in the way these equations were applied. The equations have height and diameter as two independent variables, and the values for the parameters were estimated by Wensel and Krumland from data that had values for both height and diameter. The parameter values are subject to statistical errors.

  CDF, though, measured diameters and did not measure heights in its plots, except for a small subset of trees. It then used the small subset of trees to develop and estimating equation for height as a function of diameter and tree species. Herein lie multiple problems.

- First, it is statistically questionable to use a statistically derived value to replace an independent variable in an equation that itself has parameter values that were statistically derived. This compounds errors in the estimation process. A more statistically robust and accurate estimation equation would be to correlate directly **volume** with diameter measurements, rather than first estimating height from diameter and then plugging the height value (along with the diameter value) into a volume estimating equation.
- Second, the estimated equations for height-diameter relations were evidently not stable and solid. The 1989 estimated height-diameter relation yielded volume estimates that were much different than the ones in 1989. Compared to the 1984 equations, the 1989 equations produced volume estimates that were 32% greater, whereas the 1999 volume estimates were 16% greater. This wide variability casts doubts on the design and conduct of the estimation procedure.
- Third, the height-diameter estimation model did not include site class as a variable. This is a significant deficiency, because site class importantly affects height relative to diameter. The CFI equations, which had only diameter as the dependent variable (with the influence of height captured in the correlation of diameter with volume) included site class as a significant factor.

- There were evidently problems with the data collection and processing for the 1989 IFI inventory. The unsupportable estimated growth estimate from 1984 to 1989 still exists, though somewhat smaller, if the 1984 estimating equations are applied to both years of data. Growth after harvest is 12% for the five years. Total forest growth including harvests equals 366 million board feet, or 27%. This is outside the bounds of possibility. The expected outcome would be no net growth after harvest, as was the intent of the cutting policy in this period.

  One way to get at this would be to compare the 1984 and 1989 tree data plot by plot to see where and how the spurious "growth" arose.

- The processing of the huge amounts of data for 2050 plots of the 1989 inventory overwhelmed the rudimentary computer facilities of JDSF. The problems were detailed by Mr. Ederer, the JDSF aide, in his newsletter article. He eloquently and with feeling described the nearly insuperable problems of processing the multiple data values for each of the 50,000 trees in the sample 80286 (AT) computer. He details these in a 1992 JDSF Newsletter article, A reading of this article will convince anyone that errors were almost certain. In a personal interview, Mr. Ederer, went into more details about the complexities and difficulties of processing the data.[35] At the end, he summarized, ""Let me say that the data processing was fraught with possibilities for errors."

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[16] Vince Taylor, *Comments on the Draft Management Plan and Draft Environmental Impact Report for Jackson Demonstration State Forest*, July 18, 2002 (Hereafter, *Taylor Comment 2000*).

[17] If anything, the CFI inventory system appears to have overestimated growth in its last twenty years, because inventories declined by 78 million board feet between 1964 and 1984, or 4 million board feet per year. As harvests were set equal to estimated growth, the decline in inventory implies that estimated growth exceeded actual growth.
[18] Response to Comment 241.4, *JDSF 2002 Final EIR,* p. IV-266.
[19] See 5.1 and the accompanying discussion later in this section.
[20] Response to Comment 241.6, *JDSF 2002 Final EIR,* p. IV-267.
[21] Norm Henry, "JDSF Forest Inventory – Transitioning form the Old to the New", *JDSF Newsletter,* Spring/Summer, 1999
[22] Letter to Marc Jameson, Forest Director, JDSF, from Vince Taylor, Dharma Cloud Foundation, April 22, 1998, 7 pages. See Table 2. The new diameter-volume relations were used for both sets of plots. Attachment VT-IN-1 in Taylor Comments 2002.
[23] *Taylor Comments 2002*, Section 2.3.4
[24] Response to Comment 241.6, *JDSF 2002 Final EIR,* p. IV-267.
[25]Norm Henry, *op. cit.*, p. 6. Attachment VT-IN-11 in *Taylor Comments 2002*.
[26] *Taylor Comments 2002*, p.9.
[27] The IFI-CFI plots were IFI circular plots of 1/5 acre that were located in the centers of the ½ acre rectangular CFI plots. There were 141 plots in 1984 and 1989. In 1999, one of the plots could not be found. CDF conjectured that the plot had been logged and thereby obscured.
[28] Estimates were also produced for the 1999 data, but I did not have time to create summary tables from the individual plot and specie data; thus I did not compare results of the 1989 inventory estimates with the other ones.
[29] JDSF harvests from 1985 through 1989 in millions of board feet at the mill were: 32.7, 25.2, 37.7, 24.4, 33.0; total = 181 million board feet. Gross standing volume harvested was approximately 214 million board feet. Gross standing volume equals 1.18 net volume delivered to the mill, according to John Griffen, head of timber sales, JDSF, private conversation, January 1998.
[30] Paul Ederer, "Forest Inventory – Managing the Numeric Monster for Forest Planning," *JDSF Newsletter*, #46, Summer 1992. Included herein as Attachment VT-6.
[31] *Interview of Paul Ederer,* by Vince Taylor 4/18/05. Included herein as Attachment VT-7
[32] Ederer, *op. cit.*, p.5.
[33] See *Taylor Comments 2002,* Attachments VT-IN-1 and VT-IN-2.
[34] Norm Henry, *op. cit*.
[35] Ederer, *op. cit.*, p.5

6 Proposed Harvest Plans Will Not Achieve Maximum Sustained Production

The law requires JDSF to demonstrate that its proposed harvest plans will achieve maximum sustained production of high quality timber products (MSP). JDSF has elected to make this demonstration under the rules of subsection (a) of the relevant Forest Practice Rule (14 CCR 913.11). The DFMP relies on the analysis in an unapproved Option A document filed in 2000 to show that this condition is met.

The Option A analysis uses the erroneous, highly inflated IFI inventory and growth rates to project the 100-year long term sustainable yield (LTSY) that sets the upper bound of harvests under Option A. The LTSY assumes a beginning inventory of 2.09 billion board feet (all species). The modeled growth in the first decade, excluding hardwoods, appears to barely exceed the projected harvest of 39.2 million board feet per year. (Figure 6, JDSF Option A). Given the 50% overstatement of initial inventories, the projected harvest certainly exceeds the **actual** growth of the forest.

The most credible estimate of conifer forest growth is the 1984 CFI estimate. 29.6 million board feet (net).[36] The allowable cut, which makes additional adjustments, was set at 28.5 million board feet.[37]Even before adjusting this figure to reflects areas of the forest where harvesting will not occur or is constrained and reduce, it is below the 31 to 33 million board feet established as the allowable harvest in the DFMP.

Adjustments to reflect no harvest and limited harvest areas reduce the amount available for harvesting significantly. The Option A analysis designated 8.4% of the forest as "No Harvest."[38] The DFMP discussed possible operational constraints not incorporated in the Option A analysis and set the allowable cut between 15 and 20% less than the Option A projected harvest rate.

Adjusting the 1984 CFI allowable cut (28.5 million board feet) for "no harvest" areas (8.4%) and operational uncertainties (15-20%) yields growth available for harvest of 22 to 21 million board feet. The harvest levels proposed in the DFMP are 50% greater than these values. The proposed harvest levels fail to meet the requirements of LTSY by a wide margin. The DFMP is legally defective.

6.1 Alternative Analysis of Harvest Available for Growth

In my comments on the 2002 EIR, I analyzed the growth available for harvest with methodology used by CDF in previous management plans.[39] This methodology has merit of making explicit the assumed impact on harvest of restrictions in harvesting in areas of the forest. This analysis, which assumed "no harvesting" in Woodlands Transfer Area (see below), estimated the growth available for harvesting would be 18 million board feet. This is practically identical to the allowable harvest rate estimated by the methodology used in the DFMP, adding to the credibility of the estimate.

6.2 The Woodlands Transfer Area

The DFMP and the DEIR should examine, as one of the sub-alternatives of the proposed management plan, the case where timber harvesting is not allowed in the Mendocino Woodlands Recreational Demonstration Area (Woodlands Transfer Area) transferred into JDSF from federal ownership. If harvesting is not allowed there, the forest available for

harvest would be reduced by an additional 4646 acres (9.5%). The growth available for harvest would be 19 to 18 million board feet.

The act of Congress authorizing the transfer stated in part: "Every such deed or lease shall contain the express condition that the grantee or lessee shall use the property exclusively for public park, recreational, and conservation purposes. …" {Act of Congress of June 6, 1942[56 Stats. 326: 16 U.S.C. 459t].} On the face of it, this act would appear to prohibit timber harvesting, which does not appear to fit into the "exclusive uses" required by the transfer deed.

The state of California has maintained that it is authorized to do timber harvesting in the Woodlands Transfer Area because of an opinion letter from the U.S. Attorney General's Office.[40] Paul Carroll, who has represented Dharma Cloud in earlier suits concerning JDSF, issued an opinion letter on this issue to an unrelated client. His opinion was that the clear language of the law states that any use must be compatible with all three of "exclusive uses."[41] Clearly, under this interpretation, timber harvesting is not permitted.

