JAG Research and Demonstration Recommendations Report

with Executive Summary, Background Appendices and editorial edits[1]

Based on Research Committee Reports up thru v5.3

Research Recommendations to the Board of Forestry

Including Elements Formally Adopted by JAG on:

October 2009

July 30th 2010 (Recs #1-4)

August 26th 2010 (Recs #5-8)

Consensus RE-ADOPTION November 22, 2010

[1] *Edits include removal of relict references (e.g. old Recommendation numbers), transition language associated with inserted sections (e.g. silvicultural constriaints) and occasional editing to clarify awkward cumulative edits.*

EXECUTIVE SUMMARY

JAG proposes a comprehensive research-oriented management framework as a pathway toward moving JDSF toward a World-Class Research and Demonstration Forest. The framework is focused on transitioning the fForest toward a more rigorous scientific basis consistent with other research forests in western North America. The framework views forest management as an opportunity to inform managers and policy-makers on the effectiveness of management, the validity of working assumptions, and the impacts on environmental resources. It would facilitate innovations in forest management policies and practices that would yield improved overall sustainability and stewardship of forest resources throughout the state in general and the redwood region in particular.

Our proposed research-oriented management framework would develop narrowly-defined "Centers of Excellence" utilizing JDSF's unique strengths. The Centers would position JDSF as a hub for multi-disciplinary research addressing issues and challenges associated with redwood forest management. It envisions that each Center would leverage JDSF resources within a regional context by utilizing lands throughout the redwood region through collaboration with a broad consortium of stakeholders. Example topics of focus (subject to additional review) could include Centers on Coho Salmon Recovery, Upland Terrestrial Habitat & Forest Structural Relationships, and Sustainable Forest Management Practices.

Our vision has been presented to numerous stakeholder groups and has generally received broad support. We recommend that the next step should be to convene a Research Planning Team to develop much of the detail for this framework in the form of a professional research agenda focused around the Centers of Excellence. We anticipate that this team will need to comprise a group of professional scientific researchers and managers with the skills and tools necessary to develop a professional research agenda. We note that this team could be at a substantial dis-advantage if it is staffed by volunteers, since it will require considerable attention to detail and professional due diligence to develop a quality plan. Our recommendations provide some initial thoughts about the scope of work for this Research Planning Team, subject to review and refinement by the Board and CAL FIRE staff to identify a scope that can be implemented within available resources.

The long-term implementation of the scientific, demonstration and adaptive management mission of the forest could best be guided by a semi-independent research-oriented organization (Redwood Research Group) that would be primarily responsible for the administration of all research, adaptive management, monitoring and possibly demonstration**.** This group would consist of the scientists, technicians and support staff responsible for various scientific programs within each Center of Excellence, and would leverage additional resources through universities, landowners, conservation groups, and other research organizations. The Redwood Research Group should seek to leverage funds from timber harvests with other funding mechanisms (e.g., grants, foundations, partnerships, conservation funding, etc.) both as a means of extending resources and ensuring that the forest is generating marketable value to

a diverse group of stakeholders. The Research Group could also act as a facilitator for a broader regional collaborative (Redwood Regional Consortium).

INTRODUCTION

This document describes our vision for how JDSF could improve its status toward a **World-Class Research Forest.** Such a forest is fostered by its integrated research program and is realized by the ability of that program to drive forest management activities in a manner that is broadly recognized as a source of quality, rigorously tested, scientific knowledge. A World-Class Forest is one where:

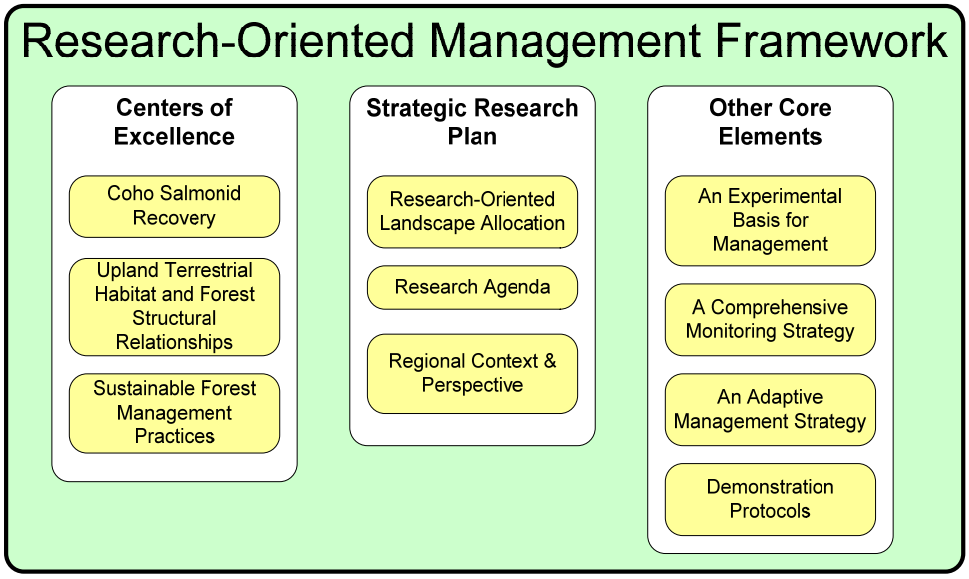
- The management plan and its landscape allocation create the opportunities for testing important hypotheses related to forest science, policy and management.
- Research efforts extend beyond the forest to integrate studies and lessons from, and inform management decisions on, other relevant forestlands.
- The forest uses opportunities, both on the forest and regionally, to seek answers that are relevant to a broad cross-section of stakeholders and other landowners.
- Research results are published and cited widely, in a breadth of professional and scientific journals, especially those highly regarded within and among disciplines.
- Techniques are actively developed that support sustainable forest management practices and knowledge-based policies, both of which are transportable to other landscapes and inform key issues.
- Data, maps, and history are well-tracked and well-maintained.

Together, these qualities will create a compelling set of conditions that will attract cooperative funding opportunities and diverse researchers investigating a broad array of subjects.

The following Research-Oriented Management Framework represents JAG's best effort to develop a management framework that would fit within the existing Management Plan framework and other JAG recommendations.

A Research-Oriented Management Framework

To put JDSF on a path toward World-Class status, we recommend that the Board adopt and implement a **Research-Oriented Management Framework**, as described in this document. The long-term objective for a Research-Oriented Management Framework on JDSF is to provide a transparent and objective scientific basis for forest management in California's redwood region. A scientific basis describes a rational system of technical information, models and other tools that inform policy and management, and collectively describes the methods for achieving sustainable economic, ecologic, and social stewardship of the forest.



The proposed Framework would integrate several key concepts (each described below) that together provide an organizational structure for testing and improving forest policies and practices both within JDSF and throughout the Redwood region (and perhaps beyond). This Framework should be organized around **Centers of Excellence** that describe the state-of-the-art science using models that range from simple conceptual models to more detailed empirical and/or quantitative models. Such models would provide organizational rigor that could provide a structure for scientists and would over time, improve the ability to predict impacts associated with management practices and enable management to achieve ecological goals.

The framework should also consider a **Strategic Research Plan** that leverages the forest's resources to the benefit of core management issues. Such a Strategic Research Plan would integrate the efforts related to Centers of Excellence with the operational management of the forest. It would identify and implement a landscape allocation that better supports research

activities, and would provide a structure for organizing relevant research at a regional and/or state-wide scale.

Over a period of a few years, this Research-Oriented Management Framework should lead to the development of formal management systems (combinations of regulations, policies, practices and Adaptive Management) that would provide important tools and management models for other landowners.

The proposed Research-Oriented Management Framework should be designed to provide more than sufficient opportunities to generate substantial revenues while meeting all the other goals of the forest (as described in both the Management Plan and these JAG recommendations). Additional Core Elements for the Research-Oriented Management Framework are described in greater detail within the Appendix C.

