STATE OF CALIFORNIA

CONTRACT REQUEST FORM (CRF)

CEC-94 (Revised 5/11) CALIFORNIA ENERGY COMMISSION

☐ New Contract - - ☒ Amendment to Existing Contract: 600-10-006 Amendment Number: 1

Division	Contract Manager:	MS-	Phone	CM Training Date
600 Fuels and Transportation Division	Bill Kinney	27	916-654-4774	11/2009

Contractor's Legal Name	Federal ID Number
USDA US Forest Service--Pacific Southwest Research Station.	72-0564834

Title of Project
Assessing the Sustainability of Forest Biomass Utilization in California

Term	Start Date	End Date	Amount
New/Original Contract	06 / 09 / 11	05 / 11 / 14	$ 1,500,000

Line up the Amendment information as best as possible in the following boxes

Amendment #	End Date *(mm/dd/yy)*	Amount
# 1	03/31/2015	$361,716

Business Meeting Information			
Proposed Business Meeting Date	6/13/12	☐ Consent	☒ Discussion
Business Meeting Presenter	Bill Kinney	Time Needed:	10 minutes

Agenda Item Subject and Description

Possible approval of a proposed amendment to the interagency agreement Contract # 600-10-006--Assessing the Sustainability of Forest Biomass Utilization in California, with the US Forest Service -Pacific Southwest Research Station, for an additional $361,716. The proposed amendment supports activities and personnel excluded from the original Agreement, which examines the sustainability of forest biomass utilization for biofuels production.

Business Meeting approval is not required for the following types of contracts: *Executive Director's signature is required in all cases.*

☐ Contracts less than $10k *(Policy Committee's signature is also required)*

☐ Amendment for a no-cost time extension. Must be first extension, less than one year and original contract less than $100k.

☐ Contracts less than $25k for Expert Witness in Energy Facility licensing cases and amendments.

Purpose of Contract or Purpose of Amendment, if applicable

The purpose of this agreement is to amend the existing Agreement of June 2011 between the California Energy Commission and the US Forest Service Pacific Southwest Research Station (PSW), Contract #600-10-006--Assessing the Sustainability of Forest Biomass Utilization in California. This amendment will add $361,716 to the original $1.5 million contract. The goal of this agreement between CEC and PSW is to comprehensively investigate how elements of forest ecosystem sustainability interact with potential biomass extraction and utilization systems under differing management practices and disturbance regimes. This amended contract will address activities and issues which could not be included in the original Agreement because of resource and timing constraints that are now resolved.

California Environmental Quality Act (CEQA) Compliance

1. Is Contract considered a "Project" under CEQA?
   ☒ Yes: skip to question 2 ☐ No: complete the following (PRC 21065 and 14 CCR 15378):
   Explain why contract is not considered a "Project":
   Contract will not cause direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment because .
2. If contract is considered a "Project" under CEQA:
   ☐ a) Contract **IS** exempt. (Draft NOE required)
   ☐ Statutory Exemption. List PRC and/or CCR section number:
   ☐ Categorical Exemption. List CCR section number:
   ☐ Common Sense Exemption. 14 CCR 15061 (b) (3)
   Explain reason why contract is exempt under the above section:
   ☒ b) Contract **IS NOT** exempt. The Contract Manager needs to consult with the Energy Commission attorney assigned to their division and the Siting Office regarding a possible Initial Study.

Budgets Information

Contract Amount Funded		Breakdown by FY			Funding Sources			
Funding Source	Amount	FY	Amount	Approved ?	Funding Source	FY	Budget List No.	Amount
ARFVTF	$361,716	10/11	$361,716	Yes	Funding Source	10/11	601.118C	$361,716
ECAA	$		$	No	Funding Source			$
State- ERPA	$		$	No	Funding Source			$
Federal	$		$	No	Funding Source			$
PIER - E	$		$	No	Funding Source			$
PIER - NG	$		$	No	Funding Source			$
Reimbursement	$		$	No	Funding Source			$
RRTF	$		$	No	Funding Source			$
Other:	$		$	No	Other:			$
TOTAL:	$361,716	TOTAL:	$361,716				TOTAL:	$361,716
Reimbursement					Federal Agreement #:			

Contractor's Administrator/ Officer		Contractor's Project Manager	
Name:	Brian Hanlon	Name:	Richard Bottoms
Address:	800 Buchanan St.	Address:	Pacific Southwest Research Station 1731 Research Park Drive
City, State, Zip:	Albany, CA 94706	City, State, Zip:	Davis, CA 95618
Phone/ Fax:	510 559-6309	Phone/ Fax:	530 759-1703
E-Mail:	bhanlon@fs.fed.usu	E-Mail:	rmbottoms@fs.fed.us

Contractor Is

☐ Private Company *(including non-profits)*
☐ CA State Agency *(including UC and CSU)*
☒ Government Entity *(i.e. city, county, federal government, air/water/school district, joint power authorities, university from another state)*

Selection Process Used

☐ Solicitation Select Type Solicitation #: ____-____-____ # of Bids: _____ Low Bid? ☐ No ☐ Yes
☐ Non Competitive Bid *(Attach CEC 96)*
☒ Exempt Other Governmental Entity

Civil Service Considerations

☐ Not Applicable (Contract is with a CA State Entity or a membership/co-sponsorship)
☐ Public Resources Code 25620, et seq., authorizes the Commission to contract for the subject work. (PIER)
☒ The Services Contracted:
- ☐ are not available within civil service
- ☐ cannot be performed satisfactorily by civil service employees
- ☒ are of such a highly specialized or technical nature that the expert knowledge, expertise, and ability are not available through the civil service system.

☒ The Services are of such an:
- ☐ urgent
- ☐ temporary, or
- ☒ occasional nature

that the delay to implement under civil service would frustrate their very purpose.

Justification:
This research requires highly specialized expertise in forest ecology, Life Cycle Analysis, and forest harvest technologies and impacts.

Payment Method

☒ A. Reimbursement in arrears based on:
☐ Itemized Monthly ☒ Itemized Quarterly ☐ Flat Rate ☐ One-time
☐ B. Advanced Payment
☐ C. Other, explain:

Retention		
1. Is contract subject to retention?	☐ No	☒ Yes
If Yes, Do you plan to release retention prior to contract termination?	☒ No	☐ Yes

Justification of Rates

Disabled Veteran Business Enterprise Program (DVBE)

1. ☒ Not Applicable
2. ☐ Meets DVBE Requirements DVBE Amount:$ _____ DVBE %: _____
   - ☐ Contractor is Certified DVBE
   - ☐ Contractor is Subcontracting with a DVBE: _____
3. ☐ Contractor selected through CMAS or MSA with no DVBE participation.
4. ☐ Requesting DVBE Exemption (attach CEC 95)

Is Contractor a certified Small Business (SB), Micro Business (MB) or DVBE?	☒ No	☐ Yes
If yes, check appropriate box:	☐ SB ☐ MB	☐ DVBE

Is Contractor subcontracting any services?	☐ No	☒ Yes
If yes, give company name and identify if they are a Small Business (SB), Micro Business (MB) and/or DVBE:		
University of California, Davis	☒ No ☐ SB ☐ MB	☐ DVBE
University of California, Berkeley	☒ No ☐ SB ☐ MB	☐ DVBE
Spatial Informatics Group	☐ No ☐ SB ☒ MB	☐ DVBE

Miscellaneous Contract Information

1. Will there be Work Authorizations?	☒ No	☐ Yes
2. Is the Contractor providing confidential information?	☒ No	☐ Yes
3. Is the contractor going to purchase equipment?	☒ No	☐ Yes
4. Check frequency of progress reports		
☒ Monthly ☐ Quarterly ☐ Other...		
5. Will a final report be required?	☐ No	☒ Yes
6. Is the contract, with amendments, longer than a year? If yes, why?	☐ No	☒ Yes
This contract amends Contract 600-10-006, which requires multiple years of data collection.		

The following items should be attached to this CRF		
1. Scope of Work, Attach as Exhibit A.	☐ N/A	☒ Attached
2. Budget Detail, Attach as Exhibit B.	☐ N/A	☒ Attached
3. CEC 96, NCB Request	☒ N/A	☐ Attached
4. CEC 30, Survey of Prior Work	☒ N/A	☐ Attached
5. CEC 95, DVBE Exemption Request	☒ N/A	☐ Attached
6. Draft CEQA Notice of Exemption (NOE)	☒ N/A	☐ Attached
7. Resumes	☒ N/A	☐ Attached
8. CEC 105, Questionnaire for Identifying Conflicts		☒ Attached
9. CEC 106, IT Component Reporting Form		☐ Attached

Contract Manager	Date	Office Manager	Date	Deputy Director	Date

The following signatures are only required when contract approval is delegated to the Executive Office and not approved at a Business Meeting. See Business Meeting Information Section.

Presiding Policy Committee	Date	Associate Policy Committee	Date	Executive Director	Date

Exhibit A
SCOPE OF WORK

TECHNICAL TASK LIST

Task #	CPR	Task
1	X	Agreement Management
2		Survey Forest-Practice Regulations
3		Develop BioSum 3.0
4		Develop Impacts Analysis for Thinned Even-Aged Mixed-Conifer Stands
5		Develop Fuel Treatment Design ~~Model~~ **Tool**
6		Quantify Carbon Storage and Mass Balances
7		Measure Forest Ecological Impacts from Recent Fires
8		~~Model~~ **Synthesize** Impacts of Biofuel Demand
9		~~Model~~ **Synthesize** Lifecycle Energy and GHG Emission Balances
10		Quantify the Effects of Biomass Reduction Treatments on Habitat Quality
11		Quantify the Efficacy of Fuel Reduction Treatments
12		Integrate Project Results

GLOSSARY

Specific terms and acronyms used throughout this work scope are defined as follows:

Acronym	Definition
ARFVT	Alternative and Renewable Fuel and Vehicle Technology
BioSum	An analytical framework that provides a statistically-representative foundation to estimate fire risk reduction impacts of different silvicultural treatments
CCM	Commission Contract Manager
CPR	Critical Project Review
Energy Commission	California Energy Commission
FIA FVS FFE FRCS	Forest Inventory and Analysis Forest Vegetation Simulator Fire and Fuels Extension Fuel Reduction Cost Simulator
GBSM	Geospatial Bioenergy Siting Model
GHG	Greenhouse Gas
IFWG	Inter-Agency Forestry Working Group
LCA	Life Cycle Analysis
TL	Commission Technical Lead
UCD	University of California, Davis
USFS	U. S. Forest Service

Background

California's biomass resources have the potential to serve as feedstock for alternative low-carbon transportation fuels such as Compressed Natural Gas (CNG) and cellulosic ethanol. A key policy concern is to determine the appropriate volumes, locations and methods for procuring these resources in a sustainable manner. California Assembly Bill 118 (AB 118), (Nùñez, Chapter 750, Statutes of 2007), created the Alternative and Renewable Fuel and Vehicle Technology (ARFVT) Program, which authorizes public investment in alternative and renewable fuels and technologies, and requires the California Energy Commission (Energy Commission) to develop sustainability standards for projects funded through the AB 118 investment fund.

Concurrently, state and federal forest managers have identified the need to reduce fire risk and restore forest health and resilience through a variety of thinning and other fuel treatments strategies. Such forest treatments could help California's forests to be more resilient to increasing climate change, and sustain its role in carbon sequestration.

The Inter-Agency Forestry Working Group (IFWG) was formed to facilitate the implementation of Assembly Bill 32 (AB 32) (Núñez, Chapter 488, Statutes of 2006) – the California Global Warming Solutions Act of 2006, one of California's climate change initiatives – in the forest sector. The Energy Commission's role in IFWG is to help integrate the utilization of forest biomass for transportation fuels with other forest management policy goals.

AB 118 also authorizes investment in research that evaluates the sustainability of forest biomass utilization. Defining sustainability for forest biomass requires research from multiple scientific perspectives. This research project is intended to collect and analyze critical field data and develop actual case studies to answer the basic questions of where, when, and how woody biomass utilization is sustainable.

Vulnerability of California's forests to fires, insects, disease, and drought are significant and increasing. In the mid-elevation, mixed-conifer zones of the Sierra Nevada, altered forest conditions caused by 100 years of fire suppression and changing climatic conditions have generated unstable fire regimes that threaten catastrophic impacts on forest health and productivity; soils and watershed function; and public health and safety. Fire is a critical focus in evaluation of biomass utilization impacts, because it plays a critical role in the health and sustainability of these ecosystems.

This project will evaluate the impact of biomass utilization on expected fire behavior and carbon sequestration, and the resulting ecological and environmental impact on both treated and untreated stands, with and without wildfire.

This study will also address issues and questions regarding the role of California Forest Practice Regulations and third-party certification programs in addressing the sustainability of forest biomass utilization. Forest Practice Regulations and certification

guidelines were originally focused on timber and sawlog harvesting. Thus, these requirements are not formally linked to greenhouse gas (GHG) mitigation and carbon management incentives. Moreover, increased regulation of forest practices in California, without corresponding financial incentives, have the potential to increase timber and wood product imports from British Columbia and the Northwest states. Over 85 percent of these imports are generated from clear cuts where sustainability requirements may not adequately address emerging policy needs and sustainability questions.

Goal of the Agreement

The goal of this agreement between the Energy Commission and the U.S. Forest Service (USFS) Pacific Southwest Research Station is to comprehensively investigate how elements of forest ecosystem sustainability interact with potential biomass extraction and utilization under differing management practices and disturbance regimes. In addition, the economics of biomass utilization will be analyzed to identify dynamic interactions among biomass project design characteristics. By using existing research teams with proven track records and active study sites with robust data sets, existing research programs and findings will be leveraged to create synergistic research results that close key research gaps in the sustainability of forest biomass utilization.

This research project will connect four critical perspectives in determining biomass utilization sustainability:

- Collection of field data from working sites where forest management activities are generating or have generated woody biomass materials, with and without fire.
- Analysis of field data to calibrate and predict ecosystem responses to forest improvement and restoration over a range of site conditions.
- On-the-ground case studies of actual biomass utilization activities and projects.
- Decision tools for project design and analysis, prescription design, facility location and design, and feedstock availability.

Objective of the Agreement

The main objective of this study is to inform the IFWG implementation team and the Energy Commission's ARFVT Program about the sustainability of increased forest biomass utilization. To accomplish this objective, this project will utilize an integrated research approach capitalizing on the ongoing and proposed field projects that will be collecting scientific data relevant to the sustainability of forest biomass utilization.

The following assumptions will be used in the performance of this project:

- The focus will be on forest biomass feedstock for low-carbon transportation fuels.
- The temporal scale of operation is 20 to 50 years.
- The spatial scales of analysis will include project and fireshed scales.

Task 1: AGREEMENT MANAGEMENT

MEETINGS

Task 1.1 Attend Kick-off Meeting

The goal of this task is to establish the lines of communication and procedures for implementing this Agreement.

The Contractor shall:

- Attend a "kick-off" meeting with the Commission Contract Manager (CCM), the Commission Technical Lead (TL), the Contracts Officer, and a representative of the Accounting Office. The Contractor shall include their Project Manager, Contracts Administrator, Accounting Officer, and others designated by the CCM to attend this meeting. The administrative and technical aspects of this Agreement will be discussed at the meeting. Prior to the kick-off meeting, the CCM will provide an agenda to all potential meeting participants.

The administrative portion of the meeting shall include, but not be limited to, a discussion of the following:

- Invoicing/Accounting procedures
- Terms and conditions of the Agreement

The technical portion of the meeting shall include, but not be limited to, a discussion of the following:

- Expectations for accomplishing the technical tasks described in the Scope of Work (Tasks 2 through 12)
- CPRs (Task 1.2)
- Final Meeting (Task 1.3)
- File Formats (Task 1.4)
- Progress Reports (Task 1.5)
- Deliverables and Deliverable Due Dates (Task 1.6)
- Final Report (Task 1.7)

The CCM shall designate the date and location of this meeting, but the Contractor should plan on the meeting being held at the Energy Commission's offices in Sacramento.

Contractor Deliverables:

- Updated Schedule of Deliverables (if applicable)

Task 1.2 Critical Project Review Meetings

The goal of Critical Project Review (CPR) meetings is to determine if the project should continue receiving Energy Commission funding to complete this Agreement and to identify any modifications that need to be made to the tasks, deliverables, schedule or budget. Participants include the CCM, the TL, and the Contractor, and may include the

Commission Contracts Officer, other Energy Commission staff and Management, and other individuals selected by the CCM to provide support to the Energy Commission. CPRs shall be conducted **annually** as shown in the Schedule of Deliverables and Due Dates. However, the CCM may schedule additional CPRs as necessary, and any additional costs will be borne by the Contractor.

The Commission Contract Manager shall:

- Determine the location, date and time of each CPR meeting with the Contractor. These meetings generally take place at the Energy Commission, but they may take place at another location.

- Send the Contractor the agenda and a list of expected participants in advance of each CPR.

- Conduct and make a record of each CPR meeting. One of the outcomes of this meeting will be a schedule for providing the written determination described below.

- Determine whether to continue the project, and if continuing, whether or not to modify the tasks, schedule, deliverables and budget for the remainder of the Agreement, including not proceeding with one or more tasks. If the CCM concludes that satisfactory progress is not being made, this conclusion will be referred to the appropriate Energy Commission Policy Committee for its concurrence.

- Provide the Contractor with a written determination in accordance with the schedule. The written response may include a requirement for the Contractor to revise one or more deliverable(s) that were included in the CPR.

The Contractor shall:

- Prepare a CPR Report for each CPR meeting that discusses the progress of the Agreement toward achieving its goals and objectives. This report shall include recommendations and conclusions regarding continued work of the projects. This report shall be submitted along with any other deliverables identified in this Scope of Work. Submit these documents to the CCM and any other designated reviewers at least 15 working days in advance of each CPR meeting.

- Present the required information at each CPR meeting and participate in a discussion about the Agreement.

Deliverables:

- CPR Report(s)

Task 1.3 Final Meeting
The goal of this task is to present the findings, conclusions, and recommendations resulting from this Agreement.

The Contractor shall:

- Meet with the Energy Commission to present the findings, conclusions, and recommendations. The final meeting must be completed before the end of the term of this Agreement.

  This meeting will be attended by, at a minimum, the CCM, the TL, and the Contractor. The technical and administrative aspects of Agreement closeout will be discussed at the meeting. The technical portion of the meeting shall present findings, conclusions, and recommended next steps (if any) for the Agreement. The CCM will determine any additional appropriate meeting participants.

- Prepare written documentation of meeting agreements.

- Prepare a schedule for completing the closeout activities for this Agreement.

Deliverables:

- Written documentation of meeting agreements
- Schedule for completing closeout activities

REPORTING

Task 1.4 Electronic File Format
The goal of this task is to unify the formats of electronic data and documents provided to the Energy Commission as contract deliverables. Another goal is to establish the computer platforms, operating systems and software that will be required to review and approve all software deliverables.

The Contractor shall:

- Deliver documents to the CCM in the following formats:
  - Data sets shall be in Microsoft (MS) Access or MS Excel file format.
  - PC-based text documents shall be in MS Word file format.
  - Documents intended for public distribution shall be in PDF file format, with the native file format provided as well.
  - Project management documents shall be in MS Project file format.

- Request exemptions to the electronic file format in writing at least 90 days before the deliverable due date.

Deliverables:

- Exemption letter (if applicable)

Task 1.5 Monthly Progress Reports
The goal of this task is to periodically verify that satisfactory and continued progress is made towards achieving the objectives of this Agreement.

The Contractor shall:

- Prepare monthly progress reports which summarize all Agreement activities conducted by the Contractor for the reporting period, including an assessment of the ability to complete the Agreement within the current budget and any anticipated cost overruns. Each progress report is due to the CCM 15 calendar days after the end of the reporting period. The CCM will provide the format of the Monthly Progress Reports.

Deliverables:

- Monthly Progress Reports (No Draft)

Task 1.6 Deliverables and Deliverable Due Dates
The goal of this task is to specify the general requirements for deliverables and the deliverable due dates. When creating reports, the Contractor shall use and follow, unless otherwise instructed in writing by the CCM, the latest version of the Consultant Reports Style Manual published on the Energy Commission's web site:
http://www.energy.ca.gov/contracts/consultant_reports/index.html

The Contractor shall:

- If the *Schedule of Deliverables and Due Dates* requires revision after the execution of the Agreement, the revised dates cannot go beyond the term end date of the Agreement. The Contractor shall work with the CCM to come to an agreement on new deliverable due dates. The CCM shall issue the revised *Schedule of Deliverables and Due Dates* to the Contractor and to the Contracts Office.

- Unless otherwise directed in this Scope of Work, submit a draft of each deliverable listed in the Technical Tasks to the CCM for review and comment in accordance with the approved *Schedule of Deliverables and Due Dates*.

- Provide each draft deliverable to the CCM in electronic format. The CCM will provide written comments back to the Contractor on the draft deliverable within 30 calendar days of receipt. The Contractor shall review the comments and discuss any problematic recommended changes to each draft with the CCM.

- Once agreement has been reached on the draft, the Contractor shall submit the final deliverable to the CCM. Each final deliverable shall be delivered to the CCM as one original, reproducible, 8 ½" by 11", and camera-ready master in black ink. Illustrations and graphs shall be sized to fit an 8 ½" by 11" page, readable if printed in black and white. In addition, the Contractor shall deliver an electronic copy (CD ROM or memory stick or as otherwise specified by the CCM) of the full text in Microsoft Word (.doc). The CCM shall provide written approval of the final deliverable within 30 calendar days of receipt.

Task 1.7 Final Report
The goal of this task is to prepare a comprehensive written Final Report that describes the original purpose, approach, results and conclusions of the work done under this Agreement. The CCM will review and approve the Final Report. The Final Report must be completed before the termination date of the Agreement in accordance with the *Schedule of Deliverables and Due Dates*. The Final Report shall be a public document.

Task 1.7.1 Final Report Outline

The Contractor shall:
- Prepare and submit a draft outline of Final Report to the CCM for review and approval. The CCM will provide written comments back to the Contractor on the draft outline within 15 calendar days of receipt. Once agreement has been reached on the draft, the Contractor shall submit the final outline to the CCM. The CCM shall provide written approval of the final outline within 15 calendar days of receipt.

Deliverables:
- Draft Outline of Final Report
- Final Outline of Final Report

Task 1.7.2 Final Report

The Contractor shall:
- Prepare the Draft Final Report for this Agreement in accordance with the approved outline.

- Submit the Draft Final Report to the CCM for review and comment. The CCM will provide written comments to the Contractor within 15 calendar days of receipt. The Contractor shall review the comments and discuss any problematic recommended changes with the CCM.

- Prepare and submit the Final Report.

Deliverables:
- Draft Final Report
- Final Report

Task 1.8 Manage Subcontractors
The goal of this task is to ensure quality products, to enforce subcontractor Agreement provisions, and in the event of failure of the subcontractor to satisfactorily perform services, recommend solution to resolve the problem.

TECHNICAL TASKS

The Contractor shall prepare all deliverables in accordance with the requirements in Task 1.6.

Task 2: SURVEY FOREST-PRACTICE REGULATIONS

The goals of this task are to (1) develop empirical case studies to demonstrate the differential impacts of California forest-practice regulations and third-party certification systems on forest biomass utilization sustainability, and (2) investigate the feasibility of performance-based incentive programs that would complement existing requirements.

The Contractor shall:

- Summarize the major applicable forest-practice regulations and third-party certification programs (with respect to increased production of forest-based biomass to meet California's needs for low-carbon fuels and GHG reductions).

- Survey and assess the impact of forest-practice regulations and third-party certification programs on the sustainability of increased use of forest-based woody biomass from private forest lands in California.

- Prepare a draft Forest-Practice Regulations and Third-party Certification Impact Report. The report shall include a summary of the major forest-practice regulations and third-party certification programs and their impact on the sustainability of increased use of woody biomass from private forest lands in California.

- Prepare a final Forest-Practice Regulations and Third-party Certification Impact Report

- Survey and assess landowner interest in other supplementary approaches that link financial incentives to sustainability performance.

- Prepare a draft Forest Landowner Interests Report on the findings from forest landowner surveys regarding their interests in various sustainability-enhancing forest activities that would be linked to financial incentives.

- Prepare a final Forest Landowner Interests Report.

- Develop two to four case studies illustrating the differential impacts of alternative regulatory/certification systems on forest biomass utilization sustainability across representative examples of private ownership and site conditions

- Prepare a draft Case Study Analysis Report, documenting two to four different case studies on how increased demand for woody biomass could affect private forest management in California.

- Prepare a final Case Study Analysis Report.

Deliverables:

- Draft Forest-Practice Regulations and Third-party Certification Impact Report
- Final Forest-Practice Regulations and Third-party Certification Impact Report
- Draft Forest Landowner Interests Report
- Final Forest Landowner Interests Report
- Draft Case Study Analysis Report
- Final Case Study Analysis Report

Task 3: DEVELOP BIOSUM 3.0

The goal of this task is to update the **existing** USFS BioSum 2.0 platform ~~model~~ to a California statewide ~~version~~ (BioSum 3.0) **analysis tool** that integrates information on forest stands, vegetation treatments, surface fuel **analytics** ~~models~~, transportation networks, activity costs, and product revenues to produce economic and biological estimates of the outputs from different biomass-generating forest management scenarios. **Empirical data will be collected from a range of treatments used on private forest lands in California that cover pre-commercial treatments, light partial cuts, heavy partial cuts, and clear cuts.**

The Contractor shall:

- Develop an updated, California statewide BioSum 2.0-compatible dataset for California forests, based on the latest Forest Inventory and Analysis (FIA) standards, for use in BioSum 3.0.

- Develop the California statewide BioSum 3.0 ~~model~~ **analysis tool** suitable for conducting project-scale economic and policy analysis on management options for fuels and forest management under a range of economic, policy, and fire hazard scenarios. Key components shall include (1) a Sierra-wide transportation grid layer; (2) an updated FIA dataset; and (3) modified ~~programming code~~ **functionality** to allow access to fuel, tree-growth, and cost data sets that change over time, and that allow better dynamic characterization of surface and tree fuels, tree growth, and multiple treatment re-entries over a 30-year period. The ~~model~~ **analysis tool** shall be housed at the USFS Pacific Northwest Research Station.

- Develop a suite of field-tested silvicultural prescriptions for BioSum 3.0 which are designed to address multiple forest management objectives, including increased fire resilience, timber improvement, and improved forest health.

- Develop and ~~run~~ **analyze** a set of federal and state public policy scenarios, using the new silvicultural prescriptions incorporated in BioSum 3.0, to estimate impacts on bioenergy development and production.

- **Collect and analyze plot data on forest structure and surface fuels from the existing Blodgett database to establish baseline conditions**.

- **Collect additional surface fuel plot data, focusing on masticated stands.**

- **Analyze fire behavior in response to various thinning treatments used on private forest lands, including a no-treatment scenario, at multiple intervals after treatment.**

- **Compare predicted fire behavior within treated and untreated stands under various surface fuel scenarios.**

- **Recommend surface fuel analysis tools for different thinning treatment types to incorporate into BioSum 3.0.**

- **Prepare a draft Surface Fuel Analysis Tool Report that describes the recommended surface fuel analysis tools calibrated to different thinning treatments in mixed conifer forests and the process for incorporating the tools into BioSum 3.0 to replace the default surface fuel analytics in Forest Vegetation simulator (FVS) / Fire and Fuels Extension (FFE), Fuel Reduction Cost Simulator (FRCS), and other sub-modules used by BioSum 3.0**

- **Prepare a final Surface Fuel Analysis Tool Report.**

- **Provide a copy of any peer-reviewed article that describes the Surface Fuel Analysis Tool and the application of the Tool. Refer to the Terms and Conditions of this contract in the event that a manuscript is published as a result of this task.**

- Prepare a BioSum 3.0 Operating Manual to support public use and access to the model.

- Prepare a draft Summary Report, BioSum 3.0: ~~Model~~ Developments and Policy Scenario Results, describing BioSum 3.0 modifications, upgrades, and prescription designs, and summarizing ~~model~~ analysis outputs in terms of renewable energy, changes in fire risks and net revenues to forest land owners or managers, and policy scenario results.

- Prepare a final Summary Report, BioSum 3.0: ~~Model~~ Developments and Policy Scenario Results.

Deliverables:

- **Draft Surface Fuel Analysis Tools Report.**

- **Final Surface Fuel Analysis Tools Report.**

- BioSum 3.0 Operating Manual and user interface (No Draft).

- Draft Summary Report, BioSum 3.0: ~~Model~~ **Analytics** Developments and Policy Scenario Results.

- Final Summary Report, BioSum 3.0: ~~Model~~ **Analytics** Developments and Policy Scenario Results.

- **Copy of any peer-reviewed articles.**

Task 4: DEVELOP IMPACTS ANALYSIS FOR THINNED EVEN-AGED MIXED-CONIFER STANDS

The goal of this task is to plan the empirical analysis of the impacts on soil productivity, fire risk reductions, and nutrient cycling from thinning young even-aged stands under private management. **Under this task, treatments will be implemented representing the most common silvicultural harvest activities that produce significant quantities of biomass.**

The Contractor shall:

- Collect pre-treatment soil productivity and forest-fuel structure data, including stand metrics that affect fire risk, from 20- to 30-year-old, even-aged stands of Sierra mixed conifers on the Blodgett ~~Experimental~~ Forest **Research Station**, El Dorado County, California.

- Delineate ~~several potential~~ areas for three replicates of two types of thinning treatments and three control sites.

- Develop the framework to analyze the costs and impacts on soil productivity, fire risk, and carbon storage aspects for six treated plots and three control plots. This shall include modeling the changes in fire risk, potential wildfire emissions, biomass productivity, and climate benefits related to in-forest carbon dioxide fluxes. It also includes tracking any biomass removals.

- Develop a long-term monitoring plan for treated and controlled sites, including split plots on treated sites.

- **Implement thinning treatments on three replicates of two types of thinning treatments within high fire risk, 20 to 30-year-old, even-aged stands of Sierra mixed conifers on Blodgett Forest Research Station, El Dorado County, California.**

- **Collect the post-treatment data, including soil productivity, forest-fuel structure data, and stand metrics that affect fire risk, ~~following~~ according to the long-term monitoring plan for treated and controlled sites, including split plots on treated sites.**

- **Implement thinning treatments on three replicates of two treatment types comprised of light and heavy partial cutting of uneven-aged stands of Sierra mixed conifers on the Blodgett Forest Research Station, El Dorado County, California**.

- **Collect the post-treatment information, including pre-treatment soil productivity, forest-fuel structure data, and stand metrics that affect fire risk, according to the long-term monitoring plan for treated and controlled sites, including split plots on treated sites.**

- Prepare a draft ~~Preliminary~~ Treatment Impacts Report, to include:
  - Pre-treatment plot measurement
  - **Post-treatment plot measurement**
  - Estimated **and actual** costs of treatment
  - Experimental design using three replicates of two thinning treatments and three control plots
  - **Analysis of pre and post-treatment plot measurements, harvested volumes, treatment costs, soil productivity metrics, fire risks, and carbon storage**
  - Treatment specifications and ~~preliminary~~ recommendations.
  - Specification of the statistical analysis of pre- and post-treatment data, including analysis of costs and impacts on soil productivity, fire risk, and carbon storage
  - Long-term monitoring plan for treated and untreated plots. The plan will include split plots on treated sites.

- Prepare a final ~~Preliminary~~ Treatment Impacts Report.

Deliverables:

- Draft ~~Preliminary~~ Treatment Impacts Report
- Final ~~Preliminary~~ Treatment Impacts Report

Task 5: DEVELOP FUEL TREATMENT DESIGN ~~MODEL~~ TOOL

The goal of this task is to develop a watershed-scale Fuel Treatment Design **Tool** ~~Model~~ to test different landscape treatment scenarios that have been developed to maximize substantial carbon storage, slow fire spread and intensity, and balance the need for wildlife habitat, ecosystem restoration and fuels reduction within a watershed.

The Contractor shall:

- Develop a Fuel Treatment Design **Tool** ~~Model~~ that will:

- Quantify fuel treatment acreage and prescriptions, and establish optimal placement of treatments to reduce the risk of high-severity fire.
- Compare how treatment acreage and placement change when optimizing for threatened and endangered old-forest habitat.
- Quantify how much forest biomass will be produced under these treatment scenarios.
- Determine the carbon balance of these treatment scenarios when the removed biomass is used to displace fossil fuels or to produce wood or other co-products, when avoidance of wildfire emissions is included in the model. The ~~web-based~~ Fuel Treatment Design **Tool** ~~Model~~ shall be publicly accessible at the University of California, ~~Davis (UCD)~~ **Berkeley (UCB).**

- Prepare an Operating Manual for the Fuel Treatment Design **Tool** ~~Model~~.

- Provide a copy of any peer-reviewed article that describes the Fuel Treatment Design **Tool** ~~Model~~ and the application of the **Tool** ~~model~~. Refer to the Terms and Conditions of this contract in the event that a manuscript is published as a result of this task.

Deliverables:

- Web-based User interface for the Fuel Treatment Design **Tool** ~~Model~~ (No Draft)
- Operating Manual for the Fuel Treatment Design **Tool** ~~Model~~ (No Draft)
- Copy of any peer-reviewed articles

Task 6: QUANTIFY CARBON STORAGE AND MASS BALANCES

The goal of this task is to quantify carbon storage, carbon mass balances, and tree survival on treated and untreated forests from recent California wildfires.

The Contractor shall:

- Establish field plots at seven recent wildfires, sampling burned/untreated, burned/treated and unburned/untreated forest conditions.

- Determine how much carbon is released per hectare in treated and in untreated forests when a wildfire burns through an area, compared to the carbon costs of fuels reduction treatments. Carbon dynamics will be quantified by measuring trees, snags, and logs left after the burn and surface fuels and soil carbon estimated from comparable, proximate forests outside the burn perimeter

- Determine which fuels treatments (for example, mastication, pile and burn, whole-tree harvest, thin from below with lop and scatter, and others) are most effective in reducing carbon emissions and increasing tree survivorship from wildfires.

- Quantify how treatments need to vary in response to topography.

- Prepare a draft Carbon Balance and Storage Report, including:
    - Description of methods for estimating carbon costs and benefits of fuels treatments, and forest emissions and storage if the forest is burned
    - Comparison of alternative treatment effectiveness
    - Analysis of topographical design considerations
    - Recommendations for treatment modifications due to topography

- Prepare a final Carbon Storage Report.

- Provide copy of any peer-reviewed article resulting from the research supported by this contract. Refer to the Terms and Conditions of this contract in the event that a manuscript is published as a result of this task.

Deliverables:

- Draft Carbon Storage Report
- Final Carbon Storage Report
- Copy of any peer-reviewed articles

Task 7: MEASURE FOREST ECOLOGICAL IMPACTS FROM RECENT FIRES

The goal of this task is to measure the ecological effects of forest fuel treatments in burned and unburned, treated and untreated stands in areas which have been subject to recent fires. The measured effects will include, among others, tree mortality and survival, soil health, post-fire beetle attack rates, seedling densities, hardwood re-sprouting response, understory diversity, and soil litter.

The Contractor shall:

- Conduct inventory and monitoring of salient ecological effects of forest fuel treatments in treated and untreated forest stands, after fire and in nearby unburned control areas. Metrics will include but are not limited to: standard measures of fire severity (for example, percentage of scorch and torch, scorch and torch height, bole char height, and others), tree mortality and survival, hardwood re-sprouting response, percentage of green canopy, tree density and basal area, beetle attack rates on pine species, ground cover, soil health, soil litter cover and depth, vegetation cover, understory plant species diversity, shrub cover, shrub seedling density, and spatial heterogeneity.

- Visit at least ~~seven~~ **ten** recent fires, distributed across the geographic range of yellow pine and mixed conifer forest ecosystems in California, and monitor vegetation conditions for three consecutive years. Add appropriate new fires to the study as they occur, and conduct monitoring of vegetation conditions until the end of the study. New fire areas would include those which burn into forest fuel treatments completed within the previous one to seven years.

- Prepare a draft Ecological Impacts of Fire Report on the methods used and findings from the research in this Task.

- Prepare a Final Ecological Impacts of Fire Report.

- Provide a copy of any peer-reviewed article that details results related to fire severity or that details results related to the ecological effects of treatments. Refer to the Terms and Conditions of this contract in the event that a manuscript is published as a result of this task.

Deliverables:

- Draft Ecological Impacts of Fire Report
- Final Ecological Impacts of Fire Report
- Copy of a**n**y peer-reviewed articles

Task 8: INTEGRATE ANALYSIS ~~MODEL~~ OF IMPACTS OF BIOFUEL DEMAND

The goal of this task is to **integrate analysis results from the revised and adapted Geospatial Bioenergy Siting Model (GBSM) (based on work conducted under a separate agreement with UCD, Agreement # 600-11-006*)*** ~~model~~ to **assess** the impacts of renewable energy and fuels demand in California on forest biomass utilization within the study area, and to predict the location, type, and size of future bioenergy conversion facilities under a range of policy and market scenarios. Results of this Task will be integrated with results from Tasks 3 and 9, as appropriate.

The Contractor shall:

- **Integrate** ~~Develop a revised and adapted version (V.2) of~~ the **results from the revised** Geospatial Bioenergy Siting Model ~~(GBSM)~~ ~~and a direct model interface~~ **to allow coupling** with **output from** BioSum 3.0 (see Task 3), **and to support integration of results with Tasks 3, 9, and 12, as needed.** ~~such that stand-level supply curves produced from the BioSum 3.0 analysis is the basis for forest biomass feedstock supply. GBSM V.2, including inputs, results, and operating manual, will be made available on the UCD project website for public use.~~ **Revisions to the exiting assessment tool will be conducted under a separate agreement with UCD.**

  - ~~Adapt existing geographically-explicit fuel demand estimates such that biofuel facilities are located optimally with respect to both fuel demand and feedstock supply.~~

  - ~~Compile a geometric network database including road, rail, and marine routes within California connecting all operational forest units to inter-modal transportation facilities, potential bioenergy production locations and fuel distribution terminals for the study area.~~

  - ~~Adapt existing GBSM V.1 database containing non-forest biomass resource supply curves (for example, agricultural residue, municipal solid waste) to be used as alternative feedstocks for biofuels.~~

- ~~Develop four to six market and policy scenarios to estimate the bioenergy system build-out and predict the location, size, and type of bioenergy facilities built in California using forest biomass, across a range of product prices for each scenario. Possible scenarios include the impacts of federal and state energy and fuel standards, credits, and policies; and public lands or other feedstock supply restrictions.~~

- ~~Summarize bioenergy production by product type, conversion technology, feedstock consumption, and product chain emissions for each scenario.~~

- ~~Develop a user interface and access links to allow public use of the GBSM V.2.~~

- Prepare a draft GBSM V.2 Report synthesizing the results **conducted under the separate agreement with UCD (Agreement # 600-11-006) and** including:
  - Description and discussion of bioenergy system build-out analysis.
  - Description and discussion of ~~model~~ **assessment tool** interface with BioSum 3.0 for biomass transport costs, such that stand level supply curves produced from the BioSum 3.0 analysis are the basis for forest biomass feedstock supply.
  - Description and discussion of adapted geographic demand estimates to locate biofuel facilities optimally for fuel demand and feedstock supply.
  - Description and discussion of the updated geographic **networks** ~~database~~ of transportation and **energy** infrastructure ~~networks~~. This task will address transport costs from forest landing to final delivery at the fuel distribution terminal or electricity grid.
  - Description and discussion of the revised **geographic networks** ~~database~~ containing non-forest biomass resource supply curves.
  - Discussion of four to six market and policy scenarios including a summary of bioenergy production for each scenario.
  - ~~Operating manual and description of the GBSM V.2 user interface~~

- Prepare a final GBSM V.2 Report<u>s.</u>

<u>Deliverables:</u>

- Draft GBSM V.2 Report
- Final GBSM V.2 Report

Task 9: INTEGRATE ANALYSIS ~~MODEL~~ OF LIFE CYCLE ENERGY AND GHG EMISSION BALANCES

The goal of this task is to **integrate results from the analysis** ~~model~~ of ~~the~~ project-level carbon **sequestration and emissions balances** ~~balance of sequestration and emissions~~ from forests**, forest activities**, and forest products, including biomass-to-energy products, by tracking the carbon and energy dynamics of various forest management scenarios and woody product utilization pathways, under various management strategies, emission accounting methods, carbon prices, energy prices and public policy choices.

The Contractor shall:

- **Integrate** ~~Develop preliminary~~ **Excel-based** Forest Products Life Cycle Analysis (LCA) ~~Model~~ **results (based on work conducted under a separate agreement with UCD, Agreement # 600-11-006), with results from Tasks 4, 9 and 11 from this Agreement, as needed.** ~~This model will integrate results of the following model components:~~
  - ~~Supply estimates of forest products and biomass from various landowners at potential biomass utilization project sites over a range of scenarios.~~
  - ~~A baseline of annual harvested wood from available secondary data sources.~~
  - ~~Carbon emissions and sequestration estimates from the harvesting, transport, and production of forest wood and chemical products as used in steel, cement and other building material displacement, and other wood byproducts; and conversion of forest biomass to energy.~~
  - ~~An energy and carbon accounting method to calculate emissions of forest biomass power and fuels for a set of end-use pathways, as determined in consultation with the CCM and other project investigators.~~
  - ~~A set of representative forest product pathways, and analysis of the resulting carbon flux, biomass supply, and timber and forest product outputs for each pathway under each management scenario.~~

- Develop ~~a final~~ **representative end use pathways determined in consultation with the CCM from application of the** comprehensive Forest Products LCA results ~~Model~~ of forest product and biomass system energy and GHG balances ~~for representative end use pathways determined in consultation with the CCM~~. The **LCA results** ~~Model~~ shall be housed at UCD.

- Prepare a draft Forest Pathways LCA Reports covering the development, methodology and findings of the **Analysis Tool** ~~Model~~.

- Prepare a final Forest Pathways LCA Report.

Deliverables:

- Draft Forest Pathways LCA Report
- Final Forest Pathways LCA Report.

Task 10: QUANTIFY THE EFFECTS OF BIOMASS REDUCTION TREATMENTS ON HABITAT QUALITY

The goal of this task is to collect data in the field to build **tools** ~~models~~ ~~of predicted~~ **for predicting** response to two different biomass removal treatments. The study will be conducted at the Stanislaus-Tuolumne Experimental Forest on the Stanislaus National Forest near Pinecrest, California. Data collection will include measurement of vegetation, soil, fuels, birds, small mammals, and fungi characteristics, along with physical measurements (for example, slope and aspect).

The Contractor shall:

- Collect pre-treatment data from the Stanislaus-Tuolumne Experimental Forest including:
  - Tree recruitment data
  - ~~Microenviornment data~~
  - Microhabitat/**microenvironment** data
  - Understory and overstory vegetation data
  - Fuels data
  - Bird population data
  - Small mammal population data
  - Fungi population data
  - Physical measurements (including, but not limited to, slope and aspect)

- **Collect post-treatment habitat and wildlife data at the Stanislaus study site**
  - **Wildlife datasets (bird population data and small mammal population data) collected for two years**
  - **Habitat data (tree recruitment, microhabitat/microenvironment, understory and overstory vegetation, fuels data, fungi population data and physical measurements) collected for one year**

- Build statistical **tools** ~~models~~ that predict responses to two different biomass removal treatments using the metrics identified in the pre-treatment data collection activities above.

- Prepare a draft Wildlife and Habitat Data Analysis Report including pre-treatment ecological field data; methods used in collecting and analyzing wildlife and habitat data; a composite set of predictive **tools** ~~models~~; ~~and~~ ~~model~~ interpretation **of analysis results;** and discussion of management implications.

- **Revise the draft Wildlife and Habitat Data Report based on the initial year of post-treatment data.**

- Prepare a final Wildlife and Habitat Data Analysis Report **that documents how accurately the predictive tools performed and recommends adjustments based upon the field verification results.**

Deliverables:

- Draft Wildlife and Habitat Data Analysis Report

- Final Wildlife and Habitat Data Analysis Report

Task 11: QUANTIFY THE EFFICACY OF FUEL REDUCTION TREATMENTS

The goal of this task is to quantify the efficacy of fuel reduction treatments in the Sierra Nevada as measured by fire behavior, fire risk, and carbon life cycle pathways, including but not limited to, wildfire emissions, forest sequestration, and forest product extraction. This task will be accomplished using a multi-site analysis that incorporates field data collection and compilation of existing datasets, ~~computer~~ **scenario** simulations, and an integrated analytical framework.

The Contractor shall:

- Identify firesheds for multi-site studies using watershed boundaries in conjunction with fire behavior constraints and mapped fire history.

- Develop post-treatment chronologies where fires occurred and where no fires occurred by examining completed fuel reduction treatments in the Sierra Nevada mixed-conifer and hardwood forests over a range of post-treatment intervals.

- Quantify (forecast) vegetation structure and composition in areas with and without fuel reduction treatments, with associated fuels characteristics, over a 30-year period.

- Quantify (forecast) baseline fire behavior and hazard by **predicting** ~~modeling~~ fire occurrence for multiple sites and vegetation chronologies over a 30-year period, using data from the vegetation structure and composition forecast.

- Quantify baseline burn probabilities using statistical **results** ~~models~~ of fire occurrence for the multi-site analysis and the vegetation chronologies.

- Develop detailed treatment scenarios that are appropriate for each ownership type and potential biomass utilization pathway.

- ~~Model~~ **Predict** post-treatment fire behavior and hazard over a 30-year period for multiple sites and vegetation chronologies, using data from the vegetation structure and composition forecast.

- Estimate post-treatment burn probabilities using statistical **results** ~~models~~ of fire occurrence across the multiple sites and vegetation chronologies.

- Quantify the effectiveness of fuels treatments in reducing adverse fire behavior over a 30-year period. Metrics will include treatment removals, post-fire mortality, fire intensity and emission estimates.

- Develop a wildfire GHG **analysis** ~~model~~ format, defining assumptions, and input parameters based on the multiple fuel treatment scenario analysis. Produce a matrix that identifies GHG scenarios over the established management period.

- Conduct a wildfire GHG analysis to estimate GHG net savings derived from treatment implementations over a 30-year period.

- Prepare a draft Wildfire GHG Impacts Report that will include a:
  - Fireshed Map
  - Discussion of fire **analysis** ~~modeling~~ assumptions, processes, and structure, including:
    - Post-treatment chronologies
    - Forecasted vegetation structure
    - Fire behavior and hazard assessments
    - Burn probabilities
    - Treatment scenarios
    - Efficacy of fuels treatments in reducing adverse fire behavior
    - Wildfire GHG model format
    - Wildfire GHG analysis

- Prepare a final Wildfire GHG Impacts Report.

Deliverables:

- Draft Wildfire GHG Impacts Report
- Final Wildfire GHG Impacts Report

Task 12: INTEGRATE PROJECT RESULTS

The goal of this task is to integrate the results from all project activities that affect the ecological and economic sustainability of various biomass utilization strategies, and quantify the economic and ecological impacts of biomass utilization for biofuels using a scientifically-rigorous and policy-relevant approach.

The Contractor shall:

- Develop a framework for coordination of data and methods among tasks and sites to support integration of the results into a set of representative case studies.

- Prepare an Integration Analysis Framework Report which describes the framework for coordination of data and methods among tasks and sites.

- Screen candidate case-study sites and select two to four sites for a complete case study analysis.

- Integrate project results to develop selected case studies.

- **Convene quarterly science collaboration meetings as needed of key personnel from various tasks to promote interexchange of information in support of the integration framework and case studies**.

- Identify gaps in knowledge and data based on case study analysis.

- Prepare a draft Case Studies/Integration Report including integration framework, site selection, gap analysis, and case study results.

- Prepare a final Case Studies/Integration Report for eventual publication on the Energy Commission Website.

Deliverables:

- Integration Analysis Framework Report (No Draft)
- Draft Case Studies/Integration Report
- Final Case Studies/Integration Report

OFFICIAL RESPONSE
OF THE DIRECTOR OF THE CALIFORNIA
DEPARTMENT OF FORESTRY AND FIRE PROTECTION
TO ENVIRONMENTAL ISSUES RAISED DURING
THE TIMBER HARVESTING PLAN EVALUATION PROCESS

THP Number	4-11-004/ELD-2, (2011 Blodgett Forest THP)
County	Eldorado
Submitter	Robert York Forest Manager, UC Berkeley Center for Forestry
Location	Sections 5,7,8,9,16,17,20,21;T12N;R12E, MDM&B
Acres	808 Logging Acres
Silvicultural Methods	Selection, Group Selection, Clearcutting, Commercial Thinning, Shelterwood Removal Step
End of Public Comment Period	July 8, 2011
Date of Approval and Response	July 12, 2011

The California Department of Forestry and Fire Protection (CDF, CAL FIRE) prepared the following response to issues raised during the review and evaluation of the above referenced Timber Harvesting Plan (THP) in conformance with 14 CCR Sec. 1037.4. The regulations say that CAL FIRE is to consider all written comments and respond in writing to issues raised. In the attached Official Response, comments made on similar topics are grouped together and addressed as a single issue. Remarks concerning the validity of the review process, questions of law, or topics so remote or speculative that they cannot be reasonably assessed were considered by CAL FIRE, but are not addressed in writing, as they are not considered to be issues concerning the particular THP project that is the subject of this Official Response.

Sincerely,

Michael J. Bacca

Michael J. Bacca
Forester III, Forest Practice Manager
RPF # 2236

STAFF FORESTER: Little
cc: Amador El Dorado Unit
El Dorado County Planning
California Department of Fish and Game
California Department of Parks and Recreation
Central Valley Regional Water Quality Control Board
KFA – THP Tracking Center

COMMON FOREST PRACTICE ABBREVIATIONS

CAL FIRE	Department of Forestry & Fire Protection	FPR	Forest Practice Rules
CAA	Confidential Archaeological Addendum	LTO	Licensed Timber Operator
CESA	California Endangered Species Act	NMFS	National Marine Fisheries Service
CEQA	California Environmental Quality Act	PHI	Pre-Harvest Inspection
CIA	Cumulative Impacts Assessment	RPF	Registered Professional Forester
CGS	California Geological Survey	THP	Timber Harvest Plan
CSO	California Spotted Owl	USFS	United States Forest Service
DBH	Diameter at Breast Height	WLPZ	Watercourse/Lake Protection Zone
DFG	Department of Fish & Game	WQ	California Regional Water Quality Control Board
DPR	Department of Pesticide Regulation	PCA	Pest Control Advisor
NSO	Northern Spotted Owl	[SIC]	Word used verbatim as originally printed in another document. May indicate a misspelling or uncommon word usage.

OFFICIAL RESPONSE
TIMBER HARVEST PLAN #4-11-004/ELD- 2

NOTIFICATION PROCESS

To inform the public of this proposed Timber Harvesting Plan (THP) and determine if there were any concerns with the plan the following actions were taken:

- Notice of the receipt of the plan was submitted to the county clerk for posting with other environmental notices (ref. 14CCR §1032.8).
- Notice of the plan was posted at the Department's local office and also at the regional office in Fresno. (ref. 14CCR §1032.8).
- Notice of the receipt of the THP was sent to those organizations and individuals on the Department's list for notification of plans (ref. 14CCR §1032.9(b)).
- A "Notice of the Intent to Harvest Timber" was posted near the plan site (ref. 14CCR §1032.7).
- A "Notice of Intent to Harvest Timber" was mailed to all property owners within 300 ft. of the plan boundary, where applicable (ref. 14CCR §§1032.7(e) & (f)).

In addition, the Department determined that a pre-harvest inspection (PHI) was required to take place on the site of the proposed operation before a decision could be made on the proposed plan. The review of this plan resulted in site-specific measures being incorporated

into the THP. With the addition of these protective measures CAL FIRE determined there would be no significant adverse site-specific or cumulative impacts resulting from this plan.

PUBLIC REVIEW AND COMMENT

As part of the review process, the THP and other documents are available for public review and comment. THPs are available from the CAL FIRE Regional Office in Fresno CA; and, at the CAL FIRE Unit Office in Placerville, CA. THPs can be reviewed free of charge at these offices, however there is a charge for removing copies from the CAL FIRE office. The cost depends on the THP's size. Upon submittal, the plan was also scanned and e-posted and can also be reviewed at the following web link:
ftp://thp.fire.ca.gov/THPLibrary/Sierra_Southern_Region/THPs2011.

Review Team meetings occur in Fresno and, insofar as possible without disrupting the work of the team, the public may attend. The chairperson of the Review Team may impose limitations on the scope of any public participation or the number of persons who attend the meetings in the event space is limited. 14 CCR Sec. 1037.5(d). The meetings are not public hearings, however if any public is interested in attending, they can contact CAL FIRE in Fresno to obtain the time and place of the Review Team meetings.

THE THP REVIEW PROCESS

GENERAL LAWS AND REGULATIONS

Statute law governs the THP review process. These laws include, but are not limited to, the Z'berg-Nejedly Forest Practice Act (FPA) Division 4, Chapter 8, California Public Resources Code (PRC), Sections (4511-- 4628) of 1973, Timberland Productivity Act of 1982, California Environmental Quality Act (CEQA) of 1970, Porter Cologne Water Quality Act, and various laws that are concerned with protection of rare, threatened or endangered species. The State Board of Forestry and Fire Protection (BOF) determine administrative rules found in the California Code of Regulations (CCR) based on the authority granted to the BOF by the legislature as found in the Public Resources Code. One of the founding principles of the PRC as adopted by the legislature is found in PRC Sec. 4513, titled INTENT OF LEGISLATURE, as follows; "*It is the intent of the Legislature to create and maintain an effective and comprehensive system of regulation and use of all timberlands so as to assure that: (a) Where feasible, the productivity of timberlands is restored, enhanced and maintained. (b) The goal of maximum sustained production of high-quality timber products is achieved while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment, and aesthetic enjoyment.*" The CCR's purpose is to implement these laws (14 CCR 896).

The Board of Forestry and Fire Protection intended the CCRs to provide an exhaustive set of criteria for reviewing THPs. The CCR serves as detailed, explicit instructions regarding permissible and prohibited actions of on-the-ground harvest operations. Some major Articles included in the CCRs are:

Article 3. Silvicultural Methods
Article 4. Harvesting Practices and Erosion Control
Article 5. Site Preparation
Article 6. Water Course and Lake Protection
Article 7. Hazard Reduction
Article 9. Wildlife Protection Practices
Article 12. Logging Roads and Landings
Article 14. Archeological and Historical Resource Protection

THE MULTI-DISCIPLINARY REVIEW

A THP is prepared by a Registered Professional Forester (RPF) who is licensed by the State after passing education requirements and exams. CAL FIRE, which is a public agency having numerous RPFs on staff, independently reviews a submitted THP by using a multi-disciplinary Review Team. This team normally consists of, but is not limited to, representatives of CAL FIRE (team leader), the Department of Fish and Game (DFG), the Regional Water Quality Control Board (WQ),the California Geological Survey (CGS)), an Archaeologist (CAL FIRE), and a representative of county government when the county so requests. CAL FIRE can call upon other expertise to assist in review including, but not limited to, hydrologists, soil scientists, federal agencies, fire experts, tribal groups, and many others.

The Review Team meets when the THP is first received to make a preliminary determination regarding the THP's conformance to the CCRs. The team then may recommend a site-specific preharvest inspection (PHI) to determine whether the THP accurately describes ground conditions, whether the measures proposed are appropriate, and whether additional mitigation measures are necessary. Team members may attend the PHI, which is usually conducted by a local CAL FIRE Area Forester assigned to one of the Ranger Units in a particular county, and CAL FIRE may request attendance by other experts and agency personnel. The PHI often results in additional mitigation measures to better insure environmental protection. A second Review Team Meeting is convened to look at the report from the local CAL FIRE Area Forester, examine any public comment or comment from concerned agencies and determine whether the THP should be approved as written, approved with extra mitigation measures, or denied. Letters and copies of PHI reports may be sent out to the RPF who prepared the THP with a number of recommendations that the Review Team members find are necessary to bring the THP into conformance with the law and lessen any potential for environmental impacts.

For THP 4-11-004/ELD-2, the plan was first received on April 4, 2011 and was found acceptable for filing on April 14, 2011. The Review Team ordered a PHI to occur. The PHI occurred on May 16, 2011 and May 24, 2011. Present on the PHI from CAL FIRE was Forest Practice Inspector Robert Little and CAL FIRE Archaeologist Gerrit Fenenga. From Blodgett Forest were RPF's Robert York, Frieder Schurr and Ken Somers. From CGS was geologist Cheryl Hayhurst. The PHI was closed on May 24, 2011.

The Review Team met for the second review of the THP, following the PHI. Second review was to review the THP with revisions, PHI report, and to consider the public comments that had been received. The Review Team examined mitigation measures already submitted in order to insure that the revised plan was in conformance with the CCR and to insure that environmental concerns were addressed in order that no potential for significant adverse environmental impacts would be likely to occur from the timber harvest operation and associated activities.

TIMBER HARVEST AND STOCKING COMPLIANCE

Timber harvest may start after THP approval and continue for up to three years. For plans approved in 2010 and 2011, CAL FIRE may grant extensions under special circumstances with a potential of two additional two-year extensions, for a total of seven years. The THP submitter must notify CAL FIRE before starting harvest operations.

CAL FIRE inspects the harvest operation for CCR compliance, although the number and frequency depends on the size, duration, complexity, regeneration method, and potential for adverse impacts. The THP and CCRs provide the criteria that CAL FIRE uses to determine compliance. CAL FIRE's policy is to vigorously pursue the prompt and positive enforcement of the FPA, CCRs, and related laws and regulations applying to timber operations on non-federal lands in California. The policy's intent is to prevent forest practice violations, and achieve prompt corrective action if violations do occur. The FPA, CCRs, and other related laws and regulations are enforced, include issuing violation notices, imposing civil penalties and pursuing criminal court proceedings.

Licensed Timber Operator (LTO) and Registered Professional Forester (RPF) licensing actions may also be pursued. Most forest practice violations are correctable, and CAL FIRE insures they are corrected. Non-correctable violations that result in harm to the environment often result in criminal court actions against the offender. Normally some sort of correction work is required to help offset non-correctable adverse impacts when the offender is found guilty.

A THP Completion Report must be submitted certifying that the area meets CCR requirements. CAL FIRE inspects completed work to insure compliance with the CCRs. Stocking standards are to be met immediately following completion of the timber operations for some silvicultural methods or may be required five years after completion of timber operations where methods are used that require artificial or natural regeneration to successfully occur so that the area is restocked with seedlings.

THP PROPOSED ACTIONS

The following is a summary of some of the contents and objectives from THP 4-11-004/ELD-2. This summary is not intended to replace anything that is actually found in the THP as approved and is merely provided for the convenience of the public who has submitted written comments. An actual copy of the approved THP may be obtained for a fee by writing to CAL FIRE, Resource Management, 1234 E. Shaw Ave, Fresno, CA, 93710. Some of the rules and regulations are also summarized in this document in order to provide the reader with an understanding of their content and restrictions. However, a copy of the entire rule book can be purchased from CAL FIRE, or is available for review for free on the Internet site http://www.fire.ca.gov/resource_mgt/resource_mgt_forestpractice.php. Look under the title "Forest Practice more Info..." for titles "Forest Practice Act" and "Forest Practice Rules".

GENERAL DESCRIPTION OF THE THP

The THP totals a net 808 harvest acres located in Sections 5,7,8,9,16,17,20,21;T12N;R12E, MDM&B in Eldorado County. The plan area is located at an elevation ranging from 3,960' to approximately 4,560', and is located in the Lower Pilot Creek, Gaddis Creek and Whaler Creek Planning Watershed, which contains tributaries of the Middle Fork of the American River. Portions of Bacon Creek and Mutton Creek are Class I watercourses in the immediate project area, but also lesser classified watercourse segments exist in the drainages of Gaddis Creek, Dark Canyon Creek, Quintette, and North Blodgett watersheds. Slopes are gentle to moderate within the logging area. The project actually can be said to consist of 8 contiguous and irregularly shaped harvest units that utilize a variety of silvicultural methods. Within the eight contiguous logging areas there are two even-age regeneration units.

The watershed assessment areas are described in the plan as being 9,819 acres of the Lower Pilot Creek Planning Watershed; 8,685 acres of the Gaddis Creek Planning Watershed; and 10,206 acres of the Whaler Creek Planning Watershed. The biological assessment area includes an additional area within 1.3 miles of the harvest boundary. Within the watershed assessment areas, Blodgett Forest Research Station owns about 23% of the Lower Pilot Creek Planning Watershed, 12% of the Gaddis Creek Planning Watershed and 2% of the Whaler Creek Planning Watershed. Other landowners of the planning watersheds outside of Blodgett property include federal land ownerships, private industrial timberlands owned by Sierra Pacific Industries and also ownerships held by small private timberland and non-timberland owners. The biological assessment area is appropriately larger, respecting the fact that some animal species have a pattern of migration over larger areas, and are not necessarily bounded by a planning watershed type configuration.

The USFS indicated treatment operations within the assessment area in the past ten years. The USFS in general in the Sierra has been known to occasionally work to do various thinning projects, fuel treatments or management of California Spotted Owl territories. Past USFS project that covered 3,500 acres and a planned future project of 1,500 acres can be described as being consistent with light commercial thinning in which primarily lower canopy trees are being removed to benefit fire hazard reductions and stand health improvements. SPI is said to also be working on numerous projects in the Whaler, Gaddis and Lower Pilot watersheds including about 236 acres of alternative prescription, 366 acres of commercial thinning and 99 acres of Selection, as well as a plan within the Lower Pilot Creek watershed that is expected to contain about 450 acres of clearcuts. Recent past logging on SPI lands included 120 acres. For past projects on Blodgett lands, the THP on page 102 lists ten THP type projects for a total of about 2,500 acres within the three planning watersheds which involve the full variety of silvicultural treatments. In general, CAL FIRE has noted that Blodgett Forest Research Station submits one THP every year on its lands which average about 300 acres in size and which include the full variety of silvicultural treatments and which, within any given decade, tend to have overlapping areas. Therefore, CAL FIRE assumes that Blodgett Forest will be likely to continue to intensively treat the timber stand on an ongoing basis to maintain good forest health. Additionally, Blodgett Forest has been known to provide for wildlife habitat in the form of snag and LWD retention and to have reserve areas that have developed a variety of seral stages including dense canopy types.