Recent history suggests that litigation over the law governing the Woodlands Transfer Area is a possibility. The DFMP and the DEIR should explicitly consider this possibility.

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[36] "The New Inventory – What It Tells Us So Far," JDSF internal document, 1993; Attachment VT-IN-5 in *Taylor Comments 2002.* The forest growth in 1984 was down from the from the 1979 inventory value: 29.6 versus 31.8 million board feet (net conifers).

[37] Memorandum by Forest Tilley, JDSF Forest Manager, November 15, 1985.

[38] *JDSF Option A Plan*, May 2000, Table 6.

[39] *Taylor Comments 2002*, Sections 3.3.3 and 3.3.4, pp 29-30.

[40] See for example, "Letter VT-241 - Response to Comment 241.28," *Final Environmental Impact Report for Jackson Demonstration State Forest*, September 2002, p. IV-275.

[41] Paul Carroll, letter to Douglas Wheeler, Director of Resources, California Resources Agency, July 31, 1998. Included herein at Attachment VT-8

Attachments

VT-1. Letter from Roger Sternberg to Chris Rowney, July 16, 2002
VT-2. CDF internal document, "Summaries To Be Calculated – Marc's request"
VT-3. Letter to George Gentry from Vince Taylor on the need to use updated inventory estimates in the preparation of the EIR, March 14, 2005.
VT-4. Volume equations used in for estimating volume from the 1989 IFI data and the 1999 CFI inventory measurement.
VT-5. Volume equations used for estimating volume from the 1959-1984 CFI inventory measurements.
VT-6. Paul Ederer article, "Forest Inventory – Managing the Numeric Monster for Forest Planning," *JDSF Newsletter # 46,* Summer 1992.
VT-7. *Interview of Paul Ederer,* by Vince Taylor, 4/18/2005.
VT-8. Paul Carroll, letter to Douglas Wheeler, Director of Resources, California Resources Agency, July 31, 1998.

July 16, 2002

Mr. Chris Rowney, Program Manager
Demonstration State Forests
California Department of Forestry
and Fire Protection
P.O. Box 944246
Sacramento, California 94244-2460

Dear Mr. Rowney:

I am submitting the following comments on the Draft Jackson Demonstration Forest Management Plan and Environmental Impact Report at the request of the Sierra Club California. I have been asked by the Sierra Club to do an independent assessment of certain elements of the Draft Plan and EIR. The following comments are based upon my own professional judgment and experiences on-site at Jackson Demonstration State Forest (JDSF).

I am a Registered Professional Forester and have been a private consulting forester since 1998. During the period of 1998-2001, I also was the part-time Executive Director of the Mendocino Land Trust. Prior to that I was the Director of Forestland Conservation for the Pacific Forest Trust in Boonville, California. I have a Master of Forestry degree from Yale University and ran my own forestry business in Vermont for seven years.

General Comments and Observations

As a mountain biker, I use JDSF on a regular basis. Overall, I have found most of its forest management to be compatible with my recreational activities. JDSF is a valuable recreational resource to me and to many others of the public who take advantage of its trails and roads.

Some years ago, I reviewed the 1983 JDSF Plan and found it to be lacking in addressing non-timber values like wildlife. It is good to see a considerable change since then, with the new Plan paying much more attention to wildlife, watershed protection, and late seral forest management.

The level of stocking at JDSF – 43,000 mbf/acre – is far greater than not only private industrial, but also most private non-industrial timberlands in Mendocino County. Over the last 50 years, JDSF has taken a poorly managed, understocked forest and developed it into a very impressive forest. In large part this is due to its conservative level of harvests, which consistently has been lower than growth rates (p. 22, Jackson

Demonstration Forest, Option A Plan for Achievement of Maximum Sustained Production of High Quality Timber Products, 5/9/00*)*. It is important to note that JDSF is continuing to harvest conservatively -- between 1.55 % 1.65% of inventory per year, which will build inventory over the next decade.

Most recently, while biking in JDSF, I happened to notice the large woody debris (LWD) placed in Hare Creek. This work was so well done that to the casual observer, the LWD looked as if it was naturally occurring. It is this kind of exemplary work that should be a standard for all management and research activities on JDSF.

For the sake of brevity, I have enumerated the following additional comments and recommendations on both documents.

1) Insufficient Data: As a forester, I find that the information provided on silvicultural practices and stand characteristics is insufficient to ensure attainment of enunciated objectives in the Draft Plan and EIR. In general, the documents do a good job qualitatively describing desired outcomes, but don't provide fundamental quantitative information.

To be specific, the various silvicultural systems are briefly described, defined by acreage and are mapped. Yet basic information on timber stand characteristics including species composition, age classes, projected growth, present stocking level, present volume per acre, size class distribution, residual volumes under uneven-aged management, and similar characteristics projected over the planning horizon by management compartment is missing. While the Draft Plan may not be required to provide this information, as is the case for the preparation of Non-Industrial Timber Management Plan (California Forest Practice Rules, Section 1090.5), this is basic information needed by present and future forest managers to guide their actions and for the public to understand how the Plan is going to be implemented.

As someone who strongly supports JDSF's mission to demonstrate sustainable timber and non-timber resource management, I find that this lack of information weakens the case that JDSF will be practicing forest ecosystem management. At a time when JDSF's management is being severely criticized and public confidence seems low, more information, versus less, is needed.

JDSF managers express a legitimate concern that the more detailed the information provided in the Plan, the more constraints will be placed on their management. Noss et al (The Redwood Forest, 2000), in fact emphasize the need for managers to retain flexibility in managing large tracts of forestland:

> *Historically, silviculture has focused on site-specific or stand specific prescriptions. It has become increasingly clear, however, that to meet conditions of ecological sustainability, managers must look beyond the individual stand-specific treatments that will ultimately achieve desired future conditions on the landscape scale. The "big Picture" view so necessary for conservation of the biological values of redwood forests (see chap. 7) therefore is also necessary for improved management of redwoods for timber. A big-picture approach requires the flexibility to apply a broad range of stand-specific management treatments and a decision-analysis process adequate to determine the appropriate mix of management activities across the landscape and through time.*

In crafting the Draft Plan, JDSF staff has put considerable effort into presenting this "big picture," but the picture as currently written is incomplete, because it doesn't project what will be happening spatially or temporally in individual management compartments. Flexibility of management will not suffer by providing this data so long as a range of silvicultural prescriptions can be applied in each compartment.

In an effort to garner more information, CDF staff referred me to the JDSF Option A Plan, which was used to fulfill the requirements of the California Forest Practice Rules to "disclose sustainable management, a balance growth and harvest over time, and protect public trust resources" (p.3). The Option A Plan provides helpful information including Table 5 (Inventory, growth, harvest over time, conifer and hardwoods), but it and most of the other data in the Option A apply to the Forest as a whole. Sample yield streams for some of the silvicultural prescriptions to be used on the Forest were also helpful, but are generic in nature and don't indicate where the final outcomes will occur.

Recommendation: Include information on stand characteristics per the requirements in preparation of a Non-Industrial Management Plan. Provide harvest and growth, stand, and age class distribution tables on a management compartment basis that indicate the forest condition now and on a decadal basis.

Recommendation: CDF staff has informed me that the Option A Plan will be revised to be consistent with the Management Plan. Since the data in the Option A Plan are used as the basis for projecting Long Term Sustained Yield, they should be incorporated as an Appendix to the Plan or EIR.

2) Forest Cover and Wildlife Habitat: In the past, JDSF has used the WHR classification system and has created a map of WHRs for the forest. The Draft Plan recognizes the problems associated with the WHR system and, as a result, JDSF has created its own Forest Cover Types, which are more applicable to present stand conditions. Although there is a map of Forest Vegetation (Figure 7) in the Draft Plan, it does not specifically identify areas containing JDSF Size Class 6 or 6M, which have the most likelihood of having late seral forest characteristics.

Recommendation: Develop maps of JDSF Forest Cover Types today, 10 years, 50 years, and 100 years. This will add critical information for future forest managers and help the public to understand the "big picture" envisioned in the Draft Plan. The maps should illustrate changes in habitat connectivity throughout the Forest. Note that the current scale of the map of Forest Vegetation is so small that it is very difficult to interpret. Maps at a larger scale should be produced and made available at various public locations. This recommendation exceeds the Department of Fish and Game's recommendation for a new type map (page 5, Draft EIR, Vol 2.).

3) Watercourse and Lake Protection Zone Standards: On page 69 of the Draft EIR, the Plan states that a minimum of 240 square feet of basal area will be retained in WLPZs in Class I and II watercourses. Flexibility to allow for thinning in lesser-stocked sites to hasten late seral forest characteristics should be incorporated into the Draft Plan. While the present standards call for a no cut zone of 25' along Class I watercourses and canopy retention levels, there is no indication of the diameter distribution that managers should be trying to attain in riparian management zones.