CENTERS OF EXCELLENCE

JAG recommends pursing **Centers of Excellence** that define a focused set of multi-disciplinary research programs for the Forest that help resolve critical issues facing forest management and forest resources within and beyond the Redwood Region. Such Centers of Excellence should focus on informing applied forest management issues while recognizing that sustainable forest management is best ensured by an underpinning based on a fundamental understanding of ecosystem dynamics. Centers of Excellence should be drawn from issues that are politically and socially important and of likely continuing interest to stakeholders and researchers. Centers should be aimed at obtaining information that will help develop a greater understanding between important forest outputs and management by informing policies, practices, and associated consequences. The Centers of Excellence will be compelling, integrative, and exciting, drawing researchers from broad national and international professional networks. The Centers will also be durable, focused on solving complex challenges, the solutions to which will likely to be iterative and for which Jackson Demonstration State Forest, at the center of the redwood region, is well-positioned to address.

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To avoid spreading resources too thin, the number of Centers should be constrained, with an initial JAG recommendation tentatively set at three. In addition, Centers should be focused enough to prevent the largely ad-hoc approach to forest management JAG believes exemplifies R&D activities on JDSF to date. Additional criteria for selecting Centers of Excellence and other considerations are described in Appendix D.

We recommend that additional outreach and more detailed consideration by the Board of Forestry and the Research Planning Team (see Implementation Section) should help to define and/or revise the finally selected centers. JAG recognizes that adopting Centers of Excellence may have some undesirable consequences such as over-riding R&D on other important topics. Thus, JAG believes that allowances for these should explicitly be acknowledged in subsequent considerations by bodies discussed further in this document. With explicit recognition of other important research, these risks are off-set by the value of the focus brought by the Centers of Excellence. Examples of Centers of Excellence discussed within JAG include:

- **Coho Salmon Recovery** - To rapidly recover aquatic communities by understanding the integration of watershed process and functions using both active and passive restoration processes.
- **Upland Terrestrial Habitat and Forest Structural Relationships** - To understand habitat and population processes and develop predictive models of animal/plant/ habitat dynamics of upland species on a continuum from younger to older forests.
- **Sustainable Forest Management Practices** - To understand and develop improved stand development pathways that integrate sustainable timber harvesting in the

context of aesthetics, ecosystem management, timber growth and yield, forest product quality, carbon sequestration, and development of older forest conditions.

These example Centers of Excellence outlined above evolved from discussions within JAG, science workshop participants, and limited external outreach. We recommend elsewhere that a more thorough development of these concepts should be considered by the Research Planning Team before finalizing the Centers.

A Strategic Research Plan

A Strategic Research Planning process would integrate an analysis of existing and desired future conditions using proven scientific methods with other key concepts and goals described in the Management Plan and JAG Recommendations. The primary components of our recommended Strategic Research Plan include:

- A **Regional Context & Perspective** that considers JDSF in the context of management regimes and practices available on other lands, so as to extend the Research Program's relevance to stakeholders throughout the entire Redwood region.
- A **Research Agenda** that works collaboratively with scientists and stakeholders to develop a list of key issues and management questions related to each Center of Excellence. The Research Agenda will provide a framework for identifying desired research projects, monitoring requirements, and management activities needed to support desired research projects.
- A **Research-Oriented Landscape Allocation** process that carefully and thoughtfully apportion the forest to support research on key issues outlined in the Research Agenda, as it will establish the context by which research is crafted and documented.

A Regional Context & Perspective

A landscape-based, cooperative approach to developing the Research and Demonstration Program increases the relevance of JDSF to many stakeholders. Also, the ability to influence management at regional scales is greatly improved by collaborating with other landowners throughout the Redwood region. An extensive evaluation of existing land bases, silvicultural systems, management systems, and information needs will inform this regional context, and will support allocation, landscape planning, and a more cooperative approach to research.

While considering this Regional context, a Research-Oriented Management Framework should also consider how to **Leverage JDSF's Unique Qualities** – both in terms of what is special to JDSF as well as what is common to other lands. Studies are possible virtually anywhere, opportunities for active manipulation on other lands are often incidental to and supportive of achieving economic goals. One of the unique qualities of JDSF is its capacity for Research and Demonstration that allow for manipulations that foster the goal of learning and teaching about forest management as opposed to a focus primarily on revenue generation. JDSF supports independent and / or geographically distinct areas for replicates of land management and associated studies. Other lands may be more tightly bound by Habitat Conservation Plans or conservation easement constraints, and have less stability of ownership and purpose. By providing a contrast to these land-bases, JDSF can expand the range and depth of experimental study designs that may yield new innovations in forest management. Also, focus on common features will encourage more interest by other landowners and will expand the influence of

JDSF. Recommendations 5, 6 and 7 can be used to provide such a regional context and perspective.

A Research Agenda

A Strategic Research Plan requires that priorities are clearly assigned so that resources can be identified and integrated into the management plan and overall management infrastructure. The Research Agenda is an effort to compile the relevant issues and priorities for each Center of Excellence, in a manner that is supported by stakeholders, updated regularly, and accurately reflects knowledge gained (both within and external to JDSF research).

A Research Agenda works collaboratively with stakeholders and scientists to develop the programmatic focus for each Center of Excellence, including the key science questions/issues, monitoring needs, synthesis opportunities, methods of study, funding requirements, desired outcomes, etc.

Research-Oriented Landscape Allocation

A critical step in creating a Research-Oriented Management Framework is aligning the contemporary and future landscape allocation of stand-level characteristics (e.g., age, structure, composition) in ways that provide a landscape that supports research and demonstration directed towards the Centers of Excellence. Equally important is the recognition of the Regional Context in which work at JDSF is conducted, which is to say JDSF is one of handful of large, consolidated ownerships where forest management experiments and adaptive management can take place in the redwood region.

The existing allocation (Table 1 and 7) described in the Management Plan describes silvicultural allotments designed to support an ad-hoc approach to research opportunities, and are not necessarily in alignment with the Centers of Excellence concept. The proposed revisions to the landscape allocation (offered elsewhere in this document[3]) are a first step toward a landscape allocation that promotes all the goals of the Management Plan while preserving options for integrating a research focus more fully into forest operations. As described in the Research Planning Team Scope (see below), future iterations of landscape allocation should also be informed by JAG's Landscape Recommendations, the Strategic Research Planning process, and broader coordination with the Board's Research and Science Committee.

Comment [ML1]: The paragraph below is deleted because it is redundant to other statements provided elsewhere in this section and in the Landscape report. AND the paragraph is confusing as hell (clearly the victim of excessive edits).

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Deleted: [2] that will generate revenues needed to help fund the operation of the Forest, including portions of the Research and Demonstration Program, while preserving and advancing many of the unique stand structures within JDSF. JAG has compiled **Guidelines for Implementing Silviculture in the Matrix in Support of Research and Demonstration** ." (See following section.) compiled *Guidelines for Interim Research* (Appendix B) that we We believe these guidelines would provide appropriate constraints to ensure that silviculture for R&D is appropriately evaluated both before and after during the period required by thecompletion of the Strategic Research Planning process. and the transition toward implementation of the overall framework. We anticipate that JAG's recommendations should be subject to appropriate scientific peer-review and comment, while respecting JAG's landscape recommendations and other values as described by the scope of work in Appendix E and Section Y (Research Planning Team).¶

[3] *Refers to the Landscape Committee's recommendations*

We recognize that a diversity of forest and stand conditions maintained and created over time is a common feature of research and demonstration forests and that such conditions are best created as a result of a well-organized, well supported, and focused research program described by this Research-Oriented Management Framework. Thus, we favor the adoption and/or development of stand classification systems that better describe the range of structural and habitat conditions that can support the research program.

The landscape allocation of forest stand conditions and silvicultural systems defines the research setting for the forest. Thus, it enables and constrains assumptions and hypotheses the research community can apply to evaluate ecosystem response to management activities. The allocation can also provide stability in stand structure that supports long-term research. A poorly considered or unstructured allocation substantially restricts potential research opportunities, and would compromise the Centers of Excellence.

While JAG's charter requests that we provide a spatial allocation of the forest, we were unable to complete this request. Development of the landscape allocation to support research on JDSF is a complex and highly technical task. Because the research focus is derived from pursuing scientific Centers of Excellence, we suggest that JAG is not the appropriate group to develop the final spatial allocation for JDSF. We therefore recommend that this task be done primarily by a Research Planning Team in cooperation and coordination with the JAG, the Board's Research and Science Committee, JDSF Staff, CAL FIRE, and other Stakeholders. Discussions of a scope of work and other guidelines for the Research Planning Team are described in section X below.