Possible cumulative effects are analyzed in the THP. CAL FIRE found that the discussion is in compliance with the intent of the BOF regulations. In addition to noting watershed conditions utilizing the methodology recommended by the BOF, the THP included information based on the Equivalent Roaded Area (ERA) method utilized most commonly by the USFS. In general, ERA estimates for the various watercourse areas analyzed in the THP range from a low of about 6% to a high of around 11%, and are expected to be within the Threshold of Concern (TOC) for all segments.

With respect to considerations for potential significant adverse cumulative effects of the project on global warming, both CAL FIRE and timberland owners recognize their obligations to analyze a THPs potential to impact the release and sequestration of Greenhouse Gases (GHGs). Both AB32 (Global Warming Solutions Act of 2006) implemented through SB97, and the CEQA Guidelines (Codified under 14 CCR §15000 et seq.) provide the regulatory framework upon which to evaluate GHG release and sequestration potential of any THP. If emissions from the THP are deemed to be significant, then specific mitigation must be included in the THP in order to offset this impact.

Since the Board of Forestry and Fire Protection has not developed specific criteria upon which to determine how a projects GHG emissions must be evaluated, individual plan submitters must use their own methodology. Blodgett Forest has included this evaluation on pages 115 to 129.2 of the THP, which includes both a site-specific evaluation of emissions, as well as an evaluation of significance based upon the defined assessment areas. Without the benefit of regulatory guidance, it can only be assumed by the Department that the type of analysis presented in the THP might be equivalent that which would be acceptable to the Board of Forestry and Fire Protection for evaluation of the GHG production for a timber harvesting project.

While no regulatory authority in California has established a threshold of significance for GHG emissions, there are other standards which may help determine if significant GHG emissions will be emitted by a THP. On September 22, 2009 the US EPA approved its "Final Mandatory Reporting of Greenhouse Gases Rule", wherein they set reporting limits for facilities. The EPA defined a reporting limit of 25,000 tones of CO_2e /year (tonnes of carbon dioxide equivalents per year) at any facility as being the threshold at which these emissions should be reported to the EPA. While this at least can be considered some sort of a regulatory benchmark for now as CAL FIRE searches for guidance with respect to these evaluations, it is important to note that this is only the level at which they must be reported, not the level at which they must be considered significant or even mitigated.

For the proposed THP, Blodgett has estimated that the total carbon sequestration derived from the project would be 85,696 metric tonnes of CO_2e when totaling the carbon sequestered from regrowth of trees along with the total amount sequestered in sawlogs and other forest products produced by the harvest. Considering, however, that the trees harvested would have continued to grow if left in place and not harvested, but at an increasingly slower rate of sequestration over time, the net benefit in terms of sequestration is predicted at 36,341 metric tonnes of CO_2e from this project as shown on THP page 116.

CAL FIRE understands the importance of approving projects which do not combine to significantly contribute to global warming of the planet and which meet the AB 32 goals for the Forestry Sector by maintaining the current 5 MMT CO_2e reduction target through 2020 by ensuring that current carbon stock is not diminished over time. CAL FIRE has determined that the proposed THP will result in a less than significant release of GHG, and, because of increased carbon storage (increased standing volume of trees) and increased sequestration of CO_2 (faster growing trees), this project will result in a net benefit to the environment over time.

In addition to this watershed area, CAL FIRE also took into consideration known activities that have occurred in assessment areas other than the Lower Pilot Creek, Gaddis Creek and Whaler Creek Planning Watershed where there could be a potential for impacts to combine to create significant adverse individual or cumulative effects in the general vicinity of the THP area. CAL FIRE has the ability to utilize Geographical Information Systems to document the location and silvicultural methods of past and present projects and maintains a database of past projects by location, date of various events and silvicultural methods. The CAL FIRE Forest Practice Inspector considered projects inside and outside the immediate THP location to determine that the project would not contribute to significant adverse direct or cumulative environmental impacts.

SILVICULTURAL METHODS

Silvicultural Methods are listed in the CCR as various harvesting methods that can be chosen by the RPF in order to generate forest products and insure that the timber stand can be perpetuated over time so that forest values will be protected and future harvests will be possible. The CCR requires the RPF to select systems and alternatives that achieve maximum

sustained production of high quality timber products (14 CCR Sec. 953) and to meet the objectives of the Forest Practice Act (PRC 4512 & 4513).

This project proposes logging an area using the Selection method on 243 acres within seven compartments. These areas will meet an average of 125 sq. ft. of BA per acre for Site I timberland immediately following completion of logging, but in no case be less than 100 sq, ft. of BA per acre. Additionally, there should be at least 15 sq. ft. of BA in best phenotype trees retained of trees having at least 18" dbh.

There are four compartment areas which use the Group Selection method on a total of 196 acres. Group openings can be 0.25 acres to 2.5 acres in size, but will not cover more than 20% of the entire area, and are expected to actually range from 8% to 15% of each of the five stands treated with this method. Eighty percent of the area will have to meet the stocking standards of 100 sq. ft. of BA per acre.

There are 2 units using Clearcutting where stocking will be met with planted trees that require a point count of 300 to be live and healthy within two growing seasons following planting for a total of 32 acres. Site preparation can be expected to be used in these areas, and it is possible that herbicides could be used to control competition from brush or grasses that could develop.

There are 319 acres in 15 compartments that will use a Commercial Thinning method. Stocking is expected to meet 125 sq. ft of BA per acre and average post-harvest stem diameters will be greater than the pre-harvest stem diameters overall.

There are 18 acres using the Shelterwood Removal Step. These areas shall be stocked upon completion of operations with a minimum of 300 point count per acre.

Considering previously approved THPs and considering known probable future projects for the immediate area of the current THP, the assessment areas will have an assortment of various types of treatment including areas of selection type logging, areas that have been thinned, non-commercial and wet areas, reserve set-aside areas, past logging areas, plantation areas and areas that have not recently been logged within the assessment area.

HARVESTING PRACTICES AND EROSION CONTROL

The CCR states that timber operations shall be conducted to: meet the goal of maximum sustained production of high quality timber products; minimize breakage of merchantable timber; prevent unreasonable damage to residual trees, fish and wildlife habitat as identified in the THP, or contained in the rules, reproduction, and riparian vegetation; prevent degradation of the quality and beneficial uses of water; and maintain site productivity by minimizing soil loss. (14 CCR Sec. 954)

For this THP, the Plan Submitter proposes to harvest 808 net acres of conifer sawlogs, split products, poles, posts and fuelwood with the approval of this THP. The proposed harvest method will be by ground based tractor, rubber tired skidder and feller/buncher equipment. The Erosion Hazard Rating (EHR) for the area in the submitted plan was listed as Low and Moderate. The THP indicated no unstable areas, slopes over 50% with high or extreme EHR, or slopes over 65% where heavy equipment would be used. Geologists from CGS verified these findings during the PHI.

The THP does not contain provisions for operating during the winter months.

SITE PREPARATION

The CCR states that site preparation shall be planned and conducted in a manner that encourages maximum timber productivity, minimizes fire hazards, prevents substantial adverse effects to soil resources and to fish and wildlife habitat, and prevents degradation of the quality and beneficial uses of water. (14 CCR Sec. 955)

Site preparation is being proposed for areas that utilize methods that require artificial regeneration. Site preparation could also be used in group selection openings as artificial regeneration might be used to enhance stocking.

WATERCOURSE AND LAKE PROTECTION

A purpose of the CCR, with respect to watercourse and lake protection, is to insure the protection of beneficial uses that are derived from the physical form, water quality, and biological characteristics of watercourses and lakes. The BOF has stated its intent that the productivity of timberland be maintained, restored and enhanced while providing equal consideration for the beneficial uses of water. (14 CCR Sec. 956)

For this THP, there are Class I, Class II and Class III watercourses present within the THP that must be protected from timber operations. Class I watercourse segments are protected by a WLPZ that varies in width from 75' to 150' in width on either side of the watercourse depending on the steepness of side slopes. There are two Class II watercourses or segments that will be protected by a Watercourse and Lake Protection Zone which varies from 50' to 75' feet in width. There are also four Class III watercourses or segments that will be protected by an Equipment Limitation Zone of 25' or 50' wide depending on the steepness of the slopes, except for planned skid crossings of the watercourses.

DFG regulations require submission of a 1600 stream alteration permit that must be approved in the event that there are proposed timber operations that change or alter watercourse protections.

HAZARD REDUCTION

It is the intent of the BOF to provide standards for the treatment of snags and logging slash to reduce fire and pest hazards on the logging area and to protect the area from potential insect and disease problems and to do this while retaining wildlife habitat. (14 CCR Sec. 957)

This particular THP has a road that will require treatment of logging slash near the roadways as there are Wentworth Springs road is a public road. As such, slash within 100' of the edge of the surface of the road will be treated by lopping or piling and burning, chipping, burying or removal. Permanent structures will be treated with a fire protection zone wherein all woody debris created by timber operations will be removed or piled and burned within 100' of such structures and additionally, from 100' to 200' distance from said structures, slash will be lopped, removed, chipped or piled and burned.

WILDLIFE PROTECTION

The regulations state that timber operations shall be planned and conducted to maintain suitable habitat for wildlife species. (14 CCR Sec. 959).

This THP examines the potential impact of the logging on wildlife and plants and finds that there is no finding for rare, threatened or endangered plant and animal species to occur in an area impacted by the timber operation. These findings resulted from a scoping check of the Natural Diversity Database, the DFG Rarefind program, the California Wildlife Habitat Relationship program, the database of known locations for sensitive species, and discussions with the USFS. Blodgett Forest has long maintained a record of surveys for various wildlife species and plants.

There are 3 previously known locations of California Spotted Owls that occur in the biological assessment area, and some of these locations may be within range of some harvest units. The plan calls for sites of listed raptors to be surveyed when they are found in the course of timber operations that occur within 1/4 mile of the THP. If a nest site of a CASPO or other raptor is seen during the conduct of timber operations, current policy is to insure a buffer from an occupied nest and to notify CAL FIRE and DFG. It is noted that the California Spotted Owl does not currently have a status in the Forest Practice Rules as a listed species nor is there any specific regulations that pertain to the species.

CAL FIRE has been treating the owl with special concern when they are known to exist near a project area. In general, harvesting could potentially have the effect of increasing the prey base for the California spotted owl by creating more habitat for some of its prey species, especially small mammals such as mice and pocket gophers. Where there is adequate nesting and roosting habitat, increasing the prey base generally enhances owl viability.

Within the biological assessment area, there is the potential for habitat to exist for Northern Goshawk, but there has been no sightings within in the influence area of the THP. The plan calls for measures to be taken in the event that any raptor species or nest sites are discovered

during the conduct of timber operations. DFG consultation would be required in the event that a Northern Goshawk was discovered and the rules of the BOF prescribe a protection area.

The Sierra-Nevada yellow-legged frog, foothill yellow-legged frog and mountain yellow-legged frog have not been located in the project area either during THP preparation or in the literature, but the project is at the correct elevation for occurrence of some of these amphibians. Currently, an Incidental Take Permit is in effect for the Sierra Nevada yellow-legged from for THP use as designated by the California Fish and Game Commission and it is generally recognized that the WLPZ buffer width would provide species protection. The THP is at too low an elevation for Sierra-Nevada Yellow-legged frog. Foothill Yellow-Legged Frog would be protected by standard WLPZ measures, if the species were to occur. Yosemite toad was recently identified by the USFWS as a potential species of federal concern, although the species was not listed at the present time do to inadequate staffing. In 2002 the FWS said: "The Yosemite toad is a high-elevation species found in the central Sierra Nevada mountains. The current range of the Yosemite toad extends from Ebbetts Pass in Alpine County to south of Kaiser Pass and Evolution Lake, Fresno County. The Yosemite toad commonly occurs at elevations between 8,000 and 10,000 feet. In making this finding, the Service recognizes that there may have been declines in the distribution and abundance of Yosemite toads. The best available evidence indicates that some toad populations have declined by at least 50 percent from historical levels. These declines are primarily attributed to habitat degradation, airborne contaminants and drought. Declines in Yosemite toad populations have occurred in Yosemite National Park, the heart of the species' range, and throughout the Sierra Nevada. More than 90 percent of Yosemite toad habitat occurs within U.S. Forest Service wilderness areas and on National Park Service lands. The Forest Service has proposed several standards and guidelines to protect and enhance the Yosemite toad and its habitat. One of these guidelines is to develop and implement a conservation strategy for the Yosemite toad with the Service. The Forest Service believes it can take measures to improve Yosemite toad habitat through better management of livestock grazing and fish stocking on lands that it manages." Information updated to March of 2008 the FWS says: "LAND OWNERSHIP: The vast majority of land within the range of the Yosemite toad is federally managed, with 919,011 ha (2,270,918 ac) (99 percent of the range) on USFS, NPS, and BLM lands. Much of this land is within designated wilderness. The remaining land within the species' range is a mix of State, local government, and private lands." Given the species range and elevation and landownership pattern there is little likelihood that this THP will impact this species.

The THP is potentially within the historical known area for Red-legged frog. There is no known location for Red-legged frog that have resulted from surveys on Blodgett Forest lands. The closest known location is ten miles away from the project. CAL FIRE reviewed a recently published report by the Environmental Protection Agency (EPA) titled: "Effects Determination for Atrazine and the California red-legged frog and the Delta Smelt", as well as similar published reports for the chemical pesticides Glyposate, Hexazinone and Imazapyr. Also reviewed were the Effects Memorandum letter and the Transmittal Letter for each pesticide. These reports were compiled over the past three years, but have recently been released in composite at the website http://www.epa.gov/oppfead1/endanger/litstatus/effects/redleg-frog. The effects of the various products were found to differ from no direct effect to CRLF to indirect effects to CRLF habitat. The information in the publication was specific to CRLF and it

was unknown if the same effects would have been found if the target species was one of the other amphibian species. For THP 4-11-004/ELD-2 however, CRLF is not known to be currently found within the area of the project. While this THP does not propose the use of atrazine, these important reports were reviewed by CAL FIRE anyway to determine if there could be adverse impacts from the use of the other herbicides identified in the report that may be used in the assessment area. From the report is a summary of the habitat requirements for the species as follows: "*Most CRLF populations have been documented below 1,050 m, although there are some historical sightings documented up to 1,500 m. CRLFs require aquatic habitat for breeding, but also use other habitat types, including riparian and upland areas, throughout their life cycle. CRLF use of their environment varies; they may complete their entire life cycle in a particular habitat or they may utilize multiple habitat types. Overall, populations are most likely to exist where multiple breeding areas are embedded within varying habitats used for dispersal (USFWS 2002). Generally, CRLFs utilize habitat with perennial or near-perennial water (Jennings et al. 1997), and dense vegetation close to water and shading water of moderate depth are habitat features that appear especially important for CRLF (Hayes and Jennings 1988).*

Hayes and Jennings (1988) recorded occurrences from two sites in California, and found that CRLFs were primarily located in aquatic habitats with intermittent streams, which included some area with water at least 0.7 meters deep, had emergent or shoreline vegetation, and lacked introduced bullfrogs. Emergent vegetation consisted mainly of cattails (Typha spp.) and tules (Scirpus spp.), while shoreline vegetation was primarily composed of willows (Salix spp.). They report more findings of CRLFs at sites with native fish than those with introduced fish species. CRLFs were also more frequently recorded at sites influenced by a small drainage area (< 40 km^2), having a low slope, and with low-order streams (4th or below). Breeding sites include streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds (land depressions between fault zones that have filled with water), dune ponds, and lagoons. Breeding adults have been found near deep (0.7 m) still or slow moving water surrounded by dense vegetation (USFWS 2002). There is a long larval period and subsequent to hatching, larvae inhabit shallow (0.26-0.5 m) water adjacent to the main pond (Storer 1925). CRLFs are also found and breed in manmade waters, such as stock ponds, sewage treatment ponds, and artificial (concrete) pools without vegetation (Jennings, et al 1997). Data indicate that CRLFs do not frequently inhabit vernal pools, as conditions in these habitats generally are not suitable (Hayes and Jennings 1988).

CRLFs are more often found in habitats without introduced predators, such as centrarchid fish (e.g., largemouth bass), green sunfish, bluegill, crayfish, and bullfrogs (Jennings et al. 1997; Hayes and Jennings 1988). CRLFs are largely restricted to freshwater or slightly brackish water (< 9.0% salinity). Juvenile CRLFs are active during the day and night, and may be found sunning themselves on floating vegetation, while adults are mainly nocturnal (Jennings et al. 1997).

In general, dispersal and habitat use depends on climatic conditions, habitat suitability, and life stage. Adults rely on riparian vegetation for resting, feeding, and dispersal. The foraging quality of the riparian habitat depends on moisture, composition of the plant community, and

presence of pools and backwater aquatic areas for breeding. During wet periods, adults can be found to move long distances (1.6 km) between aquatic habitats (Jennings et al. 1997). Winter habitats vary with locality, but generally, CRLFs seek habitat where ponds do not freeze, and dispersal seems limited and rare (Storer 1925). During dry periods, the CRLF is rarely found far from water, although it will sometimes disperse from its breeding habitat to forage and seek other suitable habitat under downed trees or logs, industrial debris, and agricultural features (UWFWS 2002). According to Jennings and Hayes (1994), CRLFs also use small mammal burrows and moist leaf litter as habitat. In addition, CRLFs may also use large cracks in the bottom of dried ponds as refugia; these cracks may provide moisture for individuals avoiding predation and solar exposure (Alvarez 2000). "

Regarding Pacific fisher and pine marten, both species are mid-size predators that can utilize a wide variety of forest stand conditions. Landscapes comprised of a mix of forest stand and age classes can provide foraging, resting and denning habitat for these species. Baseline information is provided in the publication California's Wildlife, Volume III, Mammals (1990) and identifies the following habitat requirements for the Pacific Fisher:

Feeding: An opportunistic feeder, the Fisher feeds on rabbits, hares, mice, porcupines, squirrels, mountain beavers, shrews, birds, fruits and carrion. They acquire their food by pouncing, chasing or digging.

Cover: The Fisher utilizes snags, logs, brush piles, slash, rock and cavities in large trees. Mature stands of dense trees are also utilized and provide cover, particularly within the winter period.

Reproduction: The fisher utilizes a variety of denning locations including protected cavities, brush piles, logs, and even upturned trees. Hollow logs, trees and snags are the most important.

Pattern: Suitable habitat is generally classified as areas of mature, dense forest stands with snags and greater than 50% canopy closure.

Some of the information regarding the analysis of potential impacts of the plan on Pacific fisher has been supplied by the RPF in the THP. Information considered by CAL FIRE follows:

- While researchers have found significant fisher populations in the southern Sierra Nevada, they have been unable to detect fishers north of Yosemite National Park (Graber 1996).
- Elevation gradients are much steeper in the central and northern Sierra Nevada than in the southern Sierra Nevada fisher study area (Hubbard Scientific 1993).
- Steep elevation gradients cause a narrowing of the area of conifer forest that is free of relatively deep snow-packs in the winter.
- The fisher, as a species, is known to avoid areas that contain consistent, stable and relatively deep winter snow packs (Powell and Zielinski 1994, Krohn et al. 1997, Krohn et al 2000).
- The combination of steep gradients in the central and northern Sierra Nevada coupled with the fisher's avoidance of areas of deep snow effectively reduces the amount of potential habitat for pacific fisher in some areas between Yosemite to the California Cascades to about the size of a fisher's home range.
- Most of the area inventoried for fisher in the Sierra Nevada has been outside the conifer

area that is relatively free of winter snowpacks, (Zielinski et al. 1997) so it is not surprising that the detection effort has failed.

- No differences have been measured in the number of large trees available in areas of the Sierra Nevada that are known to support fisher populations and those areas of the Sierra Nevada where researchers have been unable to detect fisher (USDA 2000).
- Pacific fisher natal and maternal den trees in California averaged 33.1" in dbh plus or minus 16.3" at one standard deviation (Truex et al, 1998) Pacific fisher rest trees on National Forest land in the Southern Sierra Nevada average about 27 inches DBH and occur most often in stands of small sawtimber (trees less than 24"dbh) (Zielinski et al. 1996).
- Pacific fisher rest trees on private forest land in the Klamath province averaged 31" in dbh +- 13 inches at one standard deviation (Self and Kerns 1995).

The majority of rest trees of Pacific fisher on private forest land in the Klamath province occurs in small areas with quadratic mean diameters (QMDs) greater than or equal to 10" DBH, with canopy closures exceeding 60% (Self and Kerns 1995). A report by the USFWS (2004) is found in the Federal Register, Vol. 69, No. 68, Thursday, April 8, 2004, which is data developed in response to a petition to have the Pacific Fisher listed as an endangered species. The Pacific Fisher was not listed, as is outlined in the report. Some of the information from this recent review as follows:

•There have been no good population estimates for fisher populations in California....so it is unknown precisely how many fishers exist. Estimates of fisher abundance and vital rates... are very difficult to obtain (Douglas and Strickland 1987) and may vary widely based on habitat composition and prey availability (York 1996).
•Fishers have large home ranges and male home ranges are considerably larger than those of females (Buck et al. 1983; Truex et al. 1998). Fisher home range sizes across North America vary from 3,954 to 30,147 acres for males and from 988 to 13,096 for females (Powell and Zielinski 1994; Lewis and Stinson 1998). However, Beyer and Golightly (1996) reported that male home ranges in northern California may be as large as 31,629 ac.
•According to Seglund (1995), riparian areas are important to fishers because they provide important rest site elements, such as broken tops, snags and coarse woody debris.
• The key aspects of fisher habitat are best expressed in forest stands with late-successional characteristics. Fishers use habitat with high canopy closure, large trees and snags, large woody debris, large hardwoods, multiple canopy layers, and avoidance of areas lacking overhear canopy cover (Aubry and Houston 1992; Buskirk and Powell 1994; Buck et al 1994; Seguund 1995; Klug 1996; Dark 1997; Truex et al. 1998; Mazzoni 2002; Weir and Harestad 2003; Zielinski et al. In press 2003b, in press 2003a).....
However, intensive management for fiber production on industrial timberlands does not typically provide for retention of these elements. It is unlikely that early and mid-successional forestry, especially those that have resulted from timber harvest, will provide the same prey resources, rest sites and den sites as more mature forests (Zielinski and Powell 1994).
•While the Forest Practice Regulations may incidentally protect some habitat or habitat elements used by the fisher, the rules do not require fisher surveys, protection of fisher or fisher den sites, or a mechanism for identifying individual or cumulative impacts to the fisher or its habitat. The California FPRs provide specific enforceable protections for species listed as threatened or endangered under CESA or the ESA, and for species identified by the BOF as sensitive species;

however, the fisher is not currently on any of these lists.

On April 8, 2009, the California Fish and Game Commission (FGC) adopted findings declaring the Pacific fisher a candidate species under the California Endangered Species Act. At the same meeting the Commission adopted regulations allowing for the incidental take of Pacific fisher during the candidacy period provided an approved THP covers the operations. These two sets of regulations were forwarded to the Office of Administrative Law (OAL) for review. The Office of Administrative Law published the Notice of Finding designating the Pacific fisher a candidate species under CESA on April 24th 2009. However, all these provisions have now expired and recent action of the California Fish and Game Commission resulted in a finding that there was not enough data to list the species as endangered or threatened. Regarding Pacific fisher, CAL FIRE has considered that, as a result of this harvest, there will continue to be a variety of stand conditions exists within and adjacent to the THP area and will not be significantly changed by the implementation of the THP. The current THP proposes 808 acres of logging, and a majority of that will have areas of retention for both overstory and/or understory cover within the area of the THP. A portion of the assessment area contains land managed by the USFS where continuous forest cover is anticipated, as well as production of snags and down woody material. No significant adverse effects are expected to occur to these species or their habitats from this THP.

Finally, it is noted by CAL FIRE that the Pacific fisher is currently not found on or near the Blodgett ownership and is likely to have been extirpated many decades ago, as stated on THP page 15. As a result, no current mitigation is required under CESA.

Various plant databases were checked for the potential of rare or endangered plant species that might occur on the area. The plan explains the possibility of finding locations for *Arctostaphylos nissenana, Calochortus clavatus var. avius, Chlorogalum grandiflorum, Clarkia biloba spp brandegeeae, Fritillaria eastwoodiae, Horkelia parryi, Lewisia serrate, Packera layneae, Phacelia stebbinsii, Poa sierrae, Rhynchospora capitellata, Viburnum ellipticum, and Viola tomentosa.* Surveys for plant species have been done on Blodgett on a nearly continuous bases and some 250 plant species from 64 different families have been identified as described on THP page 83. None of the plant species that have been found are of the rare, threatened or endangered category.

Two other mammal species of concern were considered by the Department during the review of the THP. One of these was the Sierra Red Fox. The literature describes the range of the species to be between 3900' and 11,900' in the Sierra and primarily above 6,000'. The species seems to prefer forested areas interspersed with open areas and a wide variety of habitats from alpine shrub, wet meadow, sub alpine conifer, montane chaparral and mixed conifer. The species eats small mammals like squirrels, gophers and rabbits. It dens in rocks, hollow logs and stumps or burrows in the ground. Overgrazing in meadows has been described as the primary reason for decline. Additionally, the animal has a large home range from 900 acres to 8000 acres in size, so it is able to search out preferred habitat over a large area. (Univ of NV, Reno) For this project area, it is noted that there will still be a variety of habitats as in the description of the preferred habitat for the species, with forested areas interspersed with open areas. The area actually harvested may add to the primary food supply as gophers,

rabbits and squirrels are typical invaders that seem to do well in clearings, especially when planted with seedlings. The harvested area would also be expected to contain stumps, hollow logs and areas of rock and ground suitable for denning for the species.

Another species considered, as described briefly above, is the Pine Marten, and this species is described in some of the literature as being more common above 7,000 feet. (Storer and Usinger 1974). The animal has been known to travel up to 15 miles a day in search of food, so it can cover a wide variety of areas and habitats. (Ingels 1965). It eats grasshoppers, birds, ground squirrels and chipmunks, and even yellow jacket wasps in the fall; all of which could be expected to do well in the logged areas. It seeks shelter in tree cavities and rocks, both of which would still be present either on the project area in WLPZ retention areas or in the intervening unlogged units. From Spencer et al. (1983), Pine Marten studies done in the Tahoe National Forest showed strong presence for lodgepole pine associations and they selected against brush, mixed conifer and Jeffrey pine types at elevations below 7,000 feet. Above this elevation, Pine Marten strongly preferred red fir forest types. The THP does not contain areas of either type of favored habitat for Pine Marten.

The local at deer herd utilizes a portion of the project area for migration and fall and spring holding areas. Habitat for deer exist throughout most of the biological assessment area and the plan occupies only a less than significant portion of the total. The resulting mix of silvicultural types where stocking will be met upon completion, WLPZs, non-timbered areas, past even-aged and replanted areas, and non-logged areas will allow for production of edge and a return to early successional vegetation types in some of these areas that are favorable for deer habitat.

A letter was submitted to the THP file from DFG dated August 29, 2001 which indicated that the nearby Railroad Flat deer herd in the central Sierra Nevada had been declining for years, possibly as long as 30-40 years. Reasons for the decline were attributed to drought, residential and commercial development, and fire suppression efforts. The letter states, "*The impacts of timber harvesting to deer are variable, but Department deer biologists feel that some timber practices, if done with proper consideration for wildlife needs, can actually benefit California's deer herds.*" The letter also states, "*Our timber harvest review staff conduct desk reviews of all timber plans that we receive, and we currently conduct field reviews of 20-25 percent of these same plans. Desk and field reviews result in recommendations intended to protect and conserve aquatic and terrestrial resources, including deer, from adverse environmental impacts. These recommendations include retention of oaks and other wildlife habitat attributes where appropriate." (Curtis 2001)* CAL FIRE notes that copies of this particular THP were sent to DFG for their review and input concerning not just deer, but all other species that might be adversely impacted by the proposed timber harvest operations were reviewed.

Stated in the "Report to the Fish and Game Commission (California Department of Fish and Game 2001) is a finding that deer populations have declined greatly in the Central Sierra Nevada over the past five decades and that:

> *Openings of forests as a result of post World War II logging activities (Laudenslayer and Darr 1990) likely contributed to the final peak in deer numbers in the 1960's. Deer numbers then began to decline as those forests began to "close" again. The relationship between understory forage (herbaceous and shrub) and overstory canopy is typical of much of California's forested ranges – as canopy increases, forage decreases. The expansion of urbanization and residential development on private lands into the Sierra Nevada on both the West and East slopes further reduces available deer habitat, virtually eliminating the potential to purposely restore large-scale disturbances, such as fire, into the system in many areas. It's well-documented that deer thrive on early successional vegetation in forested communities (Leopold 1950, Wallmo and Schoen 1981), and there is a period encompassing about 2-30 years following major disturbances such as fire or logging when herbaceous and shrub species are abundant, available, and in the highest quality. Livestock and perhaps hundreds of largely unstudied species of wildlife such as blue grouse or mountain quail, also rely on the vegetation produced in forest openings where sunlight is allowed to "hit the ground" and enable plants to grow and be available for consumption or as cover.* (pg. 18)

Also stated in the report for the area known as DAU 5 - Central Sierra Nevada, which is the area of concern to the proposed THP, is that:

> *The main habitat issues affecting deer in the DAU are associated with forestry practices, lack of habitat disturbance that favors early successional communities, and overuse by livestock on key summer range habitats. Human development and encroachment onto private wildlands has been significant in many areas. Presence of this urban interface, adjacent to public lands, restricts options for use of fire to manipulate habitat, thereby resulting in declining early successional habitat.* (pg 35)

It can be stated that there are only a couple kinds of disturbances that are practical and available to improve habitat for deer and other early successional wildlife on private forestlands in California. One of these is fire, both man-made and natural, and the other is harvesting or some other similar management technique. The report clearly indicates that disturbance from fire is increasingly difficult to achieve given rising populations in these areas of the central Sierra Nevada. Even man-made fire has become increasingly difficult to accomplish due to political restrictions and objections to the addition of smoke and particulate into the air and given the sensitivity of the populous to breathing air infused with smoke and ash.

CAL FIRE finds that opening up the canopy using a variety of logging methods that allows additional sunlight to reach the ground is still an economical and politically achievable way of increasing forage opportunities for deer and other early successional wildlife. Within the area of the project, there will be openings created which will allow for not only the establishment of a new generation of conifer seedlings, but also will encourage production of grass, herbs and forbs for deer foraging. While herbicides may be used for site preparation, the impacts will be

to set back successional vegetation and not to eliminate it. There was determined to be an insignificant impact to the deer herd and recovery of the areas will be expected to be rapid, thereby returning cover to the affected areas so that any impacts would be temporary. There is no expectation of any significant adverse environmental impacts to wildlife or sensitive plants as a result of this project.

LOGGING ROADS AND LANDINGS

The rules state that all logging roads and landings shall be planned, located, constructed, reconstructed, used, and maintained in a manner which; is consistent with the long-term enhancement and maintenance of the forest resource; best accommodates appropriate yarding systems, and economic feasibility; minimizes damage to soil resources and fish and wildlife habitat; and prevents degradation of the quality and beneficial uses of water. (14 CCR Sec. 963).

For this THP, all of the roads and landings that will be needed are largely in place due to previous logging and there is no need to construct or reconstruct roads. With the approval of this THP, regulations will be in place that will require long-term road maintenance. Because of the current THP, road maintenance will be required for the period of time that the plan is active, or about 3 years time, with the possibility of two additional two-year extensions, and an additional year beyond submission of the final work completion report. Approval of this plan will result in upgrades to roads that will facilitate an improvement in the condition of the watershed through reduction of sediment sources associated with erosion from road surfaces. Likewise, numerous road crossings of watercourses will be improved with culverts or ditching.

ARCHAEOLOGICAL AND HISTORICAL RESOURCES

The purpose of the forest practice rules with respect to archaeological and historical resources is to ensure that significant sites within the area are adequately identified and protected and to provide direction to RPFs preparing THPs, Licensed Timber Operators and CAL FIRE in its review, approval and inspection programs; (14 CCR Sec 969). The results of field surveys made and mitigations designed to protect these resources are found in a portion of the THP file that is kept confidential pursuant to Government Code Sec. 6254 and 6254.10 and are not included in any documents provided to the public. (14 CCR Sec. 895.1). This is done to protect any of these resources from possible vandalism. This confidential addendum to the THP is written by an archaeologist or RPF who has been trained in archaeology and certified. It is reviewed in CAL FIRE by either a professional archaeologist or a CAL FIRE RPF trained in archaeology, usually both, and the timber operational area itself is inspected by a CAL FIRE forest practice inspector who has had this training. Copies of some of the information that is contained in the confidential addendum are sent to local tribal groups, if they are on a list that is maintained by the Native American Heritage Commission, so that their input and expertise can be sought to assist in the review of the protections for these features.

ISSUES

One letter was received from the Klamath Forest Alliance (KFA) with concerns over in clearcuts, large trees, sediment from roads, road density, watercourse buffers, herbicides, steep slopes, Northern Goshawk protection, CASPO habitat, and visual impacts.

1. Concern: There was a concern from KFA that the THP claims benefits to wildlife habitat from areas protected in WLPZs, ELZs, and/or Riparian Management Zones, although it is claimed in the concern that these areas offer minimal shade protection or bank stabilization or landslide protection or wildlife habitat. It was also stated that the rules of the BOF do not adequately protect streamside vegetation from drying out and from water temperature increases where even-aged logging is used adjacent to stream buffer areas. Also stated was that intensive logging next to buffer areas increases overland warm air flow and removes canopy cover to create "edge habitat" which favors wildlife and plants well adapted to disturbance and cannot be relied upon as a strategy to recover threatened, endangered and sensitive plant and animal species.

Response to Concern #1: The THP is in agreement with the rules of the BOF in stating benefits to wildlife, and protection of streamsides with the application of the Watercourse and Lake Protection Zone rules. 14 CCR Sec. 956(d) states, in part, that the intent of the zones are for the purpose of "...enforcing the public's historical and legal interest in protection for wildlife, fish, and water quality..." 14 CCR Sec. 956.2 states that the protection widths and distances in the rules are a "minimum" where they "...are not adequate to provide for maintenance, protection or to contribute towards restoration of beneficial uses of water set forth in 14 CCR 956.5, Table 1, additional measures to achieve these goals shall be developed by the RPF or proposed by the Director...". For this particular plan, the review of the Plan, including the PHI attended by representatives from CAL FIRE and the Interagency Review Team members who attended and reviewed the plan in the office, there was no finding that the THP as proposed would result in significant adverse impacts to water quality or to the values of the zones for the protection of wildlife and fish. For this particular THP, the Class I and Class II watercourses are being protected with WLPZ widths that, in some cases, exceed the widths proposed in the regulations of the BOF as a minimum (see WLPZ table on THP page 10). Where there is harvest being proposed within the WLPZ, harvest will be Selection logging and/or Commercial Thinning within a WLPZ. Overstory retention, as required in the rules of the BOF will help to insure that the THP area will not subject to drying conditions. The THP demonstrates on pages 138 - 190 the condition of watercourses as measured during past surveys. Where there is Clearcut logging (i.e., "Intensive Logging") being proposed, there are no Class I, Class II or Class III watercourses as shown on THP pages 33 and 46.

2. Concern: There was a concern from KFA that the THP uses clearcuts and claims that widespread use of clearcutting in California is fragmenting habitat for late-seral canopy dependant species and elevating chronic sediment delivery in watersheds with erosive soils and steep slopes leading to watercourses. Since most industrial timberlands are managed for maximum growth and yield rates the justification to use clearcutting for "stand growth" tends to override "watershed health". Also stated was that the Forest Practice rules are ineffective in terms of dealing with the cumulative effects of clearcutting.

Response to Concern #2: This particular plan uses a host of silvicultural methods to achieve the goal of improving forest health and to produce forest products and these methods include Selection (243 acres), Shelterwood Removal (18 acres), Clearcutting (32 acres), Group Selection (196 acres) and Commercial Thinning (319 acres). Clearcutting, therefore, comprises less than 4% of the total project area. The THP on pages 114 and 114.1 discusses the present and future projected condition of LSS habitat on Blodgett Forest Research Station lands and indicates that set-aside areas have been designated for this type of habitat. As well, about 19% of Blodgett Forest Research Station lands are designated for LSS recruitment. The rules of the BOF regulate the rate of replacement by placing limits on even-age regeneration unit sizes and spacing and even require that these units be replanted and have advanced tree growth prior to placing an adjacent even-age regeneration unit.

Regarding the concern that the BOF rules do not handle the cumulative impacts of clearcutting, the THP uses the methodology prescribed in the rules of the BOF to determine the direct and cumulative watershed impacts of this project in consideration of similar past, present and probable future projects. The development of the Cumulative Impacts Analysis (CIA) regulations began as early as 1980 with the creation of the Board's first Cumulative Effects Task Force (Richey, 1982) and ended with the approval of the Board's regulations in 1991. The Board's first Cumulative Effects Task Force made the following recommendations in their report after reviewing all the regulatory alternatives available to the Board for addressing cumulative impacts;

- Effective on-site best management practices, including special attention to sensitive lands, are the most direct method to avoid cumulative effects and should remain the backbone of the regulatory program. (Richey, p.13)
- Existing stream conditions should be considered in evaluating potential cumulative effects of the individual THP. Harvest planning should account for this potential during evaluation of alternative silvicultural methods. (Richey, p.13)
- Timber harvest allocation systems are complex and should not be considered unless the need is shown to be critical. (Richey, p.13)
- Road systems should be planned to minimize total disturbance and avoid sensitive sites. New road standards in the forest practice rules should be evaluated before further regulation regarding road planning is proposed. (Richey, p.13)

The Board used many of these findings in adopting the 1991 cumulative effects rules. The

methodology used in the Board's rules to determine the size of the watershed assessment area was clarified by a letter to all RPFs and LTOs from the Director on January 7, 1992. This letter states on page 4 that:

> "The watershed assessment area for assessing cumulative watershed effects (CWEs) should be selected to include an area of manageable size relative to the THP (usually an order 3 or 4 watershed) that maximizes the opportunity to detect an impact. Where there is a choice of combining watersheds with different disturbance levels, the assessment area should be based on the smallest watershed area that includes the most disturbances. The intent is to focus on an area of manageable size, where the presence of cumulative effects related to the proposed project and the benefits or failings of the proposed practices can be reasonably considered." (emphasis added)

The size of the assessment area quoted in the letter above is supported in the Board rules described in 14 CCR Section 897(b)(2) and in the definition for "planning watershed" found in 14 CCR Section 895. The size of the watershed assessment area found in these regulations is a recommended third or fourth order watershed size, and therefore, the letter from the Director is consistent with the regulations of the Board.

However, it should be noted that the detailed analysis for the watershed assessment area selected by the RPF does not limit CAL FIRE with respect to consideration of other activities outside the assessment area. The watershed assessment area is more like a window which CAL FIRE can see through to view the combined effects of other related projects, rather than a wall or barrier.

The Board's rules do not require a specific method of CIA, because the Board determined that no single, available procedure adequately addresses the wide range of site conditions and THP activities found in California. The Board's rules in the Appendix to Technical Rule Addendum #2, do give the basic concept of what should be considered and what to look for with respect to an environment that may be at or near some level of concern. As stated in the Appendix, "The watershed impacts of past upstream and on-site projects are often reflected in the condition of stream channels on the project area."

The Appendix to Technical Rule Addendum #2 also describes the factors that can be used to evaluate the potential project impacts. Such factors include gravel embeddedness, pool filling, stream aggrading, bank cutting, bank mass wasting, downcutting, scouring, organic debris, stream-side vegetation, and recent floods. These factors can be examined in the field by experienced individuals to determine if the environmental setting has suffered from past projects and/or contains the ability to absorb future projected impacts.

Individual RPFs preparing plans have surveyed other watercourse segments within the assessment area. CAL FIRE considered all these survey results to assess conditions in the entire assessment area. Information from all these assessment areas are combined like building blocks. If this project's residual impacts were great enough, after application of the CCRs and extra THP mitigations, the possibility exists to demonstrate that this project could combine in an adverse way with other past, present and future projects to cause a significant environmental effect. However, CAL FIRE did not find that this project would have such adverse residual effects.

CAL FIRE found that THP correctly complied with the rules in the discussion and identification of cumulative impacts. The US Forest Service (USFS) developed the "equivalent roaded area" (ERA) method. ERA attempts to predict downstream changes by assessing upstream conditions in a general model of basin-wide addition or multiplication. ERA is the most widely used cumulative impact assessment method. It assumes the individual land use activities in themselves are of little consequence to the whole, but have increasingly greater consequences as they increase in scale and duration. The method responds to the concerns of policy makers over fire and deforestation, and it is easy to assess and understand (Euphrat, p.9).

The Board's rules do not specify use of a quantitative method, and CAL FIRE's procedure relies on field observations and the experience of RPFs and other experts or observers, rather than the use of quantitative expressions or models.

The ERA method includes a quantitative estimate of ground disturbance that is indexed to the disturbance of a fully compacted road. The ERA method is sometimes cited as an example of how quantitative data can be used to develop a numerical rating of effects. However, it also requires experience and professional judgment to:

- Identify "sensitive" areas
- Provide the coefficients for indexing different types of disturbance
- Determine whether a project can be designed to improve on the existing condition and lessen, or at least not significantly add to, existing adverse impacts

The ERA method was originally based on the premise that soil compaction by road construction and other logging activities lead to increased runoff or snow-melt. This extra runoff increases peak flows and channel and bank erosion and results in excess sediment production. However, such flow increases from large storms are only a small part of the total erosion and sediment transport to streams.

The three basic types of determinations included in the ERA method are:

1) Natural watershed sensitivity
2) Equivalent roaded area (ERA)
3) Threshold of concern that generally ranges between 12 and 20 percent ERA

An area's intrinsic sensitivity is a function of land units, climate, and hillslope and stream-channel

processes. Professional judgment establishes the relative importance of these factors in a given setting. A sensitivity value is assigned to areas where differences in site conditions are recognized by the geologist, soil scientist, hydrologist, engineer, or forester reviewing the watershed.

Once the sensitivity of the area is defined and the past land disturbance features are cataloged, the past and proposed land disturbing activities within the watershed are "normalized" by assigning ERA values to each type of disturbance activity. (A major drawback to the ERA approach is that different roads are considered to have similar impacts. For example, a road located high on a ridge-top is assumed to have impacts equal to a road located on a very steep slope). These ERA group values are then weighted by the percent of the watershed in each ERA group and added to give a total ERA value for the watershed.

Finally, a "Threshold of Concern" (TOC) is identified, above which stream channel modifying impacts are thought to occur. If the total watershed ERA exceeds the Threshold of Concern, it raises a "flag" of potential adverse cumulative impacts and more watershed-specific analysis is warranted.

Determining thresholds for identifying significant cumulative effects is both extremely important and difficult. The USFS identifies threshold of concern ERA values using both professional judgment and comparing watersheds with different logging impact levels. It is extremely difficult to use current channel conditions as an index of future timber harvest impacts. This is because present day stream conditions often resulted from past road building and logging activities that are not permitted under current regulations.

The USFS makes the following comment regarding the uncertainty of modeling cumulative watershed effects;

> "*Modeling CWE is not a precise science; it is a young and developing field. Development of a quantitative, statistically valid, technical model for assessing CWE is not now possible because ecological and geomorphic systems are complex and vary from one watershed to another. No one technical model will reasonably simulate all variables for all ecological and geomorphic systems. Adding to the complexity of the situation, are limitations in understanding geomorphic processes in mountainous terrain and influences of climate and human activities on process rates and resulting impacts to down stream beneficial uses of water* (U.S. Forest Service 1988)."

In fact, the USFS evaluated the ERA method and found that there was a poor correlation between ERA values and measured watershed condition factors. This led to a conclusion that:

- "*The ERA methodology is not meant to serve as a predictive model of watershed condition, sediment delivery or any other watershed output or parameter. Rather, it is a system that can be used to account for watershed disturbance. . .*"
- "*Instead of trying to classify and segregate effects, the need is to try to consider each*

watershed and activity as unique, and make the best effort to evaluate processes and effects of concern, whether one might term them cumulative or not. All the while remembering how complex watersheds are (Roby 1991)."

In addition, the research done in the Redwood Creek watershed in northern California clearly shows that road and skid trail location and design has a more direct correlation with watershed impacts than percent or degree of watershed area compacted (Hagens and Weaver 1987).

The ERA method was also used for this THP evaluation, but is not a requirement in the rules of the BOF. In fact, 14 CCR Sec. 898 states that: "*Cumulative impacts shall be assessed based upon the methodology described in Board Technical Rule Addendum Number 2, Forest Practice Cumulative Impacts Assessment Process and shall be guided by standards of practicality and reasonableness. The RPF's and plan submitter's duties under this section shall be limited to closely related past, present and reasonably foreseeable probable future projects within the same ownership and to matters of public record.*" An examination of the THP by CAL FIRE found that the plan complied with these requirements and with the BOF Technical Rule Addendum #2. Also Technical Rule Addendum No. 2 states: "*The Department, as lead agency, shall make the final determination regarding assessment sufficiency and the presence or absence of significant cumulative impacts.*" As such, CAL FIRE has dutifully declared by approval of the plan that the information contained in the plan comply with the regulations cited in this paragraph of this Official Response.

3. Concern: There was a concern from KFA that new road construction should not be allowed for THPs in watersheds that have sediment problems and that only roads that correct existing problems should be approved and problem roads decommissioned.

Response to Concern #3: Besides the fact that there is no evidence from the THP that the watercourses involved with the harvest have sediment problems, the THP Item 24 on page 10 indicates that there will not be any roads constructed or reconstructed in association with this project. The PHI report from CGS dated May 25, 2011 indicates the following: "*All access roads driven on throughout the PHI were rocked. Barrier signs were observed on native surface roads indicating access is not allowed during the winter period.*" and "*Watercourses, where observed, did not appear to have excess sediment in their beds and no sediment was observed discharging from the road system at observed watercourse crossings.*"

4. Concern: There was a concern from KFA that new road construction should not be allowed for THPs in highly roaded watersheds containing more than 2 miles of road per square mile.

Response to Concern #4: Maps supplied for the THP, such as the one on THP page 25, do indicate a high density of roads within the within the project area, although some of these roads are public roads, such as Wentworth Springs Road, and other are related to subdivision and residential access, or are roads private industrial timberlands being managed for the production of forest products and are not useful for the plan submitter as related to the management of the research forest timberlands. Roads owned and controlled by the plan submitter give the research forest timberland owner the opportunity to manage their timberland property, to capture mortality

and prevent the spread of insect or disease, to provide for the production of high quality timber products in accordance to legislative mandates, and for fire protection. Roads that are the responsibility of the plan submitter for actual access to logging areas and approval of the THP will result in a road maintenance requirement as discussed elsewhere in this Official Response. As stated in the Response to Concern #3, no new road construction or reconstruction is being proposed for this THP project.

5. Concern: There was a concern from KFA that herbicide treatment has been proposed and that use of herbicides to control vegetation will prevent and/or delay a shrub and herbaceous cover from developing providing less than ideal early seral habitat for wildlife and that some herbicides are harmful to amphibians, reptiles and fish and have been linked to declining populations.

Response to Concern #5: CAL FIRE finds that the plan contains the evaluation of the most likely herbicides that could be used on the project and for which there are approved and labeled uses as regulated by the EPA, CALEPA and the Department of Pesticide Regulation. The discussion on pages 133 to 133.6 contains an indication that atrazine will not be used for the project, but a number of other products have been evaluated based on the literature for those materials. The discussion includes the possible persistence of the substances in the environment and the relative toxicity which relates to the potential impacts to wildlife species. Any applicant to the Department of Pesticide Regulation and to the local Agricultural Commissioner who wants to use a herbicide must follow all the safety procedures and follow label instructions which direct the application in relation to control of drift and safe amounts that can be applied at any one time or cumulatively over time. Unlike traditional agriculture where these products could be used annually or for multiple entries within a single growing season, forestry use of these same products will be infrequent and may be used only once or twice in a crop rotation that can last from sixty to eighty years.

CAL FIRE has consistently reviewed and re-reviewed the chemicals used in forest management when requested to do so by the public in numerous Official Responses. The following summary of our findings with respect to the use of forest herbicides is again presented in this Official Response for THP 4-11-004/ELD-2. In the Forest Practice Rules, 14 CCR 953.1(a)(3) and (4)(A) stipulate: "*Evenaged regeneration units within an ownership shall be separated by a logical logging unit that is at least as large as the area being harvested or 20 acres, whichever is less, and shall be separated by at least 300 ft. in all directions*" and "*Within ownership boundaries, no logical logging unit contiguous to an evenaged management unit may be harvested using an evenaged regeneration method unless the following are met: ... The prior evenaged regeneration unit has an approved report of stocking, and the dominant and codominant trees average at least five feet tall, or at least five years of age from the time of establishment on the site, either by planting or by natural regeneration. If these standards are to be met with trees that were present at the time of the harvest, there shall be an interval of not less than five years following the completion of operations before adjacent evenaged management may occur.*"

In a forest setting, relatively small areas averaging approximately 20 acres in size, scattered over the landscape may be treated. 14 CCR 953.1(a)(2) stipulates: "*The regeneration harvest of evenaged management shall be limited to 20 acres for tractor yarding. Aerial or cable yarding may*

be 30 acres. Tractor yarding may be increased to 30 acres where EHR is low and the slopes are <30%. The RPF may propose increasing these acreage limits to a maximum of 40 acres ..." Any increase in acreage above the 20 or 30 acres limits must be approved by the Department. In THP 4-11-004/ELD-2 the even-age harvest areas average 16 acres in size. The units are separated by a distance of 300 feet or more. Therefore use of herbicides are limited to a certain sized area and the use is also spaced out over the landscape and over time.

With respect to the analysis of chemicals typically used on lands within Eldorado County, there are publicly available summaries prepared by the California Department of Pesticide Regulation (http://www.cdpr.ca.gov) for 2006 (a recent year with posted information) which show that, for the state as a whole, forest/timberland use of pesticides ranks 59th and 54th by weight of pesticides applied and by acreage treated respectively. (See also Exhibit 14) Statewide the use of pesticides on forest/timberland, by weight was less than 1% of that used on wine grapes and less than 1% of that used on other grapes. Compared to the total for the state the weight of pesticide use for forest/timberland was approximately 0.2% (less than 1%). Likewise the use by acreage is less than 1% of the area of cotton or grapes (wine and other grapes combined) that was treated. Compared to the total for the state the area of pesticide use for forest/timberland was approximately 0.5% (less than 1%). Eldorado County ranked 42nd in pesticide use (by pounds applied) out of the state's 58 counties in 2009. The weight of pesticide use in Eldorado County was approximately 0.06% (six hundredths of one percent) of that used in the state as a whole in 2009. The plan lists the herbicides currently utilized on the ownership for vegetation management. These are Imazapyr, Glyphosate, and Triclopyr.

With respect to the potential for environmental effects of herbicides that have been used in the past by the plan submitter and are the most likely ones to be used in the future as stated in the THP, CAL-FIRE considered the information publicly available in the literature as follows: For imazapyr, the United Nations Environmental Programme (UNEP) does not list imazapyr as a persistent organic pollutant (current as of February 2002 and not expected to change in the near future); the World Health Organization (WHO) Acute Hazard Rating is "Unlikely to present acute hazard in normal use"; it is registered for use in South Africa, Australia, New Zealand, Finland, Hungary, Portugal, United Kingdom, Canada and the United States. Only about 21 pounds of imazapyr was used in forestry applications in Eldorado County in 2009 on 100 acres. Eldorado County in 2009 accounted for significantly less than 1% of the imazapyr used statewide for forest reforestation.

(http://www.pesticideinfo.org/Detail_ChemReg.jsp?Rec_Id=PC33386)

The Imazapyr used on timberlands goes under the trade names of Chopper or Arsenal. While this product can be applied by air, it is applied primarily by low-volume hand-held spray equipment or basal treatment, cut stump treatment or tree injection or frill. Imazapyr can remain active in the soil for 6 months to 2 years. It is strongly adsorbed in soil and usually found only in the top few inches. It is soluble in water. It has a low potential for leaching into ground water. It may move from treated areas into streams and use of a streamside management zone can significantly reduce the amount of offsite movement in stormflow. The half-life of imazapyr in water is about 4 days. Imazapyr is considered low in toxicity to invertebrates and practically non-toxic to fish, mammals and birds. It is of low toxicity to bees. Like many herbicides, it could be a hazard to endangered

plants if applied to areas where they grow, but would probably not be a hazard to endangered animals because of low toxicity. Lab studies with imazapyr in rats indicated no evidence of teratology and tests were negative for mutagenicity. Given the scientific and toxicological information in conjunction with the speculative information that the Department has with respect to the timing, amount of product, weather conditions at the time of application, or even if the product would be used at all, CAL FIRE finds that there is no substantial evidence that imazapyr use would be provide a significant human health hazard or significant adverse environmental impact when used in accordance to label or other regulatory restrictions and when used in reforestation in a typical manner.

For glyphosate, the United Nations Environmental Programme (UNEP) does not list glyphosate as a persistent organic pollutant (current as of February 2002 and that status is not expected to change in the near future); the World Health Organization (WHO) Acute Hazard Rating is "Unlikely to present acute hazard in normal use"; it is registered in 14 African countries, six European countries, Australia, New Zealand, Philippines, Canada and the United States. Less than 1% of the glyphosate used in California in 2006 was used in forests. Over 90% of the glyphosate used in California in 2006 was used on right-of-ways, nuts (almonds, walnuts, and pistachios), grapes, cotton, fruit (nectarines, peaches, plums, cherries, and oranges), tomatoes, landscaping, and wheat. (http://www.pesticideinfo.org/Detail_ChemReg.jsp?Rec_Id=PC33138) Of the top pesticides used on forests in California in 2006, 76,000 gross pounds of glyphosate isopropylamine salt and 10 gross pounds glyphosate were applied to forest lands. In comparison 290,000 pounds glyphosate (about 4 times that applied to forests) were applied to grapes, which provide the raw material for a product consumed by people. Other food products that were treated with greater amounts of glyphosate isopropylamine salt than forestlands in 2006 include almonds, oranges, table/raisin grapes, walnuts, pistachios, lemons, avocados and peaches. For the state as a whole, nearly 5 million pounds of glyphosate were used on reportable crop and structural uses. For all uses, including urban and household, approximately 17,000,000 pounds of glyphosate were sold in California in 2006. Forestland use is a very insignificant portion of this total. (http://www.pesticideinfo.org) Relyea, 2004 underscores how prevalent the public use of glyphosate is; "Glyphosate is the second most widely used pesticide in the United States. It is currently applied to 8.2 million ha of cropland in the United States including 2 to 3 million kg for home and garden applications and 4 to 6 million kg for commercial and industrial applications ..." 10-20% of the application of Glyphosate (Roundup) is attributed to homeowners who do not have to consider cumulative impacts when purchasing or applying these materials. For Eldorado County in 2009, 6,060 pounds of Glyphosate were used on about 2,800 acres of timberland. Compare this to the over 500,000 pounds of Glyphosate that were used on wine grapes in Eldorado County in 2009.

Glyphosate, also known by the trade name Roundup, is used to control grasses, herbaceous plants including deep rooted perennial weeds, brush, and some broadleaf trees and shrubs. It is applied to foliage and is absorbed by leaves and rapidly moves through the plant. It acts by preventing the plant from producing an essential amino acid. Aminomethylphosphonic acid is the main break-down product. It is generally not active in soil and is not usually absorbed from the soil by plants. It remains unchanged in the soil for varying lengths of time, depending on soil texture and organic matter content. The half-life of glyphosate can range from 3 to 130 days. The surfactant in roundup has a soil half-life or less than one week. The main breakdown product of the surfactant is carbon dioxide. The potential for leaching into groundwater is low as it is strongly

adsorbed by soil particles. It does not evaporate easily. Roundup has no known effect on soil microorganisms. Contact with non-target plants may injure or kill plants and therefore, use over the top of established conifers is mostly done when the conifers are dormant. It is practically non-toxic to birds and mammals and bees. It has not been tested for effects in terrestrial animals. It is no more than slightly toxic to fish and practically non-toxic to aquatic invertebrate animals. It does not build up in fish. Studies by Mitchell, Chapman & Long (1987) concluded that "*Roundup and Rodeo herbicides would be considered to be slightly toxic and practically non-toxic respectively to trout and salmon species.*" A study by Wan (1984) concluded that there was a wide variety of effects seen on salmonoid species depending on the hardness or softness of water. For chronic toxicity concerns, the EPA has concluded that glyphosate should be classified as a compound with evidence of non-carcinogenicity for humans. Laboratory studies with glyphosate in pregnant rats at dose levels up to 3500 mg/kg per day, and rabbits at dose levels up to 350 mg/kg per day, indicated no evidence of teratology. A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 30 mg/kg per day. Glyphosate was reported to be negative in tests for mutagenicity, however, it is noted that Clements, Ralph, and Petras (1997) found DNA changes to bullfrog tadpoles at a concentration of 6.75 mg/l, stressing the importance of keeping the product out of bodies of water in accordance to label restrictions. For acute toxicity concerns, in tests in rats, the acute oral LD50 was 4320 mg/kg of body weight, putting it in Category III, or next to the lowest in concern. The acute dermal toxicity LD50 was equal to or greater than 794 mg/kg in female rabbits and 5010 mg/kg in male rabbits, putting it in Category III. As a primary irritation for skin, glyphosate was not an irritant in tests with rabbits, putting it in Category IV. Glyphosate was a mild eye irritant in Category III. For acute inhalation, this study was waved by EPA based on the results of the other studies. There are no reported cases of long-term health effects in humans due to glyphosate. Most short term incidents in humans have involved skin or eye irritation in workers after exposure during mixing, loading or application or have reported cases of nausea and dizziness. Swallowing the Roundup formulation caused mouth and throat irritation, stomach pain, vomiting, low blood pressure and in some cases, death. These effects have only occurred when the concentrate was accidentally or intentionally swallowed in amounts averaging about half a cup and not as a result of the proper use of Roundup. According to label restrictions, glyphosate is not to be applied directly to water or wetlands. Typically in forestland uses, roundup is applied to individual weed species that are in competition with growing seedlings, but may also be used in a broadcast spray over the top of planted seedlings when they are dormant to control competing vegetation. Once tree seedlings have control of the site, it is no longer necessary to use this product in the approximately 50 year rotation period of the stand. Site control is usually reached within the first 4 to 5 years after planting depending on the spacing and survival rate of tree seedlings. In a water quality monitoring report done on the Stanislaus NF (USFS 1995, 1996, Selected Excerpts), sampling for glyphosate was done following a reforestation project. The report states that, "*The project EIS predicted that glyphosate would not be detected in water or streambed sediment based on its environmental behavior and from monitoring results on similar projects on the Stanislaus and other national forests in California. Project monitoring results from intensive sampling in 1995 plus sampling in 1996 validated these predictions.*" (Surface Water, Ground Water and Soil Monitoring Report Hamm-Hasloe Reforestation Project, Stanislaus National Forest by Ellsworth and Grinn, 1996). Given the scientific and toxicological information in conjunction with the speculative information that the Department has with respect to the timing, amount of product, weather conditions at the time of application, or even if the product would be used at all, CAL FIRE finds

that there is no substantial evidence that glyphosate use would be a significant human health hazard or significant adverse environmental impact when used in accordance to label or other regulatory restrictions and when used in reforestation in the typical manner.

For triclopyr, the United Nations Environmental Programme (UNEP) does not list triclopyr as a persistent organic pollutant (current as of February 2002 and not expected to change in the near future). It is registered for use in 10 African countries, New Zealand, Philippines, Germany, Hungary, Netherlands, Portugal, United Kingdom, Canada and the United States. Statewide the butoxyethyl ester formulation was reported in 2006 to be used mostly for landscaping and right-of-way uses, with less than 20% used in forestry applications. The vast majority of the triethylamine salt formulation was used for the cultivation of rice in 2006, with less than 2% used in forestry applications. Only about 148 pounds were used in Eldorado County for forestland treatment in 2009. This is but a fraction of the amount used statewide on forestlands. Other formulations of triclopyr were not reported among the top 100 pesticides used statewide in California in 2009. (http://cdpr.ca.gov/docs/pur/pur09rep/top_100_ais_lbs.pdf)

For triclopyr, also known as Garlon, the product controls woody plants and broadleaf weeds forestland, rangeland and permanent grass pastures. It acts by disturbing plant growth and it is absorbed by green bark, leaves and roots and moves throughout the plant. It accumulates in the meristem region of the plant. Triclopyr is active in the soil and is absorbed by clay particles and organic matter in the soil. Microorganisms degrade triclopyr rapidly with the average half-life being 46 days. The potential for leaching depends on the soil type, acidity and rainfall. It should not be a leaching problem under normal conditions since it binds to clay and organic matter in the soil. It may leach from light soils if rainfall is very heavy. Sunlight breaks down triclopyr rapidly in water in less than 24 hours. It is slightly toxic to practically non-toxic to soil microorganisms and low in toxicity to fish. Triclopyr does not accumulate in fish and is slightly toxic to practically non-toxic to invertebrates. It has not been tested for chronic effects in aquatic animals. However, a report by Wan, Moul and Watts (1987) indicated that "*under field conditions, the concentrations of Garlon 3A in a stream unintentionally oversprayed during an aerial operation would not likely exceed a level greater than 10 mg/L in 15 cm of water even at the highest rate of application. The potential of this product causing fish kill is therefore small when used under prescribed conditions.*" Triclopyr is slightly toxic to mammals, but most triclopyr is excreted, unchanged, in the urine. It has not been tested for effects to terrestrial animals. As for chronic toxicity considerations, laboratory tests in mice and rats fed up to 30 mg/kg per day for 2 years did not show any evidence of carcinogenicity. Tests in pregnant rats indicated no evidence of teratology. A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 30 mg/kg per day. It was negative in several tests for mutagenicity. For acute toxicity considerations, in tests in rats, the acute oral LD50 was 630 to 729 mg/kg of body weight, putting it in Category III, or next to the lowest category. The acute dermal LD50 was greater than 2000 mg/kg in rabbits, also Category III. Triclopyr was a slight to moderate irritant in Category III to IV. In laboratory tests in rabbits, triclopyr was a slight eye irritant in Category III. In laboratory tests in rats, exposure to 5.34 ppm for one hour caused no adverse inhalation effects, putting it in Category III. There are no reported long-term or short-term human health effects. It is not to be applied directly to water according to EPA label restrictions. (EPA 352-378) Triclopyr in forestland use would not be likely to be used more than once or twice in the rotation age of a conifer plantation since growing conifers would be able to get control of the site rapidly to shade out weed

and grass species. Pines especially are damaged by triclopyr, so once pines are planted, overspray of the product would not be a typical application. A ground spray of the product directed away from pine seedlings might be possible however following tree planting. Given the scientific and toxicological information in conjunction with the information that the Department has with respect to the timing, amount of product, weather conditions at the time of application, or even if the product would be used at all, CAL FIRE finds that there is no substantial evidence that triclopyr use would be provide a significant human health hazard or significant adverse environmental impact when used in accordance to label or other regulatory restrictions and when used in reforestation in the typical manner.