In The Redwood Forest, Noss et al reached the conclusion that:

***The greatest scientific shortcoming in the current California Forest Practices Act from the perspective of riparian and aquatic resources, is its reliance on the conceptual approach to stream buffer protections used in the CDF stream classification system*.**

Of particular concern is the lack of substantive protection for headwater channels feeding into Class I watercourses (pages 190-191). Similar concerns have resulted in adoption by the Arcata City Forest of watercourse standards exceeding the Forest Practice Rules. Recently, the Mendocino Redwood Company has applied standards for Class IIIs on one of its Timber Harvest Plans that exceed the Rules.

Recommendation: Provide for some flexibility in basal area retention standards to hasten late seral forest development. Define diameter distribution guidelines that comprise the basal area standard.

Recommendation: Adopt management standards for Class III watercourses that address serious concerns about preventing fine sediment migration into aquatic habitat.

Recommendation: Conduct long-term paired watershed studies in which the standards recommended for WLPZ protection submitted by NFMS to the Board of Forestry (December 1999) are applied versus the standards proposed in the Draft Plan. This research would provide a scientific basis for the determination of the adequacy of riparian area management zones.

4) Snag Retention and Recruitment: Pages 16 and 62 of the Draft Plan discuss snag retention and recruitment, recognizing the deficiency of snags in "special wildlife concern areas." The Plan defines goals for recruitment, however, there is no explicit statement discussing how snags will be recruited, e.g., through green tree retention.

Forest managers and wildlife biologists go back and forth over the issue of how many snags need to be retained to provide wildlife habitat for species inhabiting the coastal redwoods. How were the goals for snag retention determined for the Plan? Is "at least one snag per acre 30" DBH" adequate throughout the Forest?"

Recommendation: Conversations with JDSF staff indicate that all snags will be left in harvest areas unless they pose a safety, fire hazard, or pose a problem for harvesting. This should be explicitly stated in the Plan. Snags that are felled for the above reasons should be left on the ground until levels of down woody debris are sufficient.

Recommendation: Snag recruitment methods should be defined.

Recommendation: Levels of snag retention and recruitment methods should be researched on the Forest in conjunction with the Department of Fish and Game. In the meantime, it would seem prudent to increase goals per the Department of Fish and Game's recommendation (page 6, Draft EIR, Vol 2.)

5) Late Seral Forest Management: The Draft Plan states on page 47 that:

Uneven-aged management will eventually produce multi-aged stands with varied levels of large trees and structural habitat elements, many of which will be characterized similarly to WHR 6 habitat as currently defined."

However, if one of the silvicultural prescriptions modeled in the Option A Plan is to be implemented, approximately 3,133 acres of stands to be managed under group selection will not have any structural retention. This represents one-third of the total of the acreage to be managed under group selection. Further, the group selection prescription identified in the Option A Plan calls for reducing a stand currently stocked with 53mbf/acre down as low as 17.7 mbf. The combination of these two factors seems to conflict with the late seral forest management goal in uneven-aged stands.

As it currently stands, the Plan does not provide enough information to determine how the above stated goal will be met and on what scale.

Late successional/seral forest development of the various management alternatives is analyzed by Dr. Dale Thornburgh in the Draft EIR (Appendix 8A-26 thru 8A-37).

Dr. Thornburgh's assessment of Alternative C (JDSF Draft Plan), is that in 100 years and after 4 cutting cycles, stands that are currently 40-60 years old will "be progressing towards optimum conditions that are found in late successional forests." It is unclear whether Dr. Thornburgh's analysis applies to JDSF's uneven-aged management areas or to the late seral management areas identified in the Draft Plan.

Recommendation: The Plan should map second growth forests containing late seral forest characteristics using the JDSF Vegetation Type system and identify the impacts over time of proposed harvests on a management compartment and on a landscape basis. Information should also be provided on the specific effect of the Plan on older second growth forests (80-100 years).

Recommendation: The Plan should clarify whether Dr. Thornburgh's analysis applies to uneven-aged management areas in general or only to specific late seral management areas. If the latter is the case, then it would be very helpful to have Dr. Thornburgh comment on the proposed uneven-aged management silviculture in the Draft Plan and how well it will produce multi-aged stands with WHR 6 habitat characteristics referred to above.

Recommendation: Designate Late Seral Management for inner gorge areas (2,012 acres) to increase level of protection for riparian and aquatic resources

6) Old Growth Forest and Old Growth Trees: There appear to be as many definitions of old growth forests as there are forest ecologists. This lack of clarity shouldn't, however, preclude JDSF from selecting one. Without such a definition, limited management activities in old growth stands will not have a clear goal to attain.

The Plan specifically notes that individual old growth trees will be retained throughout the Forest (page 60), which will provide important structural diversity and provide additional wildlife habitat. However, the one criterion of a DBH greater than 48 inches seems to be questionable, particularly in relationship to Douglas-fir old growth, which tends to have smaller diameters than redwood old growth.

Recommendation: Define old growth forests. Noss et al (page 88) provide an excellent summary of the various definitions.

Recommendation: Change the diameter criterion for old growth conifers to 36 inches DBH.

7) Even-aged Management: According to CDF staff, 15% of even-aged managed stands will be in the 50-year or under age class at any one time. This information is important to note as it suggests that the even-aged management proposed in the Draft Plan should retain habitat connectivity.

Again, confirmation of this statement needs to be made via the provision of more data on a management compartment basis.

On page 12 of the Option A Plan, the following statement is made:

One of the Board of Forestry and Fire Protection polices for State Forests is to maximize the mean annual increment of high quality forest products…. On most sites, redwood does not appear to have a point of culmination of mean annual increment (CMAI) within a 100-year rotation age,… Most redwood stands are of mixed species composition, containing varying proportions of Douglas-fir, a species which does not exhibit a well-defined CMAI rotation in most cases. The practical interpretation of this policy directive has been to set even-aged rotations to at least 80 years on all site classes.

The Draft Plan, however, states that on the West End of the Forest, rotation ages of 60 – 90 years of age will be applied (page 54).

Recommendation: The Plan should clearly state the rationale for conducting even-aged management with a rotation of 60 years and why the change from the original minimum of 80 years occurred.

8) JDSF Budget and Staffing

Recommendation:

- Based on a $10-15 million annual budget, it is recommended that 10% of revenues be reserved specifically for JDSF-based research, demonstration, educational, and acquisition programs, and to hire a wildlife biologist.
- The Plan should call for an annual financial report to be made available to the public. Further, a report should be made yearly on the expenditure of JDSF timber revenues for such programs as the California Forest Improvement Program (CFIP). In this way, both managers and the public will be able to see the level of investment in the Forest on a programmatic basis and where overall revenues are expended.
-

I would also like to take this opportunity to thank the JDSF staff for providing information to me. Marc Jameson, Bill Baxter, and Craig Pederson helped me to better understand the management objectives and practices proposed in the Draft Plan and EIR.

Sincerely,

Roger Sternberg
RPF #2620

CFI SUMMARIES TO BE CALCULATED - marc's request

1. GROWTH BY SPECIES (ACCOUNT FOR HARVEST)
Use only trees which are present at both measurement points - this would exclude ingrowth or missed trees. Make conditional statement in systat to delete all trees which do not have dbh and height measurements in both time periods. Expand these to a per acre value

2. 10 YEAR HARVEST
delete all trees that are harvested in 1998 but were also harvest trees in 1988. Then delete all trees but ones with a harvest code remaining in the 1998 data set.

3. GROWTH/INVENTORY BY WATERSHED OR REGION
Use GIS to list all plots by watershed and do each separately

4. MORTALITY BY SPECIES

5. LWD BY TYPE
6. GROWTH BY SILVICULTURAL TREATMENT

7. SITE INDEX BY PLOT/SOIL TYPE
*CHECK ANOMALIES IN PLOT GROWTH - REFER TO OLD SUMMARIES WHICH ARE NOW REVISED AND GIVEN TO MARC ON 10/18/1999.
OTHER
1. GROWTH BY TYPE AND BY SPECIE
STANDING GROWTH
INGROWTH
GROWTH BY DIAMETER CLAS