Comment [ML2]: This intro sentence was moved here from the paragraph below.

The preferred approach to develop spatial harvest allocations on large productive forestlands would use a planning process that requires considerable scientific and analytical effort including growth and yield modeling, spatial harvesting modeling, wildlife modeling, and cumulative effects analyses. The teams necessary to develop these planning efforts include biometricians, forest analysts, wildlife biologists, watershed scientists, operational managers, and others. Developing a "world-class" landscape allocation for JDSF with the intent of improving management practices in the redwood region should be consistent with this approach. A review of approaches used by other research forests, and other cooperatives would benefit this effort.

An approach for implementing a Research-Oriented Landscape Allocation is described in Section E.

Recommended Guidelines for Silviculture Variations in Support of Research and Demonstration

JAG believes that guidelines are necessary to provide appropriate constraints to ensure that silviculture for research and demonstration is appropriately evaluated.

Comment [ML3]: His section has been edited for clarity. It originally comes from the Landscape document. Paragraphs were consolidated and constraints were moved into the bullet section.

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Silviculture other than that described in Section C of the Landscape section of this report (including even-aged management) is expected to be a continuing component of operations within the context of a professionally designed research and demonstration program. Initially, an evaluation of these proposed harvests should be made by JAG until alternative review processes are developed. The following guidelines should apply:

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1. Prior to Completion of the Strategic Research Plan

In the period prior to the adoption of the Strategic Research Plan, harvests that are inconsistent with the silviculture guidelines described in Section X[reference appropriate Landscape section] of this report should only be conducted in the Matrix Area (see Map 5), and only for research projects that meet the following guidelines:

- All proposed Research and/or Demonstration timber harvests should be presented to the appropriate advisory entities for review and recommendation prior to implementation.
- Harvest is subject to a peer-reviewed research plan
- The total area receiving the treatment is the minimum required for the scientific validity of the research involved
- The purpose of project, area of sub-watershed or watershed (including replications), and duration of project are clearly defined
- History of proposed project location in relation to age, structure, and past silviculture treatments is described
- Potential conflict with overarching Centers of Excellence, ongoing research projects, neighbors, sensitive areas, designated special treatment areas, and recreation use are identified

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2. After Completion of the Strategic Research Plan

After adoption of a Strategic Research Plan (and associated landscape allocations), harvests justified by research will be implemented only when there is reasonable confidence that the associated research will be carried out. Factors that will determine the level of confidence should include:

- Approval of the research by a standing research committee as part of the Strategic Research Plan.
- A reasonable expectation that professional and financial resources needed to implement the project and associated work plan over the specified term will be available.
- Goals and specific contributions to an associated Center of Excellence are clearly identified

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DEMONSTRATION IN A RESEARCH-ORIENTED MANAGEMENT CONTEXT

Research and Demonstration are closely related and indistinct concepts. Both are related to knowledge needed by forest managers and policy makers. Research focuses on learning, while demonstration focuses on showing and teaching.

The JAG views demonstration as a primary component of an effective Research-Oriented Management Framework. Rather than referring to a "Research Projects" or "Demonstration Projects" we suggest to think of them as elements of a more comprehensive Research & Demonstration Program.

Research on forest management will be more influential if it is associated with an effective demonstration component. Thus, demonstrations generally should be explicit complements to research projects. Evaluation of an activity for Research and Demonstration funding should give strong weight to the proposal's provisions for both research (what can we learn) and demonstration (what and how we can teach). Very few demonstrations should be made without a research complement.

Some basic research may not lend itself to demonstrations. Absence of associated demonstrations should not preclude important research from being funded. Similarly, some demonstrations may not have nor need a research complement. However, any research and/or demonstration activity that involves non-Matrix silviculture in the Matrix, or that would involve silviculture at variance with the silvicultural guidelines for OFDA and Late Seral Areas, will be carried out only following review and approval by an appropriate review body. Any demonstration that departs from silvicultural guidelines should provide new information of significant value.

[The following paragraph provides a little more guidance for Demonstration that would help to reduce the dependence on extensive review by approval bodies.]

JAG recommends that Standards for Demonstration Projects be established that provide guidance to staff as to the types of demonstration activities that can deviate from JAG's proposed silvicultural guidelines and/or other existing management constraints. This guidance should be influenced by the Research Framework (including associated Implementation bodies), outreach to stakeholder likely to rely on demonstrations, as well as other guidance developed for the forest. Where appropriate, Demonstration proposals may benefit by independent stakeholder review and/or approval, and the Standards for Demonstration should provide guidance as to when such review is necessary. The following Demonstration Protocols can provide a framework for developing Demonstration standards.

	Research Tends to be more:	**Demonstration** Tends to be more:
Intent	Learn	Teach, show
Design	Random allocation of treatments among replicates over space and time; BACI approaches; consideration of the sampling / extrapolation universe.	Few replicates to one instance, site access and availability important in locating treatment(s).
Data	More likely to be quantitative; Statistical tests.	More likely to be qualitative and visual
Presentation	Tables, Figures, Statistical tests	Photographs, videos, tours
Outlet	Professional and Scientific Society journals, conferences	Newsletters, fieldtrips
Subject	Ecological processes, timber economics, human dimensions, …	Financial considerations; logistics, techniques
Focus	Results, implications.	Methods & Equipment

[the section below was developed by the Research Committee (circa 2008) and was formerly part of Appendix C]

Demonstration Protocols

JAG notes that standard Demonstration Protocols would help to build confidence that activities on the forest are implemented to benefit the broader forestry community. A demonstration program framework should outline how basic information will be compiled and reported for significant management actions on the forest. Such information could be developed into a series of brief reports (e.g., Forestry Notes and Forestry Reports) that would be available to the public via a website or other available communication media. The reports should be compiled for the following activities (including but not limited to):

- Harvest Treatments
- Reforestation and Restocking
- Road Construction, Maintenance and Abandonment
- Burns (both Prescribed and Wildfires)
- Restoration and Enhancement Treatments
- Invasive Weed Control

Demonstration is described within this framework as those management treatments that provide examples for forestland owners, managers and the general public. Demonstration information included in these Notes and Reports should typically include:

- Pre-treatment and post-treatment data
- Economic costs & value data
- Operational consideration information
- Effectiveness evaluations
- Location maps
- A discussion of the treatment design
- A description of the justification for selected management treatment
- Relevant treatment quantities (e.g., volumes, areas, lengths, etc)
- Planned costs and actual treatment costs
- Revenues generated
- A list of monitoring and/or research activities associated with the treatment
- Availability of more detailed data and resources

The Demonstration Program should consider subsets of Demonstration for which JDSF staff will develop more detailed information and educational resources.

OTHER FRAMEWORK ELEMENTS

Other core concepts that should be explicitly integrated into this Research-Oriented Management Framework include:

- **An Experimental Basis For Management** - is a management philosophy that views every significant management activity as an opportunity for research, experimentation, demonstration, and/or monitoring activities that can inform management practices and/or policies. All significant management activities should be reviewed for their potential to contribute to addressing the objectives and questions of the research, demonstration, and monitoring programs. An Experimental Basis is driven by testing as many hypotheses as practicable, within a range of scientific rigor appropriate to the issue. An Experimental-Basis for Management improves the ability to predict responses to management activities by encouraging hypothesis testing at every opportunity, and providing the infrastructure to engage the resources to provide conclusive resolution to these hypotheses. An Experimental Basis supports repetitions of treatments and analysis over time can help minimize spurious results derived from short-term variability (e.g., climatic), and will be critical in long-term understanding of forest ecology/management in the face of novel environments (e.g., global climate change, new pests/pathogens, etc.). That is, long-term studies can circumvent problems with the more standard practice of substituting space for time.

- **A Comprehensive Monitoring Strategy** – that outlines necessary monitoring approaches, protocols, staffing needs, access, etc., and is tightly coupled with Centers of Excellence, the Research Agendas, Landscape Management Planning, the Adaptive Management Framework, and the Demonstration program. The Monitoring Strategy should extend beyond timber stand measurements to include other important ecological and scientific data related to wildlife, water resources, air quality, carbon, etc.