Biological effects of herbicide use can vary depending on the number of applications and the timing of the applications, but generally, CAL FIRE field observations would indicate that none of these materials are 100% effective in eliminating brush, forbs or weeds. All the products have labeled vegetation where the material is effective, but even a total elimination of these labeled species is not typically gained, although there may be stunting of the growth of some of these species for a time. Certainly, it could be expected that there would be a reduction of herbs, grasses and forbs for a number of years when compared to an area cleared by fire or mechanical means where no brush control methods were used at all. That can be expected since the purpose of the product is to reduce competition for sunlight, water and nutrients in order for planted conifers to gain a foothold and begin to grow. The real question is, would one expect to get more herbs, forbs and grasses in a closed canopy forest where there is no vegetation manipulation compared to a harvested area where brush control was employed? Also, one should consider that, for the most part, the plants being controlled would probably not have developed to such an extent except for the fact that the soil area is being exposed to sunlight due to the clearcut logging. It would also be expected that damage could occur to endangered plant species that were sprayed by herbicide products and that stresses the importance of scoping, examining literature sources and survey for endangered plants if the first two processes indicate the potential for occurrence of endangered plant species within blocks of harvested timberland that are likely to be sprayed with herbicides. These products do not have much effect on seeds of brush, forbs or other species so that there can be reseeding of these species within a period of time. Since the even-aged regeneration units are spaced out over time and over the area in accordance with BOF rules, other units that have brush, forb or weed growth will be available nearby so that there is not a total elimination of a variety of species useful for wildlife habitat and forage on any large landscape basis. As stated previously, the purpose of herbicide use on these forestlands is not to eliminate brush, forb and weed species, but rather it is needed to give the tree seedlings an opportunity to outgrow the competition and get up to a superior height were the trees are able to control the site by the natural process of dominating available sunlight. Observation over time by CAL FIRE inspectors finds that older plantations show a wide diversity of grasses forbs and shrubs indicating that the use of herbicides does not eliminate these plants.

A report by Carey & Bryant on the reduction of amphibian populations throughout the world, theorized that "*It is likely that no single factor or group of factors has been the causative agent through the world; each locality may have its own particular cause or causes*" and "*in most cases, causes of amphibian population declines are unknown.*" Another study done locally on amphibian populations in California by Davidson, Shaffer and Jennings (2001) indicated "*However, to date, there has been no direct evidence linking pesticides to amphibian population declines.*" This

report attempt to suggest that wind borne agrochemicals in general may be a factor in contributing to the decline of red-legged frogs in the Sierra Nevada. However, there is nothing in the report that would assist in evaluating the potential impacts of any particular chemical, type or rate of application or distance between pesticide application and the subject amphibian population. The report examines a statistical way of testing four hypotheses that were considered by the authors to be likely culprits in the reported decline of red-legged frog species in California. The report did not attempt to relate any of the findings in the California situation with the reported world-wide decline of other amphibian species. As an example, the theory of pesticide drift from agricultural areas of the San Joaquin Valley being causal for red-legged frog decline may or may not hold up when compared to other areas of the world where other amphibian species decline is reported, but where there may not be intensive agricultural use of pesticides. Additionally, the report did not test some other hypothesis, such as the potential for air pollution to be a suspect in the process. ("*We analyzed the climate change, UV-B, pesticides, and habitat destruction hypotheses, because each has distinct implications for spatial patterns of declines.*)" Finally, it is noted that nothing in the report concludes that the use of herbicides are problematical in the alleged decline of red-legged frog vs. the effects of fumigants, nematicides, or insecticides and any of the numerous other pesticides that are used in the San Joaquin Valley. In fact, the report cites several studies which have reported pesticide depositions in the Sierra Nevada, all of which chemicals turn out to be insecticides rather than herbicides. ("*However, a number of studies for the Sierra Nevada have documented the transport and deposition of pesticides originating in the Central Valley. Zabik and Sieber (1993) found organophosphate pesticide residues (chlorpyrifos, diazanon, and parathion) in wintertime air and precipitation samples from sites at 533 m and 1920 m elevations in Sequoia national Park in the southern Sierra Nevada. They found that quantities of pesticides decreased with increased distance and elevation from agricultural lands in the Central Valley floor". "At other sites, McConnell et al (1998) found organophosphate pesticides in winter and spring rain and snow both in the southern Sierra and further north in the Lake Tahoe region." "Pesticides have been found in the bodies of frogs and fish in the Sierra Nevada, beginning with Cory et al's (1970) finding of DDT residues in the bodies of mountain yellow-legged frogs (Rana muscosa) throughout the Sierra. More recently, Datta et al (1998) found PCBs and organophosphate pesticides in the bodies of trout and the Pacific treefrog (Hyla regilla) tadpoles from the southern Sierra Nevada.*") A report by Sparling, et al 2000) also identified insecticides in the bodies of tadpoles in the Sierra Nevada Mountains adjacent to the San Joaquin Valley. The analysis of amphibians in this report develops evidence for the theory that pesticide drift from insecticides that may be used in San Joaquin Valley agriculture are a factor in the decline of amphibian species in the Sierra Nevada. Among chemicals with measurable concentrations were "*chlorpyrifos, malathion, diazinon...*". A report by Calumpang et al (1997) also measured the effects of several insecticides in rice paddy water that was allowed to overflow into water inhabited by various fish and frogs. However, again, the report measured the effects of specific insecticides and not herbicides that are actually being used on Blodgett lands. Nothing in the report is specific to the situation being reviewed as the subject of this Official Response. A report by Bishop, C (1997) suggested "*more research was needed on the effects of pesticides under field conditions suing native species in order to determine the extent to which environmental contamination contributes to declines in amphibian populations.*" A report by Berrill, M et al (1994) indicated that "*a buffer zone around large water bodies is usually left unsprayed, and sites are contaminated only by unintended spray drift.*" However, the report was concerned with small lakes and ponds that may not be protected from contamination so that eggs and tadpoles are likely to be exposed to low concentrations of sprayed

chemicals. The report examined Canadian frog species which, except for the introduced bullfrog species, are not of concern in the Sierra, and concluded that there are small, but important differences between the species tested and differences in the timing of the spray as it coincides with the developmental periods of frog species.

A recent study was published by Davidson & Knapp (2007) on the *Multiple Stressors and Amphibian Declines: Dual Impacts of Pesticides and Fish on Yellow-Legged Frogs.* This study attempted to correlate the lack of yellow-legged frog populations with the presence of introduced fish species as well as the patterns of wind borne pollutants from the central valley of California. The studies were done in Yosemite National Park and also Sequoia-Kings Canyon and the John Muir Wilderness area in between the parks. The study was apparently done in an area that would be most downwind and affected by chemical drift from Kings, Kern, Fresno, Madera and Tulare Counties. These counties account for a substantial percentage of the chemicals used in California for agricultural purposes. It is not clear from the study if the same results would have been obtained in the area of the American River as this area is downwind from counties that would typically use substantially less chemicals in agriculture than was used in the study area and clearly have different wind patterns being more exposed to the gap in the coast range mountains through the San Francisco Bay area. One of the conclusions of the study is that "*Our finding that both fish and pesticides are associated with declines strongly supports the need for additional multi-factor studies.*" The regulations of the Board of Forestry and Fire Protection in Technical Rule Addendum No. 2 state "*The RPF preparing a THP shall conduct an assessment based on information that is reasonably available before submission of the THP.*" The language of the study would indicate that additional multi-factor studies are needed to determine the reason for declines of amphibians. There is nothing in the study that would indicate which of the hundreds of chemical combinations was more of a problem in the population studies of mountain yellow-legged frogs. Other studies (Davidson 2004) found that "*declines were more strongly associated with cholinesterase-inhibiting pesticides (mostly organophosphates and carbamates) than with total pesticide use or any other class or group of pesticides.*" Neither of these classes of insecticides is proposed for use on this particular THP that is the subject of this Official Response. It is also clear that the pattern of use of herbicides on a THP project is different than that which would be typical for agriculture use. Agriculture use of pesticides can occur multiple times within one season and cover large unbroken areas of land, often under conditions of high temperature where volatility of the product more of a problem. As typically used in artificial regeneration of conifer crops, chemical use is infrequent at one or two occasions during a 50 to 80 year rotation on separated units that average around 20 acres in size and is done under cooler conditions given the elevations involved.

With respect to the role of pesticide drift affects to amphibians, another more recent study comes from Roland Knapp (2007). This study focused on the role of chytridiomycosis disease on populations of Rana muscosa and Rana sierrae. From a summary of the report in http://www.mylfrog.info/threats/contaminants.html , "*In California, winds generally blow through the Central Valley and then eastward across the Sierra Nevada, and detectable (but very low) concentrations of several agricultural chemicals have been detected in the Sierra Nevada, including in mountain yellow-legged frogs from high elevations (Fellers et al.2004). Consistent with the hypothesis that pesticides are negatively affecting amphibians, recent studies have reported that the probability of extinction for mountain yellow-legged frog populations is positively correlated with the amount of agricultural land use upwind (Davidson et al. 2002) and the amount of*

pesticides applied upwind (Davidson 2004; Davidson and Knapp 2007). In addition, numerous reintroductions of Rana muscosa into historically-occupied habitat in the southwestern Sierra Nevada (Tablelands area of Sequoia National Park) have failed, perhaps due to the relatively high concentrations of pesticides characteristic of this area due to its proximity to the southern San Joaquin Valley (Fellers et al. 2007). A shortcoming of all these studies is the inability to distinguish between effects caused by pesticides and those caused by chytridiomycosis. The commonly-reported pattern of mountain yellow-legged frog disappearances in the western Sierra Nevada close to the Central Valley and their continued existence in more eastern localities has generally been attributed to the exposure of western Sierra Nevada populations to higher pesticide concentrations. However, this pattern is also entirely consistent with the amphibian chytrid fungus (Batrachochytrium dendrobatidis) spreading across the Sierra Nevada from west to east, and several observations suggest the overriding role of chytridiomycosis relative to pesticides causing the decline of the mountain yellow-legged frog. The most important of these is the recent B. dendrobatidis-caused die-off of hundreds of mountain yellow-legged frog populations in areas of the Sierra Nevada that are remote from the Central Valley and that are subjected to only very low pesticide concentrations."

Another review of this study (Roland Knapp 2007) comes from www.sciencedaily.com/releases/2007/08/070806203309.htm. In this report it states "*Biologists are still determining exactly how this fungus, first identified in 1998, kills the amphibians it infects, but most believe that the pathogen disrupts the frog's ability to absorb water through its skin.*" And "*The findings could help explain the global spread of this pathogen, which has also been found in South America, Australia, Europe and Africa, aid the researchers. While human-caused spread is possible, the fungus has infected amphibians in pristine areas too remote for human activity.*" This document also states that "*The genotype of our fungi in the Sierra are not that different from genotypes found around the world..*" and "*That means there must be someplace else on earth where this fungus is endemic. One would guess that the frogs living where the ancestral population of this fungus is located would not be affected that badly. We could then try to determine the mechanisms those frogs use to resist the pathogen.*"

From another report on the study in www.CaliforniaFarmer.com (Feb 2008), "*This group of fungi can produce spores which last decades, said John Taylor, UC Berkeley professor of plant and microbial biology. As resistant spore, the fungus could be transported by animals, including humans or birds, or lay dormant in an infected area until a new host comes along.*" CAL FIRE finds that the implication of this study as reported in the sources listed in the three paragraphs above places question on the role of pesticide drift on populations of amphibians, and more information is needed.

In Eldorado County in 2009 the top use of pesticides was not forest related as a much larger amount was used on wine grapes, landscape maintenance and road right-of-way, each of which would be much more likely to come into human contact than that which is used in forestry. Forests by contrast accounted for less than 9% of the total pesticides by weight used in Eldorado County in 2009, but with an application rate per acre of less than that for many agricultural communities. Due to the location of the assessment area for this particular project which is the subject of this Official Response, other non-forestland applications are not likely to interact with applications made to the regeneration areas for this THP to create significant adverse individual or

cumulative impacts. (see also the discussion about atrazine and other chemicals as related to California Red-Legged Frog and amphibian species from the section of the Official Response titled WILDLIFE PROTECTION.)

6. Concern: It was stated by KFA that large trees, defined in the letter of concern as being over 21" dbh, should not be removed due to their value as wildlife habitat and resistance to fire and should not be removed simply in the name of the presence of insect or disease.

Response to Concern #6: The rules of the BOF do not contain a definition for "large tree". Any definition would have to include the biological facts of each species of tree as a 21" dbh lodgepole pine would be unusual while a similar sized Giant Sequoia would in fact be a small tree; that aside, the concern came equipped with a definition. There is no requirement in the rules of the BOF for a timberland owner to retain a particular size tree, although there are provisions for consideration of 20 acre areas that achieve the definition of late succession forest stands (14 CCR Sec. 959.16). For this THP, there are no areas that are being harvested that meet this definition. (see THP Item 34 on page 17). Any requirement to keep 21" dbh trees would have to include consideration as to whether this provision would constitute a "taking" of private property. The other problem with any such rule is that timberland owners would tend to have any future tree removed prior to it obtaining a 21" dbh so that, once the existing stock of "large" trees is gone, there would not be many replacements on actively managed forestland. Would a landowner grow trees to this size if they were then going to be unable to harvest these trees as they exceeded 21" dbh? CAL FIRE thinks not. At any rate, the rule does not currently exist and CAL FIRE lacks clear authority to make such a requirement, especially where the biological assessment area indicates sufficient areas of late succession wildlife habitat so that this THP would not be expected to create a significant adverse environmental impact. (see also the discussion on Blodgett Forest Research Station data on set-aside areas and future development of LSS type stands contained in the Response to Concern #2).

7. Concern: There was a concern from KFA that the fact of having a THP will promote keeping the area permanently within the early seral stage habitat condition as it would remove multi-layered canopy and would not provide restoration of habitat for California Spotted Owl (CASPO).

Response to Concern #7: At this time, there is no provision within the rules of the BOF to provide restoration of habitat for CASPO. In the first place, the species is not listed. CAL FIRE has discussed protection for CASPO in this Official Response in the section titled WILDLIFE PROTECTION. The plan contains measures to be taken in the event of discovery of nesting CASPO as well as protections for habitat for any non-listed species, and these procedures are in excess to any BOF rule requirements. CAL FIRE supports these measures as a preventative way to keep the species from being adversely impacted leading perhaps to a situation where it would be listed in the future. In spite of even a century of harvest on these lands by previous private industrial timber landowners, CASPO continues to exist on these private lands. This particular plan retains multi-storied canopy layers in the silviculture Selection, Group Selection, and Commercial Thinning areas. These listed silvicultural methods are being applied to 94% of the project. The use of selection, group selection and commercial thinning will help to foster a new generation of naturally started seedlings to add to the multi-layered nature of the canopy. There

are federal lands available within the assessment area where there is a habitat that is managed for CASPO and other raptor species. As discussed in the Response to Concern #2 and #6, the Blodgett Forest Research Station ownership has set-aside areas for LSS type habitat as well as plans in place for future development of LSS type habitat within the ownership.

> **8. Concern:** It was stated by KFA, that tractor logging should not be allowed on slopes over 50%, and even on slopes below 50% where soil could be displaced and create landslides, and that helicopter logging is an alternative.

Response to Concern #8: Regarding the concern about operations on slopes over 50%, the THP on page 98 states: "*The topography is gentle compared to many forested areas in California, with slopes ranging from 0% to 40%, averaging 15%.*" Also, as stated in the PHI report from CGS dated May 25, 2011: "*There are no timber harvest operations during the winter period and ground equipment is not operated on slopes exceeding 50%.*"

Regarding the concern about soil that could be displaced even on slopes under 50%, the PHI report from the CAL FIRE Forest Practice Inspector states as follows: "*Slope conditions and the RPF's evaluation of the erosion hazard rating are adequate. I have not seen occurrences of erosion from timber harvest activities conducted under past THP's on this ownership. Of all the local timberland owners in the area, Blodgett Forest is by far the most pro-active in managing a road and drainage inventory plan, a use schedule; and continually implements practices that conserve or restore the soil resource.*" The Erosion Hazard Rating for the entire THP area is only Low to Moderate, and there is no indication that soils are prone to being "displaced" to the point that landslides will be created. As evidence, stated in the May 25, 2011 geological report by CGS is the following: "*Although granitic rock outcrops are present in the plan area, no active erosion was observed during the PHI.*" Measures are taken to use rock surfaced roads during wet weather and native surface roads are posted against use during these wet times. (see also the discussion in the Response to Concern #3).

Helicopter logging has financial limitations which would likely require that logging volumes might have to be increased in order to pay for the additional costs. Also, the road system would have to be augmented by additional construction as also would be needed much larger landing areas to be constructed for servicing and fly-in/fly/out access. As it stands now with ground equipment, no new roads will have to be constructed or reconstructed. More landing areas might be needed for helicopter logging as the turn-around time for loads of logs taken to the landing would have to be in the neighborhood of just a few minutes for efficient use of that type of equipment. Helicopter logging would also offer increased noise and areas of a nearby subdivision and residents or visitors would likely be disturbed by the sounds. Likewise, hazards from dropped logs would increase if helicopters were used public access areas, subdivisions and on public roads. Portions of the plan area has been logged with ground measures before and this has been a successful method when considering environmental impacts.

9. Concern: There was a concern from KFA that Northern Goshawk could occur in the THP or assessment area. Unit boundaries and operational restrictions should be adjusted as new information becomes available.

Response to Concern #9: The THP indicates that there is habitat appropriate for Northern Goshawk within the assessment area, but there are not any nesting locations that are known to be currently occupied. The THP indicates general raptor protection policy that would help to identify any raptors that may be found during timber operations. If nesting species are found, the plan on page 18 described measures to be taken. For Northern Goshawk, there would be suspension of operations and an emergency buffer zone established the is wide enough (up to 1,320') to insure that no stress associated with timber operations would be likely to occur to a newly located bird(s). Reporting of the location to DFG and CAL FIRE would also occur. If a Northern Goshawk nest is found, it would require consultation with DFG and the rules of the BOF would require a buffer area to be established.

The ability to protect raptor species is difficult to do in "advance" because the species are mobile and sometimes have alternative nesting or denning sites or, for no obvious reason, will change locations from year to year. A THP is permitted by the regulations to be effective for a three year period of time, with an allowance for two additional two year extensions for THPs approved in 2010 and 2011, for a total effective period that can be seven years long. There is an additional up-front period of time for preparation of the THP and THP review by CAL FIRE which for this plan took months of additional time. It would not be especially effective if one designed protections for a species if they are prone to move from year to year. For that reason, the BOF rule contains measures that will be performed in the event that either of the mentioned species is located and these measures include establishing a buffer zone around an active nest site. (see also the Response to Concern #2 and #6 where the Blodgett Forest Research Station ownership has set-aside areas for LSS type habitat as well as plans in place for future development of LSS type habitat within the ownership).

10. Concern: There was a concern from KFA that clearcutting is being allowed in a watershed that has significant fragmentation as viewed from Google Earth and that clearcuts should never be allowed in watersheds that suffer from cumulative impacts (sediment, temperature, etc.) or 303(d) listed watersheds.

Response to Concern #10: The view from Google Earth (or airborne view) does not reflect visual impacts as defined in the rules of the BOF which state: "*The visual assessment area is generally the logging area that is readily visible to significant numbers of people who are no further than three miles from the timber operation.*" and "*At distances of greater than 3 miles from viewing points, activities are not easily discernible and will be less significant.*" (from Technical Rule Addendum #2) The BOF in developing these visual impact rules anticipated that significant numbers of people would be those people viewing the project area from a ground based location and not from Google Earth. Therefore, the measures included in the THP, which include the use of silvicultural methods that retain basal area of trees, would be expected to screen the area from public view and offer continuous canopy cover due to the use of silvicutural methods such as Group Selection, Shelterwood Removal Step, Commercial Thinning and Selection. As stated in the THP on page 115: "*Due to the relative isolation of Blodgett there is no location within the*

assessment area where a significant number of people can view the forest other than along Wentworth Springs Road which is included in this assessment area." It should be noted that both clearcut areas are quite a long distance from Wentworth Springs Road with the closest being some 5000' away and the other clearcut at least twice that distance.

For the statement in Concern #10 about 303(d) listed watersheds, the reason for the listing has nothing to do with timber harvest. The American River below the project area is a 303(d) listed watercourse because of a mercury levels that are left over from gold mining and processing and these affected waterbodies are located well downstream from the project area. Nothing proposed in this plan will either make this situation worse or better. Forest Practice Rules require that the timber operation will not result in a change to water quality nor the beneficial uses of water. As discussed in the Response to Concern #3 and Concern #8, there is no evidence that the project area is suffering from sediment or temperature or other cumulative impact problems. With the approval of this THP, regulations will be in place that will require long-term road maintenance. Because of the current THP, road maintenance will be required for the period of time that the plan is active, or about 3 years time with the possibility of two two-year extensions, and an additional year beyond submission of the final work completion report.

SUMMARY AND CONCLUSIONS

The Department recognizes its responsibility under the Forest Practice Act (FPA) and CEQA to determine whether environmental impacts will be significant and adverse. In the case of the management regime which is part of the THP, significant adverse impacts associated with the proposed application over the 100-year sustained-yield planning horizon are not anticipated. Furthermore, the Department has concluded that the impacts from implementation of this management regime will have a net benefit from a climate perspective.

CAL FIRE has considered the impacts of the project on global warming as outlined and discussed in this Official Response and has addressed public concerns over this matter. Additionally, the THP was available for public review and contains a site specific analysis and discussion of Greenhouse Gas (GHG) production and sequestration for this particular project which is found on pages 115-129.2 of the Plan.

CAL FIRE understands the importance of approving projects which do not significantly contribute to global warming of the planet and which meet the AB 32 goals for the Forestry Sector by maintaining the current 5 $MMTCO_2e$ reduction target through 2020 by ensuring that current carbon stock is not diminished over time. As shown in the summary in the THP on page 116, this project is expected to result in a net benefit of 36,341 metric tonnes of CO_2e for the project as a whole.

CAL FIRE has considered that owners of large tracts of timberland (50,000 acres or more) are required to have a management plan (an "option 'a' plan" or a Sustained Yield Plan) as per the Rules, code section 14 CCR 913.11[933.11, 953.11]. Growth and harvest must be balanced over time. The growth and yield calculations have been reviewed by the Department for these large landowners. These growth and yield plans demonstrate that for the majority of the land ownerships of 50,000 acres or greater that there will be an increase in standing volume and growth on these ownerships as a whole over time. Therefore the total amount of carbon stored in the forest trees over time will increase through the management regimes proposed under these plans. Each harvest leads to long term sequestration of carbon with the manufacture of wood products, primarily lumber. The Rules provide protection for soils, water and other resource values that also minimize the potential for loss of carbon storage elsewhere in the ecosystem (outside of the trees themselves). Protection measures for watercourses, sensitive wildlife species (fish and birds such as the spotted owl in particular) add to carbon storage through reduced harvest levels on portions of the managed landscapes.

CAL FIRE has considered that, if the stands were left unmanaged they would return to the "old growth" state and in that state would be sequestering more carbon. In isolation this argument may have some validity. However, timber management is not a closed system. Timber is harvested to meet a demand. In California the demand for wood products results in 5 to 7 billion board feet of lumber imports into the state each year. The impact of taking industrial timberlands out of production in California simply shifts the harvest to another state or country. Assuming a similar carbon balance for the stands where the imported products are

grown and manufactured this would add additional use of fossil fuel for the transportation of the wood products into the state.

CAL FIRE has reviewed the potential impacts from the harvest and reviewed concerns from the public and finds that there will be no expected significant adverse environmental impacts from timber harvesting as described in the Official Response above. Mitigation measures contained in the plan and in the Forest Practice Rules adequately address potential significant adverse environmental effects.

CAL FIRE has considered all pertinent evidence and has determined that no significant adverse cumulative impacts will result from implementing this THP. Pertinent evidence includes, but is not limited to the assessment done by the plan submitter in the watershed and biological assessment area and the knowledge that CAL FIRE has regarding activities that have occurred in the assessment area and surrounding areas where activities could potentially combine to create a significant cumulative impact. This determination is based on the framework provided by the FPA, CCRs, and additional mitigation measures specific to this THP.

CAL FIRE has supplemented the information contained in this THP in conformance with Title 14 CCR Sec. 898, by considering and making known the data and reports which may have been submitted from other agencies that reviewed the plan; by considering pertinent information from other timber harvesting documents including THPs, emergency notices, exemption notices, management plans, etc. and including project review documents from other non- CAL FIRE state, local and federal agencies where appropriate; by considering information from aerial photos and GIS databases and by considering information from the CAL FIRE maintained timber harvesting database; by technical knowledge of unit foresters who have reviewed numerous other timber harvesting operations; by reviewing technical publications and participating in research gathering efforts and participating in training related to the effects of timber harvesting on forest values; by considering and making available to the RPF who prepares THPs, information submitted by the public.

CAL FIRE further finds that all pertinent issues and substantial questions raised by the public and submitted in writing are addressed in this Official Response. Copies of this response are mailed to those who submitted comments in writing.

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ALL CONCERNS RAISED WERE REVIEWED AND ADDRESSED. ALONG WITH THE FRAMEWORK PROVIDED BY THE FOREST PRACTICE ACT AND THE RULES OF THE BOARD OF FORESTRY, AND THE ADDITION OF THE MITIGATION MEASURES SPECIFIC TO THIS THP, THE DEPARTMENT HAS DETERMINED THAT THERE WILL BE NO SIGNIFICANT ADVERSE IMPACTS RESULTING FROM THE IMPLEMENTATION OF THIS THP.

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Note: additional literature citations are found in the THP File.

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Item
June 13, 2012
Energy Commission Business Meeting

California Environmental Quality Act Review of Addendum 600-10-006-01 with the United States Forest Service, Pacific Southwest Research Station

The Energy Commission proposes to add $361,716.00 to the Agreement, to extend the term of the agreement to March 31, 2015, to substantially revise the Scope of Work, and to reallocate funds in the budget. This document summarizes and makes recommendations on the environmental review of this project conducted under the California Environmental Quality Act (CEQA).

Procedural Background

The California Department of Forestry and Fire Protection (CAL FIRE) prepares timber harvesting plans (THPs) as part of its environmental review of plans for timber operations in California forests. (Z'berg-Nejedly Forest Practice Act, Pub. Resources Code, §§ 4511 et seq.) THPs are a certified regulatory program exempt from the requirements for environmental impact reports (EIRs) under CEQA. (CEQA Guidelines, § 15251(a).) Courts consider a THP the "functional equivalent" of an EIR. (*See, e.g.*, Ebbetts Pass Forest Watch v. Dept. of Forestry and Fire Protection (2004) 123 Cal.App.4th 1331, 1340.)

On April 4, 2011, CAL FIRE received a proposed THP from the Registered Professional Forester (RPF) for review. (THP No. 4-11-004/ELD-2.) CAL FIRE initiated consultation through with responsible agencies, including the Department of Fish and Game, the California Geological Survey, and the Regional Water Quality Control Board, on April 12, 2011, the date of "filing." The THP was open to public comment and responsible agency review for 30 days, after which the Director of CAL FIRE reviewed the plan and comments received to determine conformity with the Forest Practice Rules. (Pub. Resources Code § 4582.7; Cal. Code Regs., tit. 14, § 1037.7) On July 12, 2011, the Director issued a Official Response on the proposed THP, finding that it conformed to the Forest Practice Rules, that the THP incorporated mitigation that would reduce potentially significant direct and cumulative impacts to less than significant levels, and responding in writing to comments received on the plan. (Official Response, THP 4-11-004/ELD-2 (2011 Blodgett Forest THP) (July 12, 2011).

Use of Timber Harvesting Plan by Responsible Agency

Under CEQA, a responsible agency shall use a substitute EIR prepared by another agency if it complies with the requirements of section 15253(b) of the CEQA Guidelines located in title 14 of the California Code of Regulations. Here, the THP prepared by CALFIRE conforms to those provisions:

(a) CALFIRE is the first agency to grant a discretionary approval for the project, approving the THP on July 12, 2011, long before the Energy's Commission approval of work that involves treatment or post-treatment activities.

(b) CALFIRE consulted with responsible agencies, including the Department of Fish and Game, the California Geological Survey, and the Regional Water Quality Control Board.

(c) The THP identifies potential significant environmental effects within the jurisdiction of the responsible agencies (biological resources, water quality, soil and geology) as well as significant environmental effects within its own jurisdiction (forest health, carbon sequestration, traffic, etc.), and incorporates mitigation measures to reduce or avoid the severity of potentially significant environmental impacts to less than significant levels.

(d) The Energy Commission had the opportunity to participate in CAL FIRE's review of the property before release of the THP for public review.

(e) CAL FIRE established a consultation period with responsible agencies that was at least the same length as the public review period (30 days) for the THP.

(f) CALFIRE exercised the powers of a lead agency by considering all the significant environmental effects of the project and making findings under Section 15091 for each significant effect.

Therefore, the Energy Commission shall use the THP as a substitute EIR for the project and make findings pursuant to CEQA Guidelines, section 15091.

Summary of Timber Harvesting Plan

The project that the THP authorizes and that is before the Energy Commission for approval consists of conducting various types of treatments, including selection, group selection, commercial thinning, and clearcutting, in the Blodgett Forest Research Station. The purpose is to collect information on and analyze soil productivity, fire risk, and carbon storage to determine the potential of the treatments to assist in the collection of forest biomass for use as a transportation fuel and to inform the development of forest sustainability models.

The Blodgett Forest Research Station, a 4270 acre forest located in El Dorado County, is owned and managed by the University of California. The main tract has been previously harvested, does not contain old growth trees, consists of Sierra mixed conifer vegetation, and is currently well stocked with 75- to 95-year old trees.

The THP reviews the project for potentially significant direct impacts to: silvicultural methods, harvesting practices and erosion control, site preparation, watercourse and lake protection, hazard reduction (primarily fire and pest), wildlife protection (identifying species of concern that include California Spotted Owl; Northern Goshawk; Sierra-Nevada, foothill, and mountain yellow-legged frogs; Yosemite toad; Red-legged frog; Pacific fisher; pine marten; Sierra Red Fox; Railroad Flat deer herd; and various plant

species), logging roads and logging, and archeological and historical resources. (THP, Section II, Plan of Timber Operations; THP, Section I, General Information, p. 4.)

In addition, the THP reviews the project for potentially significant cumulative impacts to: watershed, soil productivity, biological resources, recreation, visual, traffic, and carbon sequestration. (THP, Section IV, Cumulative Effects, p. 97.)

For each potentially significant impact, the THP identifies mitigation measures within its jurisdiction or the jurisdiction of responsible agencies consulted on the project, and incorporates that mitigation into the THP. As a result, all potentially significant direct and cumulative impacts from the project were found to be mitigated to less than significant levels. (Official Response, THP 4-11-004/ELD-2 (July 12, 2011), p. 40.)

Recommendation

The Energy Commission is a responsible agency under CEQA. (Cal. Code Regs., tit. 14, § 15096.) As a responsible agency, the Energy Commission must make findings regarding the significant effects of a project and either that those effects will be mitigated to less than significant levels, that the mitigation or alterations are within the jurisdiction of another agency, or that the mitigation or alterations are infeasible due to other considerations. (Cal. Code Regs., tit. 14, § 15091.) If there are significant, unmitigated impacts, the Energy Commission may only approve the project if it finds that the specific benefits of the project outweigh the significant impacts. (Cal. Code Regs., tit. 14, § 15093.)

Energy Commission staff have considered the THP prepared by CAL FIRE for the project. After reviewing these documents, the Energy Commission's Chief Counsel's Office recommends that the Commission make the following findings under CEQA:

- that the California Department of Forestry and Fire Protection (CAL FIRE) conducted an environmental analysis for the activities funded by this amendment under the Forestry Practices Act (Public Resources Code section 4511 et seq.) and prepared a Timber Harvesting Plan (THP) for the proposed project.
- that the THP is a document prepared under a certified regulatory program in lieu of an environmental impact report (EIR) under the California Environmental Quality Act (CEQA) and that the Energy Commission shall rely on the THP as the environmental analysis document for this project pursuant to CEQA Guidelines, §15253.
- that based on its independent judgment, the mitigation measures incorporated into the THP will prevent the project from having any significant environmental impacts, and those measures are within the jurisdiction of CAL FIRE.

Notice of Determination

DRAFT

Appendix D

To:

☒ Office of Planning and Research

For U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St., Sacramento, CA 95814

☐ County Clerk
County of: _____
Address: _____

From:

Public Agency: California Energy Commission
Address: 1516 Ninth Street
Sacramento, CA 95814
Contact: Kristen Driskell, Staff Counsel
Phone: (916) 654-3951

Lead Agency (if different from above):
California Department of Forestry and Fire Protection (CAL FIRE)
Address: 1234 East Shaw Ave.
Fresno, CA 93710-7899
Contact: Michael J. Bacca
Phone: (530) 224-2481

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): N/A

Project Title: Amendment # 600-10-006-01 with United States Forest Service - Pacific Southwest Research Station (PSW)

Project Location (include county): Blodgett Forest Research Station (El Dorado)

Project Description:

The amendment authorizes PSW and subcontractors to conduct treatments on the Blodgett Forest Research Station, including thinning, clear-cutting, and selection practices, in order to collect data on soil productivity, fire risk reductions, and nutrient cycling. The information collected and analyzed will inform the Energy Commission as to the potential for forest biomass as a transportation fuel feedstock as well as determine sustainable forestry practices for both fire protection and biomass collection.

This is to advise that the California Energy Commission has approved the above described project on
☐ Lead Agency or ☒ Responsible Agency

_____ and has made the following determinations regarding the above described project:
(Date)

1. The project [☐ will ☒ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☐ was ☒ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at: 1234 East Shaw Ave., Fresno, CA 93710-7899 or online: ftp://thp.fire.ca.gov/THPLibrary/Sierra_Southern_Region/

Signature (Public Agency) _____ Title Staff Counsel

Date _____ Date Received for filing at OPR _____

DRAFT

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2005

RESOLUTION NO: [XX-XXXX-XX]

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

RESOLUTION REGARDING: AMENDMENT
TO AGREEMENT 600-10-006 WITH
UNITED STATES FOREST SERVICE
(PACIFIC SOUTHWEST RESEARCH STATION)

RESOLVED, that the State Energy Resources Conservation and Development Commission (Energy Commission) approves **Amendment # 600-10-006-01** with United States Forest Service (Contractor), to add **$361,716.00** to the Agreement, to extend the term of the agreement to March 31, 2015, to substantially revise the Scope of Work, and to reallocate funds in the budget.

WHEREAS, the Energy Commission finds that the California Department of Forestry and Fire Protection (CAL FIRE) conducted an environmental analysis for the activities funded by this amendment under the Forestry Practices Act (Public Resources Code section 4511 et seq.) and prepared a Timber Harvesting Plan (THP) for the proposed project.

WHEREAS, the Energy Commission finds that the THP is a document prepared under a certified regulatory program in lieu of an environmental impact report (EIR) under the California Environmental Quality Act (CEQA) and that the Energy Commission shall rely on the THP as the environmental analysis document for this project pursuant to CEQA Guidelines, § 15253.

WHEREAS, the Energy Commission independently finds that the mitigation measures incorporated into the THP will prevent the project from having any significant environmental impacts, and that those measures are within the jurisdiction of CAL FIRE.

FURTHER BE IT RESOLVED, that this document authorizes the Executive Director or his/her designee to execute the same on behalf of the Energy Commission.

DRAFT

CERTIFICATION

The undersigned Secretariat to the Commission does hereby certify that the foregoing is a full, true, and correct copy of a RESOLUTION duly and regularly adopted at a meeting of the California Energy Commission held on June 13, 2012:

AYE: [*List Commissioners*]
NAY: [*List Commissioners*]
ABSENT: [*List Commissioners*]
ABSTAIN: [*List Commissioners*]

_____
Harriet Kallemeyn,
Secretariat

DRAFT

FOR ADMIN. USE ONLY

Amendments-date & S or M

1. Little 7. ENF
2. AEU 8. RTC
3. DFG 2 9. _____
4. WQ 5A 10. _____
5. CUS 11. _____
6. Planning 12. _____

TIMBER HARVESTING PLAN

STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY
AND FIRE PROTECTION
RM-63 (02-03)

THP Name: **2011 Blodgett Forest THP**

(In the CDF FPS, this is "THP Description")

If this is a Modified THP, check box: [ ]

FOR ADMIN. USE ONLY

THP No. 4-11-004/EID-2

Dates Rec'd 4/4/2011

Date Filed APR 14 2011

Date Approved JUL 12 2011

Date Expires JUL 12 2014

Extensions 1) [ ] 2) [ ]

RECEIVED APR 04 2011 SOUTHERN REGION HEADQUARTERS RESOURCE MANAGEMENT

This Timber Harvesting Plan (THP) form, when properly completed, is designed to comply with the Forest Practice Act (FPA) and Board of Forestry and Fire Protection rules. See separate instructions for information on completing this form. NOTE: The form must be printed legibly in ink or typewritten. The THP is divided into six sections. If more space is necessary to answer a question, continue the answer at the end of the appropriate section of your THP. If writing an electronic version, insert additional space for your answer. Please distinguish answers from questions by *font change*, **bold** or underline.

SECTION I - GENERAL INFORMATION

This THP conforms to my/our plan and upon approval, I/we agree to conduct harvesting in accordance therewith. Consent is hereby given to the Director of Forestry and Fire Protection, and his or her agents and employees, to enter the premises to inspect timber operations for compliance with the Forest Practice Act and Forest Practice Rules.

1. TIMBER OWNER(S) OF RECORD: Name **University of California at Berkeley, Center for Forestry, Blodgett Forest Research Station (Robert A. York, Forest Manager)**

   Address **4501 Blodgett Forest Road**

   City **Georgetown** State **CA** Zip **95634** Phone **530-333-4475**

   Signature _____ Date 3-31-11

   NOTE: The timber owner is responsible for payment of a yield tax. Timber Yield Tax information may be obtained at the Timber Tax Section, MIC: 60, State Board of Equalization, P.O. Box 942879, Sacramento, California 94279-0060; phone 1-800-400-7115; BOE Web Page at http:// www.boe.ca.gov.

2. TIMBERLAND OWNER(S) OF RECORD: Name **Same as #1**

   Address **4501 Blodgett Forest Road**

   City **Georgetown** State **CA** Zip **95634** Phone **530-333-4475**

   Signature _____ Date 3-31-11

3. LICENSED TIMBER OPERATOR(S): Name **Unknown at this time** Lic. No. _____
   (If unknown, so state. You must notify CDF of LTO prior to start of operations)

   Address
   City _____ State _____ Zip _____ Phone _____

   Signature _____ Date _____

4. PLAN SUBMITTER(S): Name **Robert A. York, RPF# 2699, Forest Manager, UC Berkeley, Center for Forestry; As Forest Manager of the Center for Forestry , I have authority to submit this plan.**

   Address **4501 Blodgett Forest Road**

   City **Georgetown** State **CA** Zip **95634** Phone **530-333-4475**
   (Submitter must be from 1, 2, or 3 above. He/she must sign below. Ref. Title 14 CCR 1032.7 (a))

   Signature _____ Date 3-31-11

5. a. List person to contact on-site who is responsible for the conduct of the operation. If unknown, so state and name must be provided for inclusion in the THP prior to start of timber operations.

Name: **Unknown at this time.**

Address: _____

City _____ State _____ Zip _____ Phone _____

b. [X] Yes [ ] No Will the timber operator be employed for the construction and maintenance of roads and landings during conduct of timber operations? If no, who is responsible?

c. Who is responsible for erosion control maintenance after timber operations have ceased and until certification of the Work Completion Report? If not the LTO, then a written agreement must be provided per 14 CCR 1050 (c).
The LTO will be responsible.

6. a. Expected date of commencement of timber operations:

[X] date of THP conformance, or [ ] _____(date)

b. Expected date of completion of timber operations:

[X] 3 years from date of THP conformance, or [ ] _____(date)

7. The timber operation will occur within the:

[ ] COAST FOREST DISTRICT
[ ] Southern Subdistrict of the Coast F. D.

[X] SOUTHERN FOREST DISTRICT
[ ] High use subdistrict of the Southern F. D.

[ ] NORTHERN FOREST DISTRICT

[ ] The Tahoe Regional Planning Authority Jurisdiction
[ ] A County with Special Regulations, identify:

[ ] Coastal Zone, no Special Treatment Area
[ ] Special Treatment Area(s), type and identify:

[ ] Other

8. Location of the timber operation by legal description:

Base and Meridian: [X] Mount Diablo [ ] Humboldt [ ] San Bernardino

Section Portions of:	Township/Range		Acreage	County	~~Assessor's Parcel Number (Optional)~~ Blodgett Compartment #
5	12N	12E	40	El Dorado	Comp. 20
5	12N	12E	44	El Dorado	Comp. 40
5	12N	12E	38	El Dorado	Comp. 70
5	12N	12E	12	El Dorado	Comp. 90
5	12N	12E	34	El Dorado	Comp. 100
5&8	12N	12E	18	El Dorado	Comp. 150
5&8	12N	12E	21	El Dorado	Comp. 151
5,8&9	12N	12E	60	El Dorado	Comp. 160
5,7&8	12N	12E	42	El Dorado	Comp. 230
5&8	12N	12E	68	El Dorado	Comp. 250
5&7	12N	12E	15	El Dorado	Comp. 251
8	12N	12E	67	El Dorado	Comp. 270
5&8	12N	12E	46	El Dorado	Comp. 280
9	12N	12E	23	El Dorado	Comp. 360
9	12N	12E	14	El Dorado	Comp. 370
9	12N	12E	27	El Dorado	Comp. 371
9&16	12N	12E	45	El Dorado	Comp. 420
16	12N	12E	13	El Dorado	Comp. 431
17	12N	12E	22	El Dorado	Comp. 470
17	12N	12E	21	El Dorado	Comp. 471
20	12N	12E	20	El Dorado	Comp. 530
20	12N	12E	17	El Dorado	Comp. 532
17&20	12N	12E	26	El Dorado	Comp. 540
20	12N	12E	8	El Dorado	Comp. 553

20	12N	12E	15	El Dorado	Comp. 560
20	12N	12E	4	El Dorado	Comp. 561
20	12N	12E	2	El Dorado	Comp. 563
21	12N	12E	41	El Dorado	Comp. 640
21	12N	12E	5	El Dorado	Comp. 653

TOTAL ACREAGE 808 (Logging Area Only)

USGS Quadrangles: Tunnel Hill and Slate Mountain, both photo revised 1973.

Planning Watershed: CALWATER Version, Identification Number, and Name:
Version 2.2 #5514.430401, Lower Pilot Creek
Version 2.2 #5514.320106, Gaddis Creek
Version 2.2 #5514.320202, Whaler Creek

Watershed	THP Acres by Watershed	Total Watershed Acres
Lower Pilot Creek	~576	9,819
Gaddis Creek	~194	8,685
Whaler Creek	~38	10,206

9. [ ] Yes [X] No Has a Timberland Conversion been submitted? If yes, list expected approval date or permit number and expiration date if already approved.

10. [ ] Yes [X] No Is there an approved Sustained Yield Plan for this property? Number _____ Date app. _____

[ ] Yes [X] No Has a Sustained Yield Plan been submitted but not approved? Number _____ Date sub. _____

11. [ ] Yes [X] No Is there a THP or NTMP on file with CDF for any portion of the plan area for which a Report of Satisfactory Stocking has not been issued by CDF?
If yes, identify the THP or NTMP number(s):

[ ] Yes [X] No Is there a contiguous even aged unit with regeneration less than five years old or less than five feet tall?
If yes, explain. Ref. Title 14 CCR 913.1 (933.1, 953.1) (a)(4).

12. [X] Yes [ ] No Is a Notice of Intent necessary for this THP?
[X] Yes [ ] No If yes, was the Notice of Intent posted as required by 14 CCR 1032.7 (g)?
The Notice of Intent was posted at Blodgett headquarters and the intersection of Blodgett Forest Road with Wentworth Springs Road. A copy and accompanying letter was also sent to all neighboring land owners and other organizations that have shown interest in the harvest activities at Blodgett Forest (See section V for copies of letters).

13. RPF preparing the THP: Name **Ken Somers** RPF Number **2381**

Address **4501 Blodgett Forest Road**

City **Georgetown** State **CA** Zip **95634** Phone **530-333-4475**

a. [X] Yes [ ] No I have notified the plan submitter(s), in writing, of their responsibilities pursuant to 14 CCR 1035 of the Forest Practice Rules.

[X] Yes [ ] No I have notified the timber owner and the timberland owner of their responsibilities for compliance with the Forest Practice Act and rules, specifically the stocking requirements of the rules and the maintenance of erosion control structures of the rules.

b. [X] Yes [ ] No I will provide the timber operator with a copy of the portions of the approved THP as listed in 14 CCR 1035 (f). If "no", who will provide the LTO a copy of the approved THP?

I will provide the LTO with a copy of Sections I and II of conformed THP as part of the LTO contract. I and/or my supervised designee will meet with the LTO prior to commencement of operations to advise of sensitive conditions and provisions of the plan pursuant to Title 14 CCR 1035.2

c. I have the following authority and responsibilities for preparation and administration of the THP and timber operation. (Include both work completed and work remaining to be done):

In addition to being retained to provide professional advice throughout the timber operation I have the following responsibilities: preparation and administration of the 2011 Timber Harvest Plan, preparing current and future plan amendments, silvicultural prescriptions, tree marking, flagging of watercourses and special treatment zones, site preparation, stocking and completion reports. I am also responsible for administration of timber sale and harvest contracts. Any or all of these duties may be transferred to another RPF working for the Center for Forestry. If such a transfer occurs, CDF will be notified in the form of a minor amendment to this THP along with a new RPF Responsibility Acknowledgement. The amendment will clearly state which responsibilities are being transferred.

d. Additional required work requiring an RPF, which I do not have the authority or responsibility to perform:

None

e. After considering the rules of the Board of Forestry and Fire Protection and the mitigation measures incorporated in this THP, I have determined that the timber operation:

[ ] will have a significant adverse impact on the environment. (Statement of reasons for overriding considerations contained in Section III).

[X] will not have a significant adverse impact on the environment.

Registered Professional Forester: I certify that I, or my supervised designee, personally inspected the THP area, and this plan complies with the Forest Practice Act, the Forest Practice Rules and the Professional Foresters Law. If this is a Modified THP, I also, certify that: 1) the conditions or facts stated in 14 CCR 1051 (a) (1) - (16) exist on the THP area at the time of submission, preparation, mitigation, and analysis of the THP and no identified potential significant effects remain undisclosed; and 2) I, or my supervised designee, will meet with the LTO at the THP site, before timber operations commence, to review and discuss the contents and implementation of the Modified THP.

Signature Ken Somer Date 3-31-11

NOTE: If a provision of this THP is proposed that is different than the standard rule, the explanation and justification should normally be included in Section III unless it is clearer and better understood as part of Section II.

14. a. Check the Silvicultural methods or treatments allowed by the rules that are to be applied under this THP. Specify the option chosen to demonstrate Maximum Sustained Production (MSP) according to 14 CCR 913 (933, 953) .11. If more than one method or treatment will be used show boundaries on map and list approximate acreage for each.

[X] Clearcutting 32 ac. [ ] Shelterwood Prep. Step _____ ac. [ ] Seed Tree Seed Step ____ ac.
[ ] Shelterwood Seed Step _____ ac. [ ] Seed Tree Removal Step ____ ac.
[X] Shelterwood Removal Step 18 ac.

[X] Selection 243 ac. [X] Group Selection 196 ac. [ ] Transition _____ ac.

[X] Commercial Thinning 319 ac. [ ] Road Right of Way_____ ac. [ ] Sanitation Salvage _____ ac,

[ ] Special Treatment Area_____ac. [ ] Rehab. of Understocked Area _____ ac. [ ] Fuelbreak _____ ac.

[ ] Alternative ___ac. [ ] Conversion _____ ac. [ ] Non-Timberland Area _____ac.

Total acreage 808 ac.: Explain if total is different from that in 8. MSP option chosen: (a) [ ] (b) [ ] (c) [X]

Blodgett Forest Research Station (ownership acreage ~ 4,270 acres) shall demonstrate MSP by meeting the requirements of "Option C," (CCR 953.11(c)). The standards for demonstrating MSP are given below (see Section III item 14 a. for details about current stand inventories, site information and silvicultural treatments):

ALL PROPOSED HARVEST AREAS ARE SITE CLASS I .

b. If Selection, Group Selection, Commercial Thinning, Sanitation Salvage or Alternative methods are selected the post harvest stocking levels (differentiated by site if applicable) must be stated. Note mapping requirements of 1034 (x) (12).

For all compartments to be treated with the silvicultural methods described below, the productivity classification is Site I. All the stands contain a mix of commercial conifer species typically found in the mid-slope, west side, central Sierra Nevada mixed conifer forest type. A report of stocking shall be filed within six months following completion of timber operations.

SINGLE TREE SELECTION (Compartments 70, 100, 160, 230, 470, 471 and 540):

Single tree selection will be implemented to keep the stands within the desired density management zone and to initiate the regeneration of a cohort of seedlings. In both compartments, stocking will be reduced to an average of 125 sq. ft. /acre, depending on local conditions of species dominance and proximity to releasable regeneration gaps. Additionally, the post-harvest density of >18" dbh trees will exceed the stocking requirements of the Seed Tree Seed Step 953.1(c)(1) 15 sq. ft. basal area, with no point within the logged area 150 ft. from a seed tree. In no case shall the average basal area stocking in any stand be reduced below 100 sq ft/ac where this stocking exists prior to start of operations except in designated <1/10 acre gaps specifically created to encourage regeneration of shade intolerant species. Each of the stands shall meet FPR stocking requirements (14 CCR 953.2 (a)(2)(A)(1)) for the selection silviculture method immediately upon completion of harvest operations.

GROUP SELECTION (Compartment 20, 40, 270 and 420):

All Group boundaries will be flagged with fluorescent Green "SILVICULTE BOUNDARY" flagging. All trees to be harvested within these boundaries will be marked with blue paint.

These compartments will receive a full group selection harvest which includes creation of new group openings and a thinning of the matrix stand. Approximately 8% to 15% of each of the 5 stands will be allocated to new group openings ranging in size from approximately 1/4 to 2 acres. Average group size is expected to be approximately 1 acre. All compartments will meet FPR stocking requirements immediately after completion of harvest operations. At least 80% of the stocked plots will meet the stocking standards of 953.2(a)(2)(A)(1) 100 sq. ft. / acre retained. Not more than 20% of the stocked plots may meet stocking standards of the 300 point count standard with trees that are at least 10 yrs. old. The residual stand will have sufficient trees of size, quality , and basal area to meet the requirements of the Seed Tree method 953.1(c)(1).

Although not required to meet future stocking requirements, the new group openings will be site prepared by grapple or tractor piling and the piles will subsequently be burned during the winter period following those operations. The groups will then be planted with mixed conifer species. Hardwoods will be allowed to sprout and will be kept in the groups at composition levels similar to those found in surrounding stands.

INTERMEDIATE TREATMENT-COMMERCIAL THIN (Compartments 151, 250, 251, 280, 360, 370, 371, 431, 532, 553, 560, 561, 563, 640 and 653)

These compartments shall meet or exceed stocking levels of 125 sq ft/ac in merchantable stems immediately upon completion of Operations. The thinning operation shall be a thin from below and will be primarily conducted in the small and medium size sawtimber classes. Average post-harvest stand diameter in merchantable stems shall be greater than the

current average merchantable stem stand diameter. Species composition of the post harvest stand will not be significantly different than the overstory species composition of the pre-harvest stand.

c. [ ] Yes [X] No Will evenage regeneration step units be larger than those specified in the rules (20 acres tractor, 30 acres cable)? If yes, provide substantial evidence that the THP contains measures to accomplish any of subsections (A) - (E) of 14 CCR 913 (933, 953) .1 (a) (2) in Section III of the THP. List below any instructions to the LTO necessary to meet (A) - (E) not found elsewhere in the THP. These units must be designated on map and listed by size.

d. Trees to be harvested or retained must be marked by or marked under the supervision of the RPF. Specify how the trees will be marked and whether harvested or retained.

All trees to be harvested shall be marked with a blue stripe on two sides of the tree. A blue stump mark shall be put at the base of the trees below the cut line. In the Group Selection compartments, in addition to marking all harvest trees in the regeneration openings, the opening boundaries shall be delineated with fluorescent green flagging printed with "SILVICULTURE BOUNDARY" in bold. Fallers will be instructed to fall all trees within groups in to the openings whenever possible to reduce residual damage to the surrounding stand. The boundary of compartment 90 (clearcut) will be marked by bright pink "TIMBER HARVEST BOUNDARY" flagging. All merchantable trees within this area will be felled. Compartment 530, the boundary between the proposed clearcut and the commercial thinning in compartment 532, will be identified with fluorescent green flagging printed with "SILVICULTURE BOUNDARY" in bold. All merchantable trees within the clearcut will be felled, In the commercial thinning all trees to be harvested will be marked with blue paint as described above.

[X] Yes [ ] No Is a waiver of marking by the RPF requirement requested? If yes, how will LTO determine which trees will be harvested or retained? If yes and more than one silvicultural method, or Group Selection is to be used, how will LTO determine boundaries of different methods or groups? For commercial thinning of plantations only (compartments 151, 280, 360, 370, 371, 431, 553, 560, 561, 563 and 640): a minimum of a 10% sample mark for each compartment shall be adequate due to their homogeneous structure and composition. More area will be marked, if necessary, at the discretion of the RPF. Boundaries are flagged with fluorescent pink "TIMBER HARVEST BOUNDARY" flagging. In the sample mark area all trees to be harvested shall be marked with a blue stripe on two sides of the tree. A blue stump mark shall be put at the base of the trees below the cut line. All trees to be harvested within WLPZs, EEZs or ELZs will be marked for harvest.
(SEE ITEM 38. (9) PAGE 28 FOR "SIMPLIFIED HARVEST TREE SELECTION GUIDELINES")

e. Forest products to be harvested: sawlogs, fuelwood, split products, poles and posts

f. [X] Yes [ ] No Are group B species proposed for management?
[X] Yes [ ] No Are group B or non-indigenous A species to be used to meet stocking standards?
[X] Yes [ ] No Will group B species need to be reduced to maintain relative site occupancy of A species?

If any answer is yes, list the species, describe treatment, and provide the LTO with necessary felling and slash treatment guidance. Explain who is responsible and what additional follow-up measures of manual treatment or herbicide treatment are to be expected to maintain relative site occupancy of A species. Explain when a licensed Pest Control Advisor shall be involved in this process.

GROUP B SPECIES MANAGEMENT

Pacific madrone (*Arbutus menziesii*), California black oak (*Quercus kelogii*), tanoak (*Lithocarpus densiflorus*), big-leaf maple (*Acer* macrophylum), and California dogwood (*Cornus nutallii*), along with minor components of other native hardwoods exist within the harvest areas at varying densities. All native hardwoods are managed to provide structural and compositional diversity for wildlife habitat and food, as well as future forest products. The component of group B species ranges from <5% to 30% in the various harvest units as measured by basal area of stems >4.5" DBH. Over 95% of this hardwood component are Group B species as defined in the FPR (Black Oak, Tanoak, and Madrone).

All Native species including Group B species are managed at Blodgett Forest. The objective of the management is to keep a sustainable population and composition of all species in the forest types associated with the forest. To this end, Group B species marked for harvest shall be treated similarly to Group A species. They shall be marked, felled, and skidded to a landing, where they shall be decked and sold by Blodgett Forest. Slash shall be treated in the same manner as Group A species. As with Group A species, harvest damage to retained Group B species shall be minimized during operations. In the proposed regenerating openings, group B species shall be managed in such a way as to encourage their future presence in the main canopy. In no case shall the relative site occupancy of Group B species be significantly increased as compared to the pre-harvest conditions. *Stocking will be met with group A species only, and may include Giant sequoia, a non-indigenous group A species.*

Relative site occupancy of group A species will be maintained through a program of integrated vegetation management. Control measures such as mechanical, hand, fire or grazing will be prescribed on a site specific basis by a Licensed Professional Forester on the Blodgett staff. When the use of herbicides is required as an option, the services of a Pest Control Advisor (PCA) will be required. The PCA will make a site specific written recommendation for the type of herbicide, rate, mixing instructions, application method, timing and safety precautions.

NON-INDIGENOUS GROUP A SPECIES MANAGEMENT

Giant sequoia (*Sequoiadendron giganteum*), a Group A species in the Southern district but that is not native in the harvest areas (but found in native stands both north and south of BFRS), may be planted within proposed group selection openings and clearcut openings as a part of a 6 species mix to provide future high quality forest products. Giant sequoia, where used, will be planted at <17% of the total mix of ~340 tpa and will not be necessary to meet initial stocking. However, over time as the stands are managed, it may be necessary to use it to meet basal area requirements. Young growth sequoia

has been shown to produce high value lumber and may be a suitable replacement or supplement to Sugar Pine whose frequency is being negatively impacted by white pine blister rust (see item #15 below). Wildlife research at Whitaker's Forest and in other native stands has shown that sequoia is a preferred species for many animals and its presence at Blodgett may enhance wildlife habitat and should in no way negatively impact future habitats. Blodgett Forest has also been at the forefront of research into the early establishment and growth of giant sequoia both for restoration of native groves and for possible commercial use, work that may have important implications for both managed and natural stands into the future.

See Section III for details about Group B and non-indigenous A species management.

g. Other instructions to LTO concerning felling operations.
The fallers and skidder machine operators shall be shown each harvest area prior to operations for that area. The instructions above plus site-specific measures for protecting resources shall be stated.
Seedlings within the regenerating openings previously harvested shall be protected by avoiding falling trees into the openings and by not skidding through the openings except where expressly approved by the RPF on a case by case basis.
Trees in proposed openings shall be clear-felled into the opening whenever possible to avoid damage to the surrounding stand. Skid trails shall be located along opening boundaries unless unavoidable.

h. [X] Yes [ ] No Will artificial regeneration be required to meet stocking standards?
The clearcuts in compartment 90 and 530 will require artificial regeneration. The new openings in the group selection compartments (20, 40, 270 and 420) shall also be planted, although it will not be required to meet stocking standards. All these areas shall be planted with approximately 340 seedlings/acre in order to have well stocked regeneration areas with an appropriate mix of species. Some or all of the following species will be planted: Douglas-fir, incense cedar, ponderosa pine, sugar pine, white fir and giant sequoia. Blodgett policy is to replant an evenly distributed 5 to 6 species mix when possible. Stump sprouts of group B species will be encouraged to grow, they shall not be counted for meeting stocking standards in the planted areas.

i. [X] Yes [ ] No Will site preparation be used to meet stocking standards? If yes, provide the information required for a site preparation addendum, as per 14 CCR 915.4 (935.4, 955.4). There will be clearcuts in compartments 90 and 530. Additionally, site preparation shall be used in the new group openings in 20, 40 and 420; however, it will not be required to meet stocking standards. See the site preparation addendum below.

j. If the rehabilitation method is chosen provide a regeneration plan as required by 14 CCR 913 (933, 953) .4 (b).

SITE PREPARATION ADDENDUM

a. Indicate whether site preparation will be required to meet stocking.
The clearcut areas proposed in 90 and 530, site preparation will be required to meet stocking. Although not required, mechanical site preparation may also be used to facilitate planting and to reduce fuel loading in any new group openings and to aid in regeneration.

b. Describe the general methods of site preparation to be used.
The general site preparation sequence is as follows:

1. If necessary to facilitate piling, cut and leave all non-merchantable live trees that do not have potential for vigorous growth. Growth potential is indicated by live crown ratio and signs of damage and disease.
2. Machine pile logging slash with a grapple equipped excavator or brush rake equipped tractor.
3. Notify local representative of the Director in advance of time and place of any burning (957.6).
4. Burn the piles under the prescriptions of a smoke management plan and inter-agency burn project type permit.

Specifically, a track-laying excavator with a grapple head or tractor with brush rake will be used where slopes average less than 30% and erosion hazard ratings are moderate or low (there is no high EHR on this plan). Logging slash will be gathered into dome-shaped piles. The operator's objectives will be to minimize the amount of dirt and fine material in the piles so that, when burned, output of particulate matter (PM10) is minimized. Large woody debris (greater than 20" diameter) shall be retained and realigned parallel to the contours, where feasible. Snags greater than 16" dbh and 20 ft. in height shall be retained unless they are a hazard to the operations or are within their height of a haul road or ridge top. Site preparation shall be conducted with the goal of leaving as much of the duff and litter layer intact as is feasible. Undisturbed areas or energy dissipators shall be used to control and disperse concentrated runoff from roads, landings tractor roads, firebreaks and erosion control facilities where it flows into site preparation areas - 955.1 (d). Where slopes average greater than 30% broadcast burning may be used or these areas will be planted through as they are.

c. Types of equipment to be used:
Either chain saws or a tracked excavator with a masticating head shall be used to clear non-merchantable low vigor trees. A tracked excavator with a grapple head or tractors equipped with brush rakes shall be used to gather slash into piles to be burned.

d. Methods for protecting desirable residual trees:
Snags >16in. dbh and >20ft. and trees greater than 2" dbh with good to excellent vigor that were left behind after the first step of the site preparation will be protected as much as is feasible by instruction to the equipment operator. Piles to be burned shall be located away from snags, desired advanced regeneration, and surrounding trees bordering the clearcut and group selection openings.

e. Explanations and justifications for exceptions or alternatives:
No exceptions or alternatives are proposed.

f. Maps identifying the areas to be site prepared:
See Section II compartment maps and the THP map showing Clearcut and Group Selection compartments.

g. Person responsible for site preparation:
The LTO is unknown at this time.

h. Timing of site preparation operations:
No mechanical operations will take place during the winter period.