GIS ACRES FROM SOIL INFO

SITE
1 - 165.6 - 0.4%
2 - 24909.4 - 51%
3 - 14940.6 - 31%
4 - 7697.2 - 16%
5 - 938.4 - 1.6%

TOM JAMESON

JDSF HARVEST ESTIMATE
1990-1998

1998-99 CFI PLOT DATA

Sum of BFVOL/AC	SPECIES	DBC	OD	YC	YD	YG	OC	TD	MADRONE	OH	CH	
PLOTNO	1		2	3	4	5	6	11	12	14	19	Grand Total
103	16315.35341		2498.832028									18814.18544
301			5493.23902	7219.634756								12712.87378
303					4958.504992							4958.504992
402				12259.02536								12259.02536
403			16272.96076	7519.407365			3161.579696					26953.94782
503			12518.38651	16778.23318								29296.6197
506			12632.24362									12632.24362
601	15435.19632		17895.76246				565.4111282					33896.3699
602			17501.51862									17501.51862
603			23633.89209						804.6189012			24438.51099
703			913.6354173	680.8808755								1594.516293
804			28218.17324	60639.0818								88857.25505
901			26023.28582	891.045107								26914.33092
904			103024.1083	646.3996714				2037.806994				103670.508
905			56130.35727	22546.63592								80714.80018
906				13859.97779					159.5454167			14019.5232
1002			21773.82039									21773.82039
1004			8202.759301					315.1741716				8517.933473
1103			7303.918023					432.2861338				7736.204157
1105		33882.79091	15436.92536	32499.4935	951.4786348	1528.375717	4768.782394			2532.677783		91600.5243
1108			5338.075175	8265.415042								13603.49022
1203			267.5513106									267.5513106
1303				4820.794659								4820.794659
Grand Total	31750.54973	33882.79091	381079.4447	188626.025	5909.983626	1528.375717	11281.04052	159.5454167	804.6189012	2532.677783		657555.0524
AVG VOL/AC HARVEST	225.1812037	240.3034816	2702.691097	1337.773227	41.91477749	10.83954409	80.00737955	1.131527778	5.70651703	17.96225378		4663.51101
HARVEST FOR PERIOD	10,911,380	11,644,146	130,961,600	64,823,139	2,031,022	525,241	3,876,838	54,829	276,515	870,379		225,975,089
ANNUAL HARVEST = (9 YEARS)	1,212,376	1,293,794	14,551,289	7,202,571	225,669	58,360	430,760	6,092	30,724	96,709		25,108,343
NET	1,091,138	1,164,415	13,096,160	6,482,314	203,102	52,524	387,684	5,483	27,651	87,038		22,597,509
48456 ACRES												

DRAFT

cfinocut.xls

6/22/00

JDSF CFI GROWTH
ESTIMATE
EXCLUDING TREES HARVESTED DURING PERIOD

Sum of CFIGPID	SPECIES																			
PLOT	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	Grand Total
101			6380				2676					17							9073
102			6352	1620								781							8752
103			2670																2670
201			877	131		0	4234	78											5320
202			540	109		393												37	1079
203			15776				708												16484
204			8253	0	0														8253
205			801	14202		0						35							15038
206							3730											105	3835
301			-290	2614						288									2134
302			9073	563															9925
303			6515	1282	1207		7024			37							653		8984
304			-200	0															6862
305		3291	9473																13416
306			11641	1841	199														13681
307			2838	2347	928					416									6531
308								1250	1555										2804
309			521	365		3451	0											84	4423
401			40117																40117
402			2087	3993	-1872					174									4383
403			4558	849						-140									5267
404			10642	6877						331									17949
405			965	6665	217														7847
406			1363																1363
407		3927	5748	2120															11795
408			2641	12261		417				-255		445							15509
501			624	2189	822	536				903									5074
502			105																105
503			2750	1762															4512
504			13912	8614						179									22705
505			11847	1725															13572
506			5003																5003
507			29755	13991															43746
508			5748																5748
509			1364	3791	1660					872									7687
601		0	2820	621		83				234									2958
602			8781																8781
603			3305	3422						684									7411
604			26541	12097															38638
605			248	4252	3470	-1019				399									7350
606			10464	3077						851									22391
607			230	1598									39						1867
608			-109	15261			0			102									15274
609			7773	2479						-471									9781
701			5427	0															5427
702			22080							800		36							22836
703			6934	-3067															3867
704			22614	24258															46872
705			1286							-341	-84								870
706			3653	18826															22460
707			5226	3307						6									8539
708			2770							-772									1998
801			13724	250								36							14009
802			9499	2008						150									11656
803			8803							301									9104
804			10529	11196															21725
805			4591	16549	233					83	80								21535
806			30443	12497						73									43013
901			9	-432						-45									-469
902			-1095	2945						2880									4750
903			19181									213							19393
905		1828	13698							183									14081
906			351	33540															35721
907			6078	8125						610	-336								14477
1001			13798							1976	251								16525
1002			13295																13796
1003			9622	1572						20			17						11431
1004			4197	3558						321	-10								8067
1005			15431								0								15432
1006		-1560	2674	2188						1561	51								4893
1007		-5892	29276							405	26								23814
1101			5682	5077						0									10759
1102			724	1141							137				7				2009
1104			15237	1880						417	104								17638
1105			461																461
1106			16101		6336														22436
1107			673	4917	3111					8111	6								6868

1108			8726	15599	-147					-10									24169
1201			374							553									927
1202			5743	1174							150								7068
1203	-9610		28921							163			147						19620
1204			3289	6049	3254	2788				171								93	15643
1301			152	1228						372	162								1915
1302			12459	8072						349			144						21023
1303			2682	4295						111	326								7414
1304			19930	11169						107									31207
1401			2443	402						-88	12					53			2823
1402			3186	2737						96									6019
1403			2253	17028															19281
1404			-4127							1678	147								-2303
1405	-4363			7560						33	30								3260
1501			-242	2269						1092									3119
1502			3390	6235						-575	-33								9017
1503			1565	11506						18									13090
1504			1257	17346															18602
1505			1345	3256	650	772				574								73	6671
1506			6554	4574						1028									12156
1507			5277	1549						1269									8096
1601	23076	0	1591	0															24667
1602			2973	9548						116									12638
1603			746	2916						366									4027
1604			443	2277						1628									4348
1605			3814	5422						831									10067
1606			1986	11622						270									13878
1607			-199	1292	590					1170									2853
1701			1070	7432						-94									8408
1702			4386																4386
1703			672	5960						2029									8661
1704			-69							325									256
1705	2221		-40	1842						1143									5165
1706			1243	3636						500									5379
1801			2621	4215						1524									8360
1802	-395	-30622		580					0	299				-98					-30236
1803			1679	4388						2136	-100								8103
1804			375	3318						2348	298								6339
1805			5210	1549						1302									8061
1806			6045	5396															11441
1807	-52503		4527							1140									-46836
1901			4812	4873						502									10187
1902			109	150						1117									1377
1903			326	705						-89	7								950
1904			1257	2728						987									4973
1905			5693	2758						928	-170								9209
1906			1648	5758															7406
2001			-72	929						370									1228
2002			320	3417						2742									6480
2003			1223							1092									2316
2004			159	3573															3732
2005			3499	346						86									3931
2101			2008	8327						389	65								10788
2102				477						622									1098
2103									0	-36	42			342					348
2104			644	706															1350
2105			451							1087									1538
2106										147								8	155
2201				15195						305	667			155					16322
2202			399	291						1355									2046
2203			430	490						1919									2840
2301			2409	257															2666
Grand Total	-32536	-38095	763633	527476	17861	7420	18374	1328	1554	51450	1825	1562	347	399	7	53	653	400	1323713
	-231	-270	6416	3741	127	53	130	9	11	365	13	11	2	3	0	0	5	3	
PERCENTAGE	-2.5	-2.9	57.7	39.8	1.3	0.6	1.4	0.1	0.1	3.9	0.1	0.1	0.0	0.0		10 YEAR	AVG PLOT GROWTH =		9388
																ANNUAL AVG GROWTH /AC =			939
												GROSS	ANNUAL	TOTAL FOREST GROWTH -trees present during both inventories =					45,490,671
																plus ingrowth during the period			
																		SE% @ 95% CI =	20
												GROSS	ANNUAL HARVEST ESTIMATE =						25,108,343
																		SE % @ 95 CI	57
																	TOTAL =		70,599,014
																Combined	SE %		60

Campaign to Restore Jackson State Redwood Forest
P.O. Box 1789
Fort Bragg, CA 95437

Attachment VT-3

March 18, 2004

Mr. George Gentry, Executive Officer
State Board of Forestry and Fire Protection
P.O. Box 944246
Sacramento, Ca 94244-2460
Fax: (916) 653-0989

Subject: Scoping Comment on Jackson State Forest EIR

Dear Mr. Gentry:

In my oral comments at the Board of Forestry meeting in Fort Bragg, I supported the need to re-open the management plan to correct major deficiencies. This letter supplements my oral presentation.

I repeat two of the major points briefly here:

- The 2002 DFMP states (p.3) "This plan builds on the 1983 plan by elevating wildlife, watersheds, and ecosystem processes to a level of importance equivalent to the timber management and research, demonstration and education programs." The public and current environmental laws require that JDSF's management plan do what is stated.

  The proposed DFMP, however, does not do what it states it does. Timber harvesting is the dominant part of the plan. Little if any attention is paid to any of the non-timber values enumerated in the quoted sentence. Thus, the DFMP fails to meet its own statement of intent. It also fails to provide what 5,000 members of the public said they want, nor does it meet current state environmental objectives

- The DFMP fails completely to recognize the key role of Jackson State Forest for conservation and habitat in the region. The surrounding industrial timberlands contain only very young trees and badly degraded streams questionably supportable of salmon recovery. As a publicly owned forest with substantial stands of mature second growth and less degraded streams, JDSF can provide habitat otherwise absent in the region. The DFMP fails to evaluate regional ecosystem needs and incorporate them in the plan.

I want to enter into the record at this early point my strong recommendation that the Board order JDSF to:

1. Obtain an objective, third-party evaluation of the accuracy of the IFI inventory system and fix any errors that the evaluation finds.
2. Perform a new whole-forest IFI inventory.