- **An Adaptive Management Strategy** – that identifies performance measures, resource objectives, study designs, key questions, and other elements that integrate and direct monitoring and research activities within the forest (and beyond). The Adaptive Management Strategy is an integral component of the overall Framework and should inform practices both on JDSF and throughout the Redwood Region

These are each described in more detail in Appendix C.

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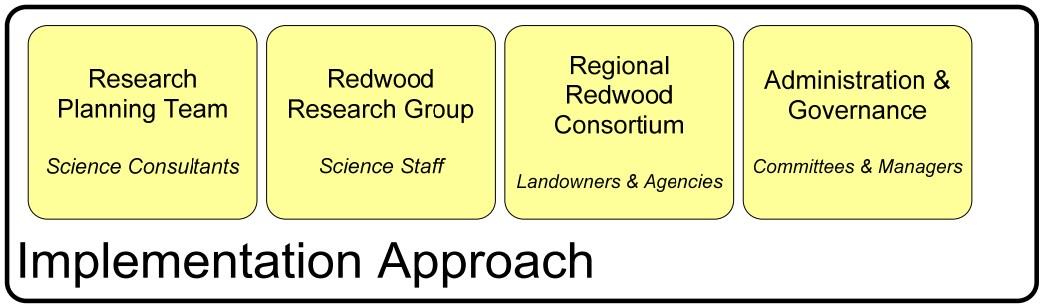
RECOMMENDED IMPLEMENTATION APPROACH

We recommend that the Board consider implementing this proposed Research-Oriented Management Framework by:

- A **Research Planning Team** that will develop strategies for aligning the Centers of Excellence with the Landscape Allocation and Research Agenda
- A **Redwood Research Group** that would be responsible for developing the Centers of Excellence and overall research, monitoring, demonstration, adaptive management and outreach programs
- A **Regional Research Consortium** that promotes collaboration and outreach among all stakeholders, including landowners, conservation groups, agencies and academia, and
- Developing an **Administration and Governance** structure that fits within the existing resources of CAL FIRE and the Board of Forestry



Research Planning Team

JAG recognizes that planning for a professionally developed research program is beyond the scope of the JAG membership, and thus we recommend that a Research Planning Team should be compiled to provide important technical review, analysis and recommendations that will help JDSF develop a Strategic Research Plan that will guide the transition toward a Research-Oriented Management Framework.

The purpose of the Research Planning Team is to provide professional recommendations to the Jackson Advisory Group (JAG) and Board of Forestry regarding the allocation of forest structure, age and composition for the forest that is best suited to supporting the Centers of Excellence, consistent with the guidance provided by JAG and adopted by the Board of Forestry (BoF).

JAG would note that the allocation classes described in the approved management plan have been amended substantially by the JAG to increase the quantity of old forest structure and

enhance habitat connectivity. JAG's recommended landscape allocation considered the ecological, aesthetic and social values of these areas and we consider them to be important factors. It is JAG's desire that the Research Planning Team recognize and incorporate these values into its deliberations to the greatest extent practical. We further anticipate that any and all deviations from JAG's recommended allocation, as well as any logical rationale in support of JAG's recommended allocation, should be well justified and articulated in the Research Planning Team's report. In the end, both the Research Planning Team and JAG recommendations should be delivered to the Board of Forestry for consideration in determining the final allocation.

We would like the team to be as inclusive and collaborative as possible, given recognized constraints of the work being performed by an outside contractor. We would expect the team to engage the Board of Forestry's Research and Science Committee, USFS Pacific Southwest Research Station, JDSF staff and JAG, among others.

The Team (working in coordination with the Board's Research and Science Committee, JDSF Staff, JAG, CAL FIRE, and other stakeholders) would be responsible for several tasks, which may include all or some of the following (subject to scoping by CAL FIRE):

- **Synthesizing information for the existing landscape** – using existing studies and data to begin to develop simplified (cartoon) conceptual models that could be used (over time) to build toward more quantitative models using to test what we think we know and don't know about the key relationships in each Center of Excellence, and how the forested landscape (both within and beyond JDSF) can be used to leverage our collective understanding

- **Providing comments to and refinements for the Centers of Excellence** – including a more complete description of the mission for each Center of Excellence, how it will look like on the landscape, what the key research questions would be for each center, and the associated research activities.

    - **Populate and refine the areas of applied-research:** for the community of applied and academic scientists and environmental professionals likely to use JDSF as a research platform, provide a more detailed definition for the Center's research focus in terms of our current scientific understanding, how the Center can improvement our understanding, what tools may evolve from this effort, and how the Centers may impact redwood forest management.

- **Formulating testable working hypotheses** (including peer-review from cooperators) that could form the basis for a research program, including limiting factors models, desired future condition trajectories, experimental approaches etc.

- **Develop simple and conceptual allocation models:** using established and/or successful research forests allocations (e.g., H.J. Andrews Experimental Forest) as a reference

point, develop conceptual allocation models for JDSF that are tailored to the three areas of applied research *and* leverage models already established in the redwood region. The products should produce landscape development hypotheses in a manner that can be understood by both technical and non-technical audiences.

- **Describe and delineate allocation classes:** reconcile the landscape development hypotheses with the existing forest structure, special status management zones, growth and yield projections and harvest schedule. The goal of this analytical task is to represent management / allocation units that create, maintain or develop desired stand conditions necessary to support research on the prioritized research questions, with explicit reference to the special status management areas, forest productivity and harvest. The delineation of allocation classes should be consistent with core elements of the management plan and the JAG principles articulated in the body of this report.

- **Developing a Research-Oriented Landscape Allocation** –building on the approaches described within the Management Plan and JAG Recommendations, and providing rationale for deviations from these approaches, the Team should provide maps and/or criteria for allocating stands into management units that would support the Centers of Excellence and other goals for the forest (as described in the Management Plan).

- **Informing and prioritizing key research questions for the Research Agenda within each Center of Excellence** – by providing recommendations down to the level of working hypotheses based on the key questions within each COE and provide guidance on the research agenda. In addition, identify the scientific gaps.

- **Comment on the financial requirements for implementing the research program** – including any influences on timber harvest, and estimated costs for research recommendations

- **Begin to outline a research agenda for the forest:** by developing a prioritized list of research questions and working hypotheses for each of the Centers of Excellence. The prioritized research questions will serve as a primary input for the development of recommended allocations necessary to support research on these questions. In addition, comment on the appropriateness of these three areas generally, in terms of their feasibility and relevance for JDSF and the redwood region; suggest and justify any new or alternative categories of research if warranted.

Given the detailed technical rigor necessary for these tasks, this team will need to be sourced by professional staff, consultants and academics that can be paid for their efforts. A voluntary team will not be able to provide the amount of time and attention to detail necessary to complete these critical tasks. The Team's work should also be subject to appropriate review.

The envisioned Research Planning Team would integrate across existing conditions using scientifically based methods (e.g., Watershed Analysis & Landscape Ecology), stakeholder needs, a Redwood Region context, and the Centers of Excellence. The outcome will be a Strategic Research Plan that better supports the research associated with Centers of Excellence, and will have a broad base of support by stakeholders. We also expect the Research Planning Team to operate within specific sidebars so as to build on the work done to date and ensure that the goals of the Management Plan and JAG's Landscape Recommendations are recognized.

Deleted: Such sidebars and other considerations for a scope of work are discussed in Appendix E.

Our vision is that CAL FIRE would refine the scope of work (outlined below) such that the team could produce its deliverables within 6-9 months. We also prefer that JAG be provided some time to respond to the Planning Team's report before the Board acts on its recommendations. A key outcome of the Research Planning Team's work is the presentation of landscape allocation alternative(s) for the forest that if adopted, will create, maintain or develop the forest structures needed to support an applied research agenda focused on the proposed Centers of Excellence over a planning horizon of approximately 40 years[4].

The Research Planning Team should develop its detailed work plan in consultation with the Board of Forestry's Research and Science Committee, JDSF staff and JAG. Before the analysis is initiated, the Research Planning Team should convene at least one 'immersion session' with JAG to understand this group's principles and recommendations. In addition, JAG and the Research Planning Team should meet when team has outlined the core elements of its analysis but *before* it initiates the analysis. Periodic status check-ins during the analysis and alternative development should be administered by the Chair of JAG and the Deputy Director of CAL FIRE.