The use of heavy equipment for site preparation shall comply with provisions set forth in 14CCR 954.2 and 955.1
No mechanical operations will take place under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III, or IV waters; that violate Water Quality Requirements; or when it cannot operate under its own power.

For timing of pile burning see Section III item 14 h., 30a. and 31(7). Slash Pile Burning

PESTS

15. a. [ ] Yes [X] No Is this THP within an area that the Board of Forestry and Fire Protection has declared a Zone of Infestation or Infection, pursuant to PRC 4712 - 4718? If yes, identify feasible measures being taken to mitigate adverse infestation or infection impacts from the timber operation. See 14 CCR 917 (937, 957) .9 (a).

b. [ ] Yes [X] No If outside a declared zone, are there any insect, disease or pest problems of significance in the THP area? If yes, describe the proposed measures to improve the health, vigor, and productivity of the stand(s).

Insect- and pathogen-related mortality levels are relatively low throughout the harvest areas. As part of Blodgett Forest's integrative pest management approach, the harvests are designed to promote vigorous growth of retained trees, thereby decreasing the long-term risk of significant insect and pathogen outbreaks in the future. The following specific actions shall be carried out to reduce future risk of insect and pathogen outbreaks:

1. **Concentrations of logging slash shall be piled and burned to reduce brood material for bark beetles.**
2. **White pine blister rust (*Cronartium ribicola*) is a major exotic pathogen that can cause > 90% mortality in non-resistant young sugar pine and will likely influence the long-term dynamics of species populations at Blodgett Forest. A genetic management program is in place to reduce the long-term impact of the disease. Seeds collected from known single-gene resistant dominant overstory trees on Blodgett Forest are used to germinate resistant seedlings that are planted. About half of the sugar pine seedlings planted in proposed regeneration openings will be resistant. Blodgett is also involved in a research project testing the effect of influencing infection rates with cultural treatments. Specifically, pruned trees have been paired with non-pruned trees to track possible differences in infection rates over time.**
3. **Trees in all partial cut units (commercial thinning, selection, matrix of group selection) will be marked in a hierarchical manner in which lower vigor trees, disease infected trees, and damaged trees will be cut before higher vigor trees and healthy releasable trees. See Marking Guidelines in Section III.**

HARVESTING PRACTICES

16. Indicate type of yarding system and equipment to be used:

GROUND BASED*	CABLE	SPECIAL
a. [X] Tractor, including end/long lining	d. [ ] Cable, ground lead g.	g. [ ] Animal
b. [X] Rubber tired skidder, Forwarder	e. [ ] Cable, high lead	h. [ ] Helicopter
c. [X] Feller buncher	f. [ ] Cable, Skyline	i. [ ] Other

* All tractor operations restrictions apply to ground based equipment.

17. Erosion Hazard Rating: Indicate Erosion Hazard Ratings present on THP. (Must match EHR worksheets)

* [X] Low [X] Moderate [ ] High [ ] Extreme
If more than one rating is checked, areas must be delineated on map down to 20 acres in size (10 acres for high and Extreme EHRs in the Coast District). *** Compartment 250 & 431 are calculated as Low EHR but will be treated as Moderate.**

18. Soil Stabilization: In addition to the standard waterbreak requirements describe soil stabilization measures or additional erosion control measures to be implemented and the location of their application. See requirements of 14 CCR 916.7 (936.7, 956.7), and 923.2 (943.2, 963.2) (m), and 923.5 (943.5, 963.5) (f).

Erosion control measures shall be carried out upon completion of harvest operations in each compartment and prior to October 15th except that such bare areas created after October 15th shall be so treated within 10 days. After harvest, each compartment shall be assessed for areas where soil is exposed or where potential for sediment transport is high. In ELZ and WLPZ areas, newly exposed soil surfaces greater than 800ft² (inside WLPZs and ELZs), including approaches to watercourse crossings, shall be treated (14 CCR956.7). Roadsides and landings shall be assessed for exposed (>20 ft lineal distance) sidecast and fill that has potential to deliver sediment to a watercourse. Treatment measures shall include spreading of straw mulch 1-3" deep across >90% of the exposed areas. Straw mulch shall be certified to be free of exotic seeds. Clearcuts and Group selection openings shall be assessed for erosion potential. If the combinations of 1) proximity to a watercourse, 2) degree of slope, and 3) bare soil exposure cumulate to pose a risk of soil transport to any class watercourse the site preparation methods described above will be modified in the form of leaving more ground cover.

After harvest, all landings shall be assessed for debris accumulations, potential for water accumulation, and exposed sidecast or fill that extends >20' lineal distance which has access to a watercourse that will require erosion control treatment(14 CCR 963.5). All landings are on less than 40% slopes (most on <25%). Any obstructed ditches and culverts will be cleaned. No landing in this plan is within a WLPZ. A small portion of one existing landing in compartment 160 is inside a Class III ELZ . A brow log will be placed on the stream side of one skid trail approach to this landing. This has been proven successful in past operations in keeping soil or slash from entering the Class III. If any slash or soil enters the Class III it will be removed from the channel and stabilized at the end of operations in compartment 160. All landings will be properly drained to prevent sediment delivery to a classified watercourse. Debris shall be piled for burning, and exposed areas shall be treated with straw mulch, as described above.

Water bar spacing on all skid trails shall conform to the rule requirements for Moderate HER *(Trail Gradient <10%-200ft., 11-25%-150ft., 26-50%100ft., no operations on slopes >50%.)* . All roads are visually inspected at least annually and recent haul roads are inspected more frequently. Any areas of concern are noted and repairs, if necessary, are carried out as soon as feasible. See the BFRS Roads Report in Section V for additional information.

All other applicable requirements of 14 CCR 956.7, 963.2, and 963.5 not specifically addressed above shall be met prior to October 15 during each year that operations occur under this plan.

19. [ ] Yes [X] No Are tractor or skidder constructed layouts to be used? If yes, specify the location and extent of use:

20. [ ] Yes [X] No Will ground based equipment be used within the area(s) designated for cable yarding? If yes, specify the location and for what purpose the equipment will be used. See 14 CCR 914.3 (934.3, 954.3) (e).

21. Within the THP area will ground based equipment be used on:

a. [ ] Yes [X] No Unstable soils or slide areas? Only allowed if unavoidable.
b. [ ] Yes [X] No Slopes over 65%?
c. [ ] Yes [X] No Slopes over 50% with high or extreme EHR?
d. [ ] Yes [X] No Slopes between 50% and 65% with moderate EHR where heavy equipment use will not be restricted to the limits described in 14 CCR 914 (934, 954) .2 (f) (2) (i) or (ii)?
e. [ ] Yes [X] No Slopes over 50% which lead without flattening to sufficiently dissipate water flow and trap sediment before it reaches a watercourse or lake?

If a. is yes, provide site specific measures to minimize effect of operations on slope stability below. Provide explanation and justification in section III as required per 14 CCR 914 (934, 954) .2 (d). CDF requests the RPF consider flagging tractor road locations if "a." is yes.

If b., c., d. or e. is yes:

1) the location of tractor roads must be flagged on the ground prior to the PHI or start of operations if a PHI is not required, and
2) you must clearly explain the proposed exception and justify why the standard rule is not feasible or would not comply with 14 CCR 914 (934, 954).

The location of heavy equipment operation on unstable areas or any use beyond the limitations of the standard rules must be shown on the map. List specific instructions to the LTO below.

22. [ ] Yes [X] No Are any alternative practices to the standard harvesting or erosion control rules proposed for this plan? If yes, provide all the information as required by 14 CCR 914 (934, 954) .9 in Section III. List specific instructions to the LTO below

WINTER OPERATIONS

23. a. [ ] Yes [X] No Will timber operations occur during the winter period? If yes, complete "b, c, or d." State in space provided if exempt because yarding method will be cable, helicopter, or balloon.
b. [ ] Yes [X] No Will mechanical site preparation be conducted during the winter period? If yes, complete "d".
c. [ ] I choose the in-lieu option as allowed in 14 CCR 914 (934, 954) .7 (c). Specify below the procedures listed in subsections (1) and (2), and list the site specific measures for operations in the WLPZ and unstable areas as required by subsection (3), if there will be no winter operations in these areas, so state.

d. [ ] I choose to prepare a winter operating plan per 14 CCR 914 (934, 954) .7 (b).

NOTE: "Winter period" means the period between November 15 and April 1, except as noted under special County Rules at

Title 14 CCR 925.1, 926.18, 927.1, and 965.5... (a) except as otherwise provided in the rules: (1) All waterbreaks shall be installed no later than the beginning of the winter period of the current year of timber operations. (2) Installation of drainage facilities and structures is required from October 15 to November 15 and
April 1 to May 1 on all constructed skid trails and tractor roads prior to sunset if the National Weather Service forecast is a "chance" (30% or more) of rain within the next 24 hours.

ROADS AND LANDINGS

24. Will any roads be constructed? [ ] Yes [X] No, or reconstructed? [ ] Yes [X] No. If yes, check items "a." through "g." Will any landings be constructed? [X] Yes [ ] No, or reconstructed? [X] Yes [ ] No. If yes, check items "h." through "k."

a. [ ] Yes [ ] No Will new or reconstructed roads be wider than single lane with turnouts?
b. [ ] Yes [ ] No Are logging roads proposed in areas of unstable soils or known slide-prone areas?
c. [ ] Yes [ ] No Will new roads exceed a grade of 15% or have pitches of up to 20% for distances greater than 500 feet? Map must identify any new or reconstructed road segments that exceed an average 15% grade for over 200 feet.
d. [ ] Yes [ ] No Are roads to be constructed or reconstructed, other than crossings, within the WLPZ of a watercourse? If yes, completion of THP Item 27 a. will satisfy required documentation.
e. [ ] Yes [ ] No Will roads be located across more than 100 feet of lineal distance on slopes over 65%, or on slopes over 50% which are within 100 feet of the boundary of a WLPZ?
f. [ ] Yes [ ] No Will any roads or watercourse crossings be abandoned?
g. [ ] Yes [ ] No Are exceptions proposed for flagging or otherwise identifying the location or roads to be constructed?
h. [ ] Yes [X] No Will any landings exceed one half acre in size? If any landing exceeds one quarter acre in size or requires substantial excavation the location must be shown on the map.
i. [ ] Yes [X] No Are any landings proposed in areas of unstable soils or known slide prone areas?
j. [ ] Yes [X] No Will any landings be located on slopes over 65% or on slopes over 50% which are within 100 feet of the boundary of a WLPZ?
k. [ ] Yes [X] No Will any landings be abandoned?

No landing construction or reconstruction (or road use for log hauling from October 15 to May 1) shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III, or IV waters or that violate Water Quality Requirements.

25. If any section in "item 24" above is answered yes, specify site-specific measures to reduce adverse impacts and list any additional or special information needed by the LTO concerning the construction, maintenance, and/or abandonment of roads or landings, as required by 14 CCR Article 12. Include required explanation and justification in THP Section III.

WATERCOURSE AND LAKE PROTECTION ZONE (WLPZ) AND DOMESTIC WATER SUPPLY PROTECTION MEASURES

26. a. [X] Yes [ ] No Are there any watercourse or lakes which contain Class I through IV waters on or adjacent to the plan area? If yes, list the class, WLPZ or ELZ width, and protective measures determined from Table I and/or 14 CCR 916 (936, 956) .4 (c) of the WLPZ rules for each watercourse. Specify if Class III or IV watercourses have WLPZ, ELZ or both.

All watercourses in this plan have WLPZ or ELZ widths and measures that are equal to or greater than the protection measures required by the Forest Practice Rules. The additional width or protection measures are Blodgett Forest policy and are intended to assure protection to the beneficial uses of water from these watercourses. All watercourses and pipelines are shown in detail on the compartment maps contained at the end of this section (Section II: Operations Plan).Locations of class I- III are shown on the THP map. There are no class IV watercourses on this THP. All protection zones shall be marked on the ground to the standards below. The location of Blodgett Forest distribution pipelines in compartment 250 will be flagged, if necessary, to prevent damage during timber operations. A preoperational meeting with the LTO will cover pipelines location and protection.

Slope Class (%)	*Standard Class*	*Comments*	*Standard width*	*THP width*	*FP Rules Standard*	*THP Measures*	*Protection Zone Type*
<30	IIIp		NONE	25 ft	NONE	CEH	ELZ
30-50	IIIp		NONE	25 -50 ft	NONE	CEH	ELZ
<30	III	*956.4(c)(1)	*25 ft	25 ft	CFH	CEH	ELZ
30-50	III	Moderate EHR	*50 ft	50 ft	CFH	CEH	ELZ
<30	II		50 ft	50 - 75 ft	BEI	BEG	WLPZ
30-50	II		75 ft	75 -100 ft	BEI	BEG	WLPZ
<30	I	and domestic water for	75 ft	75 -100 ft	BDG	BDG	WLPZ
30-50	I	Blodgett Forest	100 ft	100-150 ft	BDG	BDG	WLPZ

See Item 38(5) for protection of water pipelines.
No tractor operations will be allowed on a slope class > 50%.

Class IIIp "watercourses" listed above include draws that have no continuous defined bed/bank characteristics, nor evidence of current sediment transport. These draws are included as class IIIp where there is potential for a sediment-transporting watercourse to develop as a result of extreme disturbance and significant decreases in evaporation/transpiration, such as might occur after complete vegetation removal and heavy site preparation. The protection

measures are an effort to prevent a classified watercourse from developing after the harvest. As a manner of practice on Blodgett Forest, these draws are protected to the same degree as class III watercourses.

Besides the protective measures listed below, entry with heavy equipment into ELZ's shall be minimized by flagging dry crossings as needed. The RPF shall flag the designated crossings and show the LTO their locations. In our experience, entries are required less than once per 300 feet of length for Class III watercourses.

The alphabetical letter designations listed in the table above correspond to the protective measures described in the Forest Practice Rules 956.5(e). The descriptions below reiterate the protective measures and are followed by specific measures to be taken in this THP.

"**A**" WLPZ shall be clearly identified on the ground by the RPF who prepared the plan, or supervised designee, with paint, flagging, or other suitable means prior to preharvest inspection. For nonindustrial timber management plans, sample identification of the WLPZ prior to the preharvest inspection may be allowed. The sample shall be based upon a field examination and be consistent with the applicable provisions of 14CCR 956.4 and 956.5representing the range of conditions found within the WLPZ. The Director shall determine if the sample identification is adequate for plan evaluation during the preharvest inspection. If sample identification is allowed, the remaining WLPZ shall be identified by an RPF or supervised designee prior to the start of timber operations within or adjacent to the WLPZ. The RPF shall notify the Department when the WLPZ has been identified. **Blue-and-white flagging with the words "Watercourse and Lake Protection Zone" shall be used to delineate the protection zone before preharvest inspection.**

"**B**" WLPZ shall be clearly identified on the ground by an RPF, or supervised designee, with paint, flagging, or other suitable means, prior to start of timber operations. In watersheds with threatened or impaired values, on the ground identification of the WLPZ shall be completed prior to the preharvest inspection. For all nonindustrial timber management plans, sample identification of the WLPZ prior to the preharvest inspection may be allowed. The sample shall be based upon a field examination and be consistent with the applicable provisions of 14 CCR 956.4 and 956.5, representing the range of conditions found within the WLPZ. The Director shall determine if the sample identification is adequate for plan evaluation during the preharvest inspection. If sample identification is allowed, the remaining WLPZ shall be identified by an RPF or supervised designee prior to the start of timber operations within or adjacent to the WLPZ. The RPF shall notify the Department when the WLPZ has been identified. **Blue-and-white flagging with the words "Watercourse and Lake Protection Zone" shall be used to delineate the protection zone for Class I and II watercourses prior to start of timber operations. Blue-and-white flagging without words shall be used to delineate the protection zone for Class III, IIIp and IV watercourses prior to start of timber operations.**

"**C**" In site-specific cases, the RPF may provide in the plan, or the Director may require, that the WLPZ be clearly identified on the ground with flagging or by other suitable means prior to the start of timber operations.

"**D**" To ensure retention of shade canopy filter strip properties of the WLPZ and the maintenance of a multi-storied stand for protection values described in 14CCR 956.4(b), residual or harvest trees shall be marked, including a base mark below the cut-line within the WLPS by the RPF, or supervised designee. Outside of watersheds with threatened or impaired values, sample marking prior to the preharvest inspection is satisfactory in those cases where the Director determines it is adequate for plan evaluation. When sample marking has been used, the remaining WLPS shall be marked in advance of falling operations by the RPF, or supervised designee. In watershed with threatened or impaired values, trees shall be marked in advance of the preharvest inspection. For all nonindustrial timber management plans, sample marking of the WLPZ prior to the preharvest inspection may be allowed. The sample shall be based upon a field examination and shall be consistent with the applicable provisions of 14 CCR 956.4 and 956.5, representing the range of conditions found within the WLPZ. The Director shall determine if the sample mark is adequate for plan evaluation during the preharvest inspection. If sample marking is allowed, the remaining WLPZ shall be marked by an RPF, or supervised designee, prior the start of timber operations within or adjacent to the WLPZ. The RPF shall notify the Department when the WLPZ has been identified. **Prior to preharvest inspection, a sample mark of trees within the WLPZ to be harvested shall be done. Trees shall be marked at approximately breast height with a horizontal blue mark on two sides. A blue base mark below the cut line shall also be placed on trees to be harvested. All marking shall be done in advance of falling operations in the WLPZ.**

"**E**" To ensure retention of shade canopy filter strip properties of the WLPZ and the maintenance of a multistoried stand for protection of values described in 14 CCR 956.4(b), residual or harvest trees shall be marked, including a base mark below the cut-line within the WLPZ by the RPF, or supervised designee. Outside of watersheds with threatened or impaired values, tree marking shall be done prior to timber falling operations. In watersheds with threatened or impaired values, trees shall be marked in advance of the preharvest inspection. For all nonindustrial timber management plans, sample marking of the WLPZ prior to the preharvest inspection may be allowed. The sample shall be based upon a field examination and shall be consistent with the applicable provisions of 14 CCR 956.4 and 956.5, representing the range of conditions found within the WLPZ. The Director shall determine if the sample mark is adequate for plan evaluation during the preharvest inspection. If sample marking is allowed, the remaining WLPZ shall be marked by an RPF, or supervised designee, prior to the start of timber operations within or adjacent to the WLPZ. The RPF shall notify the Department when the WLPZ has been identified. **All trees to be cut within the WLPZ/ELZ shall be marked prior to timber falling operations. Trees shall be marked at approximately breast height with a horizontal blue mark on two sides. A blue base mark below the cut line shall also be placed on trees to be harvested.**

"**F**" Residual or harvest tree marking within the WLPZ may be stipulated in the THP by the RPF or required by the Director in site-specific cases to ensure retention of filter strip properties or to maintain soil stability of the zone. The RPF shall state in the THP if marking was used in these zones.

"**G**" To protect water temperature, filter strip properties, upslope stability, and fish and wildlife values, at least 50% of the overstory and 50% of the understory canopy covering the ground and adjacent waters shall be left in a well distributed multi-storied stand composed of a diversity of species similar to that found before the start of operations. The residual

overstory canopy shall be composed of at least 25% of the existing overstory conifers. Species composition may be adjusted consistent with the above standard to meet on-site conditions when agreed to in the THP by the RPF and the Director.

"H" At least 50% of the understory vegetation present before timber operations shall be left living and well distributed within the WLPZ to maintain soil stability. This percentage may be adjusted to meet on-site conditions when agreed to in the THP by the RPF and the Director. Unless required by the Director, this shall not be construed to prohibit broadcast burning with a project type burning permit for site preparation.

WATERCOURSE FIELD EXAMINATION

All Class I watercourses on the forest have had stream surveys conducted by a hydrologist, RPF, and/or a supervised designee of the RPF in one or more of the years from 1994 to 2003. These inventories produced quantitative assessments of in-stream structure including pool sedimentation (V* method), size and distribution of large, woody debris, detailed maps of stream channel segments (10%), estimates of canopy closure over the stream, water quality samples including: pH, temperature, total N, total P, coliform, turbidity and major sediment sources. Remeasurements of permanent plots are beginning to produce time series of the conditions of watercourses as they have been potentially influenced by forest management and other environmental factors. Any qualitative statements are made by comparing the conditions in these watercourses to the conditions of similar watercourses that the RPF's working at Blodgett Forest have observed in similar areas of the Sierra Nevada including watercourses that were observed while with hydrologists here at Blodgett Forest as well as elsewhere in the region. A complete description of these watersheds and a map of their locations are included in Section IV: Cumulative Effects.

b. [X] Yes [ ] No Are there any watercourse crossings that require mapping per 14 CCR 1034 (x) (7)?

See the "Appurtenant Roads and Existing Stream Crossing Culverts for 2011 THP" map at the end of this section.

c. [ ] Yes [X] No Will tractor road watercourse crossings involve the use of a culvert? If yes state minimum diameter and length for each culvert (may be shown on map).

d. [ ] Yes [X] No Is this THP Review Process to be used to meet Department of Fish and Game CEQA review requirements? If yes, attach the 1603 Addendum below or at the end of this Section II; provide the background information and analysis in Section III; list instructions for LTO below for the installation, protection measures, and mitigation measures; as per THP Form Instructions or CDF Mass Mailing, 07/02/1999, "Fish and Game Code 1603 Agreements and THP Documentation".

27. Are site specific practices proposed in-lieu of the following standard WLPZ practices?

a. [ ] Yes [X] No Prohibition of the construction or reconstruction of roads, construction or use of tractor roads or landings in Class I, II, III, or IV watercourses, WLPZs, marshes, wet meadows, and other wet areas except as follows:

(1) At prepared tractor road crossings.
(2) Crossings of Class III watercourses which are dry at time of timber operations.
(3) At existing road crossings.
(4) At new tractor and road crossings approved by Department of Fish and Game.

A small portion of one existing landing in compartment 160 is inside a Class III ELZ . A brow log will be placed on the stream side of one skid trail approach to this landing. This has been proven successful in past operations in keeping soil or slash from entering the Class III. If any slash or soil enters the Class III, it will be removed from the channel and stabilized at the end of operations in compartment 160. The landing and identified skid trail are not in the Class III watercourse.

b. [ ] Yes [X] No Retention of non-commercial vegetation bordering and covering meadows and wet areas?
c. [ ] Yes [X] No Directional felling of trees within the WLPZ away from the watercourse or lake?
d. [ ] Yes [X] No Decrease of width(s) of the WLPZ(s)?
e. [ ] Yes [X] No Protection of watercourses which conduct class IV waters?
f. [ ] Yes [X] No Exclusion of heavy equipment from the WLPZ except as follows:

(1) . At prepared tractor road crossings.
(2) Crossings of Class III watercourses which are dry at time of timber operations.
(3) At existing road crossings.
(4) At new tractor and road crossings approved by Department of Fish and Game.

g. [ ] Yes [X] No Establishment of ELZ for Class III watercourses unless sideslopes are <30% and EHR is low?
h. [ ] Yes [X] No Retention of at least 50% of the overstory canopy in the WLPZ?
i. [ ] Yes [X] No Retention of at least 50% of the understory in the WLPZ?
j. [ ] Yes [X] No Are any additional in-lieu or any alternative practices proposed for watercourse or lake protection?

NOTE: A yes answer to any of items "a." through "j." constitutes an in-lieu practice. If any item is answered yes, refer to 14 CCR 916 (936, 956).1 and address the following for each item checked yes:

1. The RPF shall state the standard rule;
2. Explain and describe each proposed practice;
3. Explain how the proposed practice differs from the standard practice;
4. The specific location where it shall be applied, see map requirements of 14 CCR 1034 (x) (15) and (16);

5. Provide in THP Section III an explanation and justification as to how the protection provided is equal to the standard rule and provides for the protection of the beneficial uses of water, as per 14 CCR 916 (936, 956) .1 (a). Reference the in-lieu and location to the specific watercourse to which it will be applied.

28. a. [X] Yes [ ] No Are there any landowners within 1000 feet downstream of the THP boundary whose ownership adjoins or includes a class I, II, or IV watercourse(s) which receives surface drainage from the proposed timber operations? If yes, the requirements of 14 CCR 1032.10 apply. Proof of notice by letter and newspaper should be included in THP Section V. If No, "28 b." need not be answered **(Section V item 28 a. Proof of notice by newspaper and letters).**

b. [ ] Yes [X] No Is an exemption requested of the notification requirements of 14 CCR 1032.10? If yes, an explanation and justification for the exemption must appear in THP Section III. Specify if requesting an exemption from the letter, the newspaper notice or both.

c. [ ] Yes [X] No Was any information received on domestic water supplies that required additional mitigation beyond that required by standard Watercourse and Lake Protection rules? If yes, list site specific measures to be implemented by the LTO.
A response from the Davis Trust, an adjacent landowner, is included in Section V item 28 c. They confirm that their domestic water will be unaffected by the proposed operations.

29. [ ] Yes [X] No Is any part of the THP area within a Sensitive Watershed as designated by the Board of Forestry and Fire Protection? If yes, identify the watershed and list any special rules, operating procedures or mitigation that will be used to protect the resources identified at risk?

HAZARD REDUCTION

30. a. [X] Yes [ ] No Are there roads or improvements which require slash treatment adjacent to them? If yes, specify the type of improvement, treatment distance, and treatment method.
There are no exceptions to 14CCR 957.2(a) for public roads and structures maintained for human habitation.

Wentworth Springs Rd. is a public roads. Slash within 100 feet of the edge of the travel surface of public road shall be treated by lopping *(severing limbs from the exposed sides of the unutilized portions of trees so that portions of the severed limbs are in contact with the ground and severing and spreading slash so that no part of it generally remains more than 30 inches above the ground except where a specific rule provides another standard)*, and or piling and burning (see Section III item 30a. and 31(6) for additional information on timing), chipping, burying or removal from the zone.
All permanent *(and seasonal – Southern)* private roads are behind locked gates with signs requiring permission for the public to pass.

Blodgett Forest Research Station permanent structures in compartment 250 All woody debris created by timber operations greater than one inch but less than eight inches in diameter within 100 feet of permanently located structures maintained for human habitation shall be removed or piled and burned; all slash created between 100-200 feet of permanently located structures maintained for human habitation shall be lopped for fire hazard reduction, removed, chipped or piled and burned.

b. [ ] Yes [X] No Are any alternatives to the rules for slash treatment along roads and within 200 feet of structures requested? If yes, RPF must explain and justify how alternative provides equal fire protection. Include a description of the alternative and where it will be utilized below.

31. [X] Yes [ ] No Will piling and burning be used for hazard reduction? See 14 CCR 917.1-.11, 937.1-.10, or 957.1-.10, for specific requirements. Note: LTO is responsible for slash disposal. This responsibility cannot be transferred.
RPF shall notify department when timber operations LTO (to be determined) has completed the requirements described in item 30 above. If additional hazard reduction work in the form of piling and burning is deemed necessary by the RPF, the responsibility for completion of piling slash in the group selection openings and within road side fuel abatement zones and subsequent burning of all slash will be that of LTO #C-10643 Blodgett Forest.

HAZARD REDUCTION SUMMARY:
The General Hazard Reduction Rules as stated under 14 CCR 957 through 957.9 will be followed for this THP:
1) **All slash treatments described in item 30 will be completed.**
2) **All lopping will occur concurrent with active timber operations.**
3) **Piles and concentrations shall be sufficiently free of soil and other noncombustible materials for effective burning.**
4) **All piles will be constructed a sufficient distance away from snags, live trees, or other resource elements that are to be protected to prevent scorching or destruction of those elements.**
5) **All burn piles will be surrounded by an individual fire line except piles in even-aged regeneration units or within group selection openings where a compartment boundary or group boundary fire line may be established instead.**
6) **No burning will be done until after the first significant rains following operations and will be accomplished under a project level smoke management plan approved by El Dorado County AQMD and under a burn permit issued by the USFS Georgetown Ranger District (the local responsible fire agency). Burning will only occur on AQMD authorized burn days**

or under an exception granted by AQMD. AQMD, USFS and the local representative of the Director shall be notified in advance of any burning of logging slash (see Section III item 30a. and 31(6) for additional information on timing).

Please see Section III Item #31 for current average fuel loading by management type on BFRS

BIOLOGICAL AND CULTURAL RESOURCES

32. a. [X] Yes [ ] No Are any plant or animal species, including their habitat, which are listed as rare, threatened or endangered under federal or state law, or a sensitive species by the Board, associated with the THP area? If yes, identify the species and the provisions to be taken for the protection of the species.

NOTE: See THP Form Instructions or the CDF Mass Mailing, 07/02/1999, section on "CDF Guidelines for Species Surveys and Mitigations" to complete these questions.

To evaluate the potential for projects on Blodgett Forest to impact species, a process similar to the scoping/survey/mitigation procedure recommended by CDF is followed:

1. Scoping- Information on the potential existence of agency-listed species at Blodgett is gathered from annual searches of listed-species databases (most commonly CNDDB and CNPS), visual surveys, extensive wildlife identification/habitat surveys, and interactions with professional/academic wildlife biologists. The continually updated Blodgett species list is cross-checked with listed-species databases.
2. Survey- Systematic surveys have been conducted at Blodgett since 1977 designed to monitor the effect of management practices on wildlife populations. The sampling procedure has multiple components: 1) breeding bird survey (visual and acoustic observation), 2) small mammal survey (live traps, mark and re-capture), 3) large mammal survey (infrared camera bait traps), 4) amphibian and reptile survey (live traps) and time/area searches, and 5) complete multi-season vegetation survey (See Battles et al. 2001, Section V).

   Besides systematic surveys, specific surveys for California Spotted Owl, Northern Goshawk, California Red-Legged Frog, Yellow-Legged Frog, and winter songbird use, have been carried out to track these species.
3. Mitigation development- A hierarchical mitigation approach is used where, as a general goal, biodiversity is conserved by providing a variety of forest structures station wide, including late seral stage conditions. Timing of operations to minimize seasonal impacts (nesting, breeding, and fledging) of specifically identified species near or in actual harvest areas is also employed. Section III has additional detail regarding biological resources at Blodgett.

NOTE: CAL FIRE and the Department of Fish and Game will be notified whenever a state or federal listed plant or animal species is found in an active harvest plan area. Operations will be suspended in the immediate area *(see item 38 for specific restrictions and initial buffers)* until appropriate mitigation measures can be developed and put in place.

Below is specific justification for assessment of impacts on the listed species determined to be of potential concern in the THP area.

NORTHERN GOSHAWK INFORMATION SUMMARY

The University of Minnesota biologists have completed Northern Goshawk (NG) surveys in 2008. The surveys were conducted on and near the plan area where suitable NG habitat exists. Their report can be found in section V. There have been no responses or NG located.

A 2-year NG survey was conducted at Blodgett Forest in 2003 and 2004 via dawn acoustical surveys and broadcast acoustical surveys in areas with suitable nesting habitat (see Section III item 32 for details). An audible and visual detection of a NG occurred in 2003 in Compartment 292 near the Bacchi Barn south of Wentworth Springs Road (see map in Section III). No visual or aural detections were made in 2004. Although a possible nest was found in 2003, there was no evidence of young.

Most of Compartment 292 (133 acres) is suitable habitat for NG (comp. 292's designation is "ecological reserve," i.e. no harvesting). If a NG nest is found in or near any harvest area at Blodgett Forest the mitigations described in item 38. (7)b will be followed.

The USDA Forest Service has located a nest site (last active in 1994) approximately 1/2 mile south of the southern boundary of Blodgett Forest. There has been no NG nesting at this site since then. No NG nest has been located in this part of Blodgett Forest since the mid 1980s. As of January 2011, the Georgetown Ranger District did not have any NG nest sites located within the 2011 THP assessment area. Neighboring Sierra Pacific Industries conducted a survey due to a sighting of the species in the vicinity of Bacon and Mutton Canyon in 2002. The survey was conducted in mid July – August utilizing USFS protocols for the presence of Northern Goshawk in the area. The survey found none in the area. If Sierra Pacific Industries, Blodgett Forest, or Forest Service personnel find any active nest site in or close to the proposed area in this THP, the affected operations shall be shut down or delayed as necessary as described in item 38. (7)b.

CALIFORNIA RED-LEGGED FROG and TAKE AVOIDANCE INFORMATION

Blodgett Forest has actively monitored fish and wildlife (including amphibians) since 1977. To present, no red-legged frogs have been identified. We conducted a study in the spring of 1998 that specifically looked at amphibians. No findings regarding California red-legged frogs were made. The closest known site for red-legged frogs is 10 miles west of Blodgett Forest. BLODGETT FOREST PROPERTIES, THE 2011 THP OPERATING AREA, ITS ASSOCIATED THP APPURTANANT ROADS AND DUST ABATEMENT WATER SOURCES, DO NOT OCCUR IN THE CURRENT OR HISTORICALCRF RANGE AS MAPPED BY CAL FIRE FOREST PRACTICE GIS JULY 2008. (See item 38(7)d SUSPENSION OF OPERATIONS AND EMERGENCY BUFFER ZONES FOR LISTED PLANTS AND ANIMALS THAT ARE CURRENTLY NOT RECORDED).

SIERRA NEVADA YELLOW-LEGGED FROG (Rana sierrae)

The Sierra Nevada yellow-legged frog (SNYLF) is designated as a state species of special concern. The southern 'distinct population segment" (Sierra Madre yellow-legged frog, Rana muscosa) is federally listed as endangered. In 2003 the SNYLF was found to be "warranted but precluded" from listing as endangered by the federal government. This makes the SNYLF a federal candidate species, which has no legal protections under federal or state law.

However, on September 15, 2010, the California Fish and Game Commission (CFGC) voted to accept a petition to list the mountain yellow-legged frog (both species). As these frogs are now under consideration for State listing they are legally treated as if they were listed and the State of California defined "take" of these species cannot occur.

Additionally, on September 15, 2010, the CFGC also voted to provide an Incidental Take Permit (ITP) for mountain yellow-legged frogs for Timber Harvest operations. The ITP recognized the biology of the frog combined with the protection measures of the Watercourse and Lake Protection Zones (WLPZs) as defined in the California Forest Practice Rules as being sufficient to protect frogs.

The SNYLF is a mountain species occurring primarily at elevations above 6,000 feet in the Sierra Nevada. This species is always encountered within a few meters of water. This THP is located below 5,000 feet in elevation, with all class I and II watercourses below 4,500 feet.

As mapped by CAL FIRE FPGIS, this THP is located within the MYLF Historic Range. A small portion of the Biological Assessment area lies within the CWHR SNYLF range. This species evolved in a fishless environment and is associated with perennial streams, lakes and ponds in montane riparian, and a variety of other habitats. Water of sufficient depth must be present year round for the presence of this species. Class II waters on this THP are shallow and are prone to freezing during the winter months. Blodgett Forest has actively monitored fish and wildlife (including amphibians) since 1977. To present, no SNYLF have been identified. We conducted a study in the spring of 1998 that specifically looked at amphibians. No findings regarding SNYLF were made.

The protection measures inherent in WLPZ's are expected to provide sufficient safeguards for potential habitat. Class I and II streams will receive the required watercourse and lake zonal protections according to sections 14 CCR 956.4 and 956.5, thereby adequately protecting the beneficial uses of water, including aquatic animals. WLPZ status ensures that riparian habitats are not significantly altered or fragmented, equipment use is excluded, trees are directionally felled away from watercourses, and canopy cover is maintained. We conclude WLPZ practices are sufficient to protect this species and its habitat. No additional protections are planned for this species.

If a SNYLF is discovered or observed during timber operations, Immediate SUSPENSION OF OPERATIONS within the associated WLPZ or 100 feet of in the apparent habitat (waterhole, ditch wet area...) will occur. The discovery or observance will be reported to the Department of Fish and Game, Fisheries Branch, Attn: Mountain yellow-legged frog observations, 830 S Street, Sacramento, CA 95811 or submitted by email to mylfdata@dfg.ca.gov. Information reported to CDF&G shall include as available: a contact name; the date and location of the observation, detection or take; and the details regarding the animal(s) observed.

PACIFIC FISHER (Martes pennanti)

As mapped by CAL FIRE FPGIS, this THP is located within Historic Fisher Range. The current search of the California Department of Fish and Game CNDDB indicates occurrences on four quadrangles; two quads reference "five fishers were killed for their pelts near Placerville during July 1916" (approximately 10 miles SW of this THP); one quad refers to one adult observed in 1973 at the American River canyon near Iowa Hill (approx. 15 miles NW of this THP); and one quad references 1 fisher observed crossing Wentworth Springs Rd. on June 5, 1995 (approx. 6 miles east of this THP).

Blodgett Forest Research Station has actively monitored reptiles, amphibians, fish, mammals, and birds since 1978. Large mammal presence is recorded by automated cameras placed at baited plots. These plots also have Sherman live traps to conduct, mark and recapture studies on small mammals. Camera and live traps have never located fishers on BFRS. We believe that all native populations were extirpated from the area in the 1920's by trapping and poisoning.

To provide research and habitat value, Blodgett has designated 19% of its land area as recruitment areas for late seral stage habitat. These areas have not been harvested since UC has owned the property (70+ years). Because stands have inherently different rates of change as well as direction of change, some stands already have WHR type SMC 5 or SMC 6 classifications while others are class SMC 4. Over time, the LSS Recruitment stands will likely develop enough large trees (>6 tpa >30" dbh) to meet LSS standards (SMC 6). The exclusion of harvesting activity from these areas facilitates retention of existing LSS habitat and recruitment of habitat via process-based restoration.

Late seral habitat continuity is provided by watercourse protection zones. Within Blodgett Forest Bacon Creek, Mutton Creek, Gaddis Creek and Deep Canyon Creek WLPZs either meet or are being recruited to meet late seral habitat. Over 90% of BFRS provides cover for fisher movement. Less than 0.5% of the ownership, on average, is harvested creating an "open" condition. The compartmentalized and replicated research design of BFRS insures that harvest openings are dispersed.

Hardwood Cover: The forest goal is to have about 10% of overall tree density comprised by hardwood species (variability depending on seral stage and demographic attributes of specific species). Planting design, mechanical treatment, and the application of herbicide are reserved as methods for controlling species composition.

Black oaks: Because black oak provides a significant food source for wildlife, it is specifically managed at BFRS so that a sustainable population of black oak in all size classes may develop. In the partial harvest stands (selection, group selection and commercial thinnings), black oaks will be marked in the same manner as conifers. Individuals with low vigor or signs of disease will be marked, while retaining individuals with high snag recruitment potential (large, decadent trees with cavities and large crooks). Groups of black oaks that are being encroached upon by surrounding conifers will be retained, and the encroaching conifers removed.

The critical period for fishers is March 1 through July 31, where reproduction and caring for young occurs and when the highest potential for disturbance exists. During timber operations, if a fisher den or a female with young is observed, operations shall cease within 0.25 miles and DFG will be immediately contacted. Additional measures to mitigate potential significant impacts to habitat and habitat elements that support fisher will be implemented if necessary.

During timber operations, if a fisher is observed, the pertinent DFG Timberland Planning office shall be notified.

Observations, detections, and take shall be reported to the Department of Fish and Game, Wildlife Branch, Attn: Fisher Observations, 1812 Ninth St., Sacramento, CA 95811, or by email submission to fisherdata@dfg.ca.gov. Information reported to the Department pursuant to this subdivision shall include as available: a contact name; the date and location (GPS coordinate preferred) of the observation, detection, or take; and details regarding the animal(s) observed (Item 38(7)f).

RARE, THREATENED AND ENDANGERED PLANTS

A 2010 search of the CNDDB and the CNPS Electronic Database revealed thirteen potential plants of concern that may fall into the greater geographic area (nine quadrangles) of Blodgett Forest (see Section III for discussion of findings). None of these species have been identified during BFRS extensive vegetation surveys.
If a rare, threatened or endangered plant is identified in or near the THP area; operations shall be shut down and the procedures in item 38. (7)e shall be followed.

b. [ ] Yes [X] No Are there any non-listed species which will be significantly impacted by the operation? If yes, identify the species and the provisions to be taken for the protection of the species.

CALIFORNIA SPOTTED OWL INFORMATION SUMMARY

This discussion provides information relative to California spotted owl habitat within and nearby the THP area. See section III Item 32 for additional details and maps of spotted owl home ranges. The California spotted owl is not listed as threatened or endangered and is not a sensitive species recognized by the State Board of Forestry. However, the USDA Forest Service in Region 5 has established that it is a species of special concern for their analyses. The harvest proposed in this THP attempts to maintain suitable habitat by avoiding alteration of habitat near nests and by retaining components such as snags and large trees. The proposed harvest will not significantly alter the total available habitat (relative to known California Spotted Owl habitat preferences) within their larger home range.

From 1979 to 2004, A pair (referred to as the "Bacchi pair") of California spotted owls have been known to nest in compartment 292 (an old growth reserve), last active 2004 and 250 (the headquarters and living areas of Blodgett Forest) last active 1995. Another pair (the "Pilot pair") is known to nest just outside Blodgett Forest property to the west of the northwest corner of section 5, last active 2010. Information supplied by the USFS Georgetown Ranger District in 2007 indicates a third pair (the "Conner Cabin pair") located approximately 1 mile southwest of compartment 230 in section 18 T12N, R12E on USFS property. Additional information from the USFS University of Minnesota survey team April 2008 now has the Conner Cabin territory unoccupied. One of the pair was killed by a car on Wentworth Springs Road, The other owl has relocated well outside the assessment area.

Current management plans constrain harvesting in the units where nests have been found to the following:

UNIT	*SIZE*	*ALLOWED PRACTICES*
250	68 acres	Light commercial thinning about every 10 years (last was 2003), prescribed burning
292	133 acres	NO Harvest, ecological reserve. Prescribed burning allowed (last burn in 2002).

The two pairs of spotted owls were located almost annually since the early 1980s. Nesting was generally low throughout this region in the late 1990s and early 2000s most likely due to several late snows (in April and May) that fell after nesting activity had already started. In 2002 the "Bacchi" pair nested successfully in unit 292 producing one juvenile. This pair nested in 2004, but failed to produce any young. The Bacchi Pair has not been located in 2008, 2009, or 2010.

The Pilot Creek pair nested successfully in 2007 and produced two young. The 2008 and 2009 surveys indicate the Pilot pair was present but did not produce any young. In 2010 this pair produced two fledglings. Their nest is located on USFS land west of the NW corner of section 5 and Blodgett Forest compartment 10, about 1/4 mile west of compartment 20 in this THP. The southern boundaries of compartments 151, 160, 270 and 280, are within ¼ mile of the 2002 nest tree of the "Bacchi" pair. If either pair successfully nests within ¼ mile of any unit in this plan then the procedures in Item 38.(7)b will be followed. The surveys were done according to spotted owl protocols currently being used by USFS R5 contract crews (under direction of UM Biologist R. Gutierrez) in the Sierra Nevada. The2010 surveys are available on request. CAL FIRE and the Department of Fish and Game will be notified when and if nest site(s) are located in the future. If new successful nests are found the requirements in Item 38.(7)b SUSPENSION OF OPERATIONS AND EMERGENCY BUFFER ZONES, California Spotted Owl shall be utilized.

See Section III, Item #32 for more information on spotted owl home range, available habitat and sighting location.

FOOTHILL YELLOW-LEGGED FROG

Extensive searches in riparian areas have not detected any Foothill Yellow-legged frogs. Only tadpoles of treefrogs after metamorphosis were found during amphibian searches.

Habitat/Species Protection Measures - The protection measures inherent in WLPZs are expected to provide sufficient safeguards for potential habitat. Class I and Class II streams and wet areas will receive the required Watercourse and lake protection zones protection according to sections 16 CCR 956.4 and 956.5. thereby adequately protecting the beneficial uses of water. WLPZ ensure that riparian habitats are not significantly altered or fragmented. WLPZs also function as sediment filters, which are designed to eliminate significant increases of in stream silt loads. Per DFG's California Wildlife Habitat Relationships system the home range of the FYLF is "33 feet in the longest dimension" and "this aquatic species is always encountered within a few meters of water". The WLPZ is sufficient protection. No additional mitigations are planned for this species (See item 38(7)d SUSPENSION OF OPERATIONS AND EMERGENCY BUFFER ZONES FOR LISTED PLANTS AND ANIMALS THAT ARE CURRENTLY NOT RECORDED).

33. [X] Yes [ ] No Are there any snags which must be felled for fire protection or safety reasons? If yes, describe which snags are going to be felled and why.

All snags, > 20 ft. in height and 16 in. in diameter, within the harvest areas shall be retained except those within their height of structures, landings, and haul roads and those that pose a hazard to the operations. Snags within a WLPZ or ELZ or with evidence of nesting may be retained, regardless of location. These shall be marked by the RPF with a blue 'S' at eye level on two sides. The LTO is advised to leave all snags except those listed above. The LTO may cut (at his/her sole discretion) any snag which is deemed a hazard to the operation. The LTO is required to leave the cut snag as large woody debris. Blodgett monitors snag demography, snag size, use by wildlife, and decay condition on each of > 1000 CFI plots distributed evenly across the property. Plots are re-measured approximately every 5-10 years as part of long-term monitoring that feeds back into management decisions influencing snag densities and conditions. In addition, we complete a 100% census of all snags within some compartments to monitor longevity and recruitment. Silvicultural methods in each compartment are specifically designed to facilitate snag recruitment.

34. [ ] Yes [X] No Are any Late Succession Forest Stands proposed for harvest? If yes, describe the measures to be implemented by the LTO that avoid long-term significant adverse effects on fish, wildlife and listed species known to be primarily associated with late succession forests.

35. [X] Yes [ ] No Are any other provisions for wildlife protection required by the rules? If yes, describe.

Where hardwoods are present at the time of harvest, they shall be retained at approximately the same ratio of species composition as they existed preharvest (14 CCR 959.15). See item #14f for additional information on group B species management. Snags, dead top trees and green but partially cull trees may be marked to save with a blue paint 'S'. This mark should appear on two sides of marked trees. These trees are NOT to be cut. They are designated as wildlife habitat (snags or snag recruitment). The timber fallers or LTO may (at their sole discretion) fall such trees if the trees pose a threat to operations. If felled, such trees shall be limbed but may NOT be yarded and shall be retained as large woody debris.

36. a. [X] Yes [ ] No Has an archaeological survey been made of the THP area?

b. [X] Yes [ ] No Has a current archaeological records check been conducted for the THP area?

c. [X] Yes [ ] No Are there any archaeological or historical sites located in the THP area? Specific site locations and protection measures are contained in the Confidential Archaeological Addendum in Section VI of the THP, which is not available for general public review.

The RPF shall show the LTO, sawyers, and skidder operator any areas flagged to be avoided by heavy equipment. Fallers shall be instructed to fall all trees away from the sites. The RPF shall inspect each site and surrounding areas (during and after skidding operations) to determine if additional artifacts are revealed. All timber harvesting activities shall cease at any location where additional artifacts are discovered until a qualified archaeologist can examine the site. The LTO, his/her employees, subcontractors, vendors and invited visitors have a duty (per LTO-BFRS contract – Section V) to immediately disclose the location of any cultural artifact discovered during the course of operations.

37. [ ] Yes [X] No Has any inventory or growth and yield information designated "trade secret" been submitted in a separate confidential envelope in Section VI of this THP?

Inventory, growth and yield information is available in Section III Item 14 a.

38. Describe any special instructions or constraints that are not listed elsewhere in Section II.

1) Operations will be temporarily suspended during summer if (1) ≥ 5 inches of cumulative summer precipitation is delivered or if (2) one precipitation event delivering ≥ 2" occurs. Operations will only be allowed to continue if sufficient drying of the soil profile occurs to minimize the risk of significantly increasing the amount of soil compaction.
2) The LTO shall utilize the existing skid trail networks within the THP area unless flagged for exclusion. New trails may only be constructed where access is needed and no appropriate skid trails currently exist. This will be monitored by the RPF.
3) All snags, decadent conifers and hardwoods, and any trees with dens and nests shall be retained within all WLPZs unless they pose a clear risk to human safety.
4) The LTO shall conform to the conditions specified in the TIMBER HARVESTING CONTRACT appended as part of this THP in Section V.
5) LIMITATION AND INSTRUCTIONS FOR OPERATIONS ASSOCIATED WITH DOMESTIC WATER (Pipelines):
The location of Blodgett Forest distribution pipelines in compartment 250 will be flagged, if necessary, to prevent damage during timber operations. A preoperational meeting with the LTO will cover pipelines location and protection.
6) POWERLINES COMPARTMENT 250 & 251
Power lines and poles are located along Blodgett Forest Entrance Rd. in compartment 251 and Service Rd. in compartment 250. There are also distribution lines to structures in compartment 250. It is the responsibility of the LTO to know the location of all power lines before timber operations start. Blodgett Forest staff will be available to help the LTO in locating power lines before operations begin. It will be at the sole discretion of the LTO whether tress can be harvested, equipment can be operated or any other activity can safely occur in the proximity of power lines.
7) SUSPENSION OF OPERATIONS AND EMERGENCY BUFFER ZONES FOR LISTED PLANTS AND ANIMALS THAT ARE CURRENTLY NOT RECORDED ARE AS FOLLOWS:
    a. Northern Goshawk - a SUSPENSION OF OPERATIONS buffer wide enough (up to 1,320 feet) will be established so that no sign of stress, associated with timber operations, is expressed by the newly located bird(s). CAL FIRE and DFG will be notified. A consultation with DFG will then determine the appropriate boundaries for the buffer zone, limits to timber operations, habitat retention and any other protection measures that will then be amended to the THP ,
    b. California Spotted Owl - a SUSPENSION OF OPERATIONS buffer wide enough (up to 1,000 feet) will be established so that no sign of stress, associated with timber operations, is expressed by the newly located bird(s). CAL FIRE and DFG will be notified. A consultation with DFG will then determine the appropriate boundaries for the buffer zone, limits to timber operations, habitat retention and any other protection measures that will then be amended to the THP ,
    c. Other Raptors - a SUSPENSION OF OPERATIONS buffer wide enough (up to 500 feet) will be established so that no sign of stress, associated with timber operations, is expressed by the newly located bird(s). CAL FIRE and DFG will be notified. A consultation with DFG will then determine the appropriate boundaries for the buffer zone, limits to timber operations, habitat retention and any other protection measures that will then be amended to the THP ,
    d. Listed amphibians - SUSPENSION OF OPERATIONS within the associated WLPZ; or 100 feet of in the apparent habitat (waterhole, ditch wet area...). CAL FIRE and DFG will be notified. A consultation with DFG will then determine the appropriate boundaries for the buffer zone, limits to timber operations, habitat retention and any other protection measures that will then be amended to the THP ,
    e. Listed Plants - The plant or population boundary will be flagged. No operations will occur inside the population boundary. A 50 foot equipment exclusion zone (EEZ) will be flagged beyond the population boundary. All trees will be fallen away from the plant or population. Trees will not be fallen into the EEZ. CAL FIRE and DFG will be notified. A consultation with DFG will then determine if any adjustment is needed for the buffer zone, limits to timber operations, habitat retention and any other protection measures that will then be amended to the THP, No herbicides will be used within the EEZ.
    f. Pacific Fisher (a) During timber operations, if a fisher is observed, the pertinent DFG Timberland Planning office shall be notified of the detection including time, date and map location. (b) The critical period fo fishers is March 1 through July 31, where reproduction and caring for young occurs and when the highest potential for disturbance exists. During timber operations, if a fisher den or a female with young is observed, operations shall cease within 0.25 miles and DFG will be immediately contacted. (c) Habitat retention and other measures will be amended to this THP to mitigate potential significant impacts to habitat and habitat elements that support fishers if one is located. (d) Observations, detections, and take shall be reported to DFG, Wildlife Branch, Attn: Fisher Observations, by email to fisferdata@dfg.ca.gov and shall include as available: a contact name; the date and location of observation, detection, or take; and details regarding the animal(s) observed .

38. 8)

WATERHOLES AND DRAFTING

1) Waterholes are authorized for this timber harvesting plan only. Use of the waterholes for drafting is not authorized for any other timber harvesting plan.

2) The water truck operator shall have a copy of the streambed alteration agreement and shall be familiar with all conditions.

3) Drafting water from within or downstream of a known sudden oak death infestation area or adjacent watersheds of known infestation areas shall disinfect water truck storage tanks before operating in other watersheds area. Disinfection procedures are available from the Department.

4) For Class I waters with State or Federal listed fish species present, all water drafting shall be conducted in accordance with DFG's "Guidelines for Temporary Water Drafting from Streams and Rivers Supporting Anadromous Salmonids; Special Application for Timber Harvest Activities" (August 2000).

5) No removal of vegetation or materials from the stream is authorized unless otherwise specified in the project descriptions contained in this agreement.

6) Only designated truck pads, and paved or rocked roads are authorized for water drafting activities. Trucks may not be driven on stream banks, stream beds, the dry channel, or the active channel at any time.

7) To minimize sediment production, truck pads and road approaches shall be rocked. Approaches shall be rocked from the end of the road approach nearest the watercourse for a minimum of 50 feet, or to the nearest water bar or point where road drainage does not drain toward the watercourse. Place competent angular rock on approaches and truck pads to a minimum compacted depth of 4 inches such that no mineral soil is contacted by the water truck tires and re-rock as needed to maintain this mineral soil barrier. Shape the pad such that overflows or drainage from the drafting truck and hoses does not re-enter the watercourse. Install a brow log or large rock sufficient in size to act as a barrier between the truck pad and the watercourse.

8) The water truck operator shall place an absorbent pad/shroud under the water truck for added protection from fuel/oil leaks and to prevent oil contamination of the drafting pad or road.

9) The operator shall practice water conservation practices (minimizing spray flow volume, number of loads/day etc.) to the greatest extent possible to reduce the actual volume of water removed from the watercourse.

10) Class I watercourses with a temporary, partial dam to create a drafting pool shall provide fish passage for all life stages of fish. Temporary dams shall be removed when operations are complete.

11) At no time will drafting operations result in a flow less than 2.0 cubic feet per second (cfs) in Class I watercourses. If the natural flow is less than 2.0 cfs, drafting shall cease. Flows shall be determined prior to each drafting withdrawal. If drafting from a pool within the watercourse channel, reduction in pool volume will not exceed 20%.

12) Instantaneous diversion rate shall be less than 350 gallons per minute (gpm) or 0.78 cubic feet per second (cfs). [Note: for the diversion rate to be 350 gpm (maximum), bypass flows in the source stream need to be 7.8 cfs; so as not to exceed 10 percent surface flow]. This includes the siphon hose to the water truck that shall not exceed this rate.

13) Pump intakes that take water from surface flow shall be fitted with mesh bags or screens designed to the following Department of Fish and Game specifications:

a. Round Openings: Round openings in the screening shall not exceed 2.38 millimeters (3/32 inch).

b. Square Openings: Square openings in screening shall not exceed 2.38 millimeters (3/32 inch measured diagonally).

c. Slotted Openings: Slotted openings shall not exceed 1.75 millimeters (0.0689 inch) in width.

14) The velocity of water across the screen surface shall not exceed 0.33 feet per second at any point on the screen surface. To achieve this standard, use a screen of sufficient size based on the formula: rate of intake in cfs (gpm x 0.00223) / 0.33 feet per second = size of the screen in square feet. The screen shall be kept clean and free of accumulated algae, leaves or other debris and supported above the bed of the stream so that no part of the screen surface is obstructed.

15) Water truck operators shall inspect and clean the screen surface before each use.

16) Screens may be constructed of any rigid material, perforated, woven, or slotted that provides water passage while physically excluding aquatic species. The screens can be formed into a structure that protrudes above the surface of the waterhole in which the intake pipe is placed or attached directly to the intake hose The largest possible screen open area that is consistent with other project requirements should be used. Reducing the screen slot velocity is desirable both to protect aquatic species and to ease cleaning requirements. Care should be taken to avoid the use of materials with sharp edges or projections, which could harm aquatic species.

17) Stainless steel or other corrosion-resistant material is the screen material recommended to reduce clogging due to corrosion. Care should be taken not to use materials deemed deleterious to aquatic species and other wildlife.

18) Off-channel waterhole provisions:

a. Filling of the water hole shall be gravity fed.

b. Off-channel waterholes shall be constructed with a gently sloping bank to allow for escape by animals.

c. An off-channel waterhole shall not divert more than 20% of the flow from the watercourse, as measured immediately upstream of the diversion point at any time.

d. Off channel waterholes shall incorporate a pipe or rocked channel to allow for 20% of the surface flow to continually flow from the waterhole. If the water hole is located upstream of a road crossing, the overflow from the water hole shall be returned to the channel upstream of the crossing.

e. The pipe inlet shall be screened to preclude the entrainment of aquatic amphibian life stages and all fish life stages. Temporary pipes used to feed the waterhole shall be removed prior to November 15 of each year unless there is a rocked channel outflow capable of handling all inflow.

f. If drafting occurs prior to July 15 of the calendar year, no more than 20% of the volume of the off-channel waterhole may be removed at one time to prevent the desiccation of amphibian eggs masses and invertebrate casings. Drafting following this date may not remove more than 50% of the volume of off-channel waterholes.

19) If any sensitive/listed species are discovered during operations in/near the waterhole or watercourse, operations in/near the waterhole or watercourse will cease and the DFG will be contacted to discuss the proposed protection measures to be implemented.

20) Waterholes are authorized for this timber harvesting plan only. Use of the waterholes for drafting is not authorized for any other timber harvesting plan.

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28) The operator shall practice water conservation practices (minimizing spray flow volume, number of loads/day etc.) to the greatest extent possible to reduce the actual volume of water removed from the watercourse.

29) Class I watercourses with a temporary, partial dam to create a drafting pool shall provide fish passage for all life stages of fish. Temporary dams shall be removed when operations are complete.

30) At no time will drafting operations result in a flow less than 2.0 cubic feet per second (cfs) in Class I watercourses. If the natural flow is less than 2.0 cfs, drafting shall cease. Flows shall be determined prior to each drafting withdrawal. If drafting from a pool within the watercourse channel, reduction in pool volume will not exceed 20%.

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e. Square Openings: Square openings in screening shall not exceed 2.38 millimeters (3/32 inch measured diagonally).

f. Slotted Openings: Slotted openings shall not exceed 1.75 millimeters (0.0689 inch) in width.

33) The velocity of water across the screen surface shall not exceed 0.33 feet per second at any point on the screen surface. To achieve this standard, use a screen of sufficient size based on the formula: rate of intake in cfs (gpm x 0.00223) / 0.33 feet per second = size of the screen in square feet. The screen shall be kept clean and free of accumulated algae, leaves or other debris and supported above the bed of the stream so that no part of the screen surface is obstructed.

34) Water truck operators shall inspect and clean the screen surface before each use.

35) Screens may be constructed of any rigid material, perforated, woven, or slotted that provides water passage while physically excluding aquatic species. The screens can be formed into a structure that protrudes above the surface of the waterhole in which the intake pipe is placed or attached directly to the intake hose The largest possible screen open area that is consistent with other project requirements should be used. Reducing the screen slot velocity is desirable both to protect aquatic species and to ease cleaning requirements. Care should be taken to avoid the use of materials with sharp edges or projections, which could harm aquatic species.

36) Stainless steel or other corrosion-resistant material is the screen material recommended to reduce clogging due to corrosion. Care should be taken not to use materials deemed deleterious to aquatic species and other wildlife.

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i. An off-channel waterhole shall not divert more than 20% of the flow from the watercourse, as measured immediately upstream of the diversion point at any time.

j. Off channel waterholes shall incorporate a pipe or rocked channel to allow for 20% of the surface flow to continually flow from the waterhole. If the water hole is located upstream of a road crossing, the overflow from the water hole shall be returned to the channel upstream of the crossing.

k. The pipe inlet shall be screened to preclude the entrainment of aquatic amphibian life stages and all fish life stages. Temporary pipes used to feed the waterhole shall be removed prior to November 15 of each year unless there is a rocked channel outflow capable of handling all inflow.