With respect to 1), I have repeatedly provided JDSF with evidence of serious errors in the IFI inventory estimates. This evidence is contained in my comments on the earlier JDSF

EIR and in our court challenge to the EIR. I incorporate that evidence in this letter by reference. The evidence I have submitted has been ignored or dismissed, but it has never been satisfactorily answered. I would greatly prefer that the dispute be resolved out of court than in court, but I am determined that it be resolved.

With respect to 2), the last whole-forest IFI inventory was done in 1989, fifteen years ago. Management planning needs to be based on up-to-date inventory information. There is no empirical data on growth and changes in inventory at the detailed level provided by the IFI inventory system. Inventory estimates projected by computer models from 1989 to 2004 will have no empirical test of validity and cannot be considered reliable.

The IFI system replaced the earlier CFI system, used from 1959 to 1984. The CFI system was replaced because it could not provide the detailed small-area inventory data required to do adequate analysis and planning by watershed and sub-watershed.

An inventory estimate using a small subset of the 2500 plots in the IFI inventory system evidently was done in 1999. The 1999 inventory estimate was based on the 141 plots of the IFI system that were in the earlier, CFI inventory system. The 1999 quasi-CFI inventory cannot provide reliable, detailed small-area inventory data.

Accurate inventory estimates are a prerequisite for legally adequate consideration of cumulative impacts. Delaying the preparation of a new inventory will merely delay the time at which a legally adequate EIR can be prepared.

Sincerely,

Vince Taylor, Ph.D.
Executive Director

DRAFT 4/3/00

Attachment VT-4

COMPUTE 1999 TREE HEIGHTS AND VOLUMES

```
BASIC
USE 'C:\Forest Inventory\HJWCFI\CFIS1015S.SYS'
SAVE 'C:\Forest Inventory\HJWCFI\CFIS1018S.SYS'
IF (SPECIES =1) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(5.046 - 2738350000*(DBH99^(-6.938)))
IF (SPECIES =2) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(5.046 - 2738350000*(DBH99^(-6.938)))
IF (SPECIES =3) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(6.881 - 6.248*(DBH99^(-0.335)))
IF (SPECIES =4) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(6.331 - 5.729*(DBH99^(-0.435)))
IF (SPECIES =5) AND (MEASHT$<>'MH')  THEN LET HEIGHT99=4.5+EXP(5.713- 8.267*(DBH99^(-0.725)))
IF (SPECIES >5) AND (SPECIES<10) AND DBH99<31 AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(3.549 +
0.019*(DBH99^1.287))
IF (SPECIES =5) AND (MEASHT$<>'MH') AND (DBH99>30) THEN LET HEIGHT99=4.5+EXP(6.881 - 6.248*(DBH99^(-0.335)))
IF (SPECIES =11) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(5.717 - 3.333*(DBH99^(-0.270)))
IF (SPECIES >11) AND (MEASHT$<>'MH') THEN LET HEIGHT99=4.5+EXP(4.710 - 2.857*(DBH99^(-0.578)))
RUN

IF SPECIES = 1 THEN LET VOL99 = EXP (-6.2233+1.6117*LOG(DBH99)+1.6021*LOG(HEIGHT99))
ELSE IF SPECIES = 2 THEN LET VOL99 = .0004714*DBH99^1.725*HEIGHT99^1.809
ELSE IF SPECIES = 3 THEN LET VOL99 = .0003347*DBH99^2.012*HEIGHT99^1.664
ELSE IF SPECIES = 4 THEN LET VOL99 = .0004714*DBH99^1.725*HEIGHT99^1.809
ELSE IF SPECIES = 5 THEN LET VOL99 = .00009784*DBH99^1.767*HEIGHT99^2.128
ELSE IF SPECIES = 6 THEN LET VOL99 = .00009784*DBH99^1.767*HEIGHT99^2.128
ELSE IF SPECIES = 7 THEN LET VOL99 = .00009784*DBH99^1.767*HEIGHT99^2.128
ELSE IF SPECIES = 8 THEN LET VOL99 = .0003347*DBH99^2.012*HEIGHT99^1.664
ELSE IF SPECIES = 9 THEN LET VOL99 = .0003347*DBH99^2.012*HEIGHT99^1.664
ELSE IF SPECIES = 11 THEN LET VOL99 = .0007933*DBH99^2.3095*HEIGHT99^1.2107
ELSE IF SPECIES = 12 THEN LET VOL99 = .002524*DBH99^1.7264*HEIGHT99^1.2646
ELSE IF SPECIES >12 THEN LET VOL99 = .003747*DBH99^2.2444*HEIGHT99^0.8136

IF DBH99<11 THEN LET WEIGHT99=20
IF DBH99>10.9 THEN LET WEIGHT=5
LET ACRVOL99 = VOL99*WEIGHT99
LET NACVOL99 = ACRVOL99*((100-DEFPCT)/100)*0.93
IF NACVOL99 = . THEN LET NACVOL99 = ACRVOL99 * 0.93
```

COMPUTE 1988 HTS AND VOLUMES

```
BASIC
IF (SPECIES =1) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(5.915 - 8.488*(DBH88^(-0.584)))
IF (SPECIES =2) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(42.966 - 40.550*(DBH88^(-0.019)))
IF (SPECIES =3) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(6.119 - 6.172*(DBH88^(-0.472)))
IF (SPECIES =4) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(5.970 - 5.801*(DBH88^(-0.538)))
IF (SPECIES =5) AND (MEASHT$<>'MH')  THEN LET HEIGHT88=4.5+EXP(5.364- 9.360*(DBH88^(-0.980)))
IF (SPECIES >5) AND (SPECIES<10) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(4.705 - 5.188*(DBH88^(-0.974)))
IF (SPECIES =11) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(4.353 - 7.604*(DBH88^(-1.266)))
IF (SPECIES >11) AND (MEASHT$<>'MH') THEN LET HEIGHT88=4.5+EXP(4.233 - 11.886*(DBH88^(-1.658)))
RUN

BASIC
IF SPECIES = 1 THEN LET VOL88 = EXP (-6.2233+1.6117*LOG(DBH88)+1.6021*LOG(HEIGHT88))
ELSE IF SPECIES = 2 THEN LET VOL88 = .0004714*DBH88^1.725*HEIGHT88^1.809
ELSE IF SPECIES = 3 THEN LET VOL88 = .0003347*DBH88^2.012*HEIGHT88^1.664
ELSE IF SPECIES = 4 THEN LET VOL88 = .0004714*DBH88^1.725*HEIGHT88^1.809
ELSE IF SPECIES = 5 THEN LET VOL88 = .00009784*DBH88^1.767*HEIGHT88^2.128
ELSE IF SPECIES = 6 THEN LET VOL88 = .00009784*DBH88^1.767*HEIGHT88^2.128
ELSE IF SPECIES = 7 THEN LET VOL88 = .00009784*DBH88^1.767*HEIGHT88^2.128
ELSE IF SPECIES = 8 THEN LET VOL88 = .0003347*DBH88^2.012*HEIGHT88^1.664
ELSE IF SPECIES = 9 THEN LET VOL88 = .0003347*DBH88^2.012*HEIGHT88^1.664
ELSE IF SPECIES = 11 THEN LET VOL88 = .0007933*DBH88^2.3095*HEIGHT88^1.2107
ELSE IF SPECIES = 12 THEN LET VOL88 = .002524*DBH88^1.7264*HEIGHT88^1.2646
ELSE IF SPECIES >12 THEN LET VOL88 = .003747*DBH88^2.2444*HEIGHT88^0.8136
IF DBH88<11 THEN LET WEIGHT88=20
IF DBH88>10.9 THEN LET WEIGHT=5
LET ACRVOL88 = VOL88*WEIGHT88
LET NACVOL88 = ACRVOL88*((100-DEFPCT)/100)*0.93
IF NACVOL88 = . THEN LET NACVOL88 = ACRVOL88 * 0.93
RUN

IF NACVOL88 = . THEN LET NACVOL88 = 0
IF NACVOL99 = . THEN LET NACVOL99 = 0
LET NACRGRO = NACVOL99 - NACVOL88
```

Marc: Did use different ht/dia. coefficients for 1988 + 1999 and then applied those heights to the standard set of volume equations we use now.

Norm

Note: Obtained from CDF. The handwritten note at the end is from Norm Henry, who was the inventory analyst at JDSF at the time, to Marc Jameson, Jackson Forest Director.