Comment [ML4]: Vince had suggested that this paragraph be moved toward the top of this section. In my opinion, such a placement is awkward as it describes implementation details before it conveys the broader purpose of the team. I feel it best goes here.

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Guiding Principles

The following is an excerpted list of guiding principles offered by the Jackson Advisory Group and a panel of scientists that JAG believes should guide the Research Planning Team in its deliberations related to the Research Planning Team:

- The basis for the landscape allocation should reflect to the degree possible, a more natural temporal distribution for forest characteristics based on principles of landscape ecology. Such principles include but are not limited to (a) the integration of old forest structure and conditions into matrix forest development (b) forest gap dynamics including possibly shifting mosaics and (c) pre-settlement disturbance regimes.

[4] *Additional alternatives or variations may be produced and presented by the team as necessary to meet the purposes of their assignment.*

- The landscape condition should support the needs of a well-developed, programmatic adaptive management program that clearly identifies resource objectives, performance measures, etc. and considers the economic goals of the forest.
- The landscape allocation should reflect the diverse needs of key stakeholders, including researchers, landowners, conservation groups, the public, recreationalists, regulatory and resource management agencies, and policy-makers.
- Research and demonstration at JDSF with major commitments of land should have regional relevance; start with simple, focused hypotheses and increase the level of sophistication as knowledge develops
- Make maximal use of existing forest inventory data to test key assumptions, identify data gaps and develop working hypotheses.
- Focus recovering coho populations as quickly as possible. Focus on limiting factors and life-cycle models as a starting point.
- In developing and testing working hypotheses, focus on reliable, efficient and feasible measurements that are financially sustainable over time.
- The Research Planning Team should include in its report the guidelines, maps, and principles used to arrive at their recommendations so as to aid in JAG and the Board of Forestry in further deliberations related to landscape allocations.

Redwood Research Group

The effective implementation of the Research-Oriented Management Framework and the overall Research Program should be led by an organization whose mission is to establish and maintain the Centers of Excellence through research, coordinated monitoring, advocacy, education, outreach, and policy advisement.

We recommend that research, demonstration, and monitoring programs at JDSF should be managed, administered and staffed by a broadly-based research organization that is affiliated with, but semi-independent from, CAL FIRE and JDSF operations. This will enable JDSF Management to focus on the day-to-day management and operations on the Forest, while developing the organizational infrastructure to support the Centers of Excellence and other research tasks.

The organization should consist of professional staff of interdisciplinary scientists dedicated primarily to a research and/or monitoring mission (e.g., interacting with, but not necessarily directly associated with, JDSF operations). It could be led by senior scientist(s) and/or Executive

Director team, and it would substantially benefit by seeking funds beyond JDSF revenue sources (e.g., research grants, foundations, partnerships, etc). The organization should seek to coordinate research activities beyond JDSF properties where it serves a Center of Excellence, and it should provide extensive outreach and educational roles to all stakeholders (including academic scientists). It should collaborate closely with academic researchers, but as an applied research organization, may benefit by being outside of an academic institution.

The roles of the Redwood Research Group could include:

- **Acting as Scientific Stewards for each Center of Excellence** – by developing internal staff and external research partners who can integrate expertise, develop models, and otherwise coordinate the "brain-trust" that will facilitate the development of each Center
- **Staffing and/or Coordinating Field Monitoring and Data Management Activities** – for JDSF lands, by providing the technical staff capable of collecting core monitoring data, developing standard protocols, maintaining data inventories, developing quantitative models, and other research-oriented tasks
- **Acting as a Facilitating Agency** – to ensure relevance to the broader forestry community by coordinating and funding research activities throughout the redwood region
- **Acting as Staff for Regional Cooperatives** – to help facilitate greater coordination of scientific and analytical tasks among landowners, agencies, and others
- **Administering Research on JDSF** – including grants to outside research organizations (e.g., consultants, academics, etc), development of requests for proposals, acceptance of projects, review of requests for research and demonstration, etc.
- **Leading Outreach Efforts** – which could include both educational and fund-raising functions that seek to build a broad base of support and resources from multiple stakeholders and partners, including foundations, grant agencies, universities, etc
- **Liason with JDSF Operations** – to coordinate data exchange and scientific designs with timber operations (harvest design and layout, etc).
- **Leading Adaptive Management** – by acting as advocates for new practices and policies that are developed as a result of JDSF research, the Research Group could help the dissemination of new technologies, and working to advance those recommendations thru the appropriate administrative and/or collaborative bodies

This organization could exist in various forms (e.g., An independent 3rd-party entity, independent CAL FIRE center, within JDSF, within a University Extension, as a multi-agency

cooperative, etc). The advantages and disadvantages to these various structures should be carefully considered by the Board.

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We recognize that the implementation of the Redwood Research Group may take several years to occur. Thus several of the governance and administration functions may require additional oversight during the interim.

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Redwood Regional Consortium (Long-Term)

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Formation of a Redwood Region Consortium is an integral part of implementing the Research Framework. It positions JDSF within an integrative entity that unites efforts across the Redwood landscape by acting as a Hub for collaborative research that includes private and public lands. As such, this Consortium would differentiate itself from similar cooperatives by primarily drawing its participants from scientists employed by agencies, consultants, landowners, research scientists and other applied forestry practitioners (as opposed to strictly research-oriented organizations). Within the Consortium, JDSF's role can be a resource that provides data, funds and logistical support as well as part of the land base for research. Similarly, Consortium members can provide support for advancing research implications through adaptive management and policy revision efforts. In addition, members can provide financial support through in-kind services and additional funding. JDSF's lead in forming and sustaining a Consortium also increases the relevance of JDSF to stakeholders. Finally, the ability to manage and conduct meaningful research at landscape-scales is greatly improved by collaborating with other landowners throughout the Redwood region. CAL FIRE could look to Washington (e.g., Washington's TFW) and Oregon (H.J. Andrews Forest) for models of functioning Research Cooperatives that involve a broad group of stakeholders.

The consortium would differ from the Redwood Research Group in that the Consortium would exist as a collaborative group of stakeholders and partners, while the Group would consist of paid staff dedicated to implementing the Research-Oriented Management Framework.

Administration & Governance

The administration and governance of the Research-Oriented Management Framework could be developed in coordination with the Board's Research and Science Committee, as well as the groups described above. Additional JAG thoughts are discussed in Appendix F.

APPENDICES

DISCLAIMER: *The following appendices [related to the Research Recommendations] are intended to provide background to the consensus JAG Research Recommendations described above and do not constitute a formal JAG recommendation. The appendices are intended to document an objective integration of ideas and concepts that were part of the discussion during the deliberations of the Research Committee, Science Workshop participants, JAG discussions, and in some cases, outreach with stakeholder groups.*

These appendices are designed to convey the collective thinking to those responsible for implementing the recommendations by providing additional clarity and/or descriptions that should aid implementation. The ideas represented here reflect the development of ideas over a 2+ year timespan, and while significant efforts have been taken to be comprehensive and objective, the final product may not reflect a complete catalog of all discussion elements. In some instances, multiple authors have vetted the language. In other areas, the language in the appendices represents early discussions, or ideas discussed in detail only among a subset of JAG members. Thus the ideas conveyed in these appendices may not fully capture all perspectives; although all JAG members have been invited to contribute any diverging ideas or opinions.

JAG would like to be clear that in any instances where Recommendations 1-8 and/or the Recommended Implementation Approach (i.e. the main body of the recommendations described above) may be perceived to conflict with the appendices, the main body of the report should be viewed as governing.