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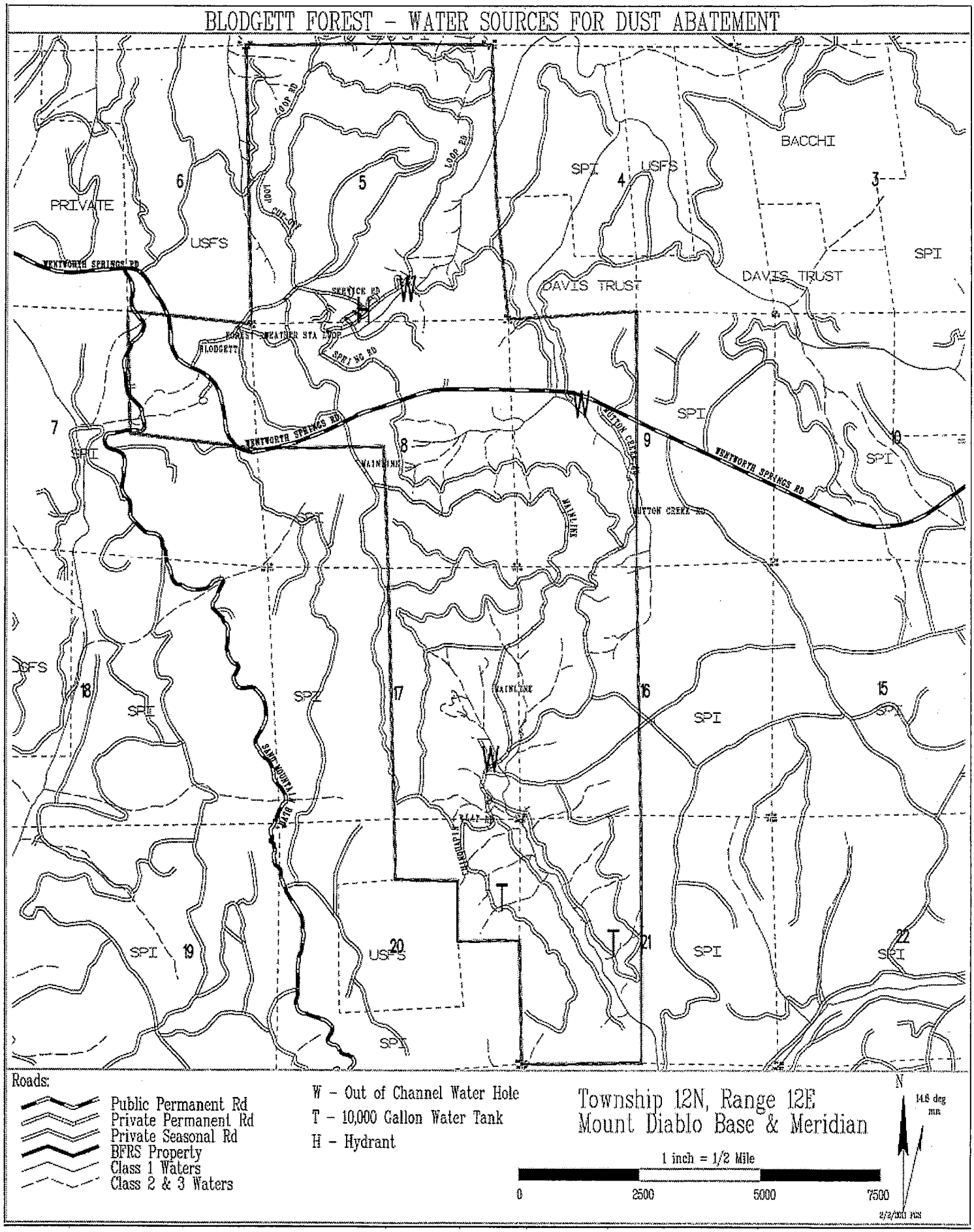
38) If any sensitive/listed species are discovered during operations in/near the waterhole or watercourse, operations in/near the waterhole or watercourse will cease and the DFG will be contacted to discuss the proposed protection measures to be implemented.


BLODGETT FOREST - WATER SOURCES FOR DUST ABATEMENT
PRIVATE
USFS
SPI
BACCHI
DAVIS TRUST
WENTWORTH SPRINGS RD
LOOP RD
SERVICE RD
BLODGETT
SPRING RD
SUTTON CREEK RD
MAINLINE
SAN MOUNTAIN
Roads:
Public Permanent Rd
Private Permanent Rd
Private Seasonal Rd
BFRS Property
Class 1 Waters
Class 2 & 3 Waters
W - Out of Channel Water Hole
T - 10,000 Gallon Water Tank
H - Hydrant
Township 12N, Range 12E
Mount Diablo Base & Meridian
1 inch = 1/2 Mile
0
2500
5000
7500
N
14.8 deg
mn

WATERHOLES AND DRAFTING

Blodgett Forest Research Station
Floating Screen for Water Drafting

Water screened by two 16 gauge 2 ft. x 2 ft. stainless steel panels perforated with 3/32 inch holes on 5/32 inch staggered centers. Screening material recommended by the Department of Fish and Game Screen Shop located in Yreka California.

Blodgett Forest Research Station
Floating Screen for Water Drafting (in use)

38 (9) Item #14 (d) SIMPLIFIED HARVEST TREE SELECTION GUIDELINES

For commercial thinning of plantations only (compartments 151, 280, 360, 370, 371, 431, 553, 560, 561, 563 and 640) areas outside WLPZ and sample mark are as follows:

1. The largest healthiest trees (e.g. free of damage, disease, genetic defects ...) are to be retained as the leave stand.
2. Where the preharvest dominant and codominant crown canopy is occupied by trees less than 14 in. DBH, 100 trees per acre over 4 in. DBH shall be retained (approximately 20 ft. x 20 ft. spacing).
3. Where the preharvest dominant and codominant crown canopy is occupied by trees greater than 14 in. DBH, 125 sq. ft. of basal area shall be left (if greater than 50% of the basal area is pine, at least 100 sq. ft. of basal area shall be left). Spacing will be approximately 20 ft. to 26 ft. between leave trees.
4. Under represented tree species (usually Douglas-fir, white fir and incense-cedar) if vigorous and of similar age, may be retained instead of a larger pine to help balance stand species composition.

Commencement of timber operations

The Plan Submitter Robert A. York, RPF# 2699, Forest Manager will be responsible for notifying CAL FIRE of commencement of timber operations. He will need to contact Robert Little, Area Forester, CAL FIRE, 2840 Mt. Danaher Rd., Camino, CA 95709, at 530 647-5204, FAX 530 647-5276. This will be required within fifteen days before and not later than the day of the start up of a timber operation.

DIRECTOR OF FORESTRY AND FIRE PROTECTION

This Timber Harvesting Plan conforms to the rules and regulations of the Board of Forestry and Fire Protection and the Forest Practice Act:

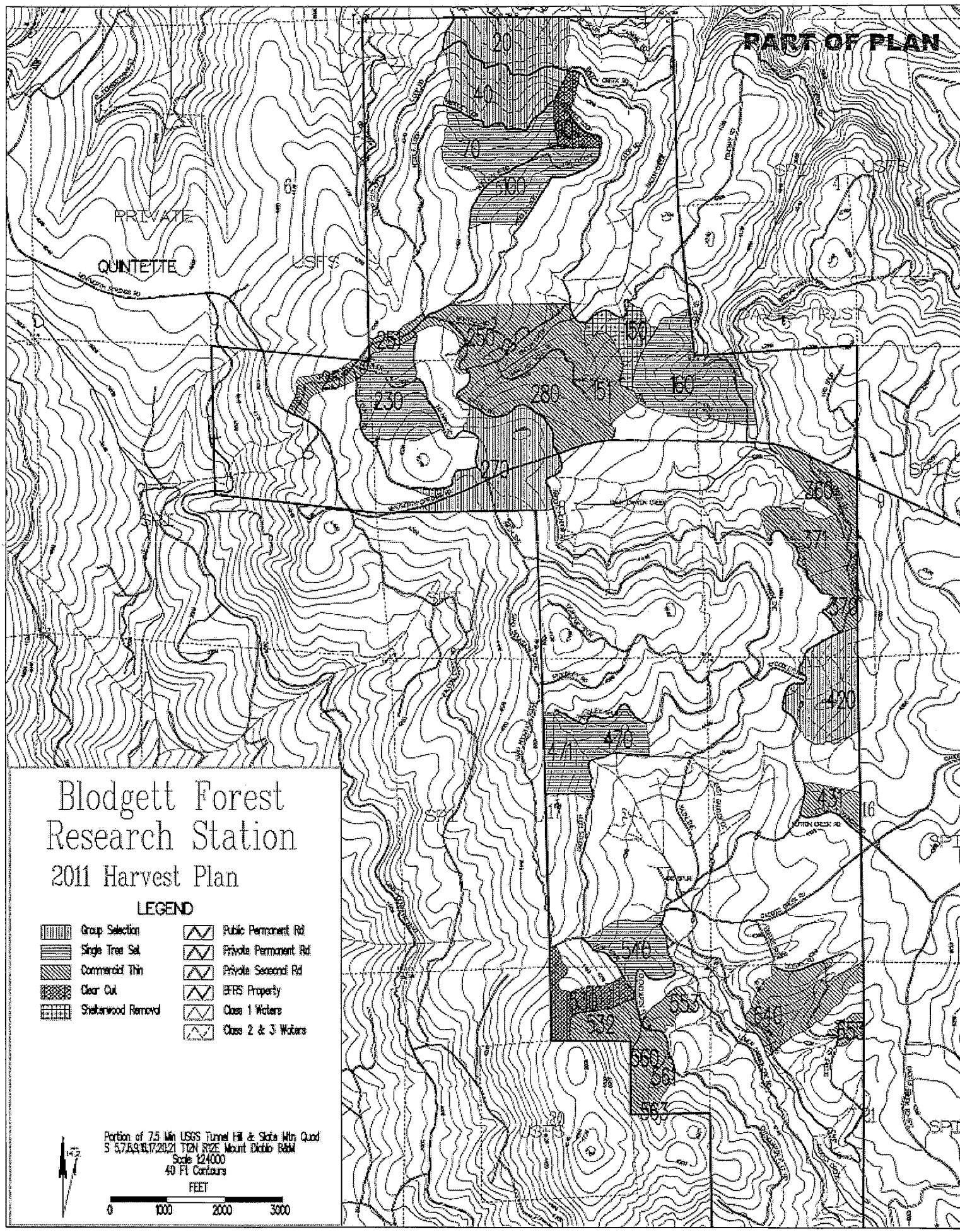
By: Michael J. Bacca (Signature)

JUL 12 2011 (Date)

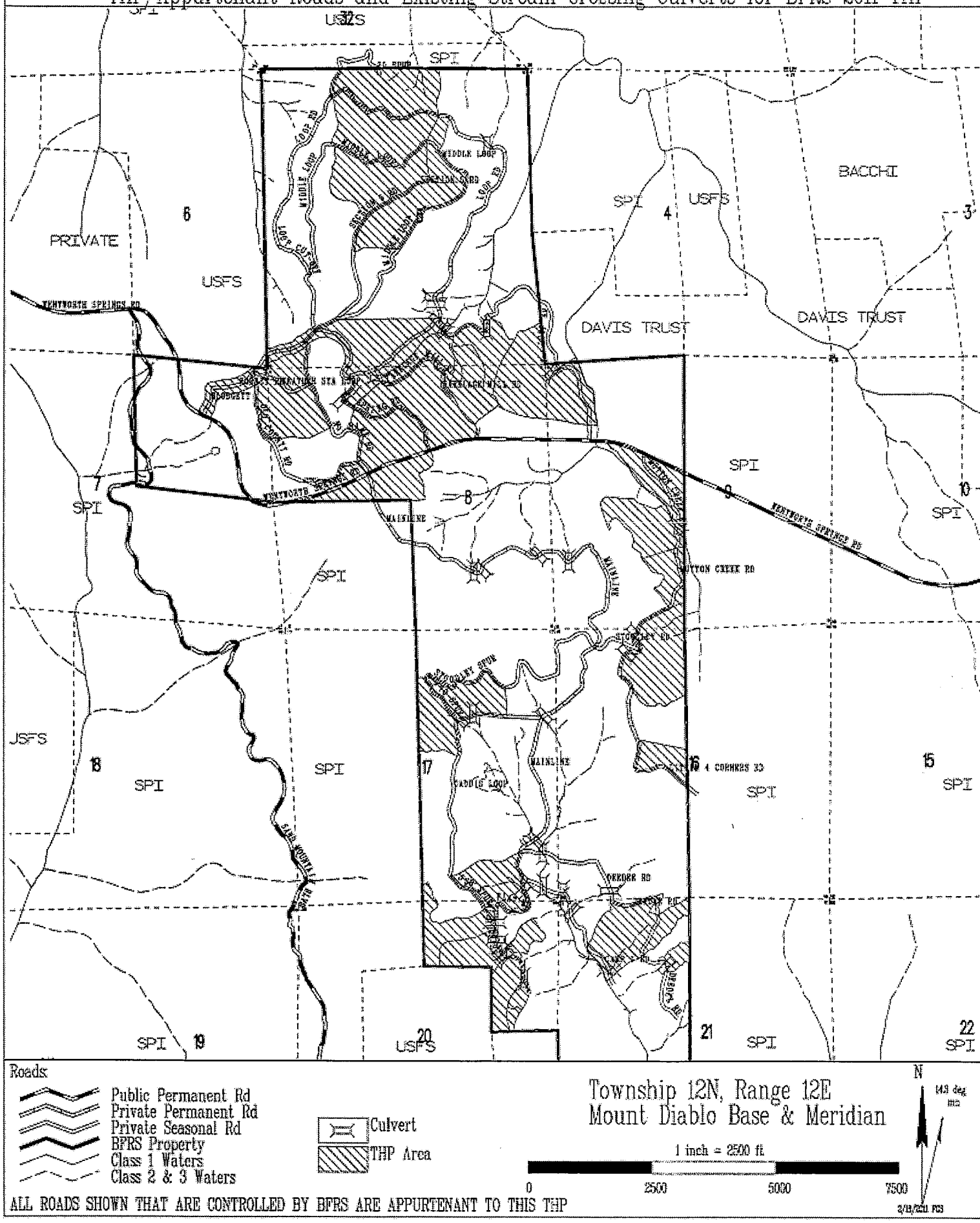
MICHAEL J. BACCA, RPF #2236 (Printed Name)

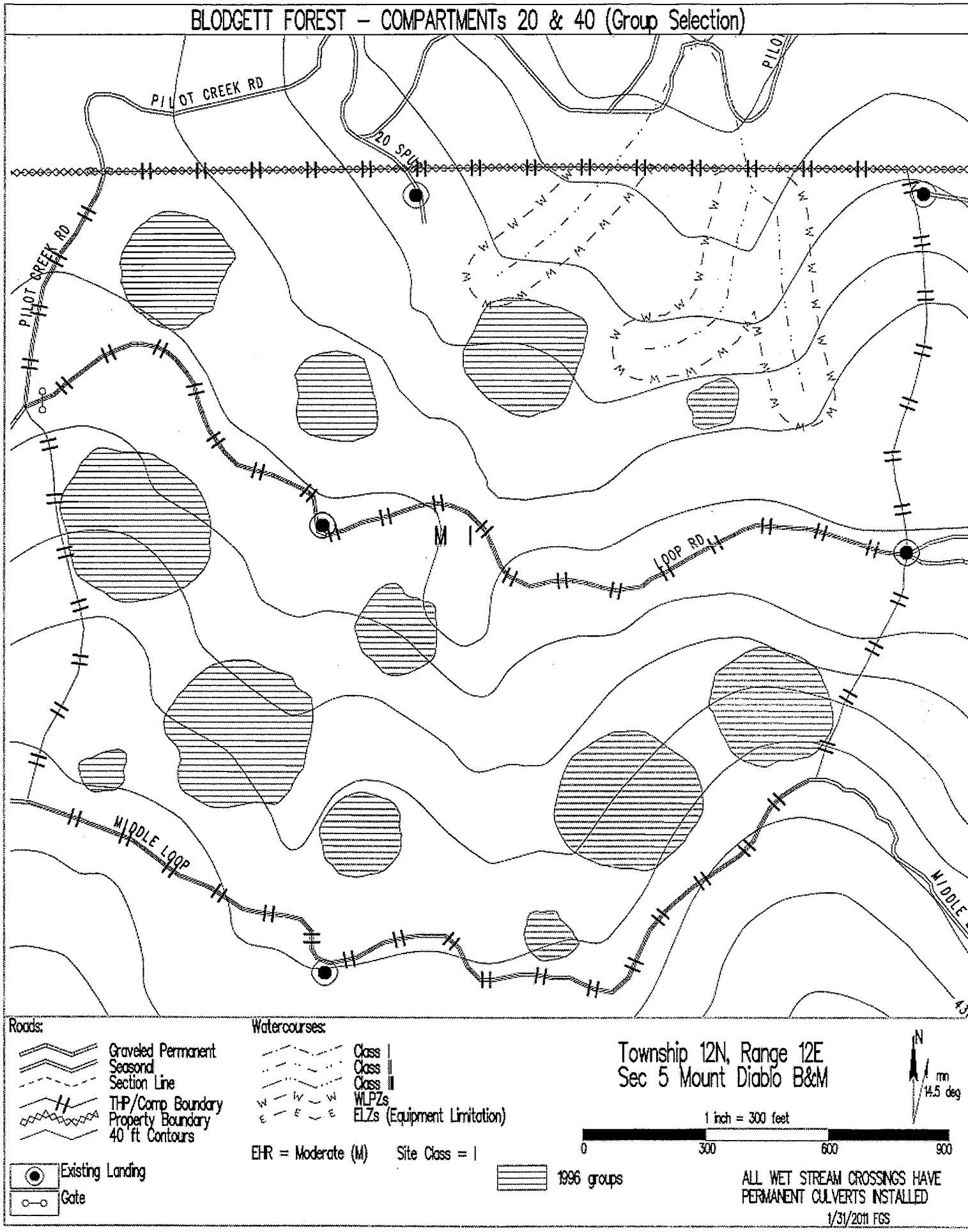
Forester III, Cascade, Sierra & Southern Regions Forest Practice Manager (Title)

MAY 5 2011

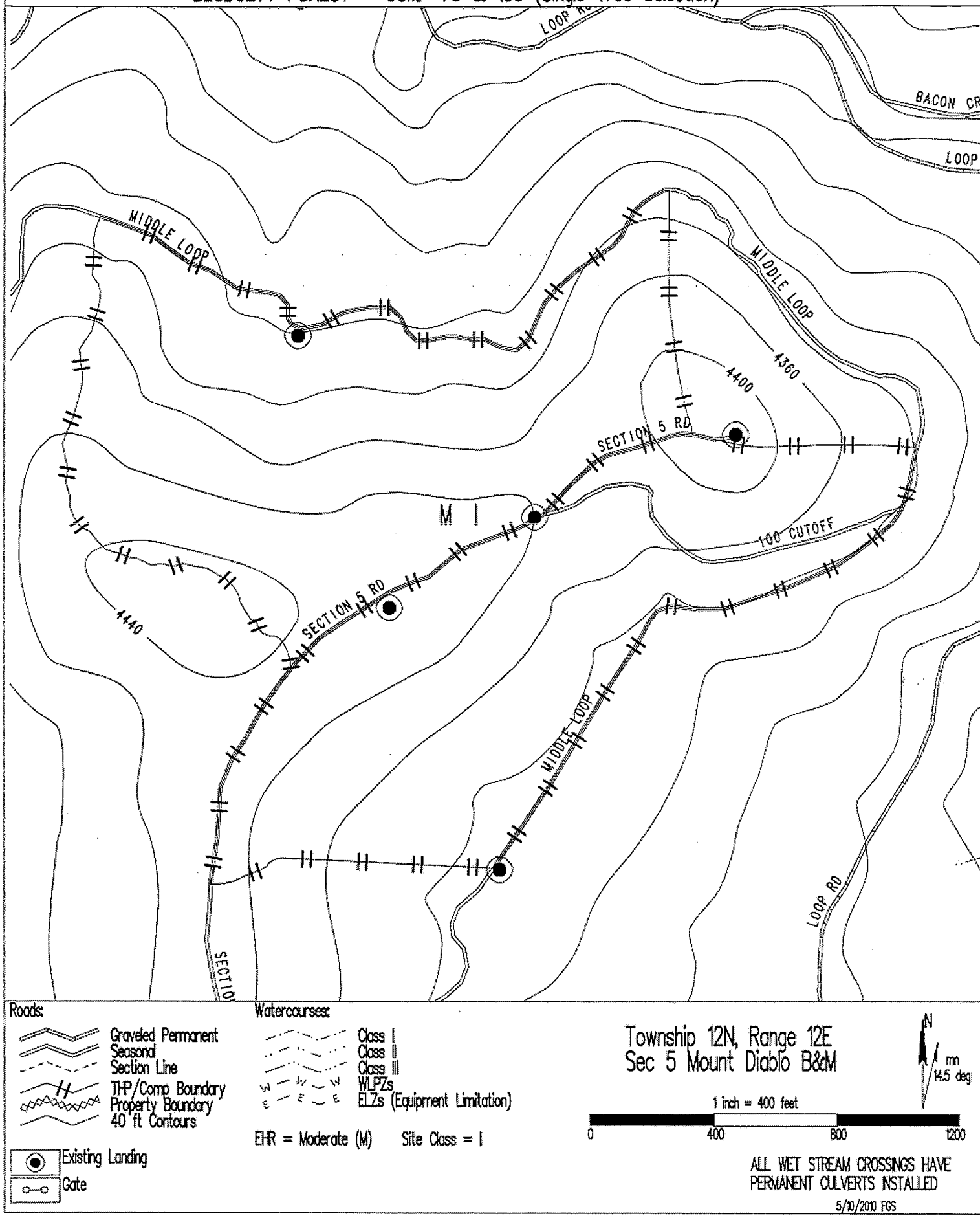

PART OF PLAN
Blodgett Forest
Research Station
2011 Harvest Plan
LEGEND
Group Selection
Single Tree Sel.
Commercial Thin
Clear Cut
Shelterwood Removal
Public Permanent Rd
Private Permanent Rd
Private Seasonal Rd
BFRS Property
Class 1 Waters
Class 2 & 3 Waters
Portion of 7.5 Min USGS Tunnel Hill & Stoke Mtn Quad
S 5,7,8,9,16,17,20,21 T12N R12E Mount Diablo B&M
Scale 1:24000
40 Ft Contours
FEET
0
1000
2000
3000
PRIVATE
QUINTETTE
TRUST

THP/Appurtenant Roads and Existing Stream Crossing Culverts for BFRS 2011 THP

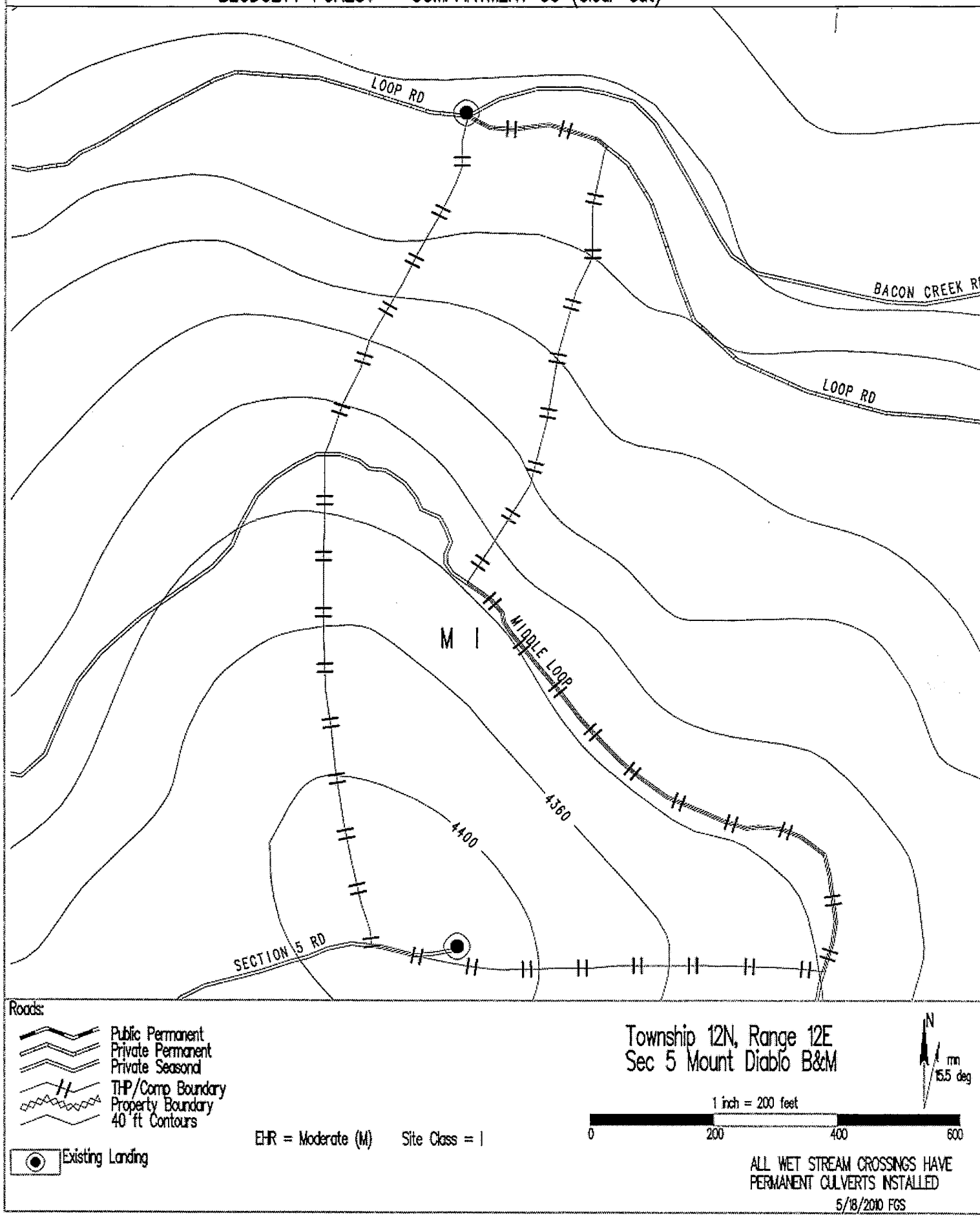



BLODGETT FOREST – COMPARTMENTs 20 & 40 (Group Selection)
PILOT CREEK RD
20 SPUR
PILOT CREEK RD
M I
LOOP RD
MIDDLE LOOP
Roads:
Graveled Permanent
Seasonal
Section Line
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Gate
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
1996 groups
Township 12N, Range 12E
Sec 5 Mount Diablo B&M
N
mn
14.5 deg
1 inch = 300 feet
0
300
600
900
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
1/31/2011 FGS

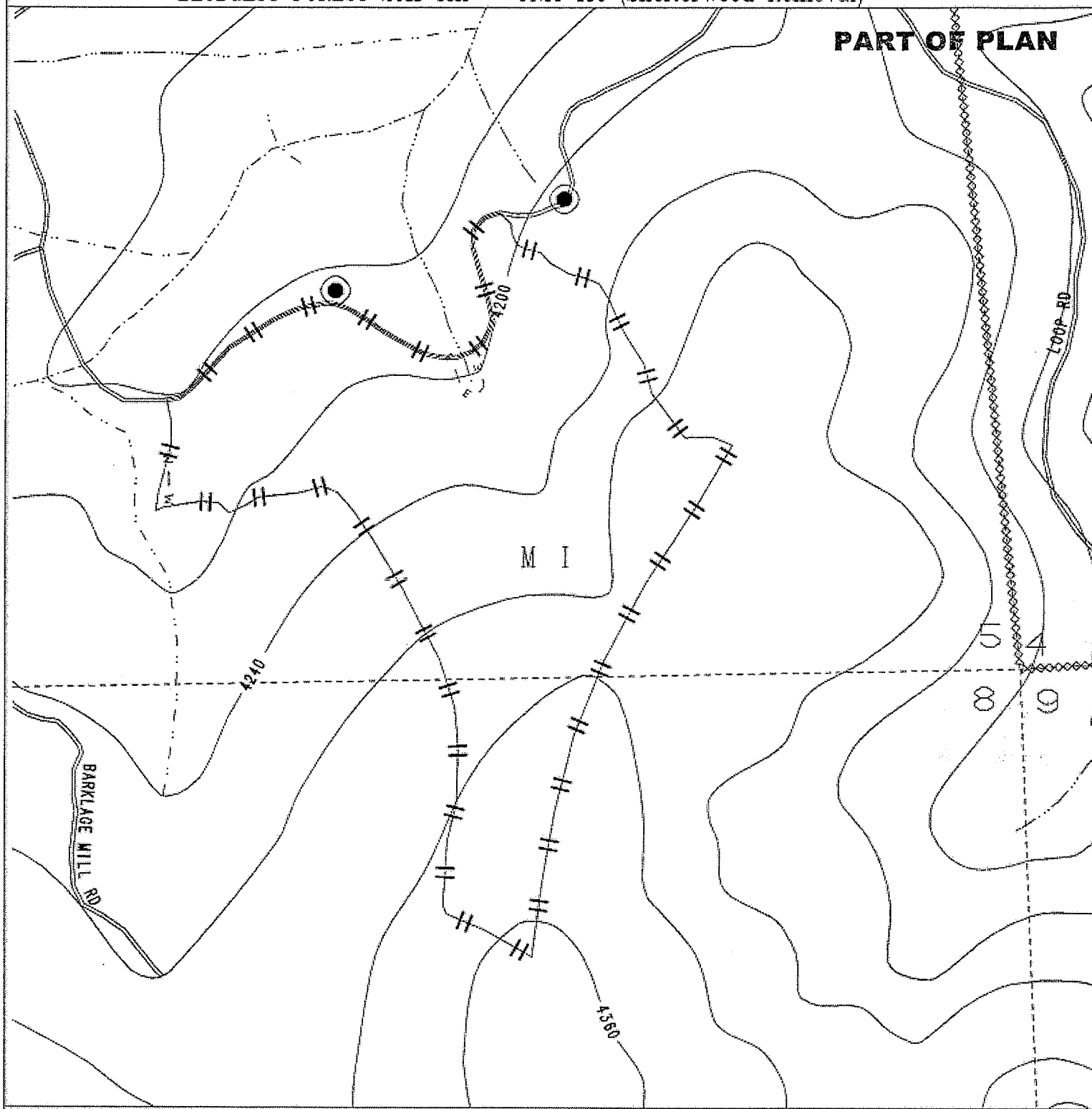
BLODGETT FOREST – COMP 70 & 100 (Single Tree Selection)



BLODGETT FOREST - COMPARTMENT 90 (Clear Cut)



BLODGETT FOREST 2011 THP - UNIT 150 (Shelterwood Removal)



Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours

Existing Landing

Watercourses:
Class I
Class II
Class III
Class IIIP (Potential)
WLPZs
ELZs (Equipment Limitation)

EHR = Moderate (M) Site Class = I

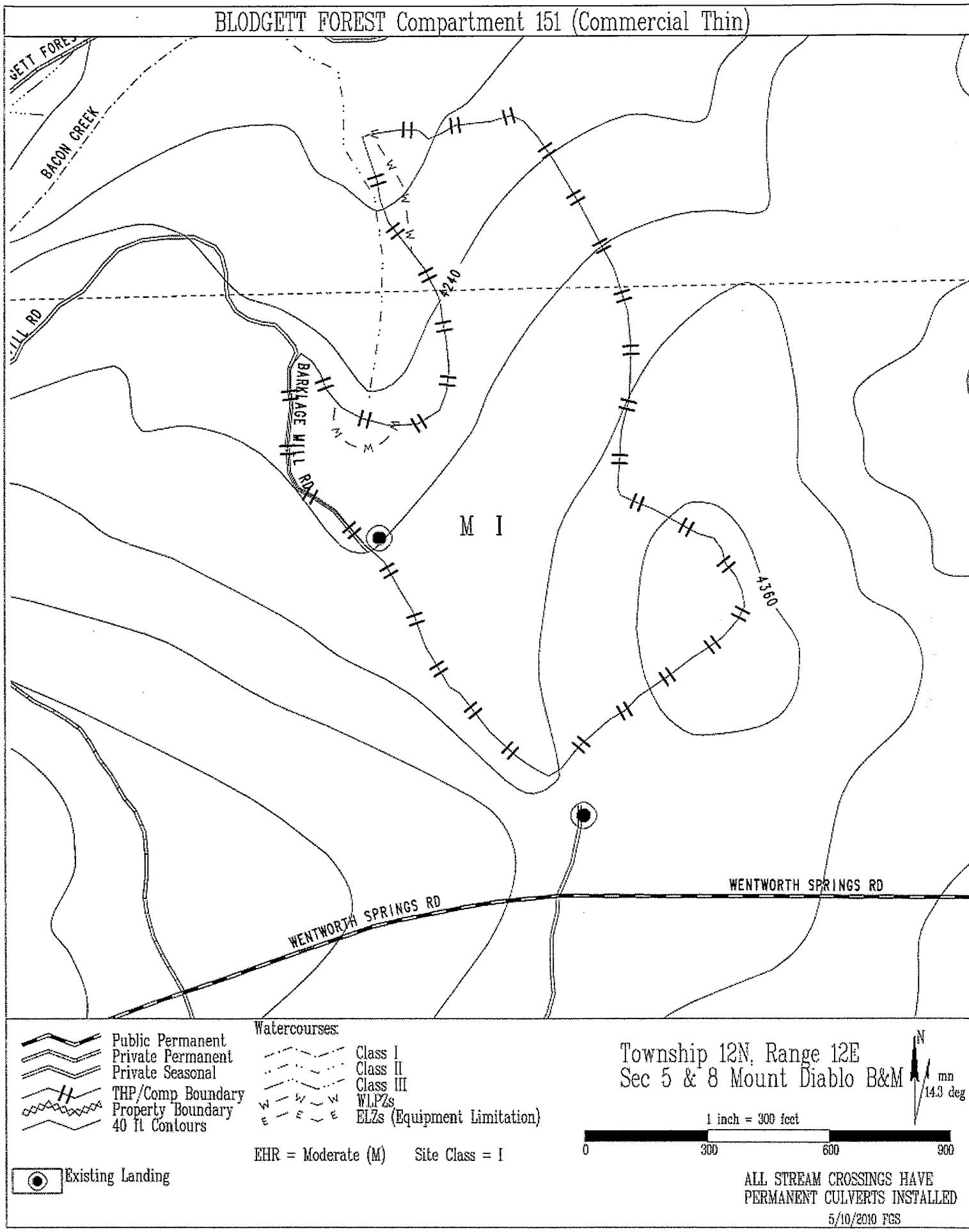
Township 12N, Range 12E
Sec 5 & 8 Mount Diablo B&M

N
mn
14.3 deg

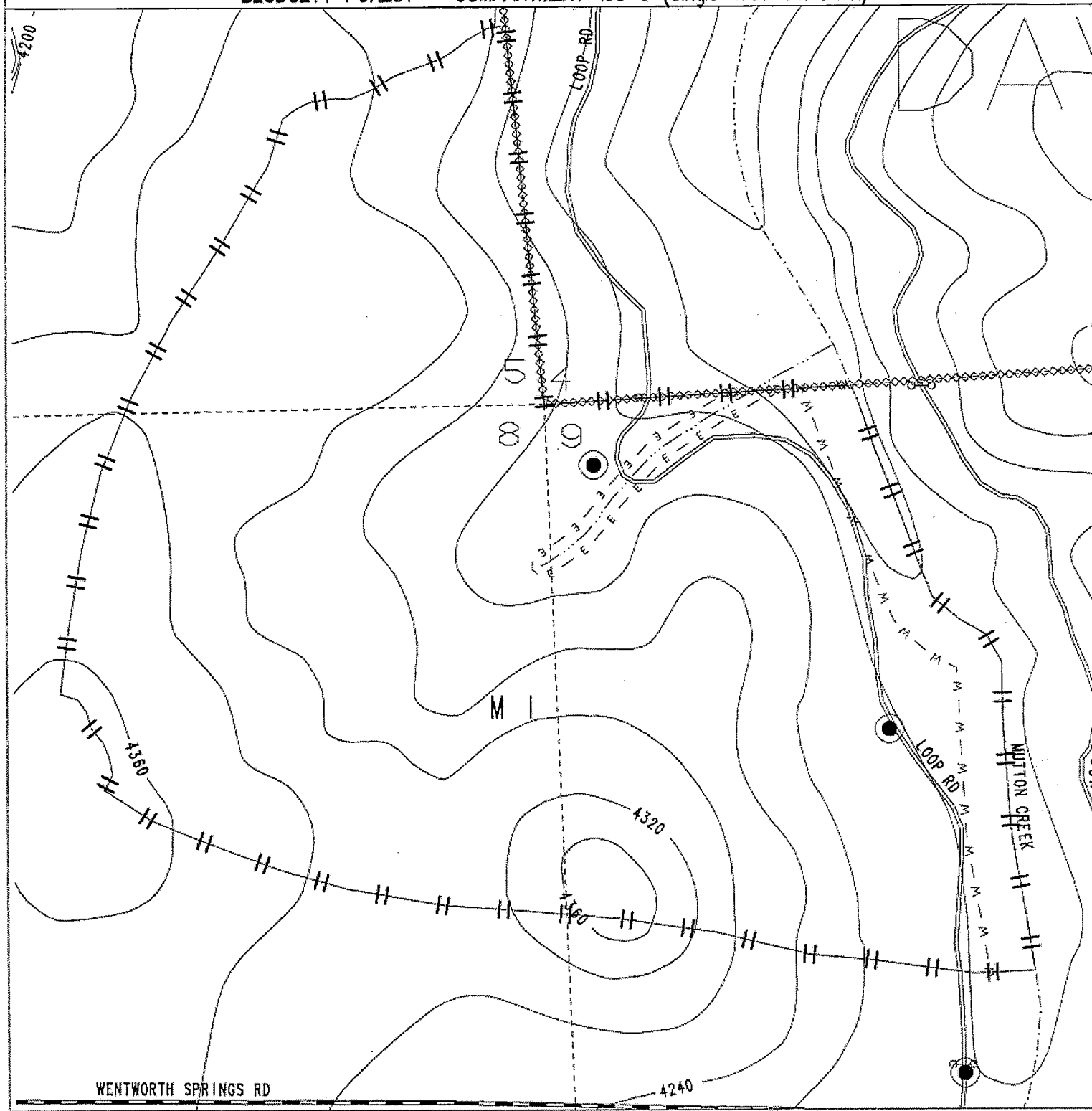
1 inch = 300 feet
0 300 600 900

ALL STREAM CROSSINGS HAVE PERMANENT CULVERTS INSTALLED

5/16/2010 FGS


BLODGETT FOREST Compartment 151 (Commercial Thin)
BACON CREEK
BARKLAGE MILL RD
4240
4360
M I
WENTWORTH SPRINGS RD
WENTWORTH SPRINGS RD
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Existing Landing
Township 12N, Range 12E
Sec 5 & 8 Mount Diablo B&M
N
mn
14.3 deg
1 inch = 300 feet
0
300
600
900
ALL STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
5/10/2010 FGS

BLODGETT FOREST – COMPARTMENT 160 U (Single Tree Selection)



Roads:
- Public Permanent
- Private Permanent
- Private Seasonal
- THP/Comp Boundary
- Property Boundary
- 40 ft. Contours

Watercourses:
- Class I
- Class II
- Class III
- WLPZs
- ELZs (Equipment Limitation)

EHR = Moderate (M) Site Class = I

Existing Landing

Proposed Landing

Gate

Township 12N, Range 12E
S 5,8&9 Mount Diablo B&M

N
mn
14.3 deg

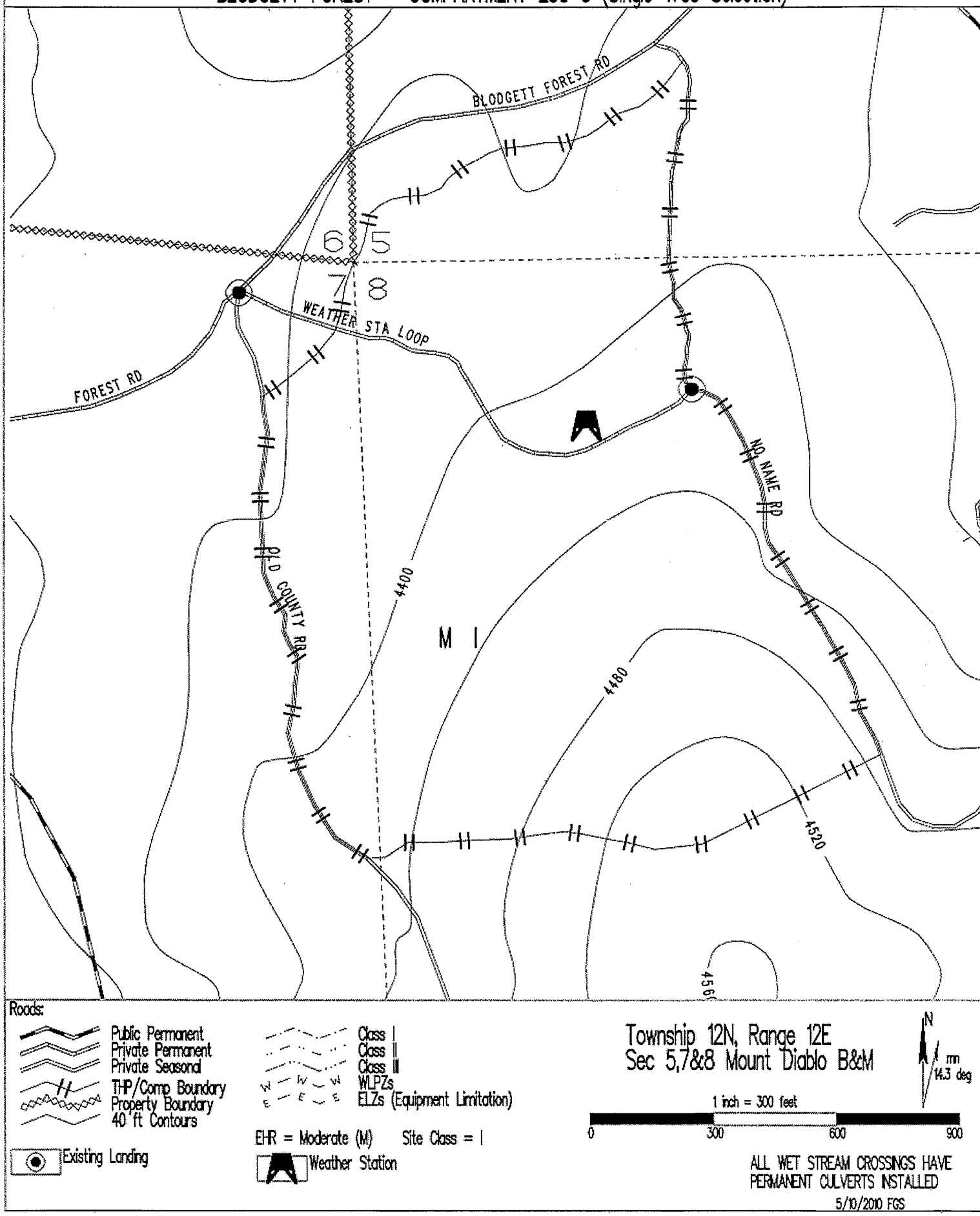
1 inch = 300 feet

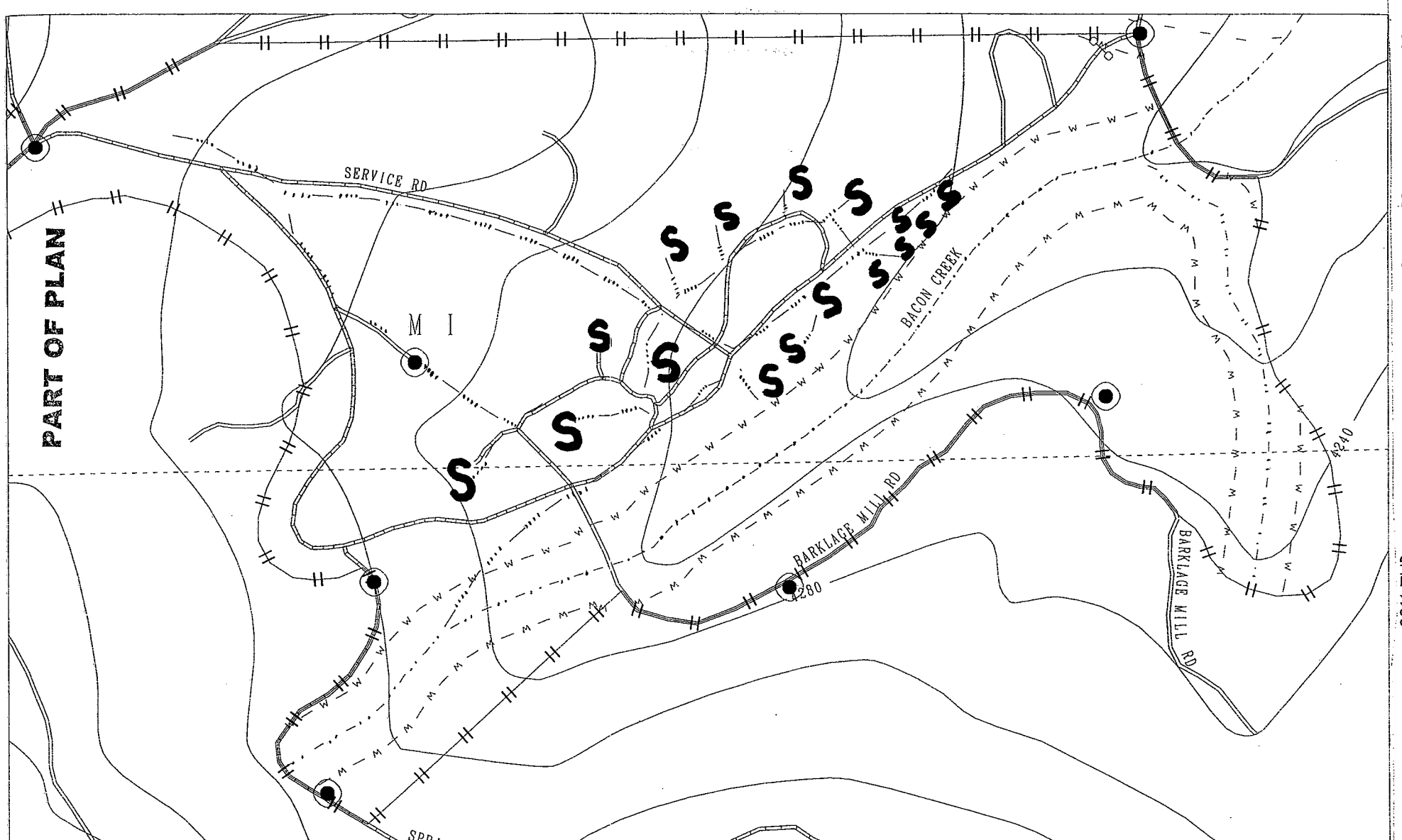
0 300 600 900

ALL WET STREAM CROSSINGS HAVE PERMANENT CULVERTS INSTALLED

5/10/2010 FGS

BLODGETT FOREST – COMPARTMENT 230 U (Single Tree Selection)





BLODGETT FOREST

COMPARTMENT 250

(Commercial Thin)

Roads:
- Public Permanent
- Private Permanent
- Private Seasonal
- THP/Comp Boundary
- Property Boundary
- 40 ft Contours

Existing Landing

S Structure / Human Habitation

Watercourses:
- Class I
- Class II
- Class III
- WLPZs
- ELZs (Equipment Limitation)
- Pipeline

EHR = Moderate (M) Site Class = I

Gate

Township 12N, Range 12E

Sec 5&8, Mount Diablo B&M

N mn 14.3 deg

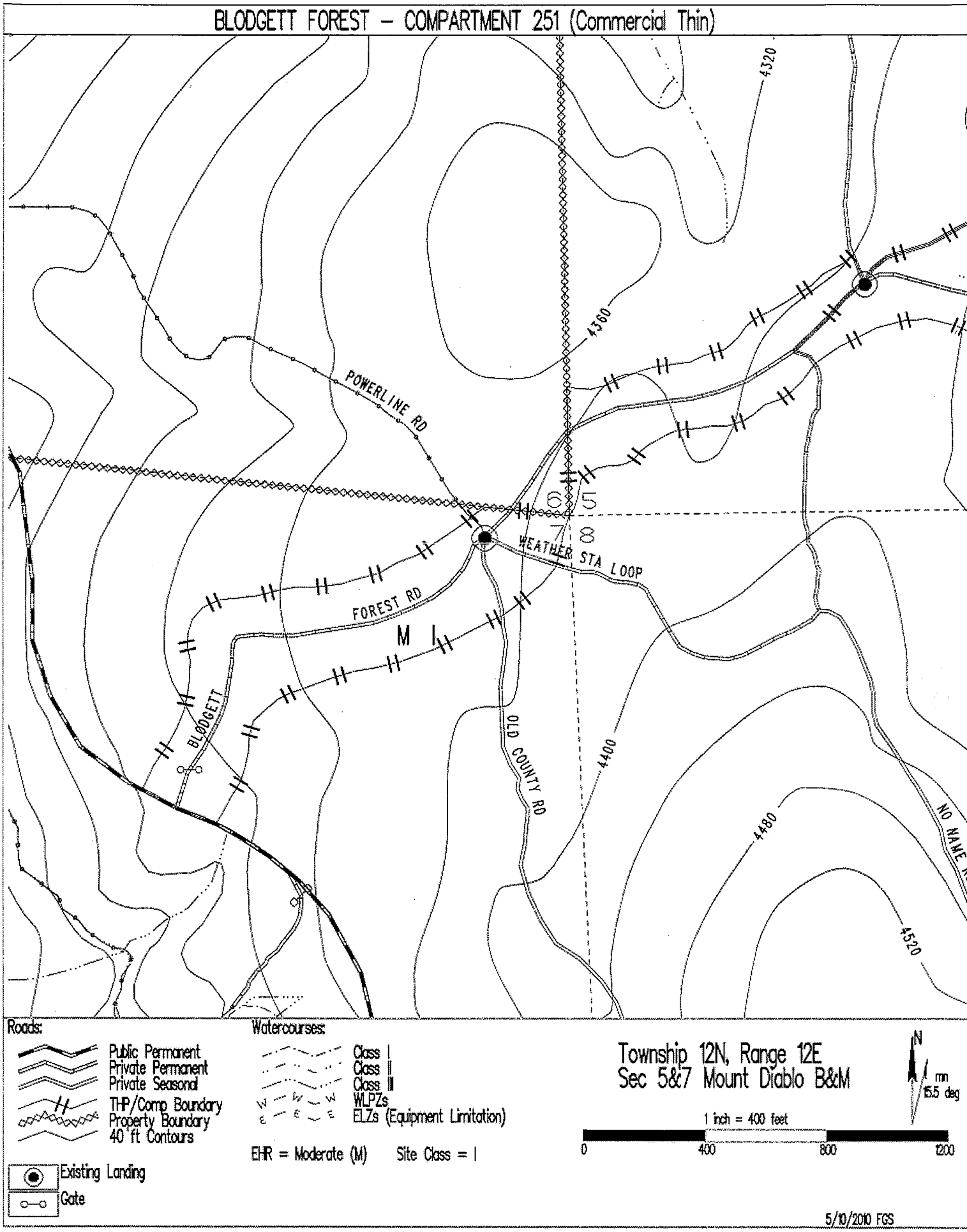
1 inch = 300 feet

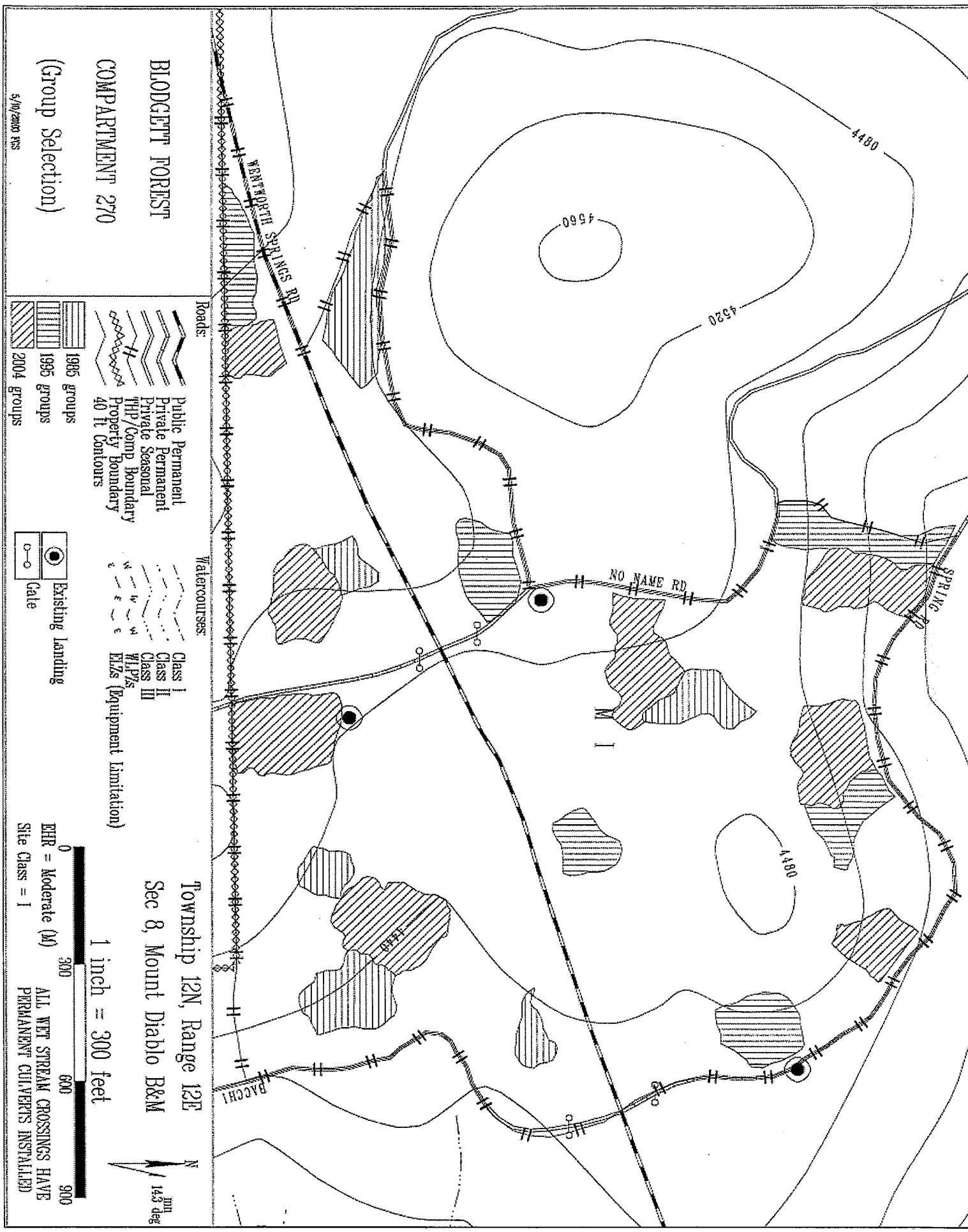
0 300 600 900

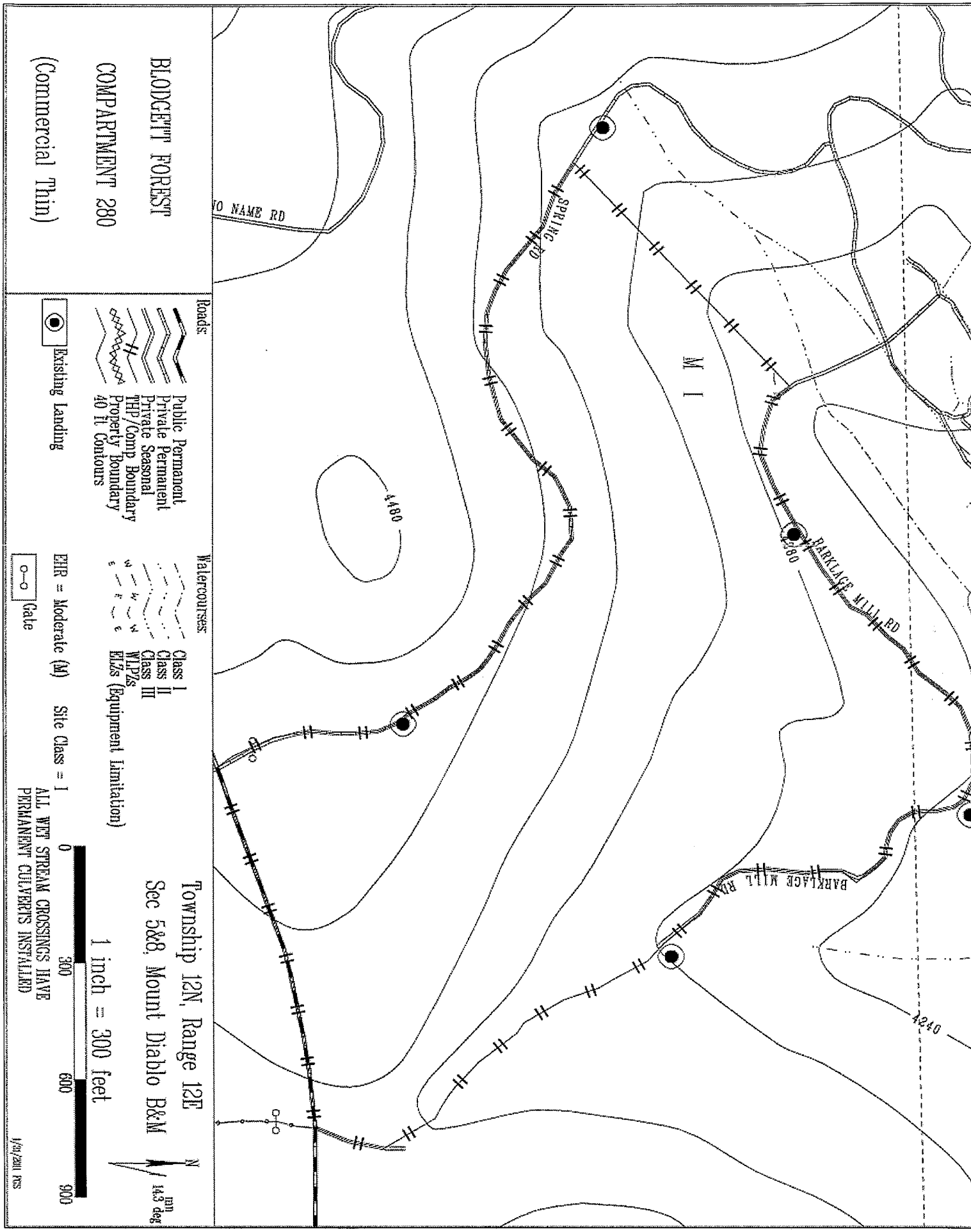
ALL WET STREAM CROSSINGS HAVE PERMANENT CULVERTS INSTALLED

1/31/2011 FGS

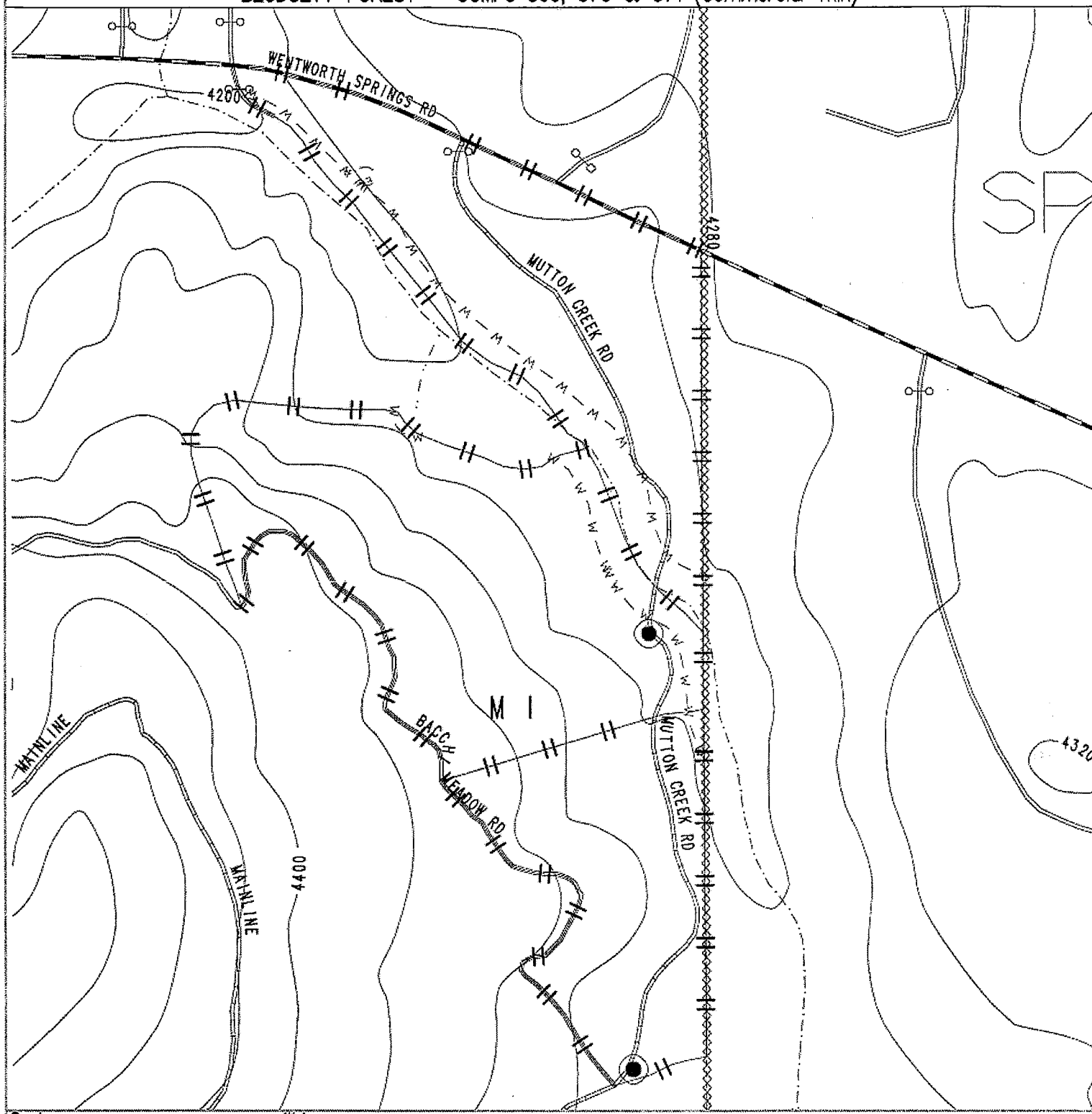
MAY 5 2011 Section II - 38
2011 THP
Blodgett Forest Research Station