Attachment VT-5

CFI volume formulas ①

TABLE A.1

JACKSON STATE LOCAL VOLUME TABLES [1/]

~~Merchantable Cubic Feet:~~ $v_i = a_1 + b_1 \cdot d_i + c_1 \cdot d_i^2$ ← SCRIBNER BOARD FEET

~~Scribner Board Feet:~~ $v_i = a_2 + b_2 \cdot d_i + c_2 \cdot d_i^2$ ← MERCH CUBIC FEET

CFI	IFI	SPECIES	v_5	AGE	SITE	BOARD FEET a_1	BOARD FEET b_1	BOARD FEET c_1	CUBIC FEET a_2	CUBIC FEET b_2	CUBIC FEET c_2
2		Douglas Fir	4	YG	I,II	156.087	-33.6927	2.47545	-8.1280	0.16200	0.254495
2		Douglas Fir	4	YG	III-V	139.386	-29.3080	2.03223	-9.7284	0.86453	0.184100
102		Douglas Fir	2	OG	-	1293.277	-110.7644	3.39810	83.7489	-7.83002	0.371421
1		Redwood	3	YG	I,II	166.090	-31.2456	1.82285	6.8793	-2.14501	0.248695
1		Redwood	3	YG	III-V	(142.130	-26.8349	1.58044)	(8.5681	-2.18287	0.229721)
101		Redwood	1	OG	-	362.238	-49.1316	2.00178	17.8595	-4.20614	0.297759
12		Beach Pine	7	-	-	217.061	-38.0766	2.01718	16.3833	-3.47671	0.288064
12		Bishop Pine	7	-	-	217.061	-38.0766	2.01718	16.3833	-3.47671	0.288064
103		White Fir	5	OG	-	1293.277	-110.7644	3.39810	83.7489	-7.83002	0.371421
		White Fir	5	YG	-	-143.866	-4.6394	1.93271	-35.3049	2.46767	0.232820
6		Hemlock	6	-	I,II	166.090	-31.2456	1.82285	6.8793	-2.14501	0.248695
6		Hemlock	6	-	III-V	142.130	-26.8349	1.58044	8.5681	-2.18287	0.229721
39		Nutmeg	19	-	-	217.061	-38.0766	2.01718	16.3833	-3.47671	0.288064
21		Cypress	8	-	-	217.061	-38.0766	2.01718	16.3833	-3.47671	0.288064
31		Alder	13	-	-	366.980	-58.2037	2.61454	51.2392	-7.71842	0.405272
32		Bigleaf Maple	17	-	-	78.440	-14.4223	0.86620	9.3576	-1.24704	0.120120
37		Willow	16	-	-	366.980	-58.2037	2.61454	51.2392	-7.71842	0.405272
36		Canyon Live Oak	15	-	-	163.337	-23.7085	1.09907	26.6426	-3.12197	0.166925
33		Tanoak	11	-	-	-25.431	-3.6834	0.65936	-21.5157	0.96750	0.133158
38		Pepperwood	14	-	-	326.409	-45.4436	1.70399	58.0630	-7.64679	0.295748
34		Chinquapin	19	-	-	-25.431	-3.6834	0.65936	-21.5157	0.96750	0.133158
35		Madrone	12	-	-	-143.437	10.0495	0.2903	12.8973	-2.61390	0.240116
39		Wax Myrtle	19	-	-	78.440	-14.4223	0.86620	9.3576	-1.24704	0.120120
39		Eucalyptus	18	-	-	366.980	-58.2037	2.61454	51.2392	-7.71842	0.405272

[1/] Extracted from Jackson State Forest inventory program written by Lee. C. Wensel

FOREST INVENTORY-MANAGING THE NUMERIC MONSTER FOR FOREST PLANNING

Paul Ederer, Forestry Aide, IFF Tech.

In 1988 , a thirty years old continuous forest inventory (CFI) system was radically changed as Jackson Demonstration State Forest (JDSF) joined the high tech information age by implementing a new state of the art forest inventory system. The original system of 141 rectangular 1/2 acre plots established in 1958-60 on a regular 3/4-mile grid was laid to rest, replaced by a new system of 2350 circular 1/5 acre plots (fig. 1) randomly located according to forest cover types. A more detailed description of the new system is available in newsletter No. 28, January 1988. Data collection for this new system began in the summer of 1988 and was completed in the spring of 1990. The analysis phase started just as forestry in California began to experience sweeping changes that are still shaking the dust out of the old forest practice rules. With the anticipated changes in rules and their focus towards a regional outlook and a even timber flow, the new intensive forest inventory (IFI) data has assumed a highly significant role in forest wide planning.

IFI is equipped to supply most of the information required by pending rule changes. Increasing concern over how timber harvesting affects other forest resources both immediately and over time has resulted in more and more information being demanded of forest managers. CFI was limited in the amount and detail of information that could be obtained, especially with regard to timber stand distribution information at the management compartment and watershed level. It also lacked the capacity to link with a growth projection model.

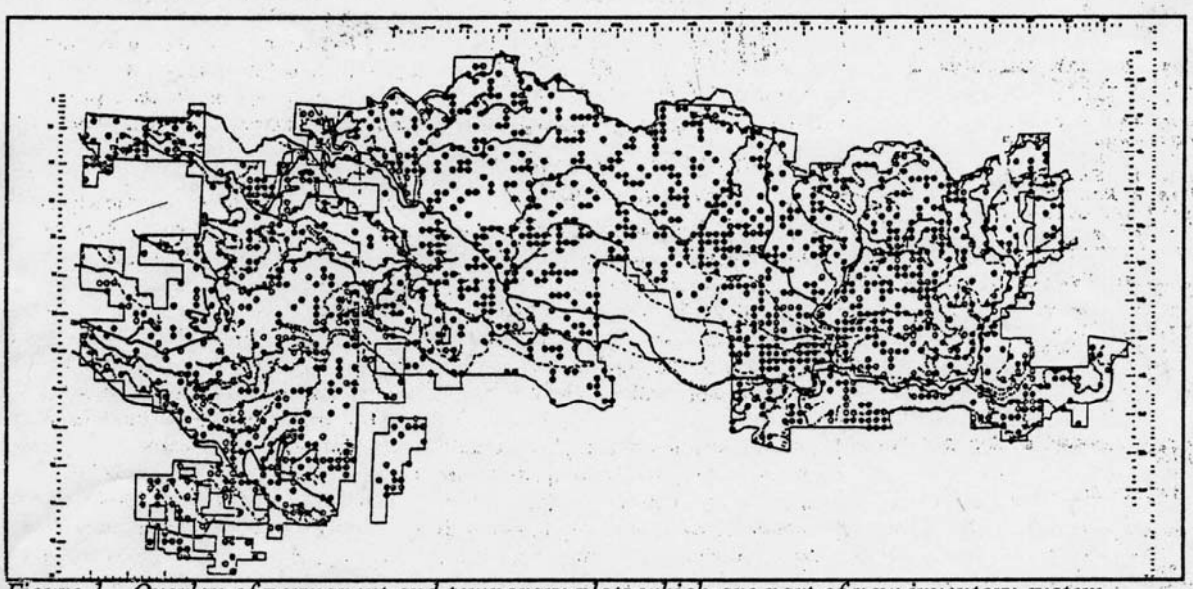

Figure 1. Overlay of permanent and temporary plots which are part of new inventory system

Of course all this new information has costs attached to it. The increased number of plots to be measured and subsequent additional data analysis burden mean less time for other staff duties. The lack of staff time necessitated bringing in outside contractors which can distance the managers from the reality of the source of the numbers generated. In balancing these trade-offs, it was decided to contract the data gathering and do the analysis in-house. With field work finished by spring of 1990, a temporary forestry aide was hired to start clicking on the computer. Most of the data entry was completed by the contractor but inserting site index and hand checking for suspicious values was left to JDSF.

The IFI system has the capability to interact with any statistical and data managing program. Inventory data is read into our statistical program where it is manipulated and transformed before being written to IFI for final processing. Two important pieces of information were required before that could be done: 1) a height/diameter relationship had to be developed since heights were only taken for a small sample of the total trees ; and 2) a radial growth model had to be developed from a subsample of cored trees for IFI to project diameters to a common year.

The height/diameter relationship was assumed to be non- linear and modeled using the following non-weighted equation:

HEIGHT=4.5+EXP(b1 + b2 * (DBH^b3))

as suggested by Forest Service Research Note PSW-408. Both equations

mentioned in the report were tried but the one shown here produced a consistently better fit with our data. Separate coefficients were developed for old and young redwood, whitewoods (Douglas-fir, grand fir) and minor conifers. Hardwood heights were not taken so coefficients from the minor conifers were used instead. Each species group was further stratified by five aggregations of 69 different stand/density codes and 3 aggregations of 12 soil/site index codes.

Ten year radial growth data was collected as it was anticipated that not all 2350 plots would be measured in a single year requiring some growth factor to adjust dbh to a common year for estimating total forest growth. Since there was no equation to directly predict radial growth, a basal area growth (BAG) variable was created. An equation taken from Research Bulletin 51 published in1985 by the Oregon State Uuniversity Research Lab was used to predict BAG. A simpler version of the equation was used as some of the information needed for the full equation was not available. BAG was envisioned as the "doughnut" of new growth formed by the difference in basal area in a 10 year period. A conversion equation was used to change the BAG variable to a radial growth value usable by the IFI. Again the data was stratified by the same species groups and stand/density, soil/site codes as were the height data. Where there were not enough data to be confident in predictions, each species group was combined by soil/site codes and then stand/density codes.