A) General Principles

Several core principles supported the development of JAG's Research recommendations. These were formally adopted by the JAG in October 2008, and include:

- The entire forest will be available for research, demonstration, and monitoring activities
  - Manipulative research will be limited in some areas
  - All significant relating to the mission-oriented activities will support Demonstration by way of brief summary reports for each activity that document essential information (e.g., Pre-treatment conditions, Treatment goals, Treatment justifications, Methods, Results, Relevant economic data etc)
- Priorities will be based on the needs of policy-makers, scientific knowledge and stakeholder issues
- All requests for research are welcome on the forest and will be considered based on available resources (e.g., staff, funding, etc).
- Research should aim to reduce the risk of unanticipated outcomes due to lack of knowledge by:
  - Conducting research in areas of uncertainty, and
  - Managing for an appropriate degree of diversity at scales that support the needs of research, and
  - Carefully examining assumptions, and
  - Implementing an appropriate forest-wide monitoring strategy, and
  - Utilizing an adaptive management approach that is informed by an integrated monitoring approach

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C) Expanded Discussion: Research-Oriented Management Framework

We envision that a Research-Oriented Management Framework as describe in JAG's recommendations would establish a regional context, research priorities, and landscape allocation that would provide the basis for forest management practices within JDSF. This Research-Oriented Framework provides a conceptual organizational structure for testing and improving forest policies and practices both within JDSF and throughout the Redwood region. Such a framework can be organized around scientific models, ranging from simple conceptual models to more detailed quantitative models, that would provide organizational rigor and could eventually improve the ability to predict potential impacts associated with management practices.

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This type of framework would provide stakeholders with reliable information for how to manage forests in a sustainable manner. It would allow the entire forestry community to leverage knowledge gained at JDSF throughout the Redwood region (and beyond), while also ensuring that management within JDSF meets the goals and objectives defined within the management plan. A primary goal of this Research-Oriented Framework would be to test and refine Forestry policies and practices within the Redwood Region (and perhaps beyond) that can support continued extraction of resources in a sustainable manner with due consideration to the critical needs of ecosystem needs, watersheds and other sensitive resources. We believe this framework should more effectively lead to:

- The recovery of endangered species, and
- Restoration of old-growth redwood forest ecosystems
- An improved technical basis for forest policies and practices
- new innovations that solve complex challenges
- cooperative alignment with external stakeholders

Over a period of years, this framework should help to evolve existing management systems (combinations of regulations, policies, practices and Adaptive Management) that could provide management models for other landowners. The framework would start by using the context of the existing regulatory and management framework, and actively refine systems and processes as resources allow.

The intention for the Research-Oriented Framework is to build a management system that:

1. Continuously tests key assumptions of existing management policies and practices in the face of changing climatic, economic and environmental conditions

2. Develops and refines policies and practices that support Sustainable Production Forestry
3. Develops and refines policies and practices that promote the recovery of Endangered Species and associated habitats
4. Tracks the impact of JDSF's research approach on the management of other lands and other stakeholders (e.g., measure and report on the feedback loop, impacts (benefits) from JDSF/JAG research activities on management policies and practices).
5. Integrates basic inventory and monitoring data to provide information to the community at large

Within this Research-Oriented Management Framework are several sub-components:

An Experimental Basis for Management

Historically, JDSF has in many ways operated more like a private timber company than a public experimental forest. Its management regime was largely driven by operational objectives that would generate revenues, provide demonstrations to other landowners, etc. Research activities on JDSF were generally considered on an ad-hoc basis as opportunities were presented, and were often (but not always) driven by academic interests.

By contrast, most other experimental forests in the western United States orient their management activities specifically around research objectives. This type of "experimental basis for management" is focused on creating the context for research by manipulating the distribution of stand conditions, structures, and disturbances in a way that supports research, monitoring and demonstration needs. Rather than allowing researchers to passively respond to available conditions, an Experimental Basis for Management would proactively develop the ecological and structural condition that best supports the research mission of the forest (as expressed by the Centers of Excellence). JAG believes that JDSF would benefit as a "World-Class" Research forest if it were to move more toward an Experimental Basis for Management.

One view of an Experimental Basis for JDSF Management would suggest that significant management activities be viewed as experiments (and/or demonstration), and that as such, sufficient information should be compiled and maintained that could test the validity of these "experiments". In some cases, it may be appropriate to integrate rigorous hypothesis testing, including statistical replicates, into some practices and/or activities. In other cases, measurements might be limited to a select set of pre-defined variables that are part of a systematic monitoring program. In yet other cases, more anecdotal information may be sufficient to provide relevant information. The key is that these considerations are part of the planning process from the onset of a project, and that such planning is done in a manner that promotes systematic thinking and integration across the forest/region.

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We note that a good experimental design requires some focus (need to define the questions) that may need to develop over time (e.g., in response to the Landscape Management Planning Process, selected Centers of Excellence, and associated Research Agendas).

The spatial and temporal scale associated with allocation for studies should support issues at a range of scales, including the individual tree level, stand (and sub-stand) level, watershed (and sub-watershed), and regional. As such, study designs should seek to leverage the unique landscape and structural characteristics of any given harvest planning area or management action (e.g., road maintenance, etc). JAG's recommendations for the Research Planning Team, Redwood Research Group, and Regional Consortium should help to coordinate around an overall scientific agenda for the forest that benefits a wide spectrum of stakeholders.

Studies will be designed based on existing or desired future stand conditions, and both research topics (see Research Agenda), including JAG advocated forest management practices and emerging science or operational issues. Individual harvests will contribute to landscape scale demonstrations and research. For clarity, JAG understands that not every facet of every THP will need an experimental focus.

One way to approach an Experimental Basis is to designate a desired overall landscape ecosystem pattern that can be used to guide management prescriptions. Such a pattern would be established using landscape ecology principles, and will be managed by allocating (zoning) lands across the forest into various characteristic classes, based on stand structure, species mix, number of cohorts, age classes, habitat guilds, etc. The Research Planning Team will help to define these classes in a way that integrates JAG's Landscape Allocation with Research priorities identified by the Centers of Excellence. Over time, the forest should seek to maintain an appropriate cumulative mix for each of these classes that will range over time according to the forest management plan.

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An Experimental Basis will also benefit by:

- A science agenda for the forest that outlines experimental questions/issues (including criteria for key questions) that should be under consideration by the forest staff.
- A clearly defined monitoring program that provides the protocols, accuracy goals, and QA/QC so that study designs can leverage the information generated by the monitoring program to the greatest extent possible.
- A clearly defined Adaptive Management Program that defines resource objectives, treatment variations, performance measures, and action triggers

A Comprehensive Monitoring Program

To support the objective of a 'world-class research and demonstration forest', JAG recommends that considerable effort be given to developing an integrated monitoring and inventory program. Such a program should outline existing monitoring approaches, protocols, staffing needs, etc. The monitoring program should be tightly coupled with Centers of Excellence, the Research Agendas, Landscape Management Planning, the Adaptive Management Framework, and the Demonstration program.

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The Monitoring and inventory program should develop, compile and analyze data to support research and management that addresses applied forestry questions. Under this program, inventory and monitoring activities along with research and demonstration activities provide a comprehensive information system that supports management. Whereas the research program will develop specific data in ways that support specific research objectives, the monitoring and inventory program typically will provide data that is more broadly collected to serve as decision support and potential data for future studies, external stakeholder needs, modeling inputs, and independent validation assessments. Data sets might be integrated into the monitoring and inventory program in a way that allows public access to the data.

The monitoring and inventory program should meet several objectives, as identified during the course of JAG's deliberations and outreach efforts:

1. It should support the scientific basis for forest management within and beyond JDSF. Monitoring data can provide the feedback necessary to test working hypotheses and implement adaptive management. As such, the monitoring and inventory system should be sufficiently robust to accommodate an ever-evolving set of management questions, hypotheses, and working assumptions.

2. This program should incorporate the current JDSF resource information system, consisting of forest inventory databases linked to a GIS. The GIS contains all currently available data layers relevant to the Forest. The current system also contains flat files of data for individual research projects.

3. A project tracking system should be implemented, in which each project and activity on the Forest completes a simple standardized report that identifies standard information for each project type. Such fundamental "case study" data can provide demonstration value, offers increased transparency, and provides basic information that can be used to document basic economic and environmental trends.

4. Given that priorities and objectives will change over the life of this inventory system, the system should be comprehensive enough to allow the questions asked of the data to evolve over time. Rather than identifying a fixed set of objectives, the system itself must be flexible enough that it can evolve along with the questions being asked of it.

5. The system should be comprehensive enough to accommodate information that will allow us to make decisions on how to sustainably manage redwood forest ecosystems, not just timber resources.

6. The system should be sufficiently simple and inexpensive to implement that it can withstand inevitable fluctuations in budgets and staffing over time. Research and development programs are usually the first to experience budget cuts or elimination in difficult economic times. Most programs for data collection and monitoring in fact succumb to budget shortfalls, as evidenced by a dearth of property-wide permanent data sets going back more than 10 to 15 years. A modular system is proposed, in which a basic set of data is always measured. This basic data are then supplemented with more comprehensive measurements in "rich" years.