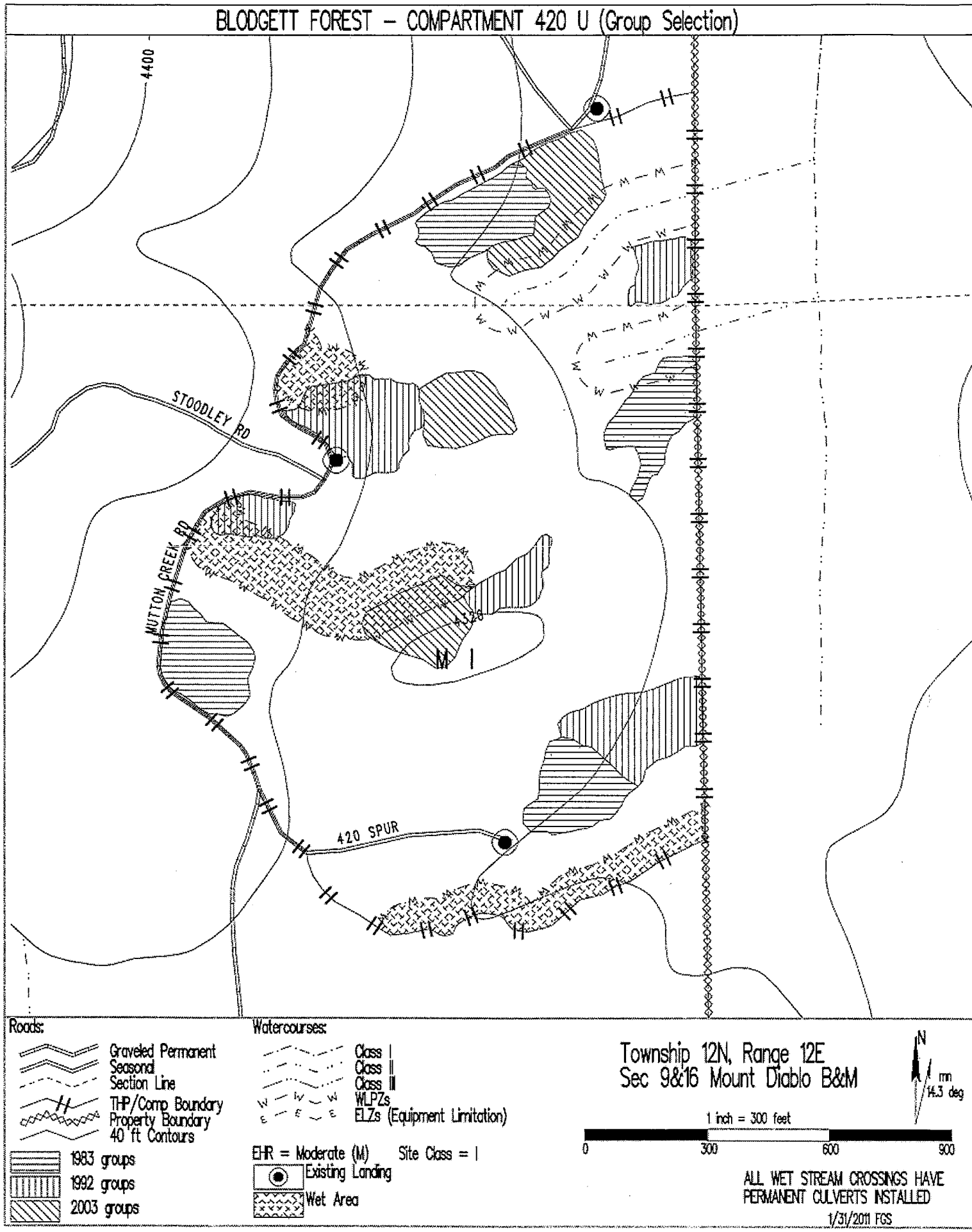

BLODGETT FOREST - COMPARTMENT 251 (Commercial Thin)
4320
4360
POWERLINE RD
6
5
7
8
WEATHER STA LOOP
FOREST RD
M
BLODGETT
OLD COUNTY RD
4400
4480
NO NAME RD
4520
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Gate
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Township 12N, Range 12E
Sec 5&7 Mount Diablo B&M
N
mn
15.5 deg
1 inch = 400 feet
0
400
800
1200
5/10/2010 FGS


BLODGETT FOREST
COMPARTMENT 270
(Group Selection)
5/10/2005 RKS
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
1985 groups
1995 groups
2004 groups
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
Existing Landing
Gate
Township 12N, Range 12E
Sec 8, Mount Diablo B&M
1 inch = 300 feet
0
300
600
900
EHR = Moderate (M)
Site Class = I
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
N
mm
14.3 deg
WENTWORTH SPRINGS RD
NO NAME RD
SPRING CO
BACCHI
4480
4560
4520
4480
4440

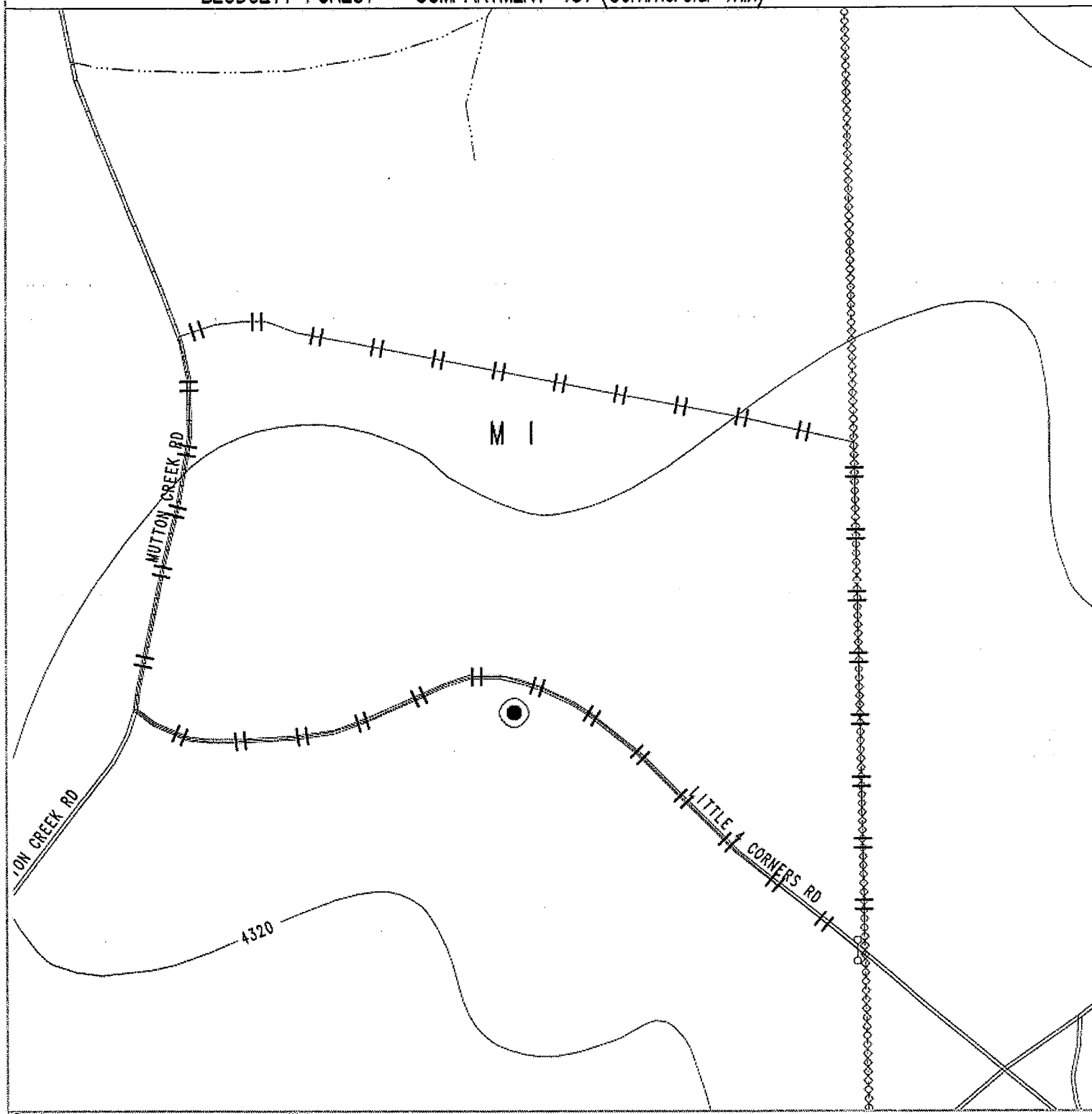

BLODGETT FOREST
COMPARTMENT 280
(Commercial Thin)
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Gate
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = 1
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
Township 12N, Range 12E
Sec 5&8, Mount Diablo B&M
1 inch = 300 feet
0
300
600
900
N
14.3 deg
1/01/2011 rns
NO NAME RD
SPRING RD
BARKLAGE MILL RD
BARKLAGE MILL RD
M I
4480
4280
4240

BLODGETT FOREST – COMPs 360, 370 & 371 (Commercial Thin)




BLODGETT FOREST - COMPARTMENT 420 U (Group Selection)
4400
STOODLEY RD
MUTTON CREEK RD
4320
420 SPUR
Roads:
Graveled Permanent
Seasonal
Section Line
THP/Comp Boundary
Property Boundary
40 ft Contours
1983 groups
1992 groups
2003 groups
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M) Site Class = I
Existing Landing
Wet Area
Township 12N, Range 12E
Sec 9&16 Mount Diablo B&M
N
mm
14.3 deg
1 inch = 300 feet
0
300
600
900
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
1/31/2011 FGS

BLODGETT FOREST – COMPARTMENT 431 (Commercial Thin)



Roads:
- Public Permanent
- Private Permanent
- Private Seasonal
- THP/Comp Boundary
- Property Boundary
- 40 ft Contours

Watercourses:
- Class I
- Class II
- Class III
- WLPZs
- ELZs (Equipment Limitation)

EHR = Moderate (M) Site Class = I

- Existing Landing
- Gate

Township 12N, Range 12E
Sec 17 & 20 Mount Diablo B&M

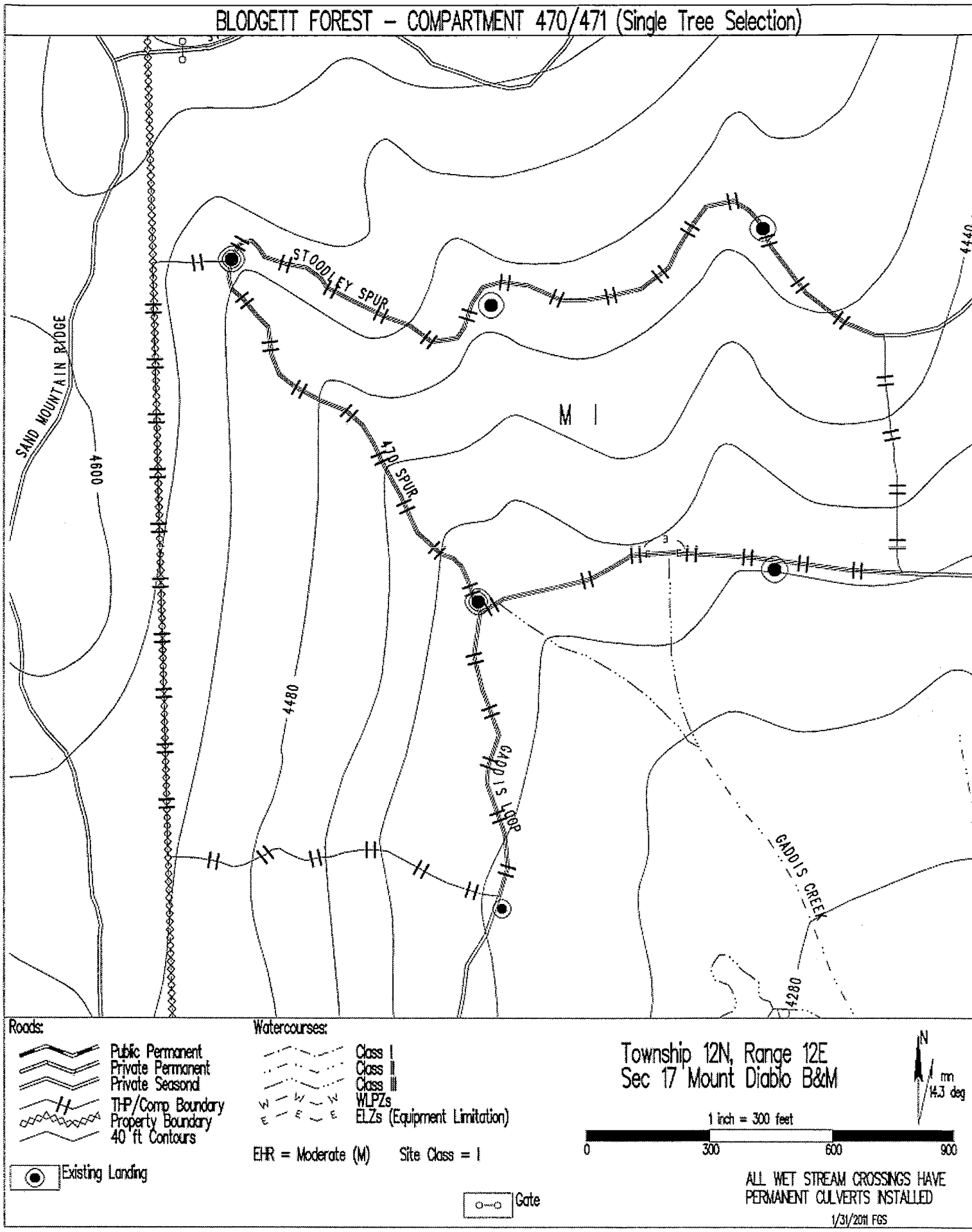
N
mn
14.3 deg

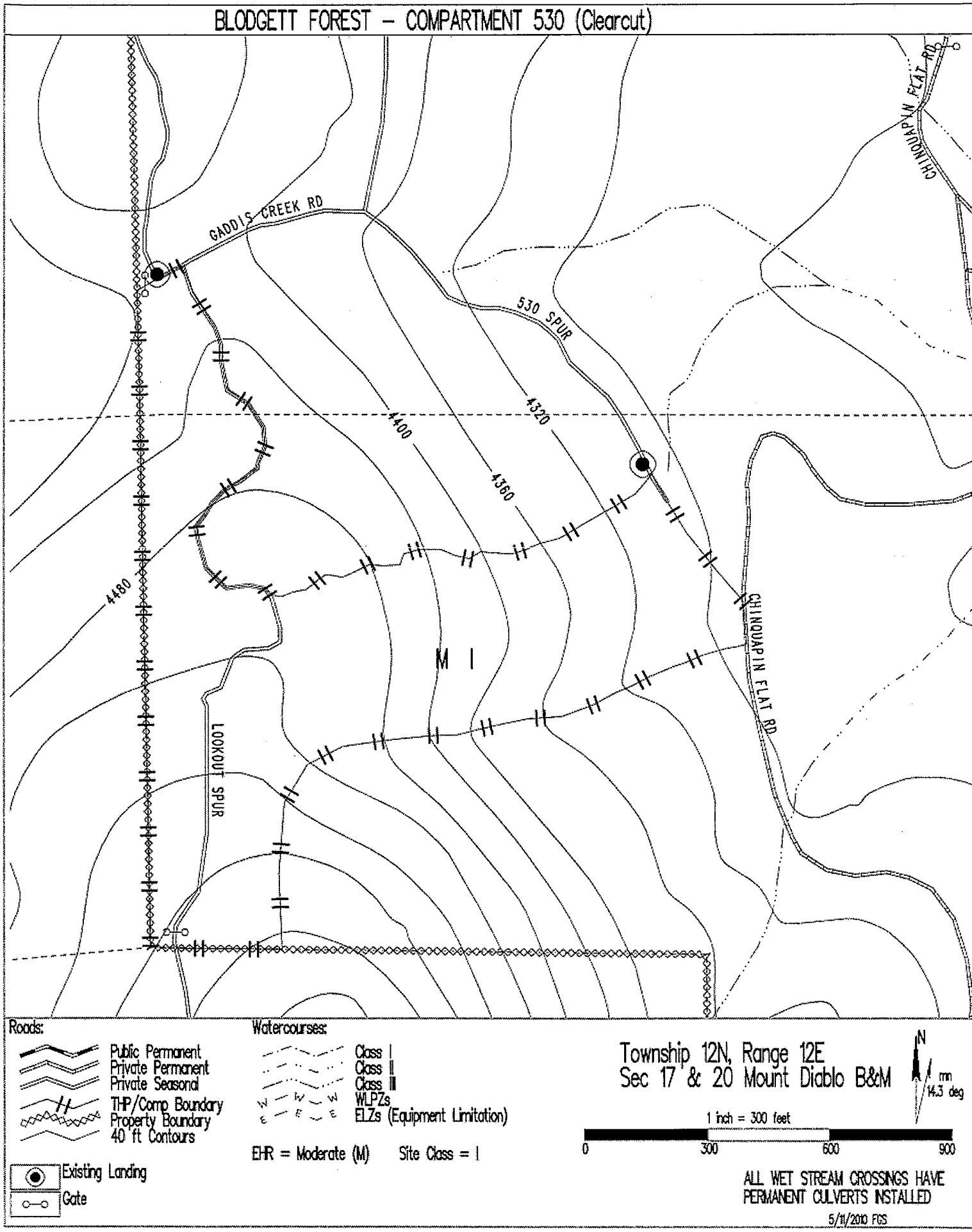
1 inch = 200 feet

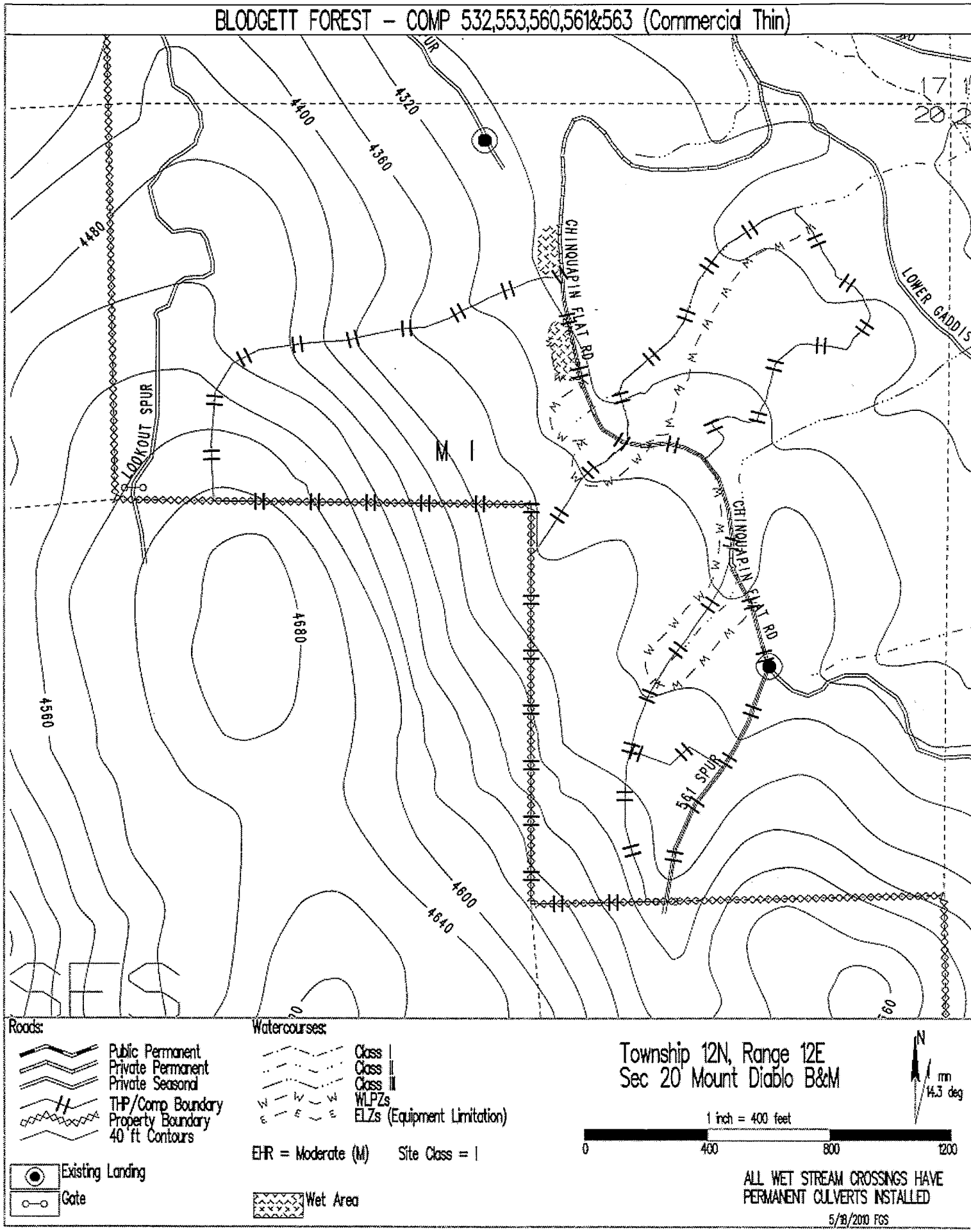
0 200 400 600

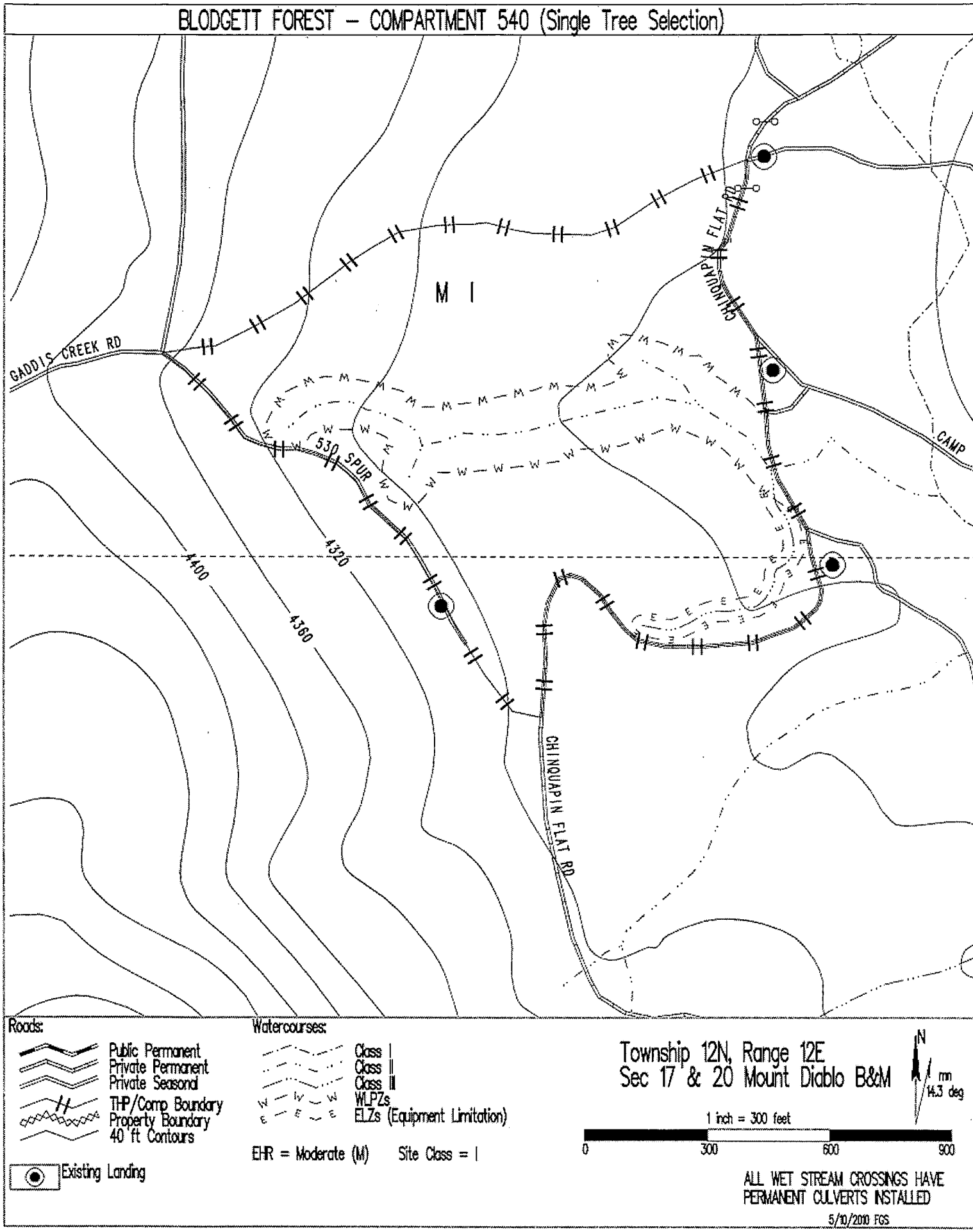
ALL WET STREAM CROSSINGS HAVE PERMANENT CULVERTS INSTALLED

5/11/2010 FGS

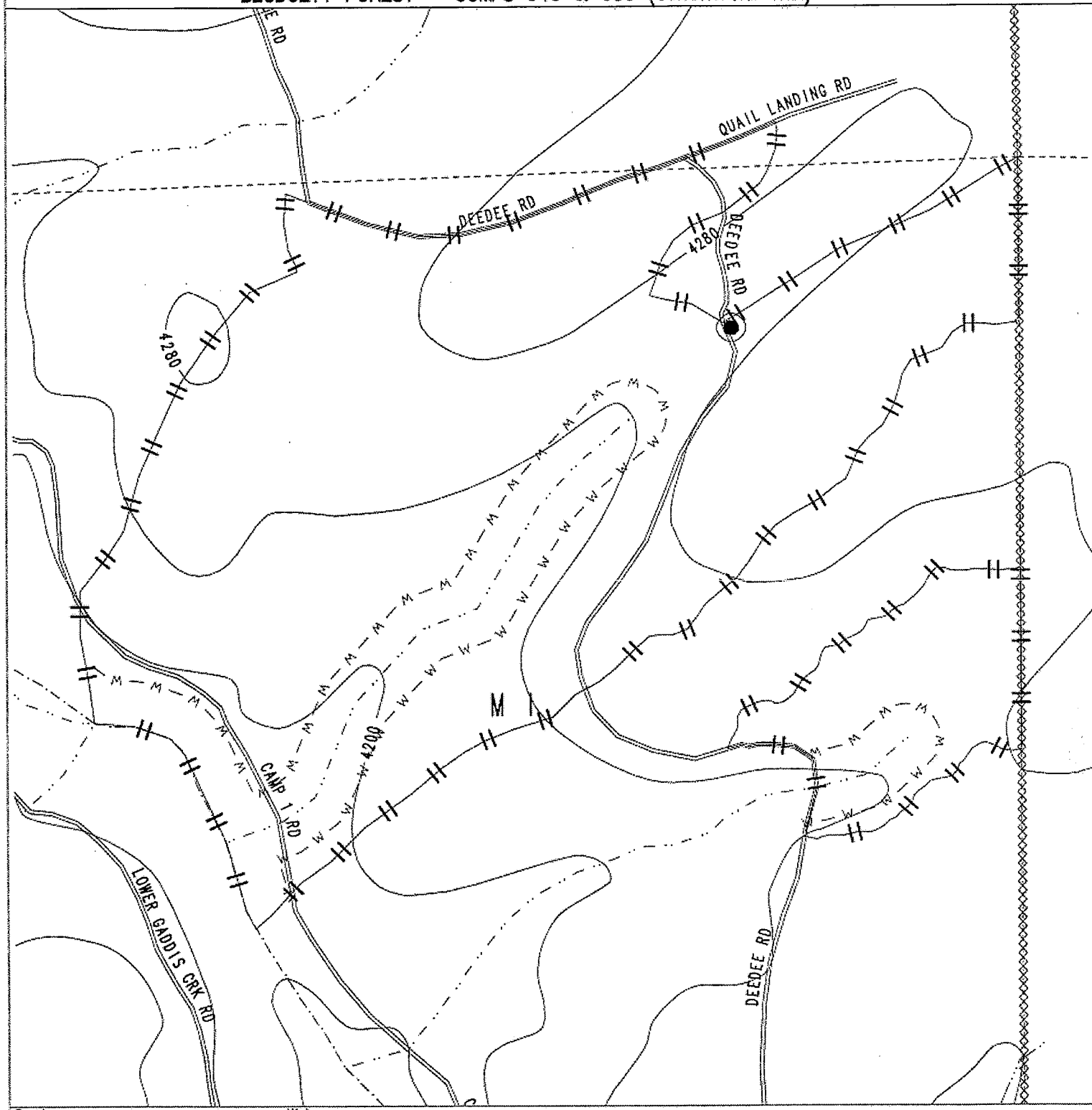

BLODGETT FOREST - COMPARTMENT 470/471 (Single Tree Selection)
STOODLEY SPUR
SAND MOUNTAIN RIDGE
470 SPUR
GADDIS SPUR
GADDIS CREEK
M I
4600
4480
4440
4280
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Gate
Township 12N, Range 12E
Sec 17 Mount Diablo B&M
N
mn
14.3 deg
1 inch = 300 feet
0
300
600
900
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
1/31/2011 FGS


BLODGETT FOREST – COMPARTMENT 530 (Clearcut)
GADDIS CREEK RD
530 SPUR
CHINQUAPIN FLAT RD
LOOKOUT SPUR
4480
4400
4360
4320
M I
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Gate
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Township 12N, Range 12E
Sec 17 & 20 Mount Diablo B&M
N
mn
14.3 deg
1 inch = 300 feet
0
300
600
900
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
5/11/2010 FGS


BLODGETT FOREST - COMP 532,553,560,561&563 (Commercial Thin)
4320
4360
4400
4480
4560
4600
4640
4680
LOOKOUT SPUR
CHINQUAPIN FLAT RD
LOWER GADDIS
561 SPUR
M I
17
20
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Gate
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Wet Area
Township 12N, Range 12E
Sec 20 Mount Diablo B&M
N
mn
14.3 deg
1 inch = 400 feet
0
400
800
1200
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
5/18/2010 FGS


BLODGETT FOREST – COMPARTMENT 540 (Single Tree Selection)
M I
GADDIS CREEK RD
CHINQUAPIN FLAT RD
CAMP 1
530 SPUR
4400
4360
4320
Roads:
Public Permanent
Private Permanent
Private Seasonal
THP/Comp Boundary
Property Boundary
40 ft Contours
Existing Landing
Watercourses:
Class I
Class II
Class III
WLPZs
ELZs (Equipment Limitation)
EHR = Moderate (M)
Site Class = I
Township 12N, Range 12E
Sec 17 & 20 Mount Diablo B&M
N
mm
14.3 deg
1 inch = 300 feet
0
300
600
900
ALL WET STREAM CROSSINGS HAVE
PERMANENT CULVERTS INSTALLED
5/10/2010 FGS

BLODGETT FOREST – COMPS 640 & 653 (Commercial Thin)



Roads:

- Graveled Permanent
- Seasonal
- Section Line
- THP/Comp Boundary
- Property Boundary
- 40 ft Contours

Existing Landing

Watercourses:

- Class I
- Class II
- Class III
- WLPZs
- ELZs (Equipment Limitation)

EHR = Moderate (M) Site Class = I

Township 12N, Range 12E
Sec 21 Mount Diablo B&M

N
mn
14.3 deg

1 inch = 300 feet

0 300 600 900

ALL WET STREAM CROSSINGS HAVE PERMANENT CULVERTS INSTALLED

5/7/2010 FGS

2011 Blodgett Forest Research Station THP

SECTION III

ADDITIONAL INFORMATION

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Item # 30 Hazard Reduction	Page 79
Item # 31 Fuel loading	Page 80
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Spotted Owl/Goshawk Site Map	Page 88
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Item # 34 Wildlife Habitat	Page 90
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General description of the plan site

Blodgett Forest Research Station (BFRS) is located on the western slope of the Sierra Nevada in central California approximately 12 miles east of Georgetown, El Dorado County. BFRS is owned by the University of California, and managed by UC Berkeley's Center for Forestry. Contained within the approximate 4270 acres that comprise Blodgett Forest Research Station are two tracts of ownership, separated by about ½ mile of neighboring land. The northern portion is hereafter referred to as "Pilot Creek tract" and the southern portion is referred to as the "main tract." Both tracts are similar in vegetation and soil type, although the management history is distinctly different. The main tract has been managed as a research station by the university since 1933, and has consistently submitted annual harvest plans as part of its research support. BFRS has acquired a plethora of data and information about the conditions of the main tract. The Pilot Creek tract was acquired by the university in 1998, and information at the site has been collected since 1995. Since that time, BFRS has sought to collect information to establish a baseline of the area's operational and environmental conditions. The prescriptions for the Pilot Creek Tract are designed to disabuse past practices, and also to support BFRS's primary mission- to support the understanding of forests through academic research and instruction. Like the main tract, achieving structural and compositional diversity on the Pilot Creek tract is a keystone strategy in supporting research. Diversity is as much our practice as it is our purpose. We strive to promote this diversity through the judicious practice of silviculture.

General conditions of the main tract

The harvest areas (all compartments proposed in the 2011 THP) on the main tract have slopes ranging from 0 to 50%, with elevations ranging from 3,960 to 4,560 feet. The soils are derived from granodiorite parent material with deeply weathered horizons. Annual precipitation averages about 64 inches, approximately 20% of which is received as snow. November through March generally yields approximately three-fourths of the annual precipitation and the summers are typically dry. Average monthly minimum temperature in January is 33 °F with an average monthly maximum temperature in August of 83 °F.

Each of the harvest areas have been previously harvested. Most of Blodgett Forest was cleared of old growth trees by the previous owners circa 1900-1920. All harvest areas in this THP have been partially harvested at least twice since 1958 by the University of California as part of long-term multidisciplinary studies of management alternatives for Sierran mixed conifer vegetation. The compartments are currently well stocked by a combination of naturally regenerated overstory trees ranging in age from about 75 to 95 years. The group selection openings have been regenerated by planting and seed fall. This regeneration is 10 to 30 years old. Compartments 360, 370, 371, 553, 560, 561, 563 and 640 are 20 to 30 year old plantations which are scheduled for commercial thinning. Watercourse conditions are described in detail in Section IV.

Discussion of Alternatives for Blodgett Forest Research Station 2011 THP

The following is a list of relative impacts for alternatives to the 2011 Blodgett Forest THP. Alternative number one is the preferred alternative as it best fulfills the management goals and objectives of the Center for Forestry at Blodgett Forest Research Station.

1. Fulfill goals outlined in 2011 THP

- Research projects will continue to provide new information for the Sierra Nevada Mixed Conifer region, and insight for research methods and concepts within natural resource disciplines.
- Through diversity of silvicultural practice, a diversity of structural complexes will be created and hence support a diversity of research and habitat types. Maintenance of no-cut forest reserves (>13 % of ownership) in other locations on this property offers habitat to those species that prefer older stand characteristics.
- The THP will help facilitate necessary maintenance on roads, facilities, and continuing research projects.
- Timber revenue will continue to support Blodgett Forest research programs and the local economy through staff and contractor revenue generation and through generation of timber taxes.

- **Risk of catastrophic wildland fire will decrease with development of containment strategies and increased protection of local residences in wildland/urban interface.**
- **Through careful silvicultural choices, BFRS will continue with restorative efforts to amend some of the negative impacts previous land use activities have imposed on this region.**
- **Water quality is not expected to be negatively impacted by continuing with harvesting activities. Active programs to identify and repair water quality issues will be funded by timber harvest revenues.**
- **Blodgett Forest uses silvicultural systems that either inherently have modest impacts on the environment or are applied at a rate across the landscape which have only modest impacts.**

2. No Action

- **Increased risk of catastrophic wildfire from fuel loading and increased trees per acre with a high percentage of suppressed trees acting as ladder fuels.**
- **Investments into Silviculture, roads, buildings, and research will degrade with no financial return. Blodgett Forest Research Station is self-supported.**
- **Research goals will be unfulfilled and a land base dedicated to research in the Sierra Nevada Mixed Conifer type will be unavailable. The comprehensive database (http://ecology.cnr.berkeley.edu/properties) developed over several decades of research would be terminated and thus no longer available.**
- **Wildlife habitat will develop to that favoring mid-successional species and become less desirable for those species needing young forest, low density forest, or mixed age class habitats.**
- **Water quality may improve as human disturbance is reduced, however, road impacts due to lack of maintenance funds may counteract this improvement for many decades.**
- **Restoration efforts to improve degradation resulting from turn of the century activities will be halted.**
- **Loss of a field teaching opportunity for local individuals and the various natural science related departments at the University of California, Berkeley.**
- **Higher tree mortality and the increased incidence of disease and decay may result due to no substitute for the original natural fire regime.**
- **No timber yield tax available to El Dorado County.**
- **Reduction in job benefits to local economy.**

3. Delay Treatment Activities for Several Years

- **Will significantly impact past, present, and future research projects. A delay in data collection and forest manipulation will negatively influence those projects requiring periodic manipulation.**
- **Future harvest levels will be more intensive to achieve same residual benefits.**
- **Increased fire risks with a delay in vegetation management and a delay in the development of a fire containment infrastructure due to funding impacts.**
- **Those stands that currently need silvicultural manipulation will be pushed further in their development to a stage where current management systems may no longer be feasible.**
- **Losses to the current local economy as financial returns are delayed.**
- **Negative impacts from timber harvesting will be postponed and natural recovery process from previous disturbances will continue.**

4. Direct Management Activities Elsewhere Within the Ownership

- **Will forgo opportunity to actively manage stands with an existing scheduled periodic harvest cycle.**
- **Pressure on other land units will be more intensive as a fixed land base has limited resources.**
- **Planned research projects within the THP area not accessed this harvest entry may be terminated.**
- **The Blodgett Forest long-term plan will not be fulfilled in having a balanced distribution of age classes, and group selection stands created systematically at intervals.**
- **Increased risk of high intensity wildfire may occur in those stands not accessed and manipulated for fuels management.**
- **Other units requiring some silvicultural manipulation can be accessed at this time rather than forgoing the opportunity, however those units have less pressing management needs than Option #1.**
- **Financial returns from timber revenue will still be available and thus the local economy will essentially be unaffected.**
- **Harvest levels will be maintained at the same level, just different sources.**
- **Opportunities as a field classroom are still available.**

ITEM #14 a.
SILVICULTURAL TREATMENTS

BFRS GENERALIZED CONIFER MARKING RULES

1. Snags
   A. Leave all snags except:
      (1) Snags >20' tall and >16" DBH within their height of landings and/or truck roads.
      2) Snags >20" DBH that have died within the year
   B. Leave all trees <1/3 sound wood.
   C. Leave all snags regardless of location if they contain currently active wildlife nests.
   D. Leave one tree per acre of less than fair vigor for snag recruitment.

2. Trees with damage/disease so extensive that they are likely to die or decline in volume within 10 years have:
   A. PP, SP, DF, IC, BO, TO: >1/3 circumference cambial damage.
   B. WF, MD >15% circumference cambial damage.
   C. Major evidence of root disease: needle retention <3 yrs., shortened and pale, foliage throughout.
   D. Mistletoe infection >Hawksworth #3 or stem cankers broken open.
   E. Less than 15% LCR (condensed).
   F. Host species within 50' of the edge of a confirmed root disease center.
   G. >25% of root mass exposed.
   H. Evidence of Ips, D. brevicomis, D. ponderosae, and/or successful D. valens attack.
   I. Evidence of Scolytus attack.

3. Tree vigor is EXCELLENT and approximately equal if:
   A. Damage and disease are absent.
   B. LCR (condensed) exceeds 40% for PP, SP, WF, and DF.
   C. LCR (condensed) exceeds 50% for IC.
   D. Foliage is normal (do not confuse normal needle shed with foliage problems).
   E. Trees are the same crown class (D = C in this case).
   F. Stem form is without crook, sweep or forking.

4. Tree vigor is GOOD but approximately equal within the GOOD class if:
   A. Damage and/or disease are minimal (see #2) but otherwise #3 applies.
   B. Or, LCR is >30% (condensed) but otherwise #3 applies.
   C. Trees are in the same crown class (D = C in this case).

5. Tree vigor is FAIR but approximately equal within the FAIR class if:
   A. LCR >15% (condensed), and/or,
   B. Damage and/or disease are minor (see #2 above), and/or,
   C. Foliage quality is normal or modestly sparse, and,
   D. Stem form is sawlog acceptable.
   E. Trees are in the same crown class (D = C in this case).
   F. Otherwise #4 applies.

6. In dense equal vigor tree clumps, cut shorter or smaller DBH (by >20%) trees first.

7. Do not split pairs of WF, rarely split other single species pairs. It is usually better to cut both or leave both.

8. When splitting pairs or very closely spaced trees of equal vigor, cut the north tree.

9. Old (>20 years) forks and/or broken tops with fully recovered leaders and no visible disease are not considered damage.

10. Fully healed stem scars on PP, SP, DF, and IC without other visible signs of disease are not considered damage.

11. Sooty mold (on IC) is evidence of < good vigor, not defect.

12. Merchantable DF, PP, and SP contain > one 16' log to 6" dib 100% sound or > one 32' log to 6" dib >50% sound. Merchantable IC contain > one 12'6" log. Merchantable (fuelwood) hardwoods contain one 16' log to a 6" dib >50% sound.

13. Wildlife Habitat:
    A. Do not cut trees with evidence of nests in current use.
    B. Within equal vigor classes leave trees with evidence of nests even if not in current use.

Single Tree Selection Compartments 70, 100, 160, 230, 470, 471 and 540

The management is guided by the silvicultural principle that there is a desirable density management zone in which the stand should stay over time to achieve both high stand growth increment and adequate regeneration. The zone is bounded on the lower end by a stand that is too sparse to allow for high stand increment and bounded on the higher end by a stand that is too dense to avoid density-dependent mortality. These stands will employ a cutting cycle length of approximately 10 years to achieve the objectives of maintaining basal area levels between 125 and 250 sq ft/ac while establishing 7 to 10 age classes when regulated.

Step-point transect canopy sample

Traditional diameter distributions do not go beyond assuming that a large tree occupies any more space than a smaller tree. The common notion that an "inverse-J" distribution is necessary stems from the idea that a lot of seedlings are necessary because they will mostly die by the time they reach maturity. But the reason they die is because there are so many seedlings competing with each other, thus presenting a self-fulfilling prophecy. Instead of allocating stem density among several size classes, growing space will be allocated among size classes. The concept of growing space allocation implies that individual trees occupy a space that is relative to their size. To quantify the current allocation of growing space, step-point transects are sampled throughout the stand. Growing space occupancy is assumed to be proportional to crown radius. At each sample point, the presence of a trees crown covering the point is recorded. Diameter and species are recorded for each crown sampled. The result is a relative allocation of growing space among diameter size classes.

Compartment Marking Guidelines (use in conjunction with BFRS General Marking Guidelines)

1. Retain 1 tree/acre >20" dbh likely to die or decline in volume during the next 10 years for snag recruitment.
    A. Refer to the Generalized Marking Guidelines for snag recruitment procedures.
    B. The long-term goal is to have about 1 greater than 30" dbh snag/acre, plus one 20-30" dbh snag/acre. These 2 snags per acre should occur at the 5-10 acre scale. Prefer to retain snags in clusters of same species. Note that retention is a long-term goal and that snags typically stay standing longer than the cutting cycle. Therefore, only high quality snags (large and with features such as crooks and forks) should be retained.

2. Cut all mistletoe infected trees unless basal area will drop below 100ft^2/acre or when needed as a seed tree.

3. Within 100 feet of currently existing canopy gaps that have releasable seedlings of ponderosa pine, sugar pine, and Douglas-fir, reduce basal area to ~ 100-125 ft^2/acre. Such gaps have seedlings or saplings that are taller than surrounding brush, and moderate recent height increment (>6"). Show the following preferences when thinning around such openings:
    A. Cut large black oaks that cast shade across the openings.
    B. Cut 24+ dbh trees on the southern edges 100% of the time when a tree of good vigor can be released below it.
    C. Use approximate equilateral spacing

4. In all other areas, thin to approximately 150ft^2/acre. Cut trees in the following order:
   A. Any tree with less than fair vigor (see generalized marking guidelines for vigor definitions)
   B. Fair, good and excellent vigor trees should be marked by the primary decision factor of equilateral spacing.
      1. Mark trees of lower vigor first
      2. If vigor is equal, prefer to mark over represented species.
      3. Leave 16"+ incense cedar with full crowns and bark that is free of sooty mold
      4. If a choice still remains, leave trees with the most leaf area
   C. Spacing for 150 ft^2/acre residual basal area:

Class	Range	Spacing for 150 ft^2/acre
PL	6-12"	D+5
SS	12-18"	D+6
MS	18-24"	D+7
LS	24-30"	D+8
XL	>30"	D+10

(e.g. 16 inch DBH trees D = 16ft. + 6 = 22 ft. spacing = 150 ft^2/acre)

Group Selection with new group regeneration and matrix treatment Compartments 20, 40, 270 and 420

The objective of this entry is to regenerate approximately 8%-15% of the area in 0.5 to 2 acre groups. These groups will be site prepped by machine piling the slash and then burning the piles. The groups will then be planted. A 5 to 6 conifer species mix will be used when possible. Hardwood stumps in the groups will be allowed to sprout and become part of the species mix. Group locations have been selected in the following order:

1) Areas that are primarily occupied by non-commercial (non A or B species) vegetation
2) Areas that are Understocked by conifers and do not have the potential to become adequately stocked through future growth
3) Areas primarily stocked by large mature commercial trees.

The matrix stand will be treated using a commercial thin from below. Residual basal area levels in the matrix will be reduced to 125 to 175 sq ft/ac based on local species composition. Areas dominated by pines, oaks or cedars will be thinned to the lower levels while areas heavier to firs will be kept at the slightly higher levels. At a 10 year cutting cycle, this will create a stand with 8 age classes and a maximum aged group of 80 years when the stand becomes regulated.

Shrub cover will temporarily decrease as skidding equipment damages adult shrubs. Brush will be allowed to sprout in major skid trails and landings. Shrubs occupying regeneration space in group selection areas after harvest will be cut and/or sprayed. Black Oaks will be cut within groups and allowed to sprout. Where necessary, black oak sprouts will be protected from browsing and encouraged to create a sustainable distribution of oak age classes.

Commercial Thin Compartments 151, 250, 251, 280, 360, 370, 371, 431, 532, 553, 560, 651, 563, 640 and 653

Commercial thinning from below will target a basal area of at least 125 sq ft/ac. The Blodgett Forest General Marking Guidelines will be followed to select harvest trees. The entry is designed to allow free growth of the remaining trees for a period of 10 to 15 years. The stand will be re-examined at that time and a decision, considering age and other factors, will be made whether to thin it once more or whether to regenerate it and establish a mixed conifer plantation. Two to 3 healthy trees per acre of each species, when available, will be left to allow for a seed tree or shelterwood regeneration step if desired. Species composition will remain similar following harvest. Crown density is expected to be reduced slightly during harvest; however, most of the largest overstory trees will be retained. Crown density should recover to pre-harvest levels within 10 years.

ITEM #14 a.

SITE CLASS INFORMATION
(for compliance with subsection (c) of 14 CCR 953.11)

ALL PROPOSED HARVEST AREAS ARE SITE CLASS I .

Timberland Site for the entire THP area is determined as follows:

As part of BFRS's continual forest inventory, site trees have been measured throughout the ownership. Trees are chosen and indexed according to the procedures used by Biging and Wensel (1984. Research Note No. 8). Site averages for the proposed harvest by species are as follows (predicted height at breast height age 50 of dominant and codominant trees). Species without stand level data are estimated from the Blodgett Forest Data Base from adjacent stands. The harvest areas are all within Forest Practice Rules Site I (>114 ft at age 100 years). The following compartment specific inventory data will provide the reviewer with site quality, soil type, slope, aspect, elevation, understory vegetation; and tree species, size, basal area, and spatial arrangement.

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 20

Number of Plots: 7 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	41	69	91
Slope:	5	13	20
Elevation:	3970	4057	4100
% Understory Cover:	0	28	100
Aspects:	N, NE		
Soil Types:	Holland-Musick		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LIDE	9	12.2	9	4.0
TRLA	6	11.7	6	0.1
CEIN	5	2.2	5	2.2
ROGY	5	1.1	5	0.7
VILO	3	0.6	3	0.0
GATR	3	0.6	3	0.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	33.08	7.1	42.6	2.37	17.12
IC	21.94	28.6	75	2.25	13.15
DF	26.78	32.9	128.6	5.54	35.33
WF	34.4	2.9	18.4	1	6.77
GS	7.78	1.4	0.5	0	0
BO	7.23	2.9	0.8	0.02	0
TO	8.65	77.1	31.5	0.5	0
HW	8.98	1.4	0.6	0.01	0
all	18.74	155.7	298.3	11.69	72.37

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	1	0	0	0	0	3	3	7
IC	0	10	4	9	3	1	1	28
DF	0	9	3	3	9	1	9	34
WF	0	0	0	0	0	3	0	3
GS	0	1	0	0	0	0	0	1
BO	1	1	0	0	0	0	0	2
TO	20	51	7	0	0	0	0	78
HW	0	1	0	0	0	0	0	1
ALL	23	74	14	11	11	9	13	155

Species	Site Index
PP	115.13
DF	107.35
WF	112.86

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 40

Number of Plots: 9 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	67	78	100
Slope:	8.0	15.6	40.0
Elevation:	4140	4222	4290
% Understory Cover:	0	12	40
Aspects:	E, N, NE, NW, W		
Soil Types:	Holland-Musick		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CEIN	2	2.8	2	1.6
TRLA	2	0.6	2	0.0
SYMO	2	0.0	2	0.1
RIRO	2	0.0	2	0.2
LIDE	5	4.6	4	7.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	28.75	3.3	15	0.76	5.32
SP	22.01	3.3	8.8	0.32	1.9
IC	14.86	56.7	68.3	1.51	7.2
DF	17.08	37.8	60.1	1.96	11.2
WF	17.43	42.2	69.9	2.84	17.23
BO	14.21	30	33	1.36	0
TO	9.7	27.8	14.2	0.29	0
ALL	15.67	201.1	269.4	9.05	42.86

Average Number of Trees per Acreby Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	All
PP	0	1	0	0	0	2	0	3
SP	0	2	0	0	1	0	0	3
IC	7	30	7	6	7	1	0	58
DF	8	10	7	8	3	0	2	38
WF	4	18	9	3	4	1	2	41
BO	12	3	7	4	3	0	0	29
TO	13	4	9	1	0	0	0	27
All	44	67	40	22	18	6	4	200

Species	Site Index
PP	110.67
SP	106.79
IC	85.69
DF	110.01
WF	101.07

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 70

Number of Plots: 10 **Plot Size:** 1/10 acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	32	48	88
Slope:	5.0	18.4	30.0
Elevation:	4310	4376	4455
% Understory Cover:	0	12	50

Aspects: E, N, NE, NW

Soil Types: Holland-Musick

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CEIN	9	3.5	9	3.0
QUKE	4	3.5	4	0.8
CHFO	5	2.5	5	0.2
SYMO	1	1.5	1	0.0
LIDE	5	0.5	5	1.4
TRLA	2	0.5	2	0.1

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	11.26	11	7.6	0.18	0.81
IC	14.64	50	58.5	1.09	4.49
DF	13.55	16	16	0.43	2.06
WF	14.84	39	46.9	1.58	8.74
BO	21.74	7	18.1	0.73	0
ALL	14.8	123	147	3.99	16.1

Average Number of Trees per Acre by Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	2	5	3	1	0	0	0	11
IC	3	18	15	13	1	0	0	50
DF	1	7	4	4	0	0	0	16
WF	8	14	9	5	1	2	0	39
BO	0	0	4	1	1	1	0	7
ALL	14	44	35	24	3	3	0	123

Species	Site Index
PP	109.21
IC	86.14
DF	100.22
WF	92.72
BO	64.09

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 90

Number of Plots: 3 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	43	65	83
Slope:	15	23	30
Elevation:	4250	4323	4400
Plant Cover:	0	0	0
Aspects:	N, NE		
Soil Types:	Holland-Musick		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
TRLA	1	0.0	1	0.2
ROGY	1	0.0	1	0.0
LIDE	1	0.0	1	1.3
GOOB	1	0.0	1	0.0
GAL-	1	0.0	1	0.3
CHFO	1	0.0	1	0.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	29	6.6	30.4	1.23	8.04
IC	13.56	100.7	101	1.77	6.74
DF	14.21	36	39.7	1.18	6.02
WF	19.13	19.5	38.9	0.69	3.59
BO	27.63	9.9	41.4	1.83	0
ALL	16.33	172.8	251.3	6.7	24.38

Average Number of Trees per Acre by Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	0	0	0	3	3	0	6
IC	0	45	46	10	0	0	0	101
DF	0	23	7	3	3	0	0	36
WF	0	13	0	0	3	3	0	19
BO	0	0	0	3	3	3	0	9
ALL	0	81	52	16	13	10	0	172

Site Index:

Species	Site Index
PP	119.78
SP	88.62
DF	87.94
WF	102.65

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 100

Number of Plots: 9 **Plot Size:** 1/10 acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	39	58	85
Slope:	10	16	30
Elevation:	4320	4363	4410
% Understory Cover:	0	7	20
Aspects:	S, SE		
Soil Types:	Holland, Holland-Musick		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CHFO	8	3.9	8	0.3
TRLA	4	1.1	4	0.1
ARVI	5	0.6	5	2.1
POCO	4	0.6	4	0.1
LIDE	2	0.6	2	1.1
COHE	2	0.6	2	0.1

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	13.14	23.6	22.2	0.57	2.91
SP	15.16	3.2	4.1	0.1	0.47
IC	12.75	76.5	67.8	1.01	3.59
DF	12.59	27.2	23.5	0.56	2.51
WF	11.99	15	11.8	0.29	1.4
BO	17.56	18.6	31.3	1.26	0
ALL	13.4	164.1	160.6	3.79	10.88

Average Number of Trees per Acre by Size Class per Acre:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	1	13	8	1	1	0	0	24
SP	1	1	1	0	0	0	0	3
IC	2	32	37	5	0	0	0	76
DF	1	12	12	2	0	0	0	27
WF	0	12	2	0	1	0	0	15
BO	0	5	9	2	0	2	0	18
ALL	4	75	68	12	2	2	0	163

Site Index:

Species	Site Index
PP	93.62
SP	85.97
DF	86.13
WF	78.92

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 150

Number of Plots: 7 **Plot Size:** 1/10 acre

CAWHR: SMC5P

	Min	Mean	Max
% Canopy Cover:	13	30	48
Slope:	5.0	20.0	30.0
Elevation:	4205	4286	4340
% Understory Cover:	0	6	20
Aspects:	N, NW, W		
Soil Types:	Holland		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CHUM	3	2.1	3	0.2
LIDE	6	1.4	6	1.3
CONU	4	0.7	4	1.3
ROS-	3	0.7	3	0.3
SYMO	1	0.7	1	0.1
RIRO	5	0.0	5	0.7

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	15.21	8.3	10.5	0.36	2.2
SP	32.33	11.3	64.2	3.2	21.62
IC	15.07	4.2	5.2	0.1	0.41
DF	23.61	4.3	13	0.49	2.94
WF	29.28	4.2	19.6	1.01	6.77
BO	13.75	1.4	1.4	0.03	0
TO	13.38	4.2	4.1	0.05	0
ALL	23.19	40.5	118.7	5.25	33.95

Average Number of Trees per Acre by Size Class per Acre:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	4	3	0	1	0	0	8
SP	4	0	0	0	1	6	6	17
IC	0	3	0	1	0	0	0	4
DF	0	1	0	0	1	1	0	3
WF	0	0	1	0	0	1	1	3
BO	0	0	1	0	0	0	0	1
TO	0	0	4	0	0	0	0	4
ALL	4	8	9	1	3	8	7	40

Site Index:

Species	Site Index
PP	96.47
SP	95.26
IC	91.16
DF	80.04
WF	100.62

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 151/280

Number of Plots: 12 **Plot Size:** 1/10 Acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	15	57	79
Slope:	5	15	25
Elevation:	4280	4333	4390
% Understory Cover:	35	63	100
Aspects:	E, N, NE, NW		
Soil Types:	Holland		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CEIN	12	33.3	12	7.0
LIDE	5	9.6	5	2.3
RULA	4	7.5	4	0.8
ARVI	6	5.4	6	1.7
RIRO	7	1.7	7	0.5
RUPA	3	1.3	3	0.3

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	12.8	53.6	47.9	0.83	3.71
SP	14.24	3.2	3.6	0.09	0.45
IC	11.92	29.2	22.6	0.32	1.27
DF	11.47	16.4	11.8	0.25	1.12
WF	11.45	37.4	26.7	0.61	2.91
GS	11.56	0.8	0.6	0.01	0.03
BO	10.76	14.7	9.3	0.22	0
HW	9.07	1.6	0.7	0.01	0
ALL	12	156.9	123.2	2.34	9.49

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	1	27	25	1	0	0	0	54
SP	2	0	0	1	0	0	0	3
IC	5	18	2	2	2	0	0	29
DF	1	13	0	2	1	0	0	17
WF	4	27	2	2	2	0	0	37
GS	0	1	0	0	0	0	0	1
BO	0	10	5	0	0	0	0	15
ALL	11	98	35	7	6	0	0	157

Site Index:

Species	Site Index
PP	187.82
SP	93.76
DF	90.93
WF	88.91

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 160

Number of Plots: 17 **Plot Size:** 0.1

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	8	59	97
Slope:	5	21	35
Elevation:	4200	4273	4340
% Understory Cover:	0	10	62

Aspects: E, N, NE, NW, S, SE, W

Soil Types: Holland, Jocal

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
TRLA	10	1.8	10	0.8
LIDE	10	1.5	10	1.4
CEIN	4	1.2	4	0.9
CHCH	4	1.2	4	0.9
CHUM	12	0.9	12	0.4
CHFO	7	0.6	7	0.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	26.37	8.1	30.8	1.3	8.52
SP	31.19	3.5	18.5	0.8	5.28
IC	9.33	72.9	34.6	0.45	1.29
DF	16	28.9	40.4	1.19	6.32
WF	13.79	38.1	39.5	1.22	6.41
BO	14.51	16.1	18.5	0.73	0
TO	13.4	1.2	1.1	0.02	0
ALL	14.12	168.8	183.4	5.71	27.82

Average Number of Trees per Acre by Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	1	1	2	2	2	1	9
SP	0	1	0	1	1	1	1	5
IC	13	47	11	1	0	0	0	72
DF	0	12	8	7	2	1	0	30
WF	2	22	7	6	2	0	0	39
GS	0	0	0	0	0	0	0	0
BO	0	5	9	2	0	0	0	16
TO	0	0	0	0	0	0	0	0
ALL	15	86	38	18	7	4	1	170

Site Index:

Species	Site Index
PP	98.58
SP	95.64
IC	66.85
DF	81.28
WF	92.81

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 230

Number of Plots: 13 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	23	60	100
Slope:	7	12	28
Elevation:	4360	4416	4525
% Understory Cover:	0	16	60

Aspects: N, NW, SW, W

Soil Types: Holland, Holland-Musick

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CLPE	9	3.1	9	0.0
TRLA	8	3.1	8	0.1
DRSY	4	2.3	4	0.1
GAL-	10	1.9	10	0.8
CEIN	8	1.9	8	1.1
COHE	3	1.9	3	0.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	27.4	4.6	18.7	0.82	5.52
SP	32.96	6.9	40.7	1.77	11.45
IC	14.79	60.1	71.7	1.44	6.42
DF	21.23	12.1	29.7	1.12	6.77
WF	14.7	65.8	77.5	2.62	14.58
BO	21.65	0.8	1.9	0.09	0
HW	13.75	0.7	0.8	0.02	0
ALL	17.11	151	241	7.88	44.75

Average Number of Trees per Acre by Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	0	1	1	2	1	1	6
SP	0	1	0	2	2	2	2	9
IC	4	31	11	8	5	1	0	60
DF	1	4	2	0	4	2	0	13
WF	4	38	12	6	4	3	0	67
GS	0	0	0	0	0	0	0	0
BO	0	0	0	1	0	0	0	1
TO	0	0	0	0	0	0	0	0
ALL	9	72	27	16	17	8	3	154

Site Index:

Species	Site Index
PP	100.70
SP	101.77
IC	69.42
DF	107.20
WF	102.84

Blodgett Forest Research Station

Compartment Inventory Report

Compartments: 250/251

Number of Plots: 18 **Plot Size:** 1/10 acre

CAWHR: SMC5M

	Min	Mean	Max
% Canopy Cover:	14	51	100
Slope:	2	14	32
Elevation:	4191	4263	4364
% Understory Cover:	0	22	85

Aspects: E, N, NW, S, SE, W

Soil Types: Holland, Holland-Musick

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LIBO	3	5.0	3	0.1
PTAQ	4	3.9	4	0.3
CONU	2	2.5	2	0.5
CEIN	10	2.2	10	1.8
LIDE	12	1.1	12	1.9
POAZ	8	1.1	8	0.6

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	31.77	5	27.4	1.32	9.04
SP	33.65	6.6	41	1.96	12.78
IC	14.6	27.5	31.9	0.8	4.25
DF	24.76	24.2	80.9	3.56	22.5
WF	24.79	9.8	32.7	1.58	10.22
TO	9.42	7	3.4	0.04	0
HW	9.96	7	3.8	0.06	0
CN	13.11	1.1	1	0.01	0.05
ALL	21.49	88.2	222.2	9.33	58.85

Average Number of Trees per Acre by Size Class:

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	0	0	0	1	4	0	5
SP	0	0	1	1	4	1	1	8
IC	3	17	4	2	0	1	1	28
DF	0	5	5	4	5	3	2	24
WF	0	2	2	2	3	1	1	11
GS	0	0	0	0	0	0	0	0
BO	0	0	0	0	0	0	0	0
TO	0	7	0	0	0	0	0	7
ALL	3	37	12	8	10	13	6	86

Site Index:

Species	Site Index
PP	97.95
SP	91.48
IC	66.38
DF	94.73

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 270

Number of Plots: 20 **Plot Size:** 1/10 Acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	5	54	82
Slope:	5	17	57
Elevation:	4370	4451	4510
% Understory Cover:	0	11	40

Aspects: E, N, NE, NW, S, SE, W

Soil Types: Holland, Holland-Musick

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CEIN	8	3.5	8	1.3
CLPE	10	3.3	10	0.1
POAZ	7	1.3	7	0.2
GAL-	16	0.8	16	0.2
VILO	10	0.8	10	0.0
CONU	4	0.8	4	0.7

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	17.59	11.8	19.9	0.72	4.47
SP	24.09	4.9	15.5	0.61	3.77
IC	12.91	43.4	39.5	0.7	2.98
DF	18.88	15.3	29.8	0.96	5.39
WF	13.92	54.2	57.3	1.77	9.26
BO	26.94	7.2	28.3	1.42	0
TO	13.68	4.3	4.4	0.1	0
ALL	15.9	141.1	194.7	6.28	25.87