All this data manipulation exposed several problems with both the computer and programs. Most of the initial work was done using a 80286 (AT) computer, frequently pushing it to the limit of its capacity. The major problem was the size of the data file. Having input data on over 50,000 individual trees, the "monster" file created occupied 12 megabytes (mb) worth of space on the hard drive. After performing a few data transformation operations in which backup files are automatically written, the hard disk would be filled. The computer was then unable to complete the assigned task or old files would have to be deleted to make room for the new. Even with a data compression program the file could not be squeezed onto one floppy disk, requiring an hour long multi-step procedure to save a file. The file size was also a hindrance to data checking; no reasonable way was found to check it manually so a technique had to be developed for the computer to do it. The problem arises in the difficulty of having the computer program error check certain items and how to anticipate every possible error condition. The data management program used was usually up to the task, but it was not always obvious how to get it done, necessitating many calls to the company.

A frustrating time ensued as errors like plot data being triplicated or deleted from the file crept in during the processing phase before being noticed. The causes for the errors then had to be determined and eliminated. A program upgrade process was also endured as it required switching between two versions of the statistical program for certain analyses. The new version was significantly better visually and procedurally than the old, so we used it as much as possible. The newer version lacked some vital routines however, resulting in extra time spent converting the data between versions with the risk of errors or the program crashing.

The system was upgraded to a 80386 model computer with the newest disk operating system (DOS 5.0) installed which lessened data storage problems and significantly increased the file processing speed. At this point in the inventory cycle, the data management program is completely operable in its new version. A future addition of a tape backup system for the hard drive will provide easy data storage and mitigate the fear of a major data loss.

As reported by the old inventory system, gross softwood volume on the forest has fluctuated around 1.36 billion board feet (standard error of 8.4%). The new inventory system indicates the Forest contains 1.87 billion board feet (standard error of 1.9%). The gain is every forest managers dream but at this time we view the new number with a cautious eye. One probable cause for the difference is the volume equations that were developed for the new system. As a check we did a comparison of the 141 old CFI plots in 1984 and 1989. Using tagged tree numbers, we were able to reconstruct the 1989 circular plots in the old 1984 rectangular plots and then process the two data sets identically. The results were not what were expected, with the '89 data suggesting 2.2 billion b.f.and the '84 data indicating 1.6 billion b.f. Some increase would be anticipated but a 37 percent increase is suspicious.

During the time this article is being written the California State Board of Forestry is considering monumental changes to the regulations that govern how timber is managed in the State. Several versions of different rules are being considered, but one main focus is on sustained yield and long term timber management. Emphasis on forest wide planning will require managers to have information at their finger tips on sustainable productivity, growth rates and growth potential, area in each timber type, diameter and age-class distribution and more.

For future management decisions an accurate estimate of inventory is required. A minor error projected over the 100 year planning period could cause major deviations between paper planning and on the ground realities. As this is the first test of a completely new and integrated system, problems were bound to occur and lessons learned in this cycle will be applied to the next . It is unknown how the pace of computer development will proceed but for this type of project bigger and faster computers are needed. The trend is for more and more information to be collected and used in addressing new forest practice rules so the demand for computer power will increase. We estimate having to track up to 4,400 different possible stand conditions. An obvious area to streamline is data entry. The forest is currently testing a

programmable data recorder that will eliminate the re-entry of data from field forms to computer disk. The recorder will be able to check data as it is entered and eliminate most typographical errors .

The space age could make its mark on JDSF if a Global Positioning System (GPS) is used for accurately locating plot centers (see Newsletter No. 40). There has been a problem in assigning the plot to the correct forest cover type for analysis. With GPS linked to a Geographic Information System all inventory data could be easily accessed and stratified by management area, watershed or whatever unit was desired by managers. At some organizational level this type of system will be a necessity in order to meet the demands of the new forestry regulations.

This paper is dedicated to the entire staff at Jackson Demonstration State Forest whose knowledge and friendship has been inspiring.

Interview of Paul Ederer, by Vince Taylor 4/18/05

Paul Ederer worked for JDSF as a Forestry Aide during the time that the 1989 IFI inventory data were being processed. He now works for Campbell-Hawthorne timber company. The primary purpose of the interview was to learn from him about the processing of the 1989 JDSF inventory data and to get his view of the possible causes of the big discrepancy between the 1984 inventory estimate and the 1989 estimate.

The notes have been reviewed by Paul and approved for submission to the Board of Forestry (see Attachment 1, e-mail excerpts).

Notes on conversation with Paul Ederer on 4/18/05

I met with Paul at the café at the Fort Bragg Depot at 3:00 p.m. on April 18, 2005.

I started by asking him about his current employment, what he did, and whether he'd worked for GP previously. He work primarily on forest restoration, but during the slow season (Spring), he does THP preparation. Today he worked above Cleone in an area filled with brush (but with a million dollar view). He enjoys his job and finds Campbell good to work for, now that they have adjusted to the realities of the property they bought. He told me quite a bit about how Campbell conducts its inventory, which I will record at another time.

Paul did work for GP briefly, 1993- 1999, but worked for Simpson 1992-1993 in Arcata after leaving JDSF.

Paul worked for JDSF starting in 1990. It was his first job after college (OSU). He was hired as a Forestry aide, to help with processing the first IFI (Intensive Forest Inventory) data, collected in 1988-89. He said that his first task was to visually scan a mountain of computer scatter plots (he indicated with his hand a stack of papers perhaps three feet high) for "outliers," data points that are so far from the norm as to be suspicious. He said he recalls the task as being extremely tedious and boring. This was only the first of many aspects of the data processing of that suggests room for error. It is only human to start glazing over and not really seeing when one is repeating boring tasks for long periods of time.

Paul wrote an article for the JDSF Newsletter in Spring 1992 describing his experiences.[1] He finished working for JDSF in Spring 1992. He worked seasonally May to November.

[1] Paul Ederer, *Forest Inventory – Managing the Numeric Monster for Forest Planning,* JDSF Newsletter, No. 46, Spring 1992.

In his article, Paul described the data-processing problems caused by the huge size of the data file, relative to the computer capabilities of that time. In our conversation he expanded on the difficulties:

- The computer was so slow that he would often start a run in the morning and then go out to the woods for the day. When he returned in the afternoon, the computer would still be working.
- The files had to be broken down into many small segments (up to 100), generally according to a stand type or forest compartment. Each segment then needed to be processed separately, involving numerous manual steps and relying up entering keystrokes tied to macros (recorded sequences of keystrokes) that had been previously prepared by someone else. There was no way of knowing what was going on in the computer, what calculations the computer was performing. The intermediate results for all of the segments then needed to manually combined to get a final whole-forest result.
- One of the steps involved in breaking down the data file was to save a copy of the file (onto a floppy disk) and then to work with the copy. Some plots got entered into the working database multiple times. This error was not detected by JDSF staff but by people using the data at Humboldt State University, who noticed that plot numbers were appearing multiple times and/or that certain plot numbers had unreasonable numbers of trees. [Comment by Paul: This was more of a joint effort where we became aware of and fixed some problems and Humboldt State staff were able to find and correct more.]

  Paul thought that the multiple entries might have occurred when saving the files. "The computer was so slow in responding to the save key that I could easily have thought that it didn't register the keystroke; so I could have hit the save key a second time or more."
- Paul summarized the situation, "Let me say that the data processing was fraught with possibilities for errors."

Paul also talked about the estimates that were derived from his (and others') efforts:

- The final figure that was generally accepted by the staff was 42,000 bf/acre. There was a lot of discussion among the staff. The consensus was that this number "passed the sniff test." But, there was also a feeling that the true number could have been significantly higher or lower.
- An initial estimate was 50,000 bf/acre. This was viewed as suspiciously high, and in looking for reasons, they found the duplicated plot entries (apparently thanks to HSU). This correction (and possibly others) led to reducing the estimate to 42,000 bf/acre. [This was still almost 50% greater than the estimate of the 1984 CFI estimate made 5 years earlier. [2]]

I queried Paul about a comparison that he reported in his article. To try to understand the discrepancy between the old (1984) and new (1989) estimates, they compared inventory

[2] The 1984 CFI estimate was 28,000 bf/acre; thus the new IFI estimate was about 50 percent higher.

data from 1984 and 1989 on a set of plots that were in both inventories (the original CFI inventory plots). They "created" data subplots within the 1984 CFI data that corresponded exactly to the new, smaller IFI plots that were placed within the old CFI plots.[3] They then could compare the inventory estimates on an identical set of plots for 1984 and 1989. "We were able to … process the two data set identically."

I asked Paul whether "identical processing" meant that they used the same height-diameter and volume equations on both sets of data. "I am virtually sure that we did. It was a very complicated process involving a lot of steps. I don't think we could have done anything else."

It is an understatement to say, as Paul did in the article, "The results were not what we expected, the '89 data suggesting 2.2 billion b.f. and the '84 data indicating 1.6 billion b.f." Over a five-year period, one would have expected very little change in the inventory estimates. Over the prior 20 years estimated inventories from the CFI system had changed very little during each 5-year interval. In his article Paul concluded, "Some increase would be anticipated, but a 37 percent increase is suspicious."[4]

I asked Paul what he and others thought could explain this difference. He replied that they didn't really have an explanation. They felt their job was to pass on this result to the higher-up managers, and it was up to the managers to act appropriately on this information. He said that later when nothing was done that he was disappointed. "I can tell you, if I was a manager and was given this major unexplained discrepancy, I would have told my staff that I wanted them to dig into it and provide me with an explanation." Why didn't this happen, I asked. He replied, "It was a hot potato, and no one wanted to touch it." "There are probably other more valid reasons but I was blissfully unaware of the politicking going on within the agency and with other state departments."