7. At a minimum, there should be enough data to enable us to detect changes over time in overall forest stand parameters, such as CWHR structure class, average stand diameter or stem volume.

8. Plot installations should be linked to the existing permanent plot (CFI) grid. Project plots should be tied to the plot grid at a higher density multiple of the Forest-wide grid to achieve the desired 10 plots per project.

9. Enough plots should be collected that it will permit making inferences to population parameters at a reasonable level of confidence. We propose that the required level of confidence be achieved over a larger area than the individual project or THP level, such as a planning watershed or a portion thereof. We propose that a set of up to 10 permanent plots be installed on each major project, such as a THP, in order to evaluate effects of treatments. As data from several projects accumulate, statistical inference can be made at a rigorous level of confidence. At the same time, installation of 10 plots per major project is a burden that can realistically be achieved even with basic staff in difficult budget situations.

10. We recommend exploring the possibility for the Redwood Research Group, the Regional Consortium or other affiliated group to take the lead in facilitating a regional resource database including other data sources such as the FIA program's grid-based inventory.

JAG acknowledges that a grid-based inventory works best for even-aged management. As new silvicultural methods such as group selection and variable retention start to replace traditional methods, one may expect that for a given grid intensity the precision of growth and inventory estimates will decrease substantially. Conversely, the grid-based inventory possesses unsurpassed utility in terms of reusability of the same data for different purposes, and maximum flexibility for incorporating new data from a variety of sources over time. A modification of the existing grid-based inventory could very easily render useless the State's longest continuously measured forest inventory data set, the JDSF CFI system. We tentatively

recommend maintaining and enhancing the grid-based inventory at JDSF, but suggest that a new design may be preferable in the near term.

Adaptive Management Framework

One role for JDSF as a Research Forest is to rigorously test the assumptions around existing policies and practices that occur within the Redwood region (and perhaps beyond). A formal Adaptive Management Framework should help to integrate monitoring, research, and demonstration in ways that improve practices and policies of interest to the forestry community. Such a framework should include performance measures, resource objectives, study designs, key questions, and other elements that integrate and direct monitoring and research activities within the forest (and beyond).

Adaptive Management allows for a more dynamic management planning approach that recognizes that changes in management environment will occur during the life of a management plan, and that provides a system to assess the effects of change and to modify management activities in response. Adaptive management can be either informal (via feedback resulting from casual monitoring) or formalized through a specific management system (with specific responses that are triggered upon meeting certain conditions). Formal approaches typically include:

- Desired Future Conditions
- Resource Objectives
- Performance Measures
- Ecological and Management Indicators
- Analytical Strategies
- Feedback Mechanisms
- Integrated Monitoring

Numerous examples of formalized Adaptive Management systems are available. As resources become available, JAG recommends considering the benefits of such a program on JDSF.

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JAG notes that standard Demonstration Protocols would help to build confidence that activities on the forest are implemented to benefit the broader forestry community. A demonstration program framework should outline how basic information will be compiled and reported for significant management actions on the forest. Such information could be developed into a series of brief reports (Forestry Notes and Forestry Reports) that would be available to the public via a website or other available communication media. The reports should be compiled for the following activities (including but not limited to):¶
<#>Harvest Treatments¶
<#>Reforestation and Restocking ¶
<#>Road Construction, Maintenance and Abandonment¶
<#>Burns (both Prescribed and Wildfires)¶
<#>Restoration and Enhancement Treatments¶
<#>Invasive Weed Control¶
¶
Demonstration is described within this framework as those management treatments that provide examples for forestland owners, managers and the general public. Demonstration information shall typically include:¶
<#>pre-treatment and post-treatment data¶
<#>economic costs & value data¶
<#>operational consideration information¶
<#>effectiveness evaluations¶
<#>location maps¶
<#>a discussion of the treatment design¶
<#>a description of the justification for selected management treatment¶
<#>relevant treatment quantities (volumes, areas, lengths, etc)¶
<#>planned costs and actual treatment costs¶
<#>revenues generated¶
<#>a list of monitoring and/or research activities associated with the treatment¶
<#>availability of more detailed data and resources¶
¶
The Demonstration Program should consider subsets of Demonstration for which JDSF staff will develop more detailed information and educational resources.¶

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D) Expanded Discussion: Centers of Excellence

As described in our recommendations, JAG has identified several tentative themes for Centers of Excellence. Much discussion and word-smithing has sought to refine these general trends. The following expanded discussion is intended to inform those who will be responsible for developing implementation guidance. It documents much of the discussion developed within JAG and our associated outreach efforts to provide context for how we arrived at these fundamental recommendations.

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As indicated in our Recommendations, JAG has identified 3 tentative Center of Excellence concepts as follows:

1. **Coho Salmon Recovery and Restoration of Aquatic Communities:** To rapidly recover aquatic communities, and coho salmon in particular, by understanding the integration of watershed process and functions using both active and passive restoration processes.

   Objectives might include:

   - Developing more active riparian management strategies that seek to recover functions at larger spatial scales
   - Active instream management practices for restoring habitat potential
   - More active measurements of nutrient dynamics and biotic integrity
   - Strategies to identify and improve limiting factors at site and watershed scales
   - Intensively monitored experimental trials
   - Expansion of Casper Creek studies
   - etc

2. **Upland Terrestrial Habitat and Forest Structural Relationships:** To understand habitat and population processes and develop predictive models of animal/plant/ habitat dynamics of upland species on a continuum from younger to older forests.

   Objectives might include:

   - Seeking to move beyond seral classes as a way to identify habitat potential
   - Identifying specific structural elements that benefit various species (or guilds of species)

- Improving the predictions of habitat characteristics associated with various silvicultural treatment practices
- Responsiveness to specific treatment practices (e.g., snag generation, prescribed fire, fungal inoculation, etc)

3. **Sustainable Forest Management Practices:** To understand and develop improved stand development pathways that integrate sustainable timber harvesting in the context of aesthetics, ecosystem management, timber growth and yield, forest product quality, carbon sequestration, and development of older forest conditions.

   Objectives might include:

   - Improved growth and yield modeling in redwood and redwood/Douglas fir stands
   - Best Management Practice innovations and trials
   - Quantifying silvicultural treatments that yield innovations in harvest design
   - Evaluating the biological response to Late Seral silviculture treatments as compared to Older Forest Development treatments.
   - etc

These preliminary ideas deserve additional consideration and planning. Factors that should influence the final selection and priorities or the Centers of Excellence

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Additional thinking around the Centers of Excellence would benefit by:

- Greater outreach to agencies, landowners, conservation groups and other external stakeholders to identify those priority deliverable products from these Centers that stakeholders would value
- Clarity about the structure, funding, staffing and other resources available to JDSF and associated research organizations (e.g., Redwood Research Group and Regional Redwood Consortium, etc)
- A broader examination of how forest structural dynamics can be leveraged to support research across the entire redwood landscape
- Additional deliberation by the Research Planning Group

The deliberations and input described above would help to resolve include several outstanding concerns and issues, including:

The right number of Centers – some have suggested focusing on fewer centers, building as organizational capacity develops. Others have suggested a broader distribution of Centers to support developing usable innovations in a more timely manner.

Sufficient Synergizing Capacity - the core idea behind the Centers of Excellence is that they promote synergy and cross-discipline research that leads to applied innovations. One challenge in defining any Center is avoiding the tendency to include topics simply because there may be a relationship between them. Centers can easily become overwhelmed with an overly broad definition that dilutes the power of the Center. We suggest that it would benefit the Centers to err on a more narrow focus than one that tries to include too many topics or issues. In general, the more specific the problem statement defining the Centers, the more excellence they will be likely to generate.