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	1	5	4	0	2	1	0	13
SP	1	2	1	1	0	1	1	7
IC	7	25	5	3	2	1	0	43
DF	1	4	4	3	3	1	0	16
WF	4	27	11	9	3	1	0	55
GS	0	0	0	0	0	0	0	0
BO	0	1	1	2	0	3	1	8
TO	0	2	1	1	0	0	0	4
ALL	12	65	27	18	10	7	2	144

Site Index:

Species	Site Index
PP	160.77
SP	104.75
DF	91.48
WF	89.30

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 360/370/371

Number of Plots: 14 **Plot Size:** 1/10 acre

CAWHR: SMC4M

	Min	Mean	Max
%Canopy Cover:	30	56	91
Slope:	7	13	20
Elevation:	4200	4214	4230
% Understory Cover:	10	44	100
Aspects:	S, SW, S		
Soil Types:	Holland		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CACH	1	18.0	1	1.1
CECO	4	11.0	4	2.8
ARPA	4	9.6	4	2.1
CHUM	2	4.0	2	0.1
CEPR	2	1.0	2	0.0
CHSE	1	1.0	1	0.4

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	11.95	83.5	65	1.05	4.62
SP	11.93	5.6	4.3	0.09	0.39
IC	12.02	27.1	21.4	0.33	1.4
DF	9.9	9.8	5.3	0.08	0.29
WF	14.06	11.8	12.8	0.33	1.72
GS	11.67	28.9	21.4	0.28	1.06
ALL	11.97	166.7	130.2	2.16	9.48

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	41	42	1	0	0	0	84
SP	3	1	1	0	0	0	0	5
IC	2	19	5	1	0	0	1	28
DF	1	7	1	0	0	0	0	9
WF	1	6	2	2	1	0	0	12
GS	0	21	8	0	0	0	0	29
ALL	6	96	59	4	1	0	1	167

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 420

Number of Plots: 6 **Plot Size:** 1/10 Acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	45	58	65
Slope:	5	11	25
Elevation:	4295	4306	4320
% Understory Cover:	5	38	85
Aspects:	N, NE, SE		
Soil Types:	Holland-Bighill		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
RHOC	3	11.0	3	9.1
CASE	3	8.3	3	2.7
CHCH	1	5.8	1	1.0
PTAQ	5	4.7	5	4.3
CONU	4	3.8	4	3.5
PYPI	5	0.8	5	0.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	19.73	2	4.2	0.17	0.98
SP	29.81	7.9	38.2	1.67	10.87
IC	11.65	51.8	38.4	0.61	2.28
DF	23.27	25.5	75.3	2.82	17.44
WF	16.01	46.2	64.5	2.4	14.16
ALL	17.41	133.4	220.6	7.65	45.73

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	0	0	2	0	0	0	2
SP	0	2	2	0	2	2	2	10
IC	8	29	12	4	0	0	0	53
DF	0	12	2	0	2	10	0	26
WF	2	27	6	8	2	0	2	47
ALL	9	67	21	16	4	12	4	136

Site Index:

Species	Site Index
PP	172.67
SP	91.75
DF	86.46
WF	92.84

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 470/471

Number of Plots: 12 **Plot Size:** 1/10 Acre

CAWHR: SMC4M

	Min	Mean	Max
% Canopy Cover:	25	55	93
Slope:	11	20	28
Elevation:	4370	4414	4465
% Plant Cover:	0	24	45
Aspects:	S, SE, SW		
Soil Types:	Holland-Musick		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LIDE	6	8.6	6	4.6
POAZ	7	4.3	7	0.9
TRLA	4	3.6	4	0.1
COHE	7	2.1	7	0.0
GAL-	5	1.4	5	0.2
VILO	5	1.4	5	0.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	28.31	5	21.7	0.99	6.67
SP	28.6	8.3	36.8	1.58	10
IC	12.66	41.5	36.3	0.65	2.82
DF	15.09	37.8	46.9	1.4	7.56
WF	13.54	29.3	29.3	0.9	4.94
BO	16.64	7.4	11.2	0.44	0
TO	12.39	1.6	1.4	0.01	0
ALL	16.04	130.7	183.5	5.97	31.99

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	1	0	0	2	2	0	5
SP	1	0	0	4	1	2	2	10
IC	4	25	8	2	2	1	0	42
DF	2	19	7	6	2	2	0	38
WF	4	15	5	4	0	1	0	29
BO	0	4	2	1	0	1	0	8
TO	0	1	1	0	0	0	0	2
ALL	11	66	23	12	10	7	2	131

Site Index:

Species	Site Index
PP	100.04
SP	103.52
DF	93.93
WF	110.32

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 530

Number of Plots: 6 **Plot Size:** 1/10 acre

CAWHR: SMC4D

Understory Vegetation:

	Min	Mean	Max
% Canopy Cover:	45	68	100
Slope:	5	21	30
Elevation:	4310	4440	4600
Plant Cover:	0	1	5
Aspects:	E, NE, NW, W		
Soil Types:	Holland, Holland-Bighill		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LIDE	5	1.0	5	2.3
PTAQ	3	0.0	3	0.1
SMRA	3	0.0	3	0.1
CHUM	2	0.0	2	0.2
POCO	2	0.0	2	0.2
CHFO	2	0.0	2	0.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	16.87	14.6	22.7	0.8	4.64
SP	20.31	18	40.5	1.25	6.93
IC	12.8	32.4	29	0.46	1.71
DF	18.1	14.8	26.5	0.81	4.39
WF	14.55	37.2	43	1.34	6.91
BO	25.91	8.3	30.3	1.49	0
TO	9.72	64	33	0.62	0
ALL	14.76	189.4	225	6.77	24.58

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	5	5	3	2	0	0	15
SP	2	3	7	5	0	0	0	17
IC	0	18	13	2	0	0	0	33
DF	0	5	3	3	3	0	0	14
WF	2	18	6	11	0	0	0	37
BO	0	2	0	2	3	2	0	9
TO	2	54	8	0	0	0	0	64
ALL	5	103	39	28	13	2	0	190

Site Index:

Species	Site Index
PP	106.65
SP	93.10
DF	110.99
WF	78.10

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 532

Number of Plots: 4 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	75	92	100
Slope:	5	21	30
Elevation:	4310	4440	4600
% Understory Cover:	0	2	5

Aspects: E, NE, NW **Soil Types:** Holland-Bighill

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LIDE	4	1.0	4	2.3
POCO	3	0.0	3	0.1
TRLA	3	0.0	3	0.1
CHUM	2	0.0	2	0.2
PTAQ	2	0.0	2	0.2
VILO	2	0.0	2	0.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	25.71	13.8	53.4	2.32	15.47
IC	9.34	31.4	15	0.18	0.46
DF	18.99	32.1	63.2	1.94	10.7
WF	10.06	31.5	17.4	0.37	1.39
BO	19.69	33.5	73	2.91	0
TO	13.04	41.8	38.8	0.67	0
ALL	15.55	184.1	260	8.45	28.02

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	2	0	7	0	2	2	13
IC	2	27	2	0	0	0	0	31
DF	0	10	5	10	5	2	0	32
WF	5	17	10	0	0	0	0	32
BO	0	5	20	2	2	2	2	33
TO	0	25	15	2	0	0	0	42
ALL	7	85	52	21	7	6	4	184

Site Index:

Species	Site Index
PP	106.65
SP	93.10
DF	110.99
WF	78.10

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 540

Number of Plots: 6 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	59	69	87
Slope:	5	9	18
Elevation:	4220	4258	4290
% Understory Cover:	25	31	40

Aspects: E, NE, SE

Soil Types: Holland-Bighill

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
PTAQ	5	7.5	5	1.3
RHOC	4	7.5	4	3.3
CHCH	4	3.3	4	4.0
LIDE	2	3.3	2	2.5
PATQ	1	2.5	1	0.3
TRLA	5	1.7	5	0.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	13.9	32.2	33.9	0.97	5.31
SP	15.95	3.3	4.5	0.11	0.5
IC	12.2	42	34.1	0.57	2.19
DF	12.53	31.1	26.6	0.74	3.5
WF	14.2	51.8	57	1.7	8.47
TO	12.03	11.4	9	0.15	0
HW	8.02	1.6	0.6	0.01	0
ALL	13.24	173.4	165.8	4.24	19.98

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	2	19	5	3	3	0	0	32
SP	0	3	0	0	0	0	0	3
IC	10	18	7	8	0	0	0	43
DF	2	16	10	3	0	0	0	31
WF	2	19	23	8	0	0	0	52
TO	0	7	5	0	0	0	0	12
HW	2							2
ALL	16	81	52	23	3	0	0	173

Site Index:

Species	Site Index
PP	93.97
SP	103.33
DF	89.23
WF	96.07

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 553

Number of Plots: 4 **Plot Size:** 0.1

	Min	Mean	Max
% Canopy Cover:	45	71	94
Slope:	8	13	25
Elevation:	4270	4275	4280
% Understory Cover:	0	12	45
Aspects:	N, NW		
Soil Types:	Holland		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
RHOC	1	10.0	1	1.3
ARPA	4	1.3	4	3.3
CASE	4	1.3	4	5.0
PTAQ	4	0.0	4	1.8
CECO	4	0.0	4	2.5
TRLA	4	0.0	4	0.4

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	14.94	83.1	101.1	2.77	16.05
SP	11.69	2.5	1.8	0.04	0.14
IC	7.79	12.1	4	0.04	0.05
DF	9.7	4.9	2.5	0.04	0.14
WF	23.32	9.8	29.1	1.02	6.1
GS	15.48	29	37.9	0.74	3.52
ALL	15.13	141.3	176.4	4.65	26.01

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	0	32	47	0	2	0	2	83
SP	2	0	0	0	0	0	0	2
IC	2	10	0	0	0	0	0	12
DF	0	5	0	0	0	0	0	5
WF	0	2	0	2	2	2	0	8
GS	2	10	12	2	2	0	0	28
BO	0	0	0	0	0	0	0	0
TO	0	0	0	0	0	0	0	0
ALL	5	61	59	5	7	2	2	141

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 560/561/563

Number of Plots: 4 **Plot Size:** 1/10 acre

CAWHR: SMC3D

	Min	Mean	Max
% Canopy Cover:	56	75	91
Slope:	3	17	35
Elevation:	4330	4378	4430
% Understory Cover:	0	50	70

Aspects: E, NE

Soil Types: Holland, Holland-Bighill

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
ARPA	3	30.0	3	3.8
CEIN	3	18.8	3	3.3
CACH	1	1.3	1	0.8
ROS-	3	0.0	3	0.1
VILO	2	0.0	2	0.0
PTAQ	2	0.0	2	0.8

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	12.29	41.5	34.2	0.55	2.39
SP	8.57	12.1	4.8	0.07	0.2
IC	14.3	12.2	13.6	0.22	0.89
DF	8.31	24.6	9.2	0.13	0.34
WF	8.48	14.6	5.7	0.08	0.24
GS	8.94	85.6	37.3	0.51	1.58
BO	14.17	5	5.4	0.14	0
TO	10.54	94	57	0.92	0
ALL	10.29	289.5	167.3	2.62	5.64

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	2	17	22	0	0	0	0	41
SP	5	2	0	0	0	0	0	7
IC	2	5	0	5	0	0	0	12
DF	5	20	0	0	0	0	0	25
WF	5	7	2	0	0	0	0	14
GS	28	40	17	0	0	0	0	85
BO	0	0	5	0	0	0	0	5
TO	0	82	12	0	0	0	0	94
ALL	48	176	61	5	0	0	0	289

Site Index:

Species	Site Index
PP	106.70
DF	93.64

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 640

Number of Plots: 9 **Plot Size:** 1/10 acre

CAWHR: SMC4D

	Min	Mean	Max
% Canopy Cover:	30	63	100
Slope:	0	10	25
Elevation:	4170	4228	4300
% Understory Cover:	10	55	90

Aspects: NW, S, W

Soil Types: Cohasset, Holland-Bighill

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CECO	8	23.3	8	2.7
ARPA	8	19.4	8	2.9
FRA-	4	2.8	4	0.4
PTAQ	2	2.2	2	0.6
RHOC	3	1.1	3	1.6
CHFO	2	1.1	2	0.2

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	13.98	55.3	58.9	1.23	6.36
SP	21.47	1.1	2.8	0.07	0.38
IC	15.25	64.2	81.4	1.24	5.06
DF	7.11	1.1	0.3	0	0
WF	17.65	14.1	24	0.64	3.36
GS	13.38	16.1	15.7	0.24	0.99
HW	7.78	2.2	0.7	0.01	0
ALL	14.79	154	183.8	3.43	16.16

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	1	20	28	3	1	1	0	55
SP	0	0	1	0	0	0	0	1
IC	8	18	24	10	4	0	0	64
DF	0	1	0	0	0	0	0	1
WF	1	3	3	4	2	0	0	14
GS	0	7	6	2	0	0	0	16
HW	0	2	0	0	0	0	0	2
ALL	10	55	62	21	8	1	0	154

Site Index:

Species	Site Index
PP	106.83
IC	83.56
WF	79.09

Blodgett Forest Research Station

Compartment Inventory Report

Compartment: 653

Number of Plots: 2 **Plot Size:** 1/10 acre

CAWHR: SMC4P

	Min	Mean	Max
% Canopy Cover:	25	32	39
Slope:	5	10	15
Elevation:	4250	4260	4270
% Understory Cover:	55	65	75
Aspects:	S, W		
Soil Types:	Cohasset, Holland-Bighill		

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
CASE	2	22.5	2	6.3
ARPA	2	17.5	2	4.5
CECO	2	12.5	2	2.0
ROGY	2	7.5	2	0.8
RHRU	2	2.5	2	2.8
PTAQ	1	2.5	1	1.0

Current Average Stand Condition per Acre (trees > 4.5" DBH):

	DBH	TPA	BA	MCF	MBF
PP	25.69	29.1	104.5	4.09	27.23
IC	13.47	9.6	9.6	0.13	0.45
WF	8.44	14.4	5.6	0.08	0.2
ALL	20.33	53.1	119.6	4.29	27.88

Average Number of Trees per Acre by Size Class (inches DBH):

	4.5-6	6-12	12-18	18-24	24-30	30-36	36+	ALL
PP	4	5	0	5	5	0	10	29
IC	0	5	5	0	0	0	0	10
WF	0	14	0	0	0	0	0	14
ALL	4	24	5	5	5	0	10	53

Site Index:

Species	Site Index
PP	105.57

Item # 14f. Management of Group B and non-native species

The forest-wide goal is to have about 10% of overall tree density comprised by hardwood species (variability depending on seral stage and demographic attributes of specific species). Planting design, mechanical treatment, and the application of herbicide are reserved as methods for controlling species composition.

Black oaks: Because black oak provides a significant food source for wildlife, it is specifically managed at BFRS so that a sustainable population of black oak in all size classes may develop. In the partial harvest stands (selection, group selection and commercial thinnings), black oaks will be marked in the same manner as conifers. Individuals with low vigor or signs of disease will be marked, while retaining individuals with high snag recruitment potential (large, decadent trees with cavities and large crooks). Groups of black oaks that are being encroached upon by surrounding conifers will be retained, and the encroaching conifers removed. Without thinning of conifers, the black oaks will be overtopped since height growth essentially stops by age 140 at around 80 to 100 feet, while the conifers continue height growth past this age (McDonald, 1969). Individual black oaks in the second-growth matrix at Blodgett are approaching the stand dynamic phase when the intolerant black oaks would die without thinning of surrounding conifers (Edwards, 1957). Black oak individuals within group selection openings will be cut and allowed to sprout. The sprout clumps will be retained into the future by allocating growing space to the clump through cultural practices (i.e. planting and thinning). The retention and allocation of growing space in the matrix forest, combined with the cutting and sprouting of trees in regeneration openings will hopefully result in a more balanced distribution of size classes in the black oak population than currently exists.

Giant sequoia: Though not a native in the harvest area, giant sequoia did once have an expanded range that encompassed BFRS (Harvey, 1985). An isolated grove continues to persist to the north of BFRS. Giant sequoia has grown relatively well through the first 30 years at BFRS, easily outgrowing other species. It is the policy of Blodgett Forest to, through diversity of silvicultural practice, conserve a high level of biodiversity. Giant sequoia will add to the structural and compositional diversity of planted stands, and will be limited to comprise less than 35% of mixed species planted stands. Giant sequoia has been planted in regeneration openings at about a 10-15% rate, though relative dominance tends to increase because of high survival and higher retention relative to other species during cultural treatments.

Young growth giant sequoia has been shown to exhibit many very desirable lumber properties and therefore may expand the range of high quality timber product produced at the forest. This species is an associate of the sierra mixed conifer forest type in other areas of its range and therefore is highly unlikely to have any significant adverse impacts on the ecology of Blodgett Forest and the lands surrounding it. Wildlife studies in sequoia forests to the south have found that sequoias are often a preferred habitat element for raptors, fishers, and martins all of which are species of interest in the greater Sierra Nevada ecosystem. Giant sequoia is an essential species for study for these reasons and therefore will continue to be included in future management activities at the forest.

Group B and non-native species stocking levels

Group B species are managed throughout BFRS where standard silvicultural methods are applied. Giant sequoia is managed where group selection and clearcut are the applied silvicultural methods.

All stocking and resource conservation standards within 14 CCR 952.7 *and 953.11 (c) (2)* will be met. Basal area stocking levels for Group B species will be approximately 10%. Minimum stocking levels shall be met with Group A species. Due to rapid growth, Giant sequoia may be at proportionally higher basal area levels than that of other planted species. In plantations and openings it could represent up to 20 % of total basal area.

Item # 30a. and 31(6) Slash Pile Burning

14 CCR 957.2 Treatment of [Logging] Slash to Reduce Fire Hazard
(a) Slash to be treated by piling and burning shall be treated not later than April 1st of the year following its creation, or within 30 days following climatic access, or as justified in the plan.

There are no exceptions to 14CCR 957.2(a) for public roads and structures maintained for human habitation.

Blodgett Forest has historically been able to complete its burning within the required time. It is in the best interest of the public and BFRS to complete this treatment in a timely fashion. In recent years the California Air Resources Board Title 17 regulations, in addition to local county rules, have narrowed the "window of opportunity" to complete burn projects. There are also conflicts between agencies as to the definition of a "good burn day." Wind and dry fuel create good smoke dispersal and efficient consumption but also increase the escape potential. Increased fuel moistures, to a point, lead to safer burning conditions but increase burn-down period, the length of time in a smoldering state, increasing particulate output. If fuel moisture reaches a point where 1000 hour fuels become saturated, usually mid-winter to spring, the chance of a desired treatment is unlikely. Drying conditions in the later part of the season usually lead to burning out the finer fuels or just burning holes in the piles. It is much safer to ignite piles in the late fall or early winter when the coming months will bring precipitation to extinguish them rather than in the spring when the coming months brings dryer hotter weather.

Insect hazards can be reduced by allowing slash to dry for as long as possible before piling. Once piled the core area of slash is insulated. The brood material piled "green" will remain viable for a much longer period of time. It is BFRS policy to allow at least four to six weeks after slash is created before piling takes place.

The following standards shall be met for clearcut and group selection slash piles:

Pile burning shall take place in the late fall or winter period after pile creation when climatic and fuel conditions present a low risk of wildfire, consumption of all fuel sizes and low risk of smoke displacement to sensitive areas. If conditions beyond the control of the LTO occur (extended "no burn" days or weather conditions in violation of the smoke management plan, deep early snow, lack of access...) causing saturation of 1,000 hour fuels, piles will be burned the next burn season. A reasonable effort will be made to burn all piles within the first burn season. CAL FIRE will be notified of the location of any unburned piles and the cause for holding them beyond April 1st. Prior to burning, an approved smoke management plan from the El Dorado County Air Quality Management District and a burn permit from the USDA Forest Service, El Dorado NF, Georgetown Ranger District shall be obtained and CDF Mt Danaher office will be notified.

ITEM #30 HAZARD REDUCTION

As part of its continual forest inventory, BFRS monitors fuel loading using a line intercept method developed by J. K. Brown (1974). There are two approaches to hazard reduction that BFRS employs in order to eventually develop a property-wide forest that is resistant to large-scale forest. The first approach involves the strategic placement of community fuelbreaks that, through coordination with adjacent landowners, will reduce the risk of large fires in and around Blodgett Forest. Fuelbreaks are proposed along major ridgetops and in areas surrounding residential areas. To date, a small percentage of these fuelbreak areas have been converted to fuelbreaks. However, BFRS has made steady progress through timber harvest plans, mechanical thinnings, and prescribed burns.

The second approach is a more preventative measure. In addition to the THP requirements in Item 30 (a) Hazard Reduction, along all interior private roads, 50 foot hazard reduction zones are designated where slash originating from harvests are treated. Slash in these zones is lopped and scattered for fuel hazard reduction. Additional measures such as mastication, debris removal, and pile-and-burn treatments are done as needed and as resources are available. This is a BFRS policy and contract requirement, not a THP requirement.

ITEM #31 Fuel Loading

Below is a summary of fuel conditions in the various management areas.

BLODGETT FOREST FUEL CONDITIONS FOR SELECTED TREATMENT TYPES

Manage Type	FUEL LINES	DUFF Depth (in.)	Litter Depth (in.)	Fuel Depth (in.)
Group Selection	211	1.66	1.39	6.51
Ind. Tree Selection	86	2.06	1.34	5.66
Shelter Wood Rem.	110	1.37	1.16	4.95
Clearcut	21	1.32	2.07	4.63
Com Thin	167	1.71	1.64	7.22
Reserve	60	2.43	1	4.81
TOTAL	754	1.78	1.46	6.06

Manage	Tons per Acre (1-100 hour fuels)			
Type	**Duff/Litter**	**1 hr**	**10 hr**	**100 hr**
Group Selection	19.57	0.32	1.81	3.27
Ind. Tree Selection	24.29	0.25	1.68	3.3
Shelter Wood Rem.	16.11	0.25	3.45	3.41
Clearcut	15.54	0.11	0.96	1.47
Com Thin	20.17	0.25	1.63	2.16
Reserve	28.71	0.59	2.6	2.29
AVE	21	0.3	2.04	2.74

Manage	Tons per Acre by Size Class of greater than 100 hour fuels							
Type	**>3"**	**R 3-10"**	**R 11-20"**	**R >20"**	**S 3-10"**	**S 11-20"**	**S >20"**	**TOTAL**
Group Selection	12.36	1.09	2.66	2.11	2.71	1.77	1.29	**37.34**
Ind. Tree Selection	13.47	1.77	3.43	0.76	3.29	2.56	1.66	**42.99**
Shelter Wood Rem.	7.64	1.36	1.62	0	3.01	1.64	0	**30.86**
Clearcut	4.36	1.46	0.63	1.55	0.73	0	0	**22.44**
Com Thin	14.02	1.82	4.09	2.6	3	1.58	1.1	**38.23**
Reserve	13.02	0.74	2.47	2.62	2.6	1.79	2.65	**47.21**
AVE	11.92	1.46	2.73	1.81	2.83	1.91	1.01	**37.99**

Item #32. Biological Resources; Species Protection

The following table summarizes the findings of a California Department of Fish and Game Natural Diversity Data Base search findings of May, 2010 and the California Native Plant Society Inventory of Rare and Endangered Plants search December, 2010. Both were nine quadrangle searches centered on Tunnel Hill. The results of the searches as well as narratives based on BFRS experience and systematic surveys are given below.

Map Code:

1 = Forest Hill	2 = Michigan Bluff	3 = Greek Store
4 = Georgetown	5 = Tunnel Hill	6 = Devil Peak
7 = Garden Valley	8 = Slate Mountain	9 = Pollock Pines

Species and Status	Map	BFRS Potential	Reason
Accipiter gentiles *CDFG - SC*	3, 6, 7, 8	YES	Audible and visual detection 2003 in compartment 292 on BFRS. See Section II 32a.
Actinemys marmorata *CDFG - SC*	7	YES	Can bask and nest in a wide variety of habitats. Not located at Blodgett by wildlife survey, or during stream inventory.
Agelaius tricolor CDFG -SC	7	NO	No cattails available for nesting.
Arctostaphylos nissenana *CNPS - 1B.2*	4, 7, 8	NO	No closed-cone coniferous forest with chaparral.
Big Tree Grove *NONE*	3	NO	All ancient Giant Sequoia groves are already located. This grove is 10 miles north of BFRS.
Calochortus clavatus var. avius *CNPS - 1B.2*	9	NO	No lower montane coniferous forests on rocky areas of Josephine silt loam or volcanically derived soil with low timber site on exposed bedrock.
Chlorogalum grandiflorum *CNPS - 1B.2*	1,2,4, 5,7	NO	No disturbed serpentine or gabbro substrates.
Clarkia biloba spp brandegeeae *CNPS - 1B.2*	1, 2, 7	NO	No chaparral, cismontane woodland.
Cypseloides niger *CDFG - SC*	1,2	NO	No cliffs behind or adjacent to waterfalls in deep canyons needed for breading present.
Fritillaria eastwoodiae *CNPS - 3.2*	1	NO	No chaparral or cismontane woodland or Lower montane coniferous forest (openings)/sometimes serpentine
Gulo gulo *State - Threatened*	3	YES	Intermediate to large tree stages of coniferous forests present on property. Wildlife surveys (camera and live traps) have never located a wolverine on BFRS. We believe that all native populations were extirpated from the area in the 1920's by trapping.
Horkelia parryi CNPS-1B.2	4, 5, 7, 8	NO	No chaparral, cismontane woodland, or Ione formations.
Lasionycteris noctivagans *NONE*	7,8,9	YES	Coastal & montane forest dweller feeding over streams, ponds, open brushy areas. Closet known finding 7 miles at 993ft. elev. Unlikely effected by operations (most habitat in WLPZ).
Lewisia serrata *CNPS - 1B.1*	2, 3, 6, 9	NO	No shaded north-facing moss covered metamorphic rock cliffs present on, or effected by this THP. 2008 surveys of potential habitat on BFRS found none.
Martes pennanti pacifica *CDFG - SC*	1,6,7, 8	YES	Intermediate to large tree stages of coniferous forests present on property. Wildlife surveys (camera and live traps) have never located martins or fishers on BFRS. We believe that all native populations were extirpated from the area in the 1920's by trapping. (See section II 32a. Pacific fisher for additional information.)
Martes americana sierra *NONE*	3	YES	
Megaleuctra sierra *NONE*	1	YES	Heavily wooded streams with seepages or spring-like areas. Unlikely effected by operations (habitat in WLPZ). . None identified during macro invertebrate surveys conducted since 1978.
Myotis yumanensis *NONE*	7, 8,9	NO	Open forest with sources of water to feed. The closest body of water is Stumpy Meadows reservoir 2 miles to the east.
Orobittacus obscurus *NONE*	1	YES	Found under overhanging banks, boulders, fallen logs along streams. Unlikely effected by operations (habitat in WLPZ) . None identified during macro invertebrate surveys conducted since 1978.

Packera layneae CNPS 1B.2 *State Rare, Federal Threatened*	1,4,7	NO	No serpentine soils within serpentine chaparral community (i.e. Pinus sabiniana, Umbellularia californica, Quercus dumosa).
Phacelia stebbinsii *CNPS - 1B.2*	3, 5, 6, 9	NO	No Canyon Live Oak Forest. No scree, tallus and soil accumulations associated with bedrock outcrops on or effected by this THP. 2008 surveys of potential habitat on BFRS found none.
Poa sierrae *CNPS – 1B.3* *Only found on CNPS search*	2	YES	Lower montane coniferous forest, 1148 to 4921ft. elevation. BFRS surveys have not located this species of Poaceae. Surveys have identified 30 members of the Poaceae family on BFRS.
Rana aurora draytonii *Federal Threatened* *CDFG SC*	2, 4	YES	Needs 11-20 weeks of permanent deep water with dense shrubby or emergent riparian vegetation. Ongoing stream surveys plus intensive amphibian survey in 1998 found none present on BFRS (closest known finding - 10 miles). Additional information in section II item # 32 Red-legged Frog and Take Avoidance Info.
Rana boylii *CDFG – SC*	2	YES	Partly-shaded, shallow streams and riffles with a rocky substrate (some cobble sized substrate) are present on BFRS. Ongoing stream surveys plus intensive amphibian survey in 1998 found none present on BFRS
Rhyacophila spinata *NONE*	1	YES	Cool running water habitat potentially present on BFRS. None identified during macro invertebrate surveys conducted since 1978.
Rhynchospora capitellata *CNPS – 2.2*	9	YES	Potential habitat surveyed summer 2008- none found. Open, soggy meadow surrounded by mixed conifer forest Habitat protected by WLPZ (no equipment) and no harvest in "open soggy meadows" (no commercial trees).
Sphagnum Bog *NONE*	6,9	YES	Same as *Rhynchospora capitellata.*
Viburnum ellipticum *CNPS 2.3*	Placer-ville	*YES	Chaparral or Cismontane woodland or Lower montane coniferous forest.
Viola tomentosa *CNPS 4.2*	3	YES	Lower & upper montane, subalpine coniferous forest BFRS surveys have not located this species of Violaceae. Surveys have identified 4 members of the Poaceae family on BFRS.
Vulpes vulpes necator *State - Threatened*	1, 2, 3	YES	Habitats from wet meadows to forested areas. Wildlife surveys (camera and live traps) have never located a Sierra Nevada red fox on BFRS. They have documented Gray fox. All CNDDB observances are 20 to 35 years ago and all noted that some sightings may not be reliable.

* Additional information supplied by Botanist Tim Nosal, Department of Fish and Game, indicates this plant has also been located in the Auburn area on north facing slopes with an associated plant community of mixed conifer, California black oak and Pacific madrone. Similar habitat occurs on this THP. To date this plant has not been located during Blodgett's continuous vegetation surveys as described on the next page of this THP.

BLODGETT FOREST WILDLIFE SURVEYS

Blodgett Forest Research Station has actively monitored reptiles, amphibians, fish, mammals, and birds since 1978. Reptiles and amphibians are studied using modified pit traps and visual searches. For visual searches observations are recorded in a time-area census. At each wildlife plot, a half hour or a full hour is spent overturning rocks and logs to identify the number of species present. Specimens are often covered by large rotten woody material as even in drier sites these retain some moisture.

Large mammal presence is recorded by automated cameras placed at baited plots. These plots also have Sherman live traps to conduct, mark and recapture studies on small mammals. Bird species are identified through visual observations, photos or bird calls during the breeding period. Birds are studied to determine where they nest and why they choose particular habitat. Also studied are what they eat, how many eggs are laid, and how many hatch. Monitoring of nestlings continue for dietary study and monitoring of effects of weather changes upon their usual habits.

An intensive wildlife survey of about 600 acres distributed throughout a sample of BFRS structural types was carried out in 2001-2004 as part of a research project. Part of the survey included infrared camera bait traps, which detected presence of the mammalian species listed below.

Species detected by camera traps	
Dusky-footed Woodrat	
Bobcat	Western Gray Squirrel
Northern Flying Squirrel	Long-eared Chipmunk
	Black-tailed Jackrabbit
Virginia Opossum	Black Bear
Striped Skunk	Gray Fox
Douglas Squirrel	California Ground Squirrel
Deer Mouse	

Wildlife surveys and studies looking at specific species on Blodgett Forest conducted in most years since 1978 provide a more comprehensive list of species using or potentially using Blodgett Forest habitat. The surveys have identified 86 bird species, 28 mammal species, 12 reptile species, and 3 amphibian species. For a complete list of these see Section V.

BLODGETT FOREST VEGETATION SURVEYS

Blodgett Forest has been conducting full vegetation inventories based on 1/10th acre permanent plots on all parts of the forest since the mid 1970's. There are currently over 1000 plots on the forest that are re-measured approximately every 5 years. Inventory information gathered on these plots includes data on all plant species that occur from ferns and grasses to trees. In addition, wildlife inventories on a subset of the plots have included full vegetation inventories on expanded 0.7 acre plots. The plots are well distributed across all management styles including 51 plots centered on streams.

Botanist Peter Rubtzoff conducted a detailed survey of all habitats at Blodgett Forest between 1970 and 1975. Forested sites, seasonal wet areas, and perennial wet areas were visited during the spring, summer, and fall seasons. Field notes and mounted specimens are available at the forest.

To maximize vegetation information in the Blodgett database, data from sources besides the 10th acre plots are also compiled into the database. For example, more intensive plant inventories (100% in small areas up to 5 acres) have been done by researchers for specific uses, and the results are included in the forest database. In 1997 ecologist Ayn Schlisky conducted a research project that specifically looked at species diversity across management styles. Five different management styles were surveyed on 32 additional 0.7 acre plots. Field and lab identification of species were checked for precision and accuracy by Dr. Schlisky, who found that approximately 68% of all species in each management area were identified. Species-area curves developed from the project indicate that the BFRS density of plots is sufficient for capturing most plant diversity. Lastly, the forest has also been the site of numerous field trips by local horticulture and native plant clubs who have shared their information with us.

All of these data sources have been used to create and continuously update the known flora of Blodgett Forest. To date, over 250 species from 64 different families have been identified on the forest. None of these species are listed as rare, threatened or endangered.

Regular plant inventories, as described above, continue on the forest. All available information shows that no listed plant species are located within the proposed THP areas. However, if a rare, threatened or endangered plant is identified within the operational area of this THP, then:

1) Operations will be halted in the area until a survey can be done to determine the extent of the plant cover.
2) Experts at the University of California, Calif. Department of Fish and Game and possibly other organizations will be asked for assistance.
3) Appropriate protection measures will be implemented before operations are allowed to continue.

The following is a detailed discussion of the species of concern that have been sited on Blodgett Forest, or have the potential to be found on this property.

CALIFORNIA SPOTTED OWL INFORMATION SUMMARY

In addition to the information below, a search of the CDF&G Northern Spotted Owl Database Management System was completed May 2010 for Tunnel Hill and the eight surrounding Quads. There were no new locations influenced by this THP. On January 04, 2011 Claudia Funari the District Wildlife Biologist for the USFS Georgetown Ranger District was contacted. She reviewed her most recent records; they confirmed that BFRS records are current.

This discussion is intended to provide additional information relative to California Spotted Owl habitat within and nearby the THP area. Please read Section II item #32 and Section III Item #14 (Silviculture) and Item #34 (Wildlife habitat) before this section to become familiar with current and proposed post-harvest vegetation structure and composition. The California spotted owl is not listed as threatened or endangered and is not a sensitive species recognized by the State Board of Forestry. However, the USDA Forest Service in Region 5 has established that it is a species of special concern for their analyses.

A pair of California spotted owls have been known to nest from 1979 to 1995 in compartment 250, which is the headquarters and living area of Blodgett Forest. These owls have also been known to nest from 1982 to 2004 in compartment 292, an "ecological reserve" area, which is 133 acres of late seral habitat.

Current management plans constrain harvesting in these units to the following:

UNIT	SIZE	SCHEDULED HARVESTS
250	85 acres	Light commercial thinning and sanitation/salvage 2014/24
292	133 acres	Never, ecological reserve

BLODGETT SPOTTED OWL HABITAT ANALYSIS

All the acres in the table below are within Blodgett Forest. Additional acres (not surveyed) include at least 160 acres (USFS) and approximately 300 acres (Davis Trust) and 200 acres (Sierra Pacific Industries) which meet at least foraging habitat within 1.3 miles of possible nest sites.

Stand types (A or B) are based on Northern Spotted Owl habitat characteristics. Many of the Type B stands would meet the Type A characteristics except that they lack sufficient numbers of trees >35" DBH. Most of the stands rated at some percentage of full habitat have been managed for 20 to 40 years via selection or group selection silvicultural method and hence have 0.1 to 2.5 acre areas scattered throughout stocked with seedlings, saplings, and pole trees. A crude estimate of this area was utilized to estimate the percentage of non-suitable habitat. Since these stand structures mimic ancient Sierra mixed conifer structure this is quite likely a conservative estimate for suitable habitat. Except for the Type A units, all these stands have dominant/co-dominant trees in the 80 to 100 year age class. This accounts for the existing scarcity of large live, decadent and dead trees. Habitat should improve in some units as tree size and age increases. Some units will have reduced habitat value due to future harvesting.

The habitat value in all compartments will not change. Densities will be reduced, but overall structure will remain similar. Overall, the amount of habitat in each type on BFRS will not alter significantly over time as younger stands regain functional foraging, roosting and even nesting status. This "shifting mosaic" structural pattern will continue as the forest approaches full regulation with older areas being converted to regeneration openings and regeneration openings regrowing into functional habitat.

Several other compartments in the area should become more desirable habitat over time, offsetting any loss from the 2011 THP harvest

Much of the early survey work and local spotted owl habitat preference information is available in:

"The Ecology of the Spotted Owl in the Central Sierra Nevada". S. A. Laymon. Ph.D. Thesis, UC Berkeley. Available at Blodgett Forest Research Station.

SPOTTED OWL HABITAT AREA

	Compartments within 0.7 Mile of nests	Compartment area (acres	Owl Habitat Type	Functional Nesting	Functional Roosting	Functional Foraging
	10	59	B	50%	75%	50%
*	**20**	**46**	**B**	**X**	**X**	**X**
*	**40**	**40**	**B**	**50%**	**X**	**X**
	50	44	B		X	X
	60	56	B		50%	X
*	**90**	14	B	X	X	X
	101	12	B		X	50%
	110	44	B		50%	50%
	123	62	B	40%	40%	40%
*	**160**	**57**	**B**	**50%**	**X**	**50%**
	180	42	B	25%	50%	50%
	190	54	B	25%	50%	50%
	210/211	28	B	X	X	X
	220	62	B	X	X	X
*	**230**	**45**	**B**	**25%**	**50%**	**50%**
	240	34	B	X	50%	50%
*	**250**	**75**	**A**	**X**	**X**	**X**
	260	34	B	25%	25%	25%
*	**270**	**57**	**B**	**25%**	**X**	**50%**
	292	132	A	X	X	X
	295	23	B		X	X
	301	22	B			X
	340	41	B		X	50%
	380	56	B		50%	50%
	390	33	A	X	X	X
	400	42	B		50%	50%
	410	49	B		X	75%
*	**420**	**44**	**A**			**75%**
	440	33	B	25%	X	X
*	**470**	**21**	**B**		**X**	**X**
*	**471**	**16**	**B**		**X**	**50%**
	490	72	B	50%	X	X
	500	40	B	25%	70%	50%
	510	46	B	X	X	X
	520/521	23	B	50%	X	X
	1140	61	B	X	X	X

* Compartments proposed for harvest in 2011 Blodgett Forest THP

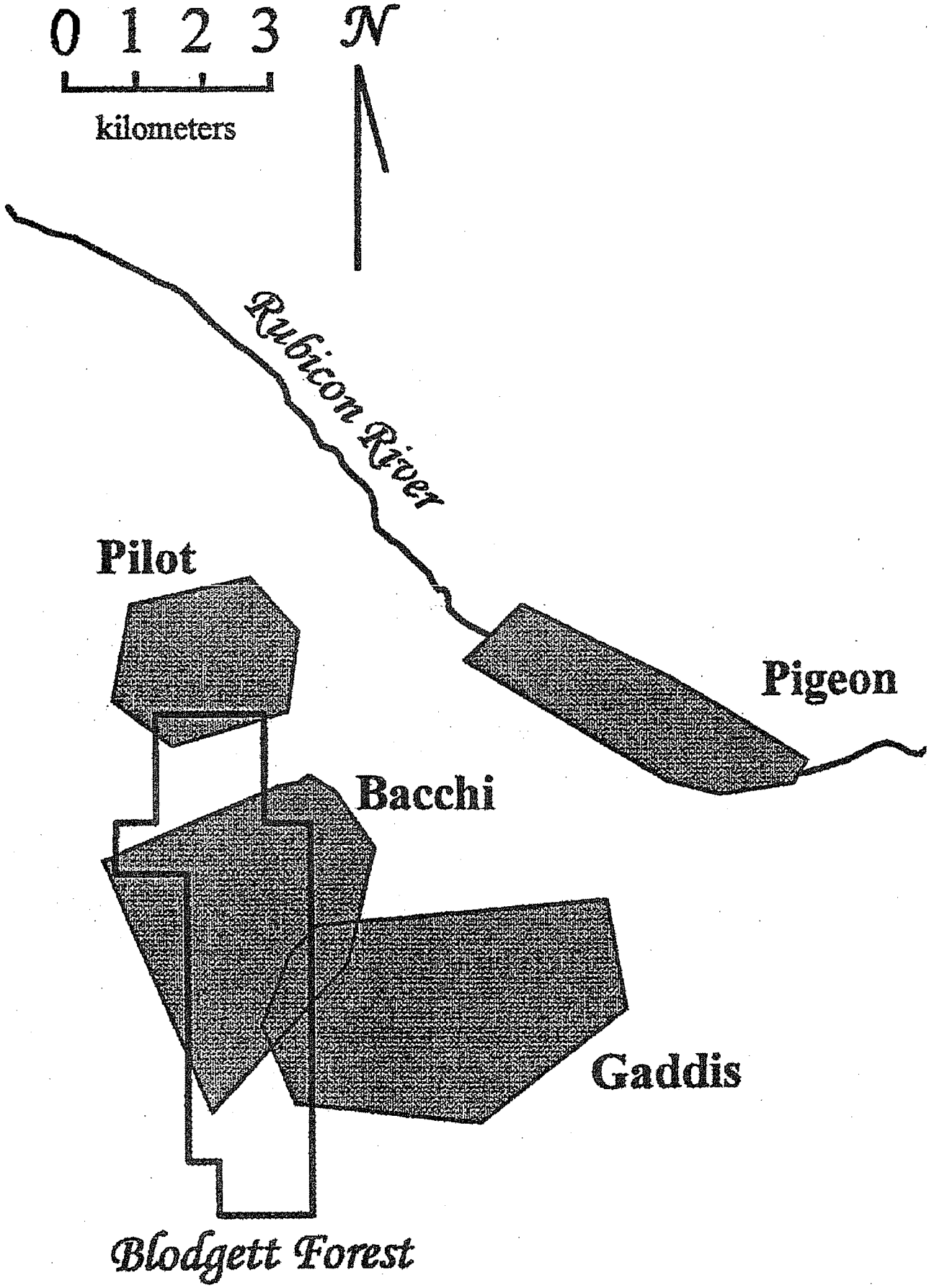
NORTHERN GOSHAWK INFORMATION SUMMARY

The University of Minnesota biologists have completed Northern Goshawk (NG) surveys for 2008. The surveys were conducted on and near the plan area where suitable NG habitat exists. There have been no responses (see section V survey report)

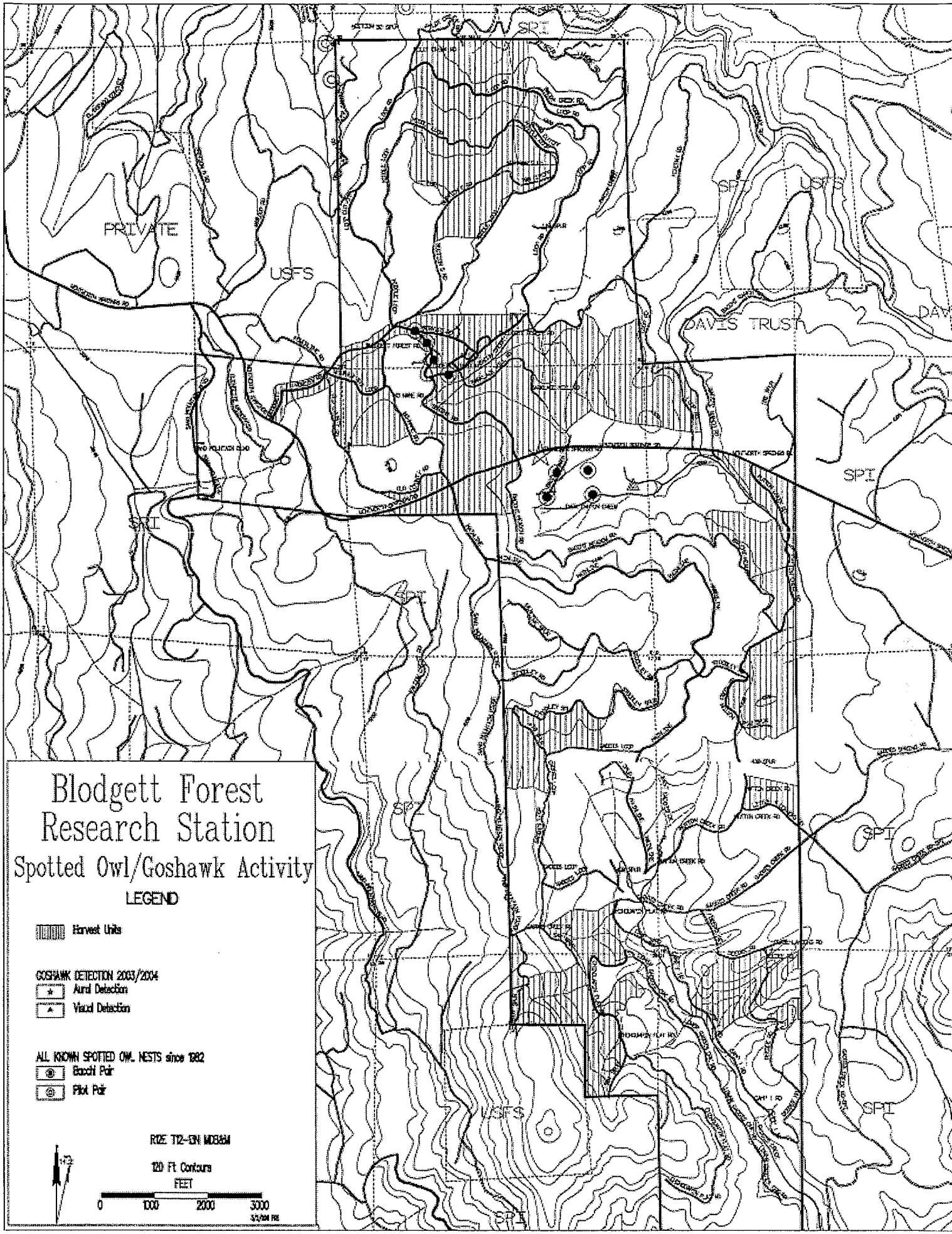
The results of the goshawk surveys in 2003 and 2004 that was presented in Section II are derived from a survey conducted according to the USDA Forest Service publication, "Survey methodology for northern goshawks in the pacific southwest region, US Forest Service." August 9, 2000. Contact locations are shown on the Spotted Owl/Goshawk Activity map below. The USFS Georgetown Ranger District Wildlife Biologist had no NG sites in the assessment area as of January, 2011.

OTHER RAPTORS

During the current year of timber operations, visual occurrences of raptors, or locating nests, or white wash in or near the THP boundary will prompt further investigation or surveys. If other raptors are located nesting within or near the Timber Harvest Plan Boundary, CAL FIRE and the Department of Fish and Game will be notified. See Section II item 38(7)(c) SUSPENSION OF OPERATIONS AND EMERGENCY BUFFER ZONES FOR LISTED PLANTS AND ANIMALS THAT ARE CURRENTLY NOT RECORDED



SPOTTED OWL PAIRS' HISTORIC HOME RANGES


Blodgett Forest
Research Station
Spotted Owl/Goshawk Activity
LEGEND
Harvest Units
GOSHAWK DETECTION 2003/2004
Aural Detection
Visual Detection
ALL KNOWN SPOTTED OWL NESTS since 1982
Bacchi Pair
Pilot Pair
120 Ft Contours
FEET
0
1000
2000
3000
PRIVATE
USFS
SPI
DAVIS TRUST

SPINY RHYACOPHILAN CADDISFLY SURVEY AND INFORMATION

Blodgett Forest has conducted surveys of macroinvertibrates in Class I streams within our property from 1994 to 2004. These macroinvertibrates were always identified to the genus level, and often to species level. Rhyacophilidae Rhyacophila spp. is regularly identified within Blodgett streams during the surveys. No R. spinata have been identified within Blodgett Forest. All watercourses within this THP are protected by watercourse protection zones equal to or greater than those required in the California Forest Practice Rules.

Item #33: Snags

As part of a long-term monitoring project, BFRS incorporates snag demography and individual snag condition measurements into the continual forest inventory (permanent, 1/10th acre plots). On every plot, every snag greater than 4.5" dbh is measured. This information will provide insight about the effect of management activity on snag density, as well as mortality rates of live trees and attrition rates of standing snags. BFRS practice is to retain snags except where they present a hazard. The table below is from one of three compartments where 100% snag inventories are ongoing. Similar Data is available from Standard BFRS inventory data (1/10th acre CFI plots) for all compartments on the forest. A full snag re-inventory was completed in 2005. Results have not been fully analyzed, but no significant changes have been noted to date.

UNIT 160 1994 **Total sample = 706 snags in 47 acre sample area**

AVG/Acre BY DBH CLASS	?	BO	DF	IC	PP	SP	WF	TOTAL
<15"	0.09	3.23	0.28	1.49	1.74	0.62	3.06	10.51
15"-30"	0.06	0.49	0.15	0.4	0.6	0.66	1.15	3.51
>30"	0.02	0.06	0.06	0.38	0.13	0.11	0.09	0.85
AVERAGE /ACRE	0.17	3.79	0.49	2.28	2.47	1.38	4.3	15.02

CONDITIONS: SNAG HARDNESS/ac	?	BO	DF	IC	PP	SP	WF	TOTAL
AVG HARD/ACRE	0.02	2.68	0.17	1.38	0.98	0.62	1.49	7.34
AVG SOFT/ACRE	0.15	1.15	0.32	0.89	1.47	0.77	2.81	7.57

BY LIMB CONDITION/ac	?	BO	DF	IC	PP	SP	WF	TOTAL
A: Foliage Present	0.00	0.06	0.02	0.13	0.11	0.09	0.30	0.70
B: Foliage Gone,	0.00	0.45	0.04	0.15	0.15	0.30	0.38	1.47
C: Twigs Gone,	0.00	0.55	0.04	0.40	0.28	0.47	0.51	2.26
D: Branch Stubs Only	0.00	0.55	0.19	0.45	1.00	0.32	1.11	3.62
E: No Branches	0.17	2.19	0.19	1.15	0.91	0.21	2.00	6.83

BY HEIGHT CLASS/ac	?	BO	DF	IC	PP	SP	WF	TOTAL
<10 feet	0.13	0.66	0.09	0.77	0.81	0.26	1.79	4.49
10-30 feet	0.02	1.06	0.15	1.30	0.66	0.26	1.60	5.04
>30 feet	0.02	2.06	0.26	0.21	1.00	0.87	0.91	5.34

WITH CAVITY NESTS/Ac	?	BO	DF	IC	PP	SP	WF	TOTAL
WITH NESTS/ACRE	0.02	0.13	0.19	0.28	0.55	0.26	0.91	2.34
WITHOUT/ACRE	0.15	3.72	0.3	2	1.89	1.13	3.4	12.6
% OF ALL SNAGS	13.3	3.5	63.3	14.0	29.1	23.0	26.8	18.6

CAVITY NESTS BY DBH/Ac	?	BO	DF	IC	PP	SP	WF	TOTAL
<15" DBH	0.02	0.09	0.11	0.06	0.32	0.09	0.09	0.77
15-30" DBH	0.00	0.02	0.06	0.11	0.23	0.02	0.02	0.47
>30" DBH	0.00	0.02	0.02	0.11	0.00	0.02	0.04	0.21

WOODPECKER FEEDING/Ac	?	BO	DF	IC	PP	SP	WF	TOTAL
<15" DBH	0.00	0.60	0.15	0.30	0.77	0.36	1.47	3.64
15-30" DBH	0.02	0.11	0.13	0.28	0.38	0.40	0.81	2.13
>30" DBH	0.02	0.04	0.04	0.30	0.06	0.04	0.04	0.55

#34: Wildlife habitat

. To provide research and habitat value, Blodgett has designated 19% of its land area as recruitment areas for late seral stage habitat. These areas have not been harvested since UC has owned the property (70+ years). The table below shows stands on Blodgett Forest that currently have late seral stage habitat (LSS), or are reserved for recruitment into late seral stage habitat (LSS Recruitment). Because stands have inherently different rates of change as well as direction of change, some stands already have WHR type SMC 5 or SMC 6 classifications while others are class SMC 4. Over time, the LSS Recruitment stands will likely develop enough large trees (>6 tpa >30" dbh) to meet LSS standards (SMC 6). The exclusion of harvesting activity from these areas facilitate retention of existing LSS habitat and recruitment of habitat via process-based restoration. Data from Compartment 292 are attached below as example of the structure of one of these LSS stands.

We also actively recruit and retain Large Tree Retention (LTR) areas that are managed with periodic low thinnings and/or prescribed burns. These areas are typically very close in structure to Late Seral Stage habitat, but lack under- and mid-story layers and large woody debris. They constitute an important structural type that we manage for. Given the 12-year median point fire return interval that existed at Blodgett prior to fire suppression (Stephens and Collins 2004), this LTR structure was common in dry mixed conifer forests prior to European settlement. Hence our approach in these areas is to take an active structural restoration approach in addition to the process-based approach (sensu Stephenson 1999). Restoration studies using historic data (Stephens and Elliott-Fisk 1998) as well as studies of contemporary reference areas (Stephens et al. 2007) provide general structural targets. While these LTR stands are structurally (and perhaps functionally) distinct from our LSS stands, our wildlife monitoring program does confirm considerable overlap in wildlife species composition between these two stand types. The table below reflects the success of this approach in creating structures with large and decadent trees, as stands with the largest average tree diameters tend to be the Large Tree Retention areas.

Blodgett Classification	Unit	Size Acres	WHR Class	QMD	FPA Classification
LSS Recruitment	I,II Bacon Cr. WLPZ*	26	SMC 4D		
LSS Recruitment	I, II Mutton Cr. WLPZ*	28	SMC 4D		
LSS Recruitment	I, II Gaddis Cr. WLPZ*	72	SMC 4D		
LSS Recruitment	II Deep Cyn Cr. WLPZ*	15	SMC 4D		
LSS Recruitment	II Whaler Cr. WLPZ*	5	SMC 4D		
Large Tree Retention	210	17	SMC 4D	19.4	
Large Tree Retention	211	11	SMC 5D	25.5	
LSS	220	74	SMC 6	18.8	LSS
LSS	292	110	SMC 6	16.8	LSS
Large Tree Retention	250 (HQ Area)	68	SMC 5M	20.3	
LSS	390	30	SMC 6	15.6	LSS
LSS Recruitment	510	35	SMC 6	12.4	LSS
LSS Recruitment	520	27	SMC 6	16.3	LSS
LSS Recruitment	600R	48	SMC 4D	15.6	
LSS Recruitment	630	15	SMC 4D		
LSS Recruitment	650	24	SMC 4M		
LSS Recruitment	1010**	31	SMC 4M	??	
LSS Recruitment	1030**	9	SMC 4M	??	
LSS Recruitment	1070**	24	SMC 4M	??	
LSS Recruitment	1120 (Pilot Cr WLPZ)**	92	SMC 4D	??	
Large Tree Retention	1140	54	SMC 4D	14.9	
LSS Recruitment	1160**	11	SMC 4D	??	

*Acres within WLPZs of units designated for other management options.
**These compartments were acquired recently and have only limited inventory information. These units have been designate as Ecological or Administrative reserves which will be managed to achieve LSS over time.

LSS Recruitment Acres:	384 Acres
Currently Meet FPA LSS	276 Acres
Total LSS + LSS Recruitment	660 Acres
Large Tree Retention	150 Acres
Total LSS + LLS + Recruitment + LTR	810 Acres
19% of total ownership (4270 Acres)	810 Acres

Additional Late Seral Stands (LSS) and Large Tree Retention (LTR)
There are approximately 1300 acres of the 3564 actively managed acres of Blodgett Forest that use even-aged systems. Rotation ages for these even-aged stands range from 75 to 100 years. We anticipate that all even-aged stands on Blodgett Forest will become LTR or LSS stands (by FPA standards) prior to regeneration. Fully managed stands are expected to meet LTR or LSS standards by age 60. This means that, once regulated, anywhere from 20% to 33% (260 to 429 acres) of the even-aged stands on Blodgett Forest will meet LTR or the FPA LSS standards. These stands along with the 150 acres of LTR and 720 acres of LSS and LSS recruitment stands listed above will result in a minimum of 25% of the land on Blodgett Forest meeting LSS or LTR standards at all times after forest regulation.

LATE SERAL STAGE EXAMPLE
OLD GROWTH RESERVE: Compartment 292

Total Area: 110 acres

Geography:

Aspect: North and East

Slope Position: Midslope to Stream bottom. This unit contains a significant portion of the Dark Canyon Creek drainage.

Slope: Average 7%, ranging from 0% to 25%

Soil Types: Holland and Holland/Bighill complex. Both soils are developed from granodiorite parent material. The Bighill soil is not as deep and has a higher content of course rock fragments. Its general texture tends to be a course loam. It is a well drained soil as is the Holland. Moisture holding capacity ~8 inches at saturation.

Distance to Water: Dark Canyon Creek flows through the unit. All parts of the unit are within 1000 ft of surface water in all but the driest years

Site: Dunning Site I to IA, Biging Site 93 to 100.

Vegetation:

Overstory: 80 to 150+ year old Mixed Conifer with several old growth residual trees. The result is a multi-story canopy with several openings created by dying larger trees where regeneration and shrubs establish.

Understory: 12% average cover of shrubs and forbs with a range of 0% to 55%. Shrubs heavy in openings and where the overstory canopy is thin. Forbs scattered throughout.

Common Shrubs: Golden Chinquapin, Deerbrush, Tan Oak, Manzanita, Western Azalea, Dogwood.

Common Forbs: Star Flower, Rattlesnake Orchid, Bracken Fern, Pine Violet

Stand History:

1896-1907 - Light High Grade

1963 - University of California purchased the property from the Bacchi Ranching Family

Inventory Year: 2004

Number of Plots: 29

	Min	Mean	Max
Reineke SDI:	321.	571.8	913.9
Slope:	2.0	19.2	43.0
Elevation:	4175.0	4295.0	4425.0

Understory Vegetation:

Species	N	Mean Cover	N	Mean Ht
LUP-	3	2.6	3	0.2
CHSE	7	2.1	7	0.7
LIDE	14	2.1	14	0.9
RUVI	3	1.6	3	0.0
TRLA	23	1.4	23	0.2

All Trees, Dominants and Codominants - Average DBH and Height (trees > 4.5 ft.):

Species	QMD	QMD Dominants	QMD Dom/Codom	Average Height	Average Height D	Average Height C/D
AL	10.3	0.0	0.0	36	0	0
BO	19.0	22.5	19.4	96	131	92
CH	10.7	0.0	0.0	30	0	0
DF	20.1	38.6	26.1	81	145	116
DW	6.0	0.0	0.0	12	0	0
IC	12.2	44.3	18.9	39	112	69
PP	29.5	32.4	26.1	131	150	145
SP	31.9	38.1	29.8	133	150	138
TO	11.9	0.0	14.1	41	0	82
WF	18.5	31.3	24.8	65	135	121
YW	7.4	0.0	0.0	17	0	0
All	16.8	35.2	24.6	56	140	115

Average Number of Trees by Size Class:

Species	Seed	Sap	Poles	Sml Saw	Med Saw	Lg Saw	XL Saw	Total
AL	0	17	0	1	0	0	0	19
BO	0	0	0	1	1	0	0	2
CH	0	10	0	1	0	0	0	12
DF	0	38	6	13	3	2	3	67
DW	0	38	0	0	0	0	0	39
IC	0	66	58	28	5	0	2	160
PP	0	3	0	0	2	1	3	10
SP	0	0	0	0	1	0	4	7
TO	0	62	4	7	0	0	0	74
WF	0	179	20	12	10	6	6	233
YW	0	28	2	0	0	0	0	30
All	0	441	96	64	22	10	18	651

Board Foot Volumes (trees > 10" DBH) and Cubic Foot Volumes (trees > 4" DBH) (in 1000's):

Species	Minimum BF	Average BF	Maximum BF	Minimum Cubic	Average Cubic	Maximum Cubic
AL	0.00	0.00	0.00	0.00	0.01	0.12
BO	0.00	0.00	0.00	0.00	0.04	0.49
CH	0.00	0.00	0.00	0.00	0.01	0.17
DF	0.00	15.58	137.97	0.00	2.54	19.84
DW	0.00	0.00	0.00	0.00	0.00	0.01
IC	0.00	7.66	84.74	0.00	1.58	12.65
PP	0.00	11.55	83.97	0.00	1.66	12.15
SP	0.00	11.74	81.22	0.00	1.78	11.91
TO	0.00	0.00	0.00	0.00	0.03	0.44
WF	0.00	25.83	107.12	0.00	4.28	16.24
YW	0.00	0.00	0.00	0.00	0.01	0.15
All	3.55	72.37	191.39	1.49	11.93	28.78

Basal Area: Species	Minimum Basal Area	Average Basal Area	Maximum Basal Area
AL	0.00	1.22	23.02
BO	0.00	3.41	41.20
CH	0.00	1.11	31.35
DF	0.00	64.19	397.82
DW	0.00	0.40	6.69
IC	0.00	77.19	324.60
PP	0.00	32.63	221.11
SP	0.00	36.47	216.12
TO	0.00	9.61	111.24
WF	0.00	101.60	323.60
YW	0.00	1.07	21.35
All	139.97	328.91	590.10

SNAG Information

Snags per Acre by Size Class

Size Class	Number
0"-10"DBH	32
10"-20"	9
20"-30"	4
30"+	0.5

Downed Woody Debris as Related to Fuel Loading

Tons/Acre by Fuel Type

Duff &Litter	<0.25"	0.25"-1"	1"-3"	3"-10"	10"-20"	>20"
28.71	0.59	2.60	2.29	3.34	5.46	5.27

Total Tons/Acre = 48.26

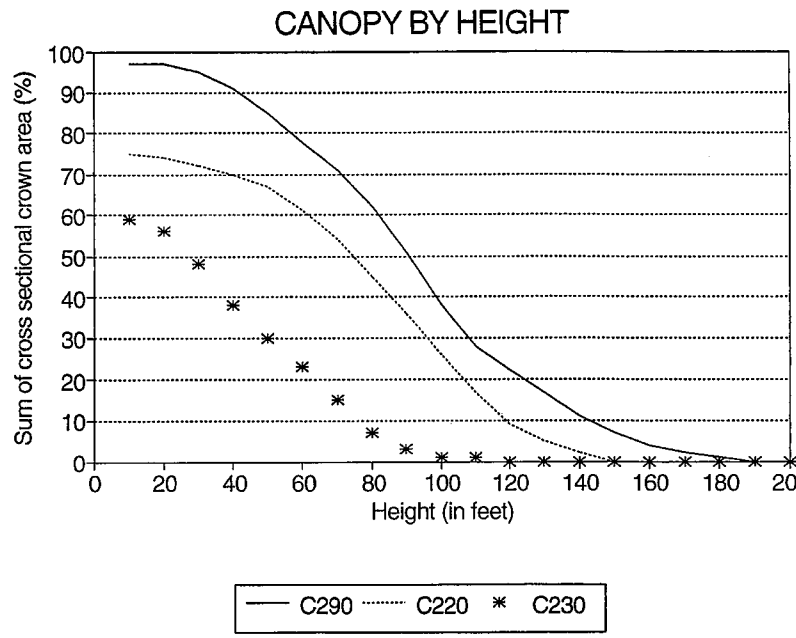
Wildlife Habitat Relationships

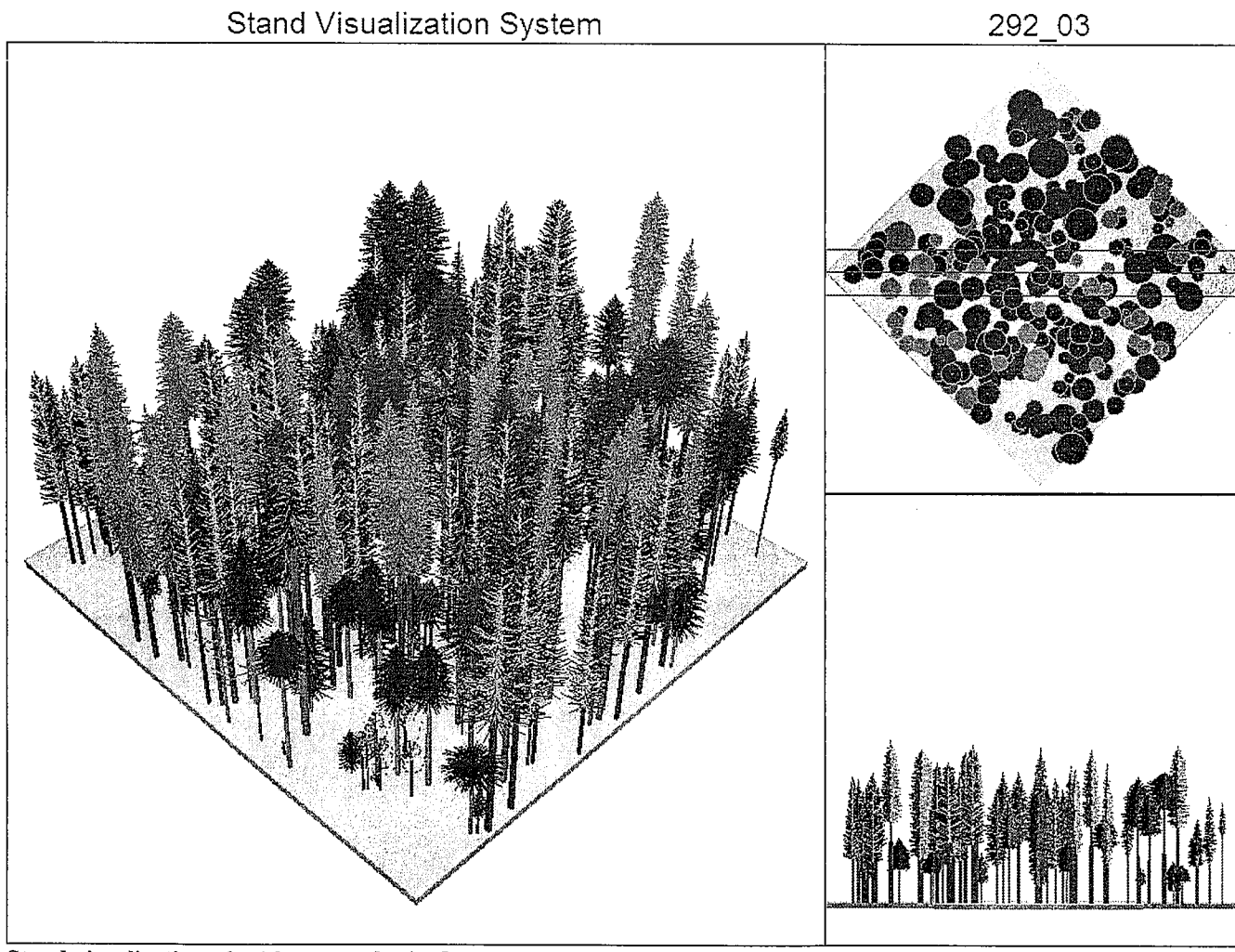
(Based on the California WHR System)

Primary Vegetation Type: Sierra Mixed Conifer (SMC)
Size Classes: 11"-24" trees (Size 4) **and** >24" trees over 6"-24" trees (size 6)
Density: 40-60% canopy cover (M) **and** >60% cover (D)

Typical California WHR = SMC4D and SMC6

The whole stand qualifies as minimum Spotted Owl Foraging Habitat of 40% canopy cover in trees >11" DBH.





Stand visualization of a 1 hectare plot in Compartment 292. Spatial placement is based upon field mapping. Inputs that influence the visualization include species, dbh, height, height to crown base, and crown radius (adapted from J. Battles, 2003. Proceedings from the Sierra Science Symposium).

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Blodgett Forest Research Station
2011 Timber Harvest Plan

SECTION IV

CUMULATIVE EFFECTS

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952.9 Cumulative Impacts Assessment Checklist

1) Do the Assessment areas of resources that may be affected by the proposed projects contain any past, present or reasonably foreseeable probably future projects?
YES

If the answer is yes, identify the project (s) and affected resource subject(s).
DESCRIBED IN THE FOLLOWING PAGES.

2) Are there any continuing, significant adverse impacts from past land use activities that may add to the impacts of the proposed activities?
Yes, both forks of the American River and Pilot Creek have dams in place that block upstream fish passage. All waters in this Plan area have man made fish blockage from dams placed far downstream from the plan area. Virtually all of the ancient forest was harvested in these watersheds prior to 1973 (most before 1950).

3) Will the proposed project, as presented, in combination with past, present, and reasonably foreseeable probable future projects identified in items (1) and (2) above, have a reasonable potential to cause or add to significant cumulative impacts in any of the following resource subjects?

Items 1 – 5 will pose no significant adverse cumulative effects after mitigation. Item 6 poses no reasonable potential significant cumulative effects.

	Yes – After Mitigation (a)	No – After Mitigation (b)	No Reasonably Potential Significant Effects
1. Watershed		X	
2. Soil Productivity		X	
3. Biological		X	
4. Recreation		X	
5. Visual		X	
6. Traffic			X
7. Sequestration CO2			X

a) Yes, means that potential significant adverse impacts are left after application of the forest practice rules and mitigations or alternatives proposed by the plan submitter.
b) No after mitigation means that any potential for the proposed timber operation to cause or add to significant adverse cumulative impacts by itself or in combination with other projects has been reduced to insignificant or avoided by mitigation measures or alternatives proposed in the THP and application of the forest practice rules.
c) No reasonably potential significant effects means that the operations proposed under the THP do not have a reasonable potential to join with the impacts of any other project to cause, add to, or constitute significant adverse cumulative impacts.

4) If column (a) is checked in (3) above, describe why the expected impacts cannot feasibly be mitigated or avoided and what mitigation measures or alternatives were considered to reach this determination. If column (b) is checked in (3) above, describe what mitigation measures have been selected to which will substantially reduce or avoid reasonably potential significant cumulative impacts except those mitigation measures or alternatives mandated by application of the rules of the Board of Forestry.

Mitigation measures are provided in discussion of individual resource subjects.

Cumulative Effects Analysis Introduction

Site Description
The timber harvest plan area is located on Blodgett Forest Research Station (BFRS), a 4270 acre field research facility of the University of California at Berkeley, Center for Forestry. Blodgett Forest is located on the western slope of the Sierra Nevada approximately 12 miles east of the town of Georgetown in El Dorado County. Blodgett Forest has been managing 2700 acres of this property since 1933, an additional 200 acres since 1964 and received title to the other 1370 acres in 1998. Blodgett Forest has been harvesting timber annually on the original 2900 acres on a sustainable basis since 1958. Over that time period, total standing forest wood volume has increased from 30MMBF to over 75 MMBF while approximately 94 MMBF have been harvested. Over 500 acres have been set aside as "ecological reserves" and are left uncut. Operations at Blodgett provide a location for wildland resource research, field instruction, and demonstration of forest management principles and practices.

Project Description:
The Blodgett Forest 2011 Timber Harvest Plan will create new age classes in eleven uneven-age stands (4 group selection and 7 individual tree) commercially thin fifteen even-aged stands, one shelterwood removal cut and 2 clearcuts . Silvicultural methods include single tree selection (243 acres), group selection (196 acres) commercial thin (319 acres), shelterwood removal (18 acres) and clearcut (32 acres). The new group selection openings are scheduled to be planted the spring or fall after creation with 5 or 6 group A species, if all are available (5 native to Blodgett and giant sequoia), and all group B species will be allowed to stump sprout. Combined post harvest canopy and ground cover will remain high in all but the clearcut where ground cover from organic matter and rocks is still expected to be greater than 50%. Overall stand health and individual tree vigor will be improved by reducing overcrowded conditions and by releasing overtopped stems. Even-aged stands on BFRS are, in general, managed under 60-100 year rotations. As discussed in section II and again below, the watercourse protection measures proposed in this THP are typically greater than those in the Forest Practice Rules.

Yarding Methods:
All areas will be harvested by ground skidding methods (ground skidding equipment and/or feller buncher or cut-to-length system). Most roads and landings necessary to complete timber operations are in place and generally stable. Some older skid trails situated within the watercourse protection areas will not be re-used unless they are within ELZs of class III watercourses which are dry during the time of operations and are specifically designated and flagged by the RPF or supervised designee. Some landings may be slightly reconstructed to accommodate new harvesting equipment (mechanical ground systems), but no existing landings are expected to receive any extensive excavation or are expected to be larger than ¼ acre in size. No landings shall exceed ½ acre in size.

Topography
Main tract
The main tract of Blodgett Forest consisting of the original 2900 acres contains all 808 acres in the 2011 THP harvest areas. It is located between 3,960 and 4,560 feet elevation straddling the Georgetown Divide. The topography is gentle compared to many forested areas in California, with slopes ranging from 0% to 40%, averaging 15%. The Georgetown Divide cuts the main tract roughly in half, with the north half draining north into the watershed of the Rubicon River (Lower Pilot Creek planning watershed #5514.430401) the south half draining into the south fork of the American River (Gaddis Creek planning watershed #5514.320106) and a small area on the west draining into Whaler Creek (Whaler Creek planning watershed 5514.320202). All watershed numbers refer to Cal watersheds version 2.2.

Technical Rule Addendum NO. 2

Identification of Resource Areas

Each of the following resources will have an individual description and if necessary a map of their geographical assessment boundaries. Each resource subject will have a brief explanation of the rationale used for establishing the resource area.

Identification of Information Sources

Consultations with Experts and Organizations
University of California Berkeley, Center for Forestry, Blodgett Forest Research Station Personnel:
- Dr. Robert York, RPF, Adjunct Assistant Professor of Forestry, Research Station Manager 530 333-4475
- Frieder Schurr, RPF, Data Manager / Planner 530 333-4475
- Dr. William Stewart, RPF, UCCE Forestry Specialist, Co-Director Center for Forestry

El Dorado National Forest Personnel:
- Patricia Trimble, District Ranger (Georgetown RD) 530 333-4312

- Jim Ingram (Georgetown RD) 530 333-4312
- Claudia Funari, Wildlife Biologist (Georgetown RD) 530 333-4312
- Susan Durham, Botanist (Placerville S.O.) 530 622-5061

Adjacent Landowner Representatives (Sierra Pacific Industries and Davis Trust):
- Rich Wade, Manager, SPI Camino 530 644 -2311
- Matt Waverly, RPF, SPI, Camino 644 -2311 ext. 220
- Robert Fecko, RPF, SPI, Camino 644 -2311 ext.218
- Kim Tiesen, RPF, SPI, Camino 530 644 -2311 ext.210
- Kevin Roberts, Wildlife Biologist, SPI, Camino 530 644-2311 ext. 216

Chris Hipkin, RPF, (Davis Trust and Bacchi Ranch consultant) 510 654-6310

CAL FIRE
- Robert Little, Area Forester 530 644 -2345
- William Solinsky, Review Team Chair 559 243-4100

Quintette Service Corporation
Dan Santos 530 333-4034

Georgetown Divide Public Utility District
Hank White, Manager 530 333-4356

University of California, Dept. of Environmental Science, Policy, and Management
-Reg Barrett, Professor of Wildlife Biology
-Andy Amacher, Wildlife Biologist
-Scott Stephens, Professor of Fire Ecology
-Kevin O'Hara, Professor of Silviculture
-Leah Beche, Stream Ecologist
-John Battles, Professor of Community Forest Ecology
-Barbara Allen-Diaz, Professor of Range Ecology
-Allen Goldstein, Professor of Atmospheric Sciences

Records Examined:

-Water Quality Control Plan, Central Valley Region (Revised September 2009), The Sacrament and San Joaquin River Basins.
-California Forest Practice Rules, Title 14, California Code of Regulations, CAL FIRE, 2011.
-California Department of Fish and Game, CNDDB Search, Tunnel Hill and 8 surrounding Quads, 2010
-California Native Plant Society Inventory of Rare and Endangered Plants, 2011
-Sierra Nevada Ecosystem Project - Final Report, 1996
-Blodgett Experimental Forest Wildlife Monitoring Report 2006, Prepared by Marjorie MacIntosh
-2004 Blodgett Forest Roads Report
-2000 Blodgett Forest Hydrology Report
-1995 Blodgett Forest Hydrology Report, Forest Soil and Water
-1984 ENF Soil Survey Map
-ENF Archeological Maps
-USFS Spotted Owl Survey Team - University of Minnesota, 1986-2010
-University of Minnesota Blodgett Forest Northern Goshawk surveys in 2009
-Population Ecology of the California Spotted Owl in the Central Sierra Nevada: Annual Results 2006
-California Dept. of Fish & Game Deer Habitat Maps
-California Dept. of Fish & Game Manual: California's Wildlife - Mammals
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Past and Future Activities

A. Blodgett Forest has had harvest activity in the Class I second and third order watersheds comprising the lower 2900 acres of the forest during each year for more than 50 years. During this time over 94 MMBF of timber has been removed from the property while standing inventory has more than doubled. On BFRS's managed stands over the next 10 years each watershed will have approximately 40% of its area receive a selection or group selection harvest, about 5% will be harvested by clear-cut or shelterwood, and 20% by intermediate (commercial thinning) harvest. These projects are described in more detail in the ERA analysis contained in the watershed discussion of this section. A complete list of all past (10 years) THPs, all current and all known proposed THPs in the planning watersheds of this years THP has been obtained from the CDFFP at Fresno and updated with information from our direct neighbors. All relevant data has been incorporated into the second order watershed equivalent road area analyses below. A summary of the entire data indicates:

Planning Watershed	Watershed #	Acres	Acres in Project - 2000 - 2011*	% of watershed
Lower Pilot	5514.430401	9819	~2900	30
Gaddis Creek	5514.320106	8743	~3100	35
Whaler Creek	5514.320202	10206	~3975	39

*Does not account for acres that were approved but never carried out; or areas which were counted twice for multiple projects within the past decade.

B. Davis Trust and Bacchi Ranch lands (approximately 850 acres in the Lower Pilot Creek watershed) have harvested in late 2006. They did not harvest timber in 2007, 2008, 2009 or 2010. At this time, their plans appear to be similar to Blodgett Forest partial-cut silviculture methods. The proposed harvests are primarily single tree and group selection cuts. The Bacchi lands may also use commercial thinning to accelerate large tree dominated forest types. No significant adverse cumulative impacts are expected. The owners of these lands have generally been very good land stewards in the past and no change from that pattern is expected in the near future.

C. Sierra Pacific Industries (SPI) acquired the former Michigan California Lumber Company lands in 1994. They are the primary industrial land owner in this area. They have completed numerous clearcuts, each averaging approximately 15 acres in size, and several commercial thinnings over the past decade in these watersheds. SPI manages some legacy regenerating clearcuts up to 60 acres in size that were created prior to the limit reductions in 1994. SPI's plans in the Blodgett Planning watershed are a continuation of intensive even-aged management to achieve maximum growth over time with proper mitigations to protect other forest values. SPI had a THP approved in 2007 which is located in sections 1, 2, 3 &12, T12N, R12E. The THP is 120 acres, less than 10 acres of clearcuts are located in the Lower Pilot Watershed. SPI Foresters as of April 2010 were in the process of preparing THPs in the Whaler, Gaddis and Lower Pilot Creek Watersheds. Approximately of 236 acres of alternative/clearcut, 366 acres of commercial thinning and 99acres of selection are planned for Whaler and Gaddis Creek. The Other Plan area in Lower Pilot Creek contains approximately 450 acres of clearcuts. Minor road construction may be needed to access some areas on this plan that require cable harvest operations. Clearcuts on both plan areas are approximately 15 acres in size. Harvest Operation on both of these new plans will likely occur in 2011 or later. Other long term future plans are unknown. Their lands generally appear to be stabilized and very well regenerated. Their roads near Blodgett Forest appear to be well maintained on the whole and upgrades/repairs appear to be conducted in a timely manner.

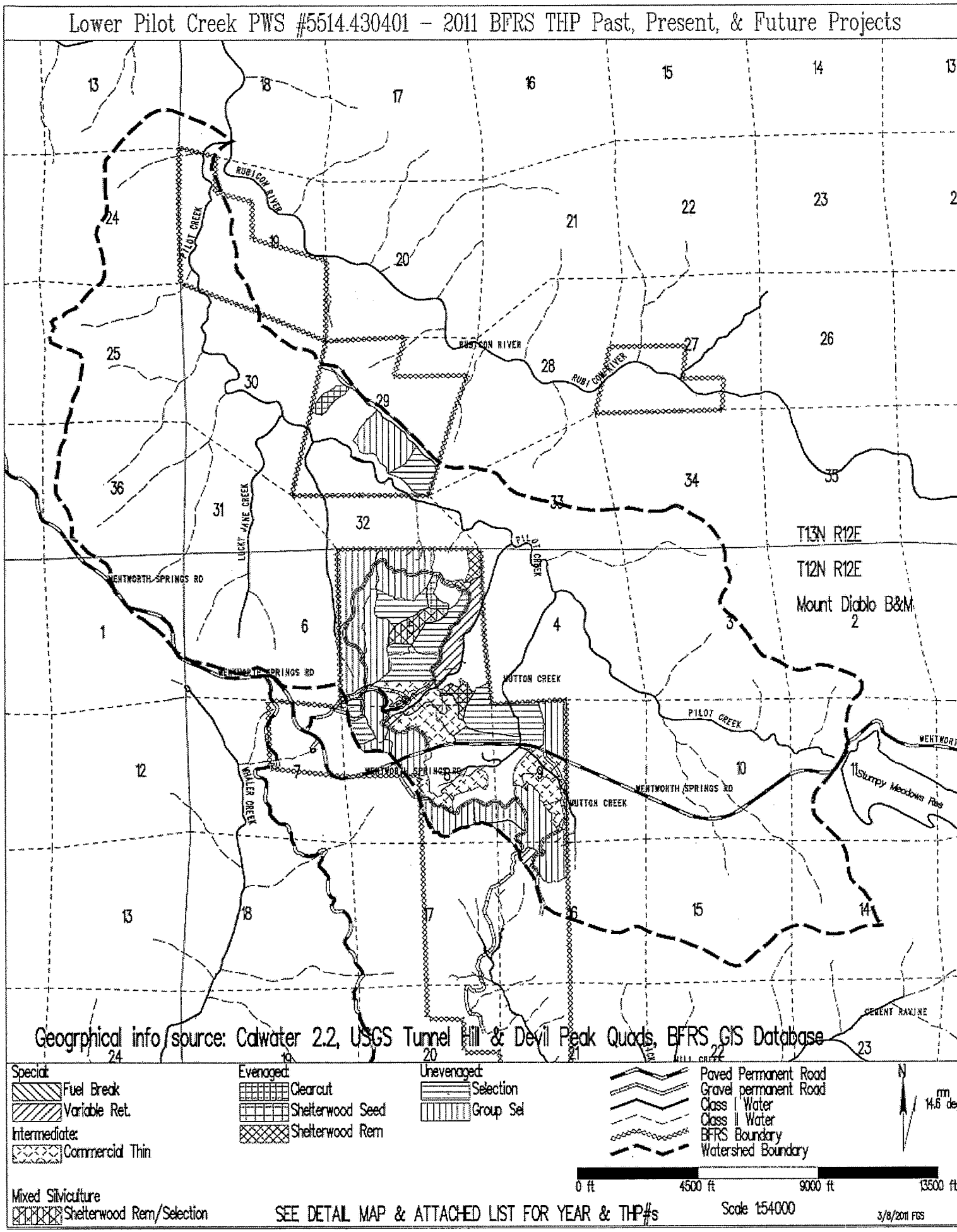
D. United States Forest Service has harvested adjacent to BFRS and conducted fuels management activities from 2007 to 2009. The "Quintette" sale is located around Quintette and extending 3miles west to Chiquita and 10 miles south to the town of Swansborough. The sale area covers 3,500 acres, with 12 MMBF of timber proposed for harvest. Approximately ¼ of the sale will occur within the Lower Pilot and Whaler Creek watersheds (mostly Whaler Cr.). Limited work began the fall of 2007. As of April 2010: all 300 acres of mastication and 300 of 1,300acres of timber harvest have been completed within the Whaler Cr. and Lower Pilot Cr. watersheds. These activities are all comparable to light commercial thins in which primarily lower canopy trees will be removed. Any cumulative impacts from this harvest will likely be beneficial and NOT adverse due to the significant fire hazard reductions and stand health improvements that will be provided. Completed areas that received similar treatments over the past few years generally maintain high to very high overstory canopy cover (>60%) and fuel ladders from understory trees and brush have been virtually eliminated. It is likely that no harvest will occur in 2010, due to economic conditions. The "2 Chaix" sale is being prepared to be put up for bid late 2010 to 2011. Operations on this sale will probably start sometime 2012 or later. This sale will be approximately 1,500 acres, with 40 acres in the Gaddis Cr. watershed and 160 acres within the Whaler Cr. watershed. The operations on the 2 Chaix will be very similar to those described above for the Quintette sale.

Past and Future THP Projects in The Assessment Areas of the 2011 THP

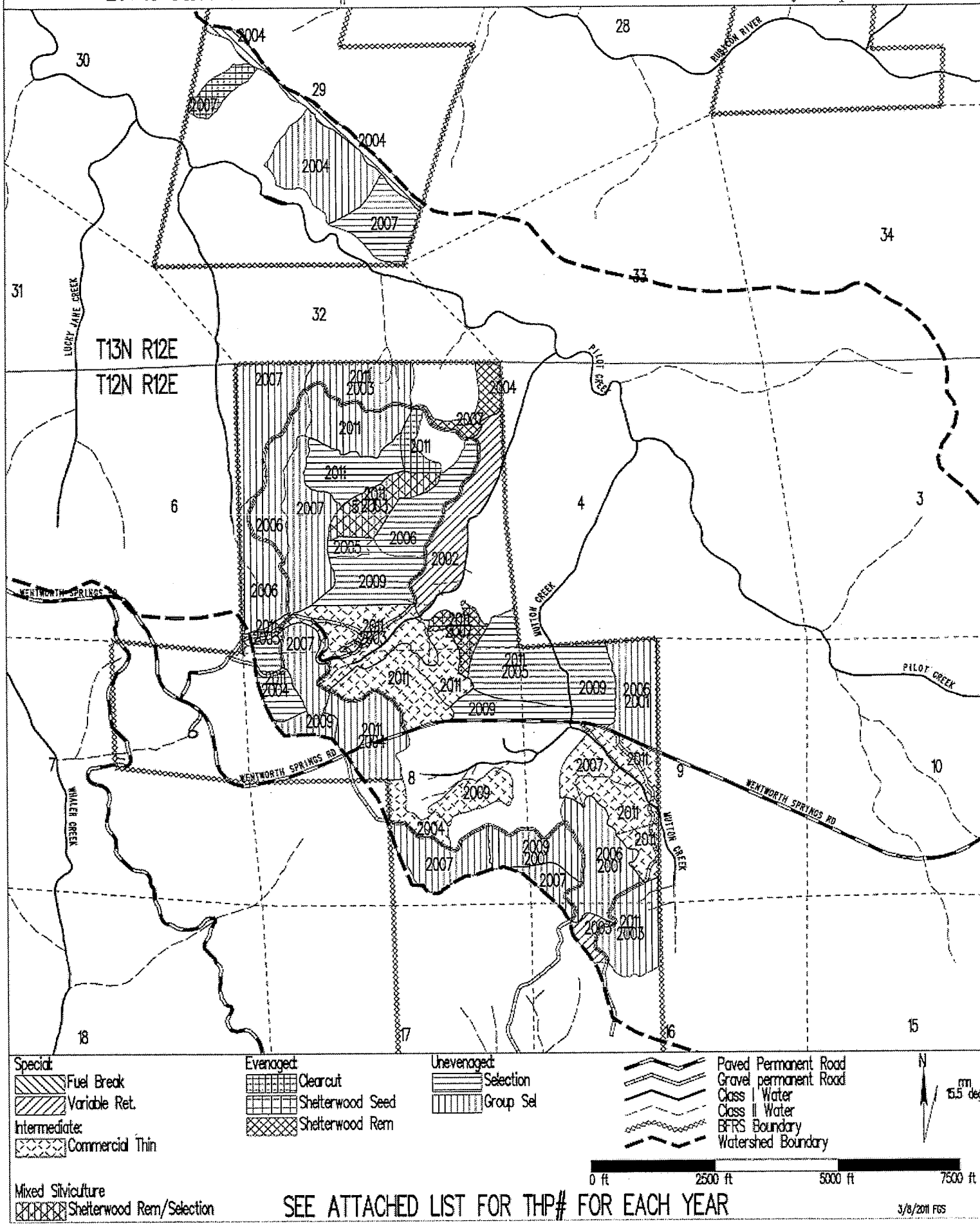
				Acres in Plan Area by Silviculture					
THP	Watershed	Submitter	Total	SWR	CC/SWS	CT	Other/ Alt/Trans	Uneven Aged	New Roads
4-00-027	Whaler, Gaddis, Lower Pilot	BFRS	248	30	46	50	16	106	
4-00-077	Whaler Creek	Elliott	25	14	6		5		
4-00-082	Gaddis Creek	SPI	~611		533	43		35	
4-01-024	Whaler Creek	Fairbanks	10		10				
4-01-025	Lower Pilot, Whaler, Gaddis	BFRS	237					237	
4-01-058	Lower Pilot Creek	Bootjack	10			10			
4-00NTMP6	Gaddis Creek	Smith	44						
4-01NTMP2	Gaddis Creek	Clark /Smith	107						
4-02-021	Lower Pilot	BFRS	62		62				
4-02-037	Whaler Creek	Quintette	19	19					
4-02-072	Whaler Creek	SPI	~692		367	109	162	52	2
4-03-021	Lower Pilot & Whaler & Gaddis Creek	BFRS	253	33		132	20	68	
4-03-058	Gaddis Creek	SPI	~305		217		78	9	1
4-04-012	Lower Pilot, Gaddis , Whaler & Zero Spring	BFRS	333	39		35	42	217	0.2
4-05-020	Lower Pilot &Gaddis Cr.	BFRS	220	25	11	84		100	
4-05NTMP3	Lower Pilot	Bacchi	307						
4-05-054	Gaddis Creek	SPI	~1313	45	315	619	125	197	12
4-06-003	Lower Pilot & Gaddis Cr.	BFRS	325		6	19		300	
4-06-024	Whaler	Mitchell	8					8	
4-06-025	Lower Pilot	Case	36					36	
4-06-045	Whaler	SPI	~430	225	130		11	64	
4-07-011	Lower Pilot, Gaddis & Whaler	BFRS	482	17	29	77	25	333	0.1
Quintette sale 2007 +	Lower Pilot & Whaler	USFS El Dorado NF	~1500				~ 1500 fuel mngt.		
4-07-026	Lower Pilot Creek	SPI	10		10 actual				
4-08-027	Lower Pilot, Gaddis & Whaler	BFRS	428			105		323	
4-10-010	Gaddis, Whaler Creek	SPI	~701			366	236	99	
2011	Lower Pilot, Gaddis & Whaler	BFRS	808	18	32	319		439	
2011	Lower Pilot	SPI	~450		~450				minor
2 Chaix sale 2011 - 2012	Gaddis & Whaler	USFS El Dorado NF	~200				~ 200 fuel mngt.		

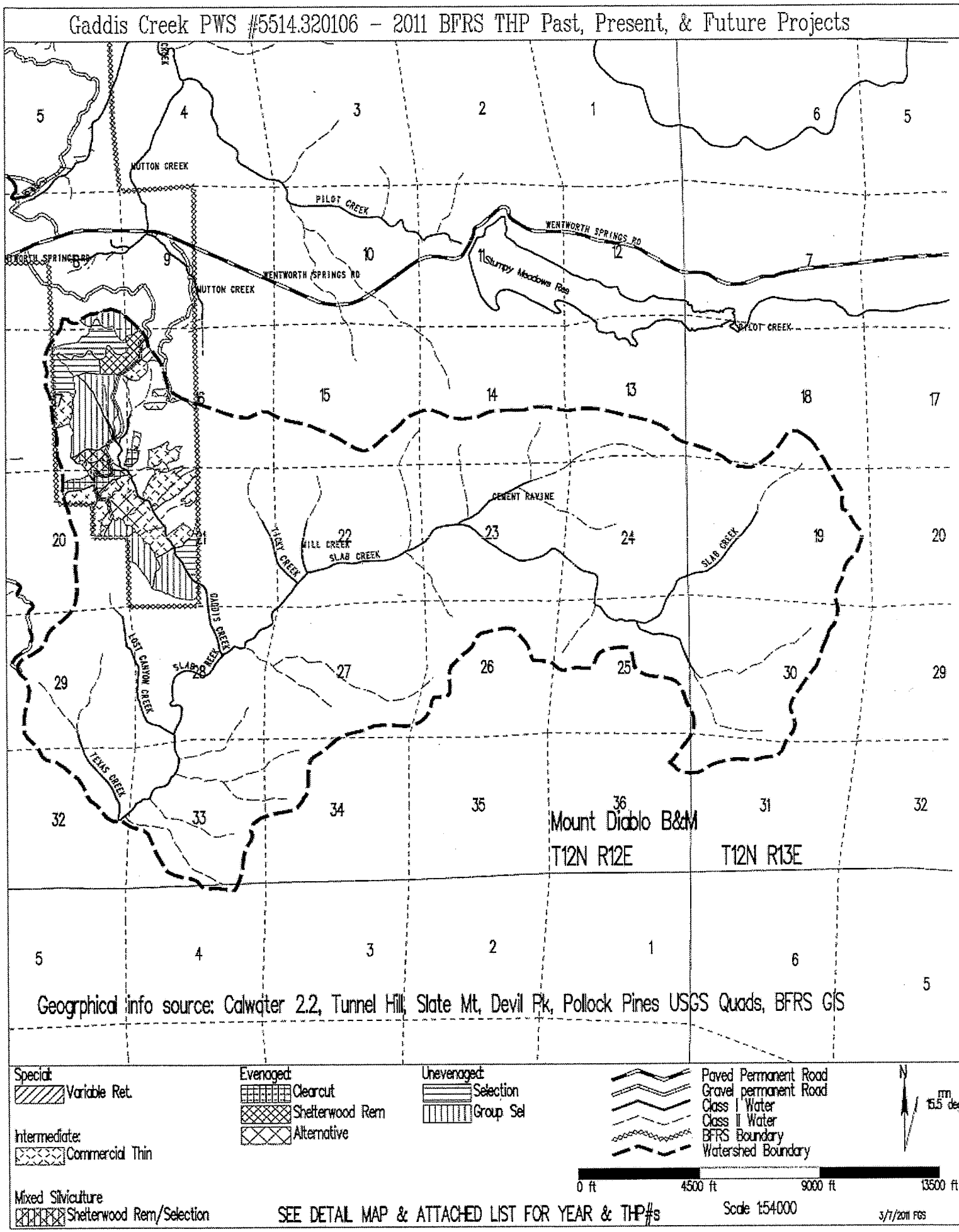
(~) Acres are total acres and may not be entirely within the listed Planning Watershed. Actual acre will be equal or less.

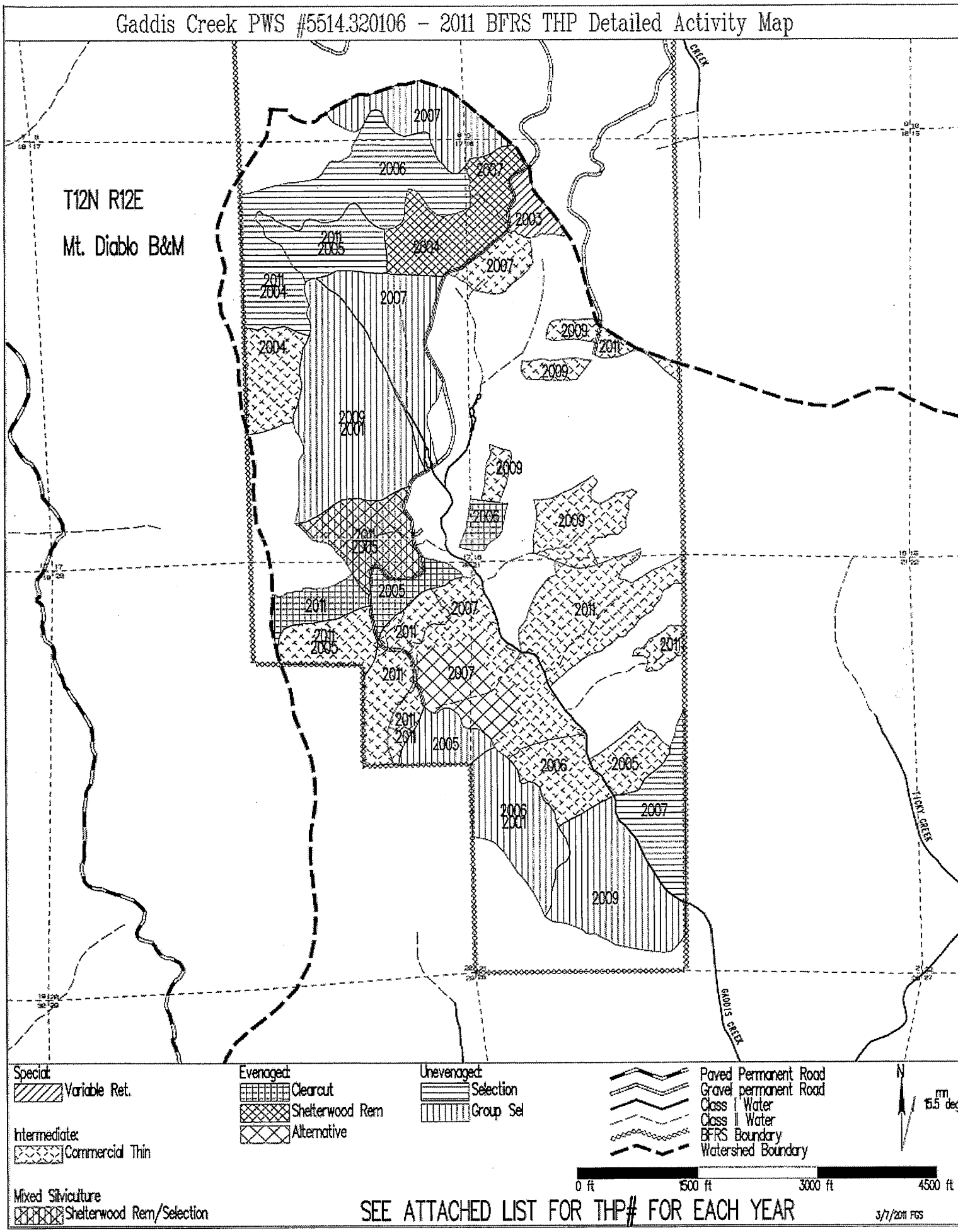
Planning watershed and detail maps are on the following pages.

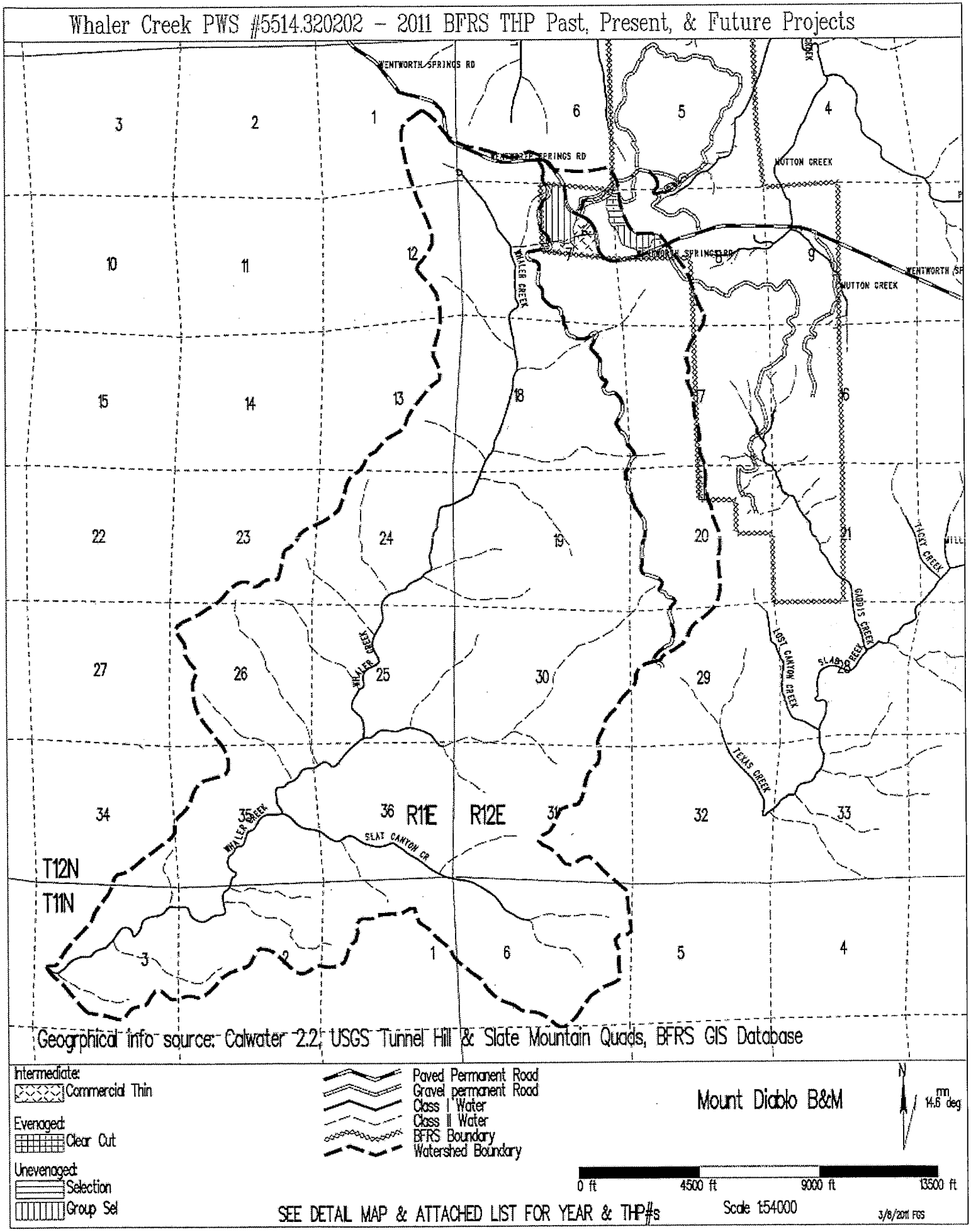

Lower Pilot Creek PWS #5514.430401 - 2011 BFRS THP Past, Present, & Future Projects
RUBICON RIVER
PILOT CREEK
LUCKY JANE CREEK
WENTWORTH SPRINGS RD
MUTTON CREEK
WALLER CREEK
Stumpy Meadows Res
CEMENT RAVINE
T13N R12E
T12N R12E
Mount Diablo B&M
Geogrphical info source: Calwater 2.2, USGS Tunnel Hill & Devil Peak Quads, BFRS GIS Database
Special:
Fuel Break
Variable Ret.
Intermediate:
Commercial Thin
Mixed Silviculture
Shelterwood Rem/Selection
Evenaged:
Clearcut
Shelterwood Seed
Shelterwood Rem
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
mn
14.5 deg
0 ft
4500 ft
9000 ft
13500 ft
SEE DETAIL MAP & ATTACHED LIST FOR YEAR & THP#s
Scale 1:54000
3/8/2011 FGS

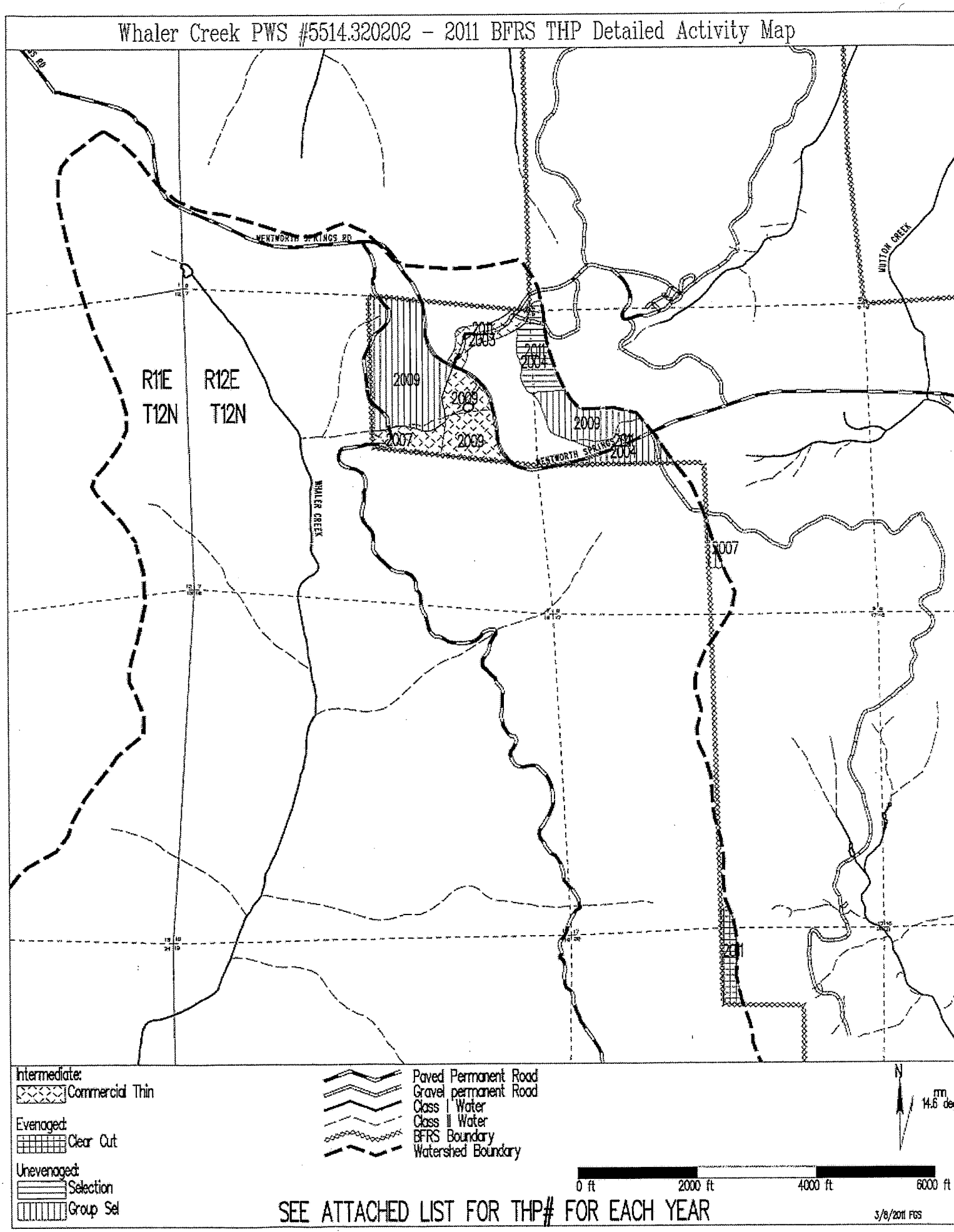
Lower Pilot Creek PWS #5514.430401 - 2011 BFRS THP Detailed Activity Map




Gaddis Creek PWS #5514.320106 - 2011 BFRS THP Past, Present, & Future Projects
HUTTON CREEK
PILOT CREEK
WENTWORTH SPRINGS RD
Stumpy Meadows Res
CEMENT RAVINE
MILL CREEK
SLAB CREEK
GADDIS CREEK
LOST CANYON CREEK
TEXAS CREEK
Mount Diablo B&M
T12N R12E
T12N R13E
Geographical info source: Calwater 2.2, Tunnel Hill, Slate Mt, Devil Pk, Pollock Pines USGS Quads, BFRS GIS
Special:
Variable Ret.
Intermediate:
Commercial Thin
Mixed Silviculture
Shelterwood Rem/Selection
Evenaged:
Clearcut
Shelterwood Rem
Alternative
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
mn 15.5 deg
0 ft
4500 ft
9000 ft
13500 ft
SEE DETAIL MAP & ATTACHED LIST FOR YEAR & THP#s
Scale 1:54000
3/7/2011 FGS


Gaddis Creek PWS #5514.320106 - 2011 BFRS THP Detailed Activity Map
T12N R12E
Mt. Diablo B&M
GADDIS CREEK
TICKY CREEK
Special:
Variable Ret.
Intermediate:
Commercial Thin
Mixed Silviculture
Shelterwood Rem/Selection
Evenaged:
Clearcut
Shelterwood Rem
Alternative
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
mm
15.5 deg
0 ft
1500 ft
3000 ft
4500 ft
SEE ATTACHED LIST FOR THP# FOR EACH YEAR
3/7/2011 FGS


Whaler Creek PWS #5514.320202 - 2011 BFRS THP Past, Present, & Future Projects
WENTWORTH SPRINGS RD
HUTTON CREEK
WHALER CREEK
TIGER CREEK
GIDDIS CREEK
LOST CANYON CREEK
SLATE CREEK
TEXAS CREEK
SLATE CANYON CR
R11E
R12E
T12N
T11N
Geographical info source: Calwater 2.2, USGS Tunnel Hill & Slate Mountain Quads, BFRS GIS Database
Intermediate:
Commercial Thin
Evenaged:
Clear Cut
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
Mount Diablo B&M
N
mn
14.6 deg
0 ft
4500 ft
9000 ft
13500 ft
SEE DETAIL MAP & ATTACHED LIST FOR YEAR & THP#s
Scale 1:54000
3/8/2011 FGS


Whaler Creek PWS #5514.320202 - 2011 BFRS THP Detailed Activity Map
WENTWORTH SPRINGS RD
MUTTON CREEK
WHALER CREEK
R11E
T12N
R12E
T12N
2009
2009
2009
2009
2007
2003
2004
2004
2007
2011
Intermediate:
Commercial Thin
Evenaged:
Clear Cut
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
mm
14.6 deg
0 ft
2000 ft
4000 ft
6000 ft
SEE ATTACHED LIST FOR THP# FOR EACH YEAR
3/8/2011 FGS

Federal Clean Water Act Section 303(d), American River Hydrological Unit, Central Valley Region WQCB
American River, Lower (Nimbus Dam to confluence with Sacramento River) / Stressor- Mercury / Sources abandoned mines.
American River, South Fork (below Slab Cr. Res. To Folsom Lake) / Stressor- Mercury / Source Unknown

There are no stream crossings or any other operation or related disturbance that will occur in watercourses associated with historic mining activities.
There will be no mercury from the 2011 Blodgett Forest THP area or operations added to the two river segments listed above.

Appendix Technical Rule Addendum # 2

A. Watershed Resources

The Watershed Assessment Area is defined by Lower Pilot Creek (LPC), Gaddis Creek (GC) and Whaler Creek (WC) State Planning Watersheds (see map page 136).Please also refer to a complete description of, 2nd order watersheds Deep Canyon Creek (LPC), Dark Canyon Creek (LPC), Bacon creek (LPC), Mutton Creek (LPC), Gaddis Creek (GC) and East Whaler Creek (WC) in the watershed discussion of Section IV below for more detailed analyses.

Version 2.2 #5514.430401, Lower Pilot Creek
Version 2.2 #5514.320106, Gaddis Creek
Version 2.2 #5514.320202, Whaler Creek

State Planning Watershed	2011 THP Acres Within Watershed	Total BFRS owned acres	BFRS Reserve (no cut) acres	Total Acres in Watershed
Lower Pilot Creek	~576	2239	252	9819
Gaddis Creek	~194	1060	136	8685
Whaler Creek	~38	229	145	10206

Lower Pilot Creek Watershed

Lower Pilot Creek extends from Stumpy Meadows Reservoir Dam to the confluence with the Rubicon River. Blodgett Forest Research Station owns 2239 acres of the total 9819 watershed acres (23%). Silvicultural methods used by Blodgett Forest for this plan in this watershed will be single tree selection, group selection, shelterwood removal step, clearcut and commercial thin.

During the fall of 2006 in addition to routine road maintenance, improvements were made to drainage facilities on approximately 0.5 miles of Loop Road. There was also road fabric and rock placed over a 300 foot segment that has been poorly drained as it passed by a wet area near compartment 150. In compartment 180 an area on the 180 Spur was looked at during the preharvest inspection of the 2006 THP by both Water Quality and CDF. Water collected on an old road to the east, owned by an adjacent land owner, and was discharging onto a segment of the 180 spur. Water then flowed down via a through-cut for several hundred feet before leaving the road. Water bars were to be installed to prevent future riling in this area. In the fall 2006 this area was rocked and rolling dips were installed above and below the area of concern. The fix will provide a higher standard of repair than what was requested and should prove much more durable over time. As part of the 2007 THP, repairs to Pilot Creek Rd. and Wildcat Spur have stabilized problem areas and will provide permanent protection to the watershed. Additionally, the five new rocked fords and associated rocked approaches will significantly reduce the potential of sediment to enter the class III watercourses that are tributary to Pilot Creek.

Generally over 60% of the portion of the watershed owned by Blodgett Forest will be managed using uneven-aged or reserve (no cut) prescriptions and will therefore always have significant upper canopy cover. WLPZs have been established to protect Class I and II waters. ELZ's have been established to protect Class III, IV and some unclassified draws. Each of these ELZ's will be 25-50 feet wide and, at the minimum, 50% of all understory vegetation will be retained within them to retain any filtering properties. Slopes within the project area are 0 to 40%. Because of the combination of prescription, harvest method, equipment exclusion zone, and WLPZs, no significant surface erosion is expected to occur. Principal sediment yield will continue to be generated by existing soil surfaced roads and summer seasonal cattle grazing. Sediment yield from roads on Blodgett Forest has been greatly reduced during the past decade due to an aggressive road maintenance/rehabilitation plan that has included surfacing, reshaping, abandoning and upgrading the majority of the roads on the property. We currently have no open range grazing on BFRS land in this drainage. If grazing occurs, it is confined with electrical fences to small areas. Occasionally, breaks in the perimeter fence may allow unwanted cows onto the property. These situations are corrected as soon as is feasible (see North Blodgett, Bacon Creek, Dark Canyon, Deep Canyon and Mutton Canyon 2nd order watershed for additional information following "State Planning Watershed Map").

Gaddis Creek Watershed

The primary watercourse in the Gaddis Creek watershed is Slab Creek, which extends from Lookout Mountain to Deerview (roughly the upper half of Slab Creek drainage). Slab Creek drains into the South Fork American River through Slab Creek Reservoir. Approximately 1060 acres of the 8,685 total acres of this watershed (12%) is owned by Blodgett Forest. WLPZ's are typically larger than standard and retain more vegetation than required (see WLPZ Section II, Item 26). In the commercial thinning and single tree selection compartments, canopy cover will not dramatically change but will be temporarily reduced by no more than ~40%. The new group openings will have most of the live vegetative cover removed after site preparation, but are still expected to retain much of the ground cover at that time. Principal sediment yield will continue to be regenerated by existing soil surfaced roads and summer seasonal cattle grazing. Sediment yield from roads on Blodgett Forest has been greatly reduced during the past five years due to an aggressive road maintenance/rehabilitation plan that has included surfacing, reshaping, abandoning and upgrading the majority of the roads on the property.

On the preharvest inspection of the 2006 THP, Water Quality and CDF brought to the attention of BFRS an area on Dee Dee Spur that they felt needed attention. It was not related to the THP under review and was located during a previous visit. This area had poor drainage on both sides of a class II road crossing that posed a potential of sediment input to the stream. Fall 2006, this segment of road was reshaped for better drainage and the area of highest concern, the approach from the west, was rocked. Additional drainage facilities were installed before and after this area to prevent any other road drainage from entering this area. Between this area and Gaddis Cr. for approximately 0.5 miles, traveling to the north and west, drainage facilities were up graded. The road grade descending to Gaddis Cr. (~500 feet) was rocked. Inspections of these areas in the summers of 2007 to 2010 revealed that the up grades have eliminated or greatly reduced all previous road drainage and erosion problems.

Cattle grazing on Blodgett Forest within the Gaddis Creek watershed are controlled by a full property perimeter fence. Occasionally, breaks in the perimeter fence may allow unwanted cows onto the property. These situations are corrected as soon as is feasible (see Gaddis Creek 2nd order watershed for additional information following "State Planning Watershed Map").

Whaler Creek Watershed

The primary watercourse in the Whaler Creek watershed is Whaler Creek a portion of whose headwaters are located on the westernmost portions of Blodgett Forest Research Station and in the community of Quintette. Blodgett Forest only owns 229 of the 10,204 acres in this watershed (2%). Of this, 145 acres are in reserve stands that will never have any significant harvesting. Another 15 acres of the managed stands are in WLPZs and other protected status that will also only be minimally harvested. There are 8 acres of Commercial Thin and 30 acres of Selection proposed for harvest within this watershed in the 2011 THP (see Quintette 2nd order watershed for additional information following "State Planning Watershed Map").

A. (1.) Water Quality Control Plan

Assessment of Impacts to the Beneficial Uses of Water as listed and defined in the Water Quality Control Plan, Central Valley Region (Revised September 2009), The Sacrament and San Joaquin River Basins.

Surface Water Bodies and Beneficial Uses

The State Planning Watershed Lower Pilot Creek is tributary to American River, Middle Fork, Source to Folsom Lake (Hydro Unit Number 514.4).

Beneficial uses include: Existing Municipal and Domestic Supply, Agricultural-irrigation and stock watering, Industry-power, Recreation-contact, canoeing and rafting, and other noncontact, Freshwater Habitat-cold and potential warm, Spawning-cold (salmon & steelhead), and Wildlife Habitat.

The State Planning Watershed Gaddis Creek is tributary to the South Fork of the American River, Source to Placerville (Hydro Unit Number 514.3).

Beneficial uses include: Existing Municipal and Domestic Supply, Industry-power, Recreation-contact, canoeing and rafting, and other noncontact, Freshwater Habitat-cold and potential warm, Spawning-cold (salmon & steelhead), and Wildlife Habitat.

The analyses of the 2nd and 3rd order sub-watersheds that drain Blodgett and the Watershed Assessment of the larger state planning watersheds which are tributary to the surface water bodies listed above, provide detailed information on impacts to water quality and quantity. Blodgett Forest Research Station is located at the headwaters of each of the sub-watersheds and therefore does not "inherit" any impacts from upstream activities. We believe that by not creating a significant negative impact at our position in the watersheds that our activities are unlikely to combine with other activities downstream to create a significant impact at the state planning watershed scale or to the surface water bodies. We do not control the actions of the other owners within the watersheds and are not currently aware of any significant impacts elsewhere in these state planning watersheds except Stumpy Meadows Dam, the Georgetown Divide Public Utility District's water supply conduit and the town of Quintette (all in the Lower Pilot Creek watershed).We are committed to managing Blodgett Forest in such a way as to not contribute to any significant adverse impacts to the beneficial uses of water downstream. If a significant cumulative impact were to develop in another portion of the watershed or at the surface water body level then it is unlikely that activities at Blodgett Forest would add in any significant way to its severity. The proposed Timber Harvest Plan will not cause or add to significant cumulative impacts affecting the existing or potential beneficial uses of water associated with surface water bodies H.U.No. 514.3 and 514.4.

A. (2.)(a.) Sediment Effects

Most soils on Blodgett Forest were formed in place from granodiorite parent materials. These soils are classified in a developmental sequence by the US Natural Resource Conservation Service (NRCS) Soil Survey as Musick, Holland, and Bighill series in order of descending development. The soil has deeply weathered horizons extending three to more than six feet deep. It has a moderate erosion hazard (almost entirely as surface rill and sheet erosion). To date, minimal evidence of erosion has been observed, isolated to skid trails and main roads. Virtually all of this sediment travels only a short distance before settling out. Slopes of the 2011 THP compartments have an average slope of ~25%. The moderately deep soils (~4-6') will hold 6-8" of water at the beginning of dry summers. Soil temperatures are not expected to have abnormal variations. Temperatures typically range from 33° to 68° F. Within the group selection openings, downed logs and snags will be retained to replenish soil carbon and soil micro-flora/fauna habitat. The surface soil will be protected as described in the site preparation addendum. Situations where sediment production potential is greatest (i.e. high extreme erosion hazard ratings, tractor operations on steep slopes, or unstable areas) do not exist within the THP area. Watercourse protection zones meeting or exceeding FPR standards; decommissioning poorly located roads; upgrading stream crossings, road surface materials and drainage structures have reduced potential sediment effects.

Descriptions and actual measurements down to 2nd and 3rd order watersheds can be found following "State Planning Watershed Map". Sediment related information includes channel morphology (i.e. stream gradient, deposition and transport zones, Vstar index of sediment loads in pools and disturbance coefficients in equivalent road acres). The data shows no significant adverse impacts resulting from timber operations on Blodgett Forest.

A. (2.)(b.) Water Temperature Effects

Blodgett Forest policy and the 2011 THP require watercourse protection zones widths, overstory canopy and understouy vegetation retention equal to or greater than the standard Forest Practice Rules. Stream temperature data, rapid bioassessment and vegetation inventories can be found within 2nd and 3rd order watershed analysis following "State Planning Watershed Map".

Data indicates no signs of elevated stream temperatures that could have a negative impact on salmonid habitat. Bioassessment data also shows a "very good water quality" biotic index. Past and proposed forest management activities on Blodgett Forest have and will provide thermal protection to water resources. The data shows no significant adverse impacts resulting from timber operations on Blodgett Forest.

A.(2.)(c.) Organic Debris Effects

Blodgett Forest policy and the 2011 THP require watercourse protection zones widths, overstory canopy and understouy vegetation retention equal to or greater than the standard Forest Practice Rules. These requirements will protect against the introduction of excessive amounts of small organic debris and provide for recruitment of beneficial large woody debris. There will be no significant adverse impacts to or from organic debris

Woody Debris data can be found within 2nd and 3rd order watershed analysis following "State Planning Watershed Map".

A.(2.)(d.) Chemical Contamination Effects

There are currently no known significant sources of toxins within the assessment area. Blodgett Forest has not and is not planning to use chemical dust abatement on its roads. Any spills of fuel, lubricants, cleaning agents, or any other toxic substance must be cleaned up immediately. Pesticide use will comply with the California Department of Pesticide Regulations. The services of a Licensed Pest Control Advisor (PCA) will be required for any pesticide application. The PCAs written recommendation will be strictly followed. This will ensure the safe and effective use of herbicides and compliance with the California Environmental Quality Act. There will be no significant adverse impacts from chemical contamination associated with this THP.

A summary of abiotic and biotic water quality can be found in Appendix B within 2nd and 3rd order watershed analysis following "State Planning Watershed Map".

A.(2.)(e.) Peak Flow Effects

Peak flow increase is thought to be related to reduced vegetative water use or openings (clearcut) where snow can accumulate. The standing volume on Blodgett Forest has more than doubled since 1958 (30MMBF to >75MMBF). Less than 40% of Blodgett Forest is managed evenaged. The rotation age for evenage stands on Blodgett Forest is 60 to 100 years. There are only two clearcuts (32 acres total) proposed in this THP.

A.(3.) Watercourse Condition

The most significant impacts to watercourse condition, on Blodgett Forest have been historical. These impacts include mining from1848 to 1930, railroad logging 1901 to 1915, grazing 1880 to present and ditches associated with the Georgetown Divide Public Utility District 1852 to present These activities are describe in detail in the Watershed Characteristics within the 2nd and 3rd order watershed evaluations following "State Planning Watershed Map".

Measurements of current watercourse conditions on-site are located in the 2nd and 3rd order watershed evaluations following "State Planning Watershed Map". Steam channel conditions with associated data are as follows:

Gravel Embedded – See 2nd and 3rd order watershed specific "Habitat Typing" and "Stream Characteristics" (Figure 2.) percent of habitat unit covered by substrate. Substrate types include silt, sand, gravel, small cobble, large cobble, boulder and bedrock.

Pools Filled - See 2nd and 3rd order watershed specific Vstar description, (Table 2.) Summary of Vstar data and (Figure 5) percent of residual pool volume filled with sediment by meter location of plot.

Aggrading