I want to emphasize that the result of this comparison is so contrary to expectation that it completely undermines the credibility of the data processing procedures used to compute the estimates for the whole forest based on the 2350 sample plots of the entire IFI system. The comparison was of samples taken on the same plots only five years apart, supposedly using exactly the same computational procedures and equations. Harvesting was taking place during this period at approximately the forest growth rate, so there should have been only a small change in the estimated inventories between 1984 and 1989 – not the 37% difference found. Something was radically amiss with the computational process. Paul's earlier remarks about the incredible manual complexity of the process and lack of any means of validating the results give ample explanation of how the computations could have been wildly wrong.

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[3] There were 141 ½-acre rectangular plots in the CFI system. The IFI sample plots included 1/5-acre circular plots placed within each of the CFI plots. JDSF went back to the CFI plots and, using tagged tree information, reconstructed the circular IFI plot within the 1984 CFI data.

[4] The estimate for 1984 using the IFI system is also significantly higher than the estimate of 1.37 billion b.f. made by the CFI system in use in 1984.

To his knowledge, and as far as I have been able to determine, no one has ever gone back and checked the IFI estimates using more robust computers and applying error-checking and validation procedures.

Attachment 1: Approval by Paul Ederer to submit his interview.

From: Vince Taylor [mailto:vtaylor@mcn.org]
Sent: Tuesday, November 29, 2005 6:34 PM
To: Paul Ederer
Subject: Jackson EIR

Dear Paul,

…
Secondly, **I'd like to submit our interview, minus your comments, as part of my submission on the EIR. Do I have your permission?**

…
Thanks,

Vince

Subject:
RE: Jackson EIR
From:
"Paul Ederer" <PEderer@campbellgroup.com>
Date:
Wed, 30 Nov 2005 09:11:15 -0800
To:
"Vince Taylor" <vtaylor@mcn.org>

Vince, Next week we will start tree planting and I will be unavailable for any comments. **It's Ok to submit my interview.** …
Paul

PAUL V. CARROLL
Attorney at Law
5 Manor Place
Menlo Park, California 94025
telephone (650) 322-5652
facsimile (same)

July 31, 1998

Douglas Wheeler, Director of Resources
James Branham, Chief Deputy Director of Resources
California Resources Agency
1416 Ninth Street, Room 1311
Sacramento, CA 95814

Re: Mendocino Woodlands Recreational Demonstration Area

Dear Gentlemen:

I write in regard to the 5,426 acre Mendocino Woodlands Recreational Demonstration Area on behalf of the Big River Watershed Council.

This beautiful area of California is comprised of the 780 acre Mendocino Woodlands Outdoor Center, a surrounding 2,550 acre special treatment area, and an additional outlying area of 2,155 acres, adjacent to Russian Gulch State Park. The special treatment and outlying areas are currently under the control of the California Department of Forestry as part of the Jackson State Demonstration Forest. I understand, though, that plans are afoot to transfer the special treatment area from CDF to the California Department of Parks and Recreation. The Big River Watershed Council applauds this transfer.

But I write now to urge you to also transfer the remaining 2,155 acre outlying area to the Department of Parks. Such a transfer makes sense from both legal and environmental perspectives. CDF's use of the land for logging violates the plain language of the Congressional enactment authorizing the land's conveyance to the State of California. Transferring the land to the Department of Parks would honor Congress's intent, and greatly benefit the environment, creating a continuous expanse of state park stretching from the Pacific Ocean through the Russian Gulch State Park and on to the Woodlands Outdoor Center.

The Mendocino Woodlands Recreational Demonstration Area was transferred by the

United State to California in 1947. The transfer was authorized by an earlier act of Congress ("Act") that stated in pertinent part: "Every such deed or lease shall contain the express condition that the grantee or lessee shall use the property exclusively for public park, recreational, and conservation purposes. . . ." (Act of June 6, 1942 [56 Stats. 326; 16 U.S.C. 459t].) The quitclaim deed transferring the land expressly derived its authority from the Act, and California accepted the transfer under the same authority, expressly agreeing to take the land "for public park, recreational, and conservation purposes."

Members of the public have expressed their concern over the conflict between the Congressional directive to use the land for "public park, recreational, and conservation purposes," and CDF's use of the land for logging. Recently, Richard Wilson, the Director of CDF, responded to these concerns by letter dated September 24, 1997. Mr. Wilson pointed out that the Director of the National Park Service and the Assistant Secretary of Interior, in 1942 and 1947 respectively, were of the opinion that logging was consistent with the Act and its limitations on the use of the land.

Mr. Wilson quoted from the October 31, 1946, letter of the then Assistant Secretary of the Interior, Girard Davidson. I, too, will quote part of this letter, because it vividly illustrates how the Act was misinterpreted by those meant to enforce it. The Assistant Secretary's letter provided: "I believe that the State can appropriately determine in future years the extent to which the area should be used for (1) public park, (2) recreational, or (3) conservation purposes, or for any combination of these purposes, and that so long as the area is used for one or more of those purposes, the conditions stated in the proviso quoted above will be met."

The Assistant Secretary's interpretation—that the land could be used as a public park *or* for recreational purposes *or* for conservation purposes—is contrary to the plain language of the Act. Congress did *not* provide that the land could be used for "public park, [or] recreational, [or] conservation purposes." To the contrary, it provided that the land was to be used for "public park, recreational, *and* conservation purposes."

The Assistant Secretary's substitution of the disjunctive "or" for the conjunctive "and" was a serious legal error. In the construction of a statute, such as the Act at issue, the terms "and" and "or" have well defined legal meanings, which often determine the larger meaning of the statute. Congress's use of the conjunctive "and" means that all three uses—public park, recreational, and conservation—must be honored by the State. (*Lusardi Construction Co.* v. *Oubry* (1992) 1 Cal.4th 976, 988 [construing statute according to Legislature's use of the disjunctive "or"]; *People* v. *Skinner* (1985) 39 Cal.3d 765, 775 [Legislature's use of "and" to be construed conjunctively unless it appears clear that the word has been erroneously used]; *Melamed* v. *City of Long Beach* (1993) 15 Cal.App.4th 70, 79 ["and" should be interpreted to connote a conjunctive meaning].)

This interpretation is further bolstered by the three stated purposes for which the land was to be used—*public park, recreation*, and *conservation*. These terms and the ideas they embody are mutually inclusive and reinforcing: they all point to a conservationist ethic.

Logging, therefore, is not compatible with the plain, unambiguous language of the Act. Mr. Wilson erred in relying upon an individual's interpretation of the statute, rather than on the statute itself.

Transferring both the outlying and special treatment areas avoids Mr. Wilson's erroneous legal interpretation and the future possibility of litigation. In light of the language of the Act and the identical language of the quitclaim deed, CDF is without legal right and jurisdiction to use the Mendocino Woodlands Recreational Demonstration area as a demonstration forest for logging operations. Any future logging operation on the land invites a legal challenge on this basis.

But more importantly, a transfer of the outlying area to the Department of Parks would greatly benefit the environment and those of us who cherish it. To the west, the outlying area borders Russian Gulch State Park, which reaches to the Pacific. To the east, the outlying area borders the special treatment area, which in turn surrounds the Woodlands Outdoor Center. If transferred as parkland, the outlying area would connect two areas of parkland that now remain separate. Thus joined, one could walk on State parkland from the Pacific Ocean through the changing landscape of Russian Gulch, with its coastal waterfalls and pygmy forests, on to the staircase of redwood forest, and finally into the Woodlands Outdoor Center with its beautiful, historic cabins and structures.

And the outlying area (and special treatment area) would join two parks into a larger, more complex ecosystem. The ecological benefits of preserving larger landscapes are now well accepted—the degree of biodiversity is proportional to the area of ecosystem preserved.

In light of the foregoing, Big River Watershed Council respectfully urges you to transfer the outlying area to the Department of Parks. The public would benefit from a beautiful addition to California's parkland, the natural world would benefit from preservation of a greater landscape, and the continuing controversy over CDF's unlawful logging of the land and jurisdiction over it would come to an end.

I also respectfully ask that you respond to this letter. Numerous concerned groups and individuals have a keen interest in the land and wish to know what your office intends to do.

Thank you for your consideration of this matter. I look forward to hearing from you.

Very truly yours,

Paul V. Carroll

cc: Senator Mike Thompson

Assemblymember Virginia Strom-Martin
Richard Wilson, California Department of Forestry
Ken Jones, California State Parks
Susan Smartt, California State Parks Foundation
Sierra Club, Redwood Chapter
Mendocino Land Trust
Save The Redwoods League
Ronnie James, Mendocino Woodlands
Big River Watershed Council
Mendocino Environmental Center
Mendocino Area Parks Association
Trust For Public Lands