In our outreach efforts with scientists and other stakeholders, we discovered that there was only limited support for using JDSF as a focus area for the following issues:

- Basic ecosystem processes
- Climate Change Issues
- How to restore old-growth characteristics
- Exotic invasive species & response to disturbances (e.g., fire, fog, etc)

Criteria for Selecting Center Priorities and Topic Areas:

In light of these considerations, the JAG through its work within the Research Committee, Science Workshop, and its outreach efforts has identified criteria for selecting the types of scientific priorities that could be contained within a programmatic Center of Excellence[5]. These criteria are provided here to help guide those who may be helping to influence the selection of Centers of Excellence. These are not intended to be comprehensive, but reflect work done to date that may benefit those giving additional consideration to this topic. Primary Criteria include:

- **Centers of Excellence should focus primarily on achieving outcome-oriented goals v. theme-oriented topics.** The intention is to focus toward specific tools that can be used by

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[5] *These criteria are focused on selecting and/or refining the Centers of Excellence priorities. It does not preclude other research (including ad-hoc) that may be appropriate for JDSF.*

managers, landowners and policy-makers. One approach might seek to seek to develop and/or apply quantitative models as a way of guiding the development of knowledge and ensuring sufficient scientific rigor.

- **Centers of Excellence should focus on informing applied forest management issues.** Inherent in this concept is the idea that applied forestry requires the scientific basis provided by a fundamental understanding of the ecosystem dynamics, silviculture, and other natural processes and functions, and that developing our understanding in these areas will also need basic (theoretical) research.

- **Centers of Excellence should be politically and/or socially important and of interest to stakeholders.** Each Center should seek to integrate the understanding between the scientific, socio-political, economic, engineering and factors that affect the management and stewardship of these resources. and values - directed toward informing policy, which includes both knowledge-based and values-based issues, and is relevant to:

  - developing a fundamental understanding of ecosystem functions and processes
  - informs forestry regulations and/or policy
  - is important to stakeholders
  - is relevant to the redwood region forest and conservation issues

- **Each Center should represent a significant research topic that offers continuity and long-term research opportunities.** Priorities should be provided for those topics and issues that:

  –Leverage the unique position of JDSF to develop science that cannot easily be developed elsewhere

  –Offer the potential for results that lead to cutting-edge innovations

  – Research results should be relevant for several decades and relevant to large areas

- **Considers the capacities available from the pool of experts, including** researchers, consultants, partner agencies, etc. Ideally, the Centers should promote synergies and collaboration among a multitude of technical and stakeholder interests

- **Best leverages JDSF's unique characteristics,** which include an excellent opportunity for active, manipulative experimental research that takes approaches that are difficult to conduct on other lands. Descriptive studies are available anywhere, yet there are few opportunities for active manipulation of the landscape. Other lands are more tightly bound by state Forest Practice Regulations, Habitat Conservation Plans, Federal constraints, or conservation easement constraints. JDSF also offers stability in landscape structure; the ability for confidence that installations and studies can persist over the long-term (i.e. less subject to economic drivers or ownership changes, etc). However, another unique quality

of JDSF is its similarity to other redwood landscapes. Greater focus on these common features will encourage more interest by other landowners and expands our influence. We note that JDSF is probably NOT suited to landscape-scale studies in the absence of cooperation with other landowners. By itself, JDSF offers too few replicates, too few sub-watersheds, and too little variation. As such, JAG and JDSF can play a vital role in linking researchers with managers and the public. By providing a contrast to these land-bases, JDSF can expand the range and depth of experimental study designs that may yield new innovations in forest management.

Additional preferences have been captured by various stakeholders that may also warrant consideration in selecting the core Centers. These include:

- Focusing on developing a fundamental understanding of ecosystem functions and processes
- Informing forestry regulations and/or policy
- Representing all stakeholder interests in a way that maintains relevancy to the redwood region forest and conservation issues
- Representing a significant research topic that offers continuity and long-term research opportunities
- Innovating toward cutting-edge solutions to key management and policy issues
- Promoting research that will be relevant for several decades and relevant to large areas (perhaps even beyond the redwood region)
- Considering the capacities available from the pool of experts (researchers, consultants, partner agencies, etc.)
- Promoting synergies and collaboration amongst multiple disciplines and topic areas
- Providing a sufficiently compelling interest to funding entities (e.g., grants, foundations, non-profits, industry, etc.), possibly using public/private models
- Leveraging JDSF lands by integrating with other lands (both managed and unmanaged) throughout the redwood region (and perhaps beyond)
- Creating a narrative that describes the story of the forest in a way that the public can understand and appreciate

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- Characterizing our certainty about the consequences of management decisions, with a preference towards research that seeks to improve confidence around our predictive capacity
- Promoting the skills and capabilities needed to use management to influence the forest on its trajectory toward natural recovery of important ecosystem functions and processes
- research that promotes the ability to maintain a broad range of dynamic conditions (including early to mid-seral habitats)

F) Expanded Discussion: Redwood Research Group and Regional Redwood Consortium

Generally, we see the Redwood Research Group as the center for Administration of Research and Demonstration, Adaptive Management, and possibly monitoring. Its semi-independence of CAL FIRE could provide an autonomy that would strengthen the perception of objectivity and scientific rigor. This status might improve its ability to leverage funding and resources from a broader base. Complete independence would also allow the Group to operate outside of the constraints of a State agency. Benefits might include improved credibility of research results, enhanced collaboration with other landowners, and eased adoption of new management practices outside of a regulatory context. Independence might also enable financial management that helps insulate R & D activities from governmental budgeting swings and better assures long-term research.

There are several models for how such an entity could be organized. Each offers various pros and cons that the Board of Forestry and CAL FIRE may want to weigh carefully. Examples include:

- Public/Private Partnership –
- Independent Non-Profit Entity –
- Academic Affiliation –
- Multi-Agency Task Force –
- CAL FIRE Department –

The organizational structure of the Redwood Research Group may want to include a separate Executive Director as well as a Senior Scientist. The Exec Director's role might focus on funding, administration, facilitation, adaptive management and policy issues. The Senior Scientist's role might focus on the scientific aspects of the organization's mission. Staff may also want to include a full compliment of multi-disciplinary scientists ranging from field staff to senior researchers, who can be responsible to collecting data, implementing studies, and publishing results.

There is a wide range of example organizations to model in the development of this type of organization. We recommend looking to other "world-class" forests for examples, including HJ Andrews (OR), Olympic Experimental Forest (WA), Carnation Creek Experimental Station (BC) and others. Another potential model is the California State Parks Foundation.

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A Collaborative Research Cooperative

A research cooperative would position JDSF as an integrative entity that unites efforts across the Redwood landscape by acting as a Hub for collaborative research that includes private lands, parks, conservation forests and federal lands. JDSF can be a resource that provides staff, money and logistical support as a center of research. Similarly, collaborative members can provide support for adaptive management and policy revision efforts. Such an approach increases the relevance of JDSF to many stakeholders. Also, the ability to manage at landscape-scales is greatly improved by collaborating with other landowners throughout the Redwood region.

We recognize that the extent that JDSF will be supported by the broader forestry community depends in part on how stakeholder perspectives and concerns are solicited and addressed in objective, transparent, and well-designed R&D. The community of relevant stakeholders is quite large, and consists of

- Landowners and Associated Technical Support
  - Industry and non-industrial family owners
  - UC Extension
  - Consultants
- Researchers
  - USFS Pacific Southwest Research Station
  - Key University professors at HSU, UCB, and Cal Poly
  - Other Research Institutions
- Conservation groups
- Policy, regulatory, and agency groups

The Research Cooperative could provide a pool of competent and trained technicians, capable of collecting various forms of field data, including forest inventory, biological surveys, stream data, etc. It could also provide internal peer-review of the Research Agendas, study designs, and work products. CAL FIRE could look to Washington (e.g., TFW) and Oregon for example models of functioning Research Cooperatives that involve a broad group of stakeholders. Building a Research Cooperative would:

- Leverage funding resources from a broader array of cooperators, agencies and granting entities
- Establish JDSF as a center of research that provides the staff, money and support for the cooperative

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- Provide collaborators that can also support adaptive management efforts by engaging in evaluations of policies and practices throughout the region
- Leverage the unique capacities of JDSF to do manipulative studies that cannot be easily replicated by other land-uses, recognizing that generally,
    - Parks and Conservation blocks can provide references
    - Industrial landowners typically offer more active production-oriented forestry
    - USFS lands have different management constraints than typically apply to lands operating under Forest Practices regulations
    - Habitat Conservation Lands offer other management models
    - Descriptive studies can be conducted anywhere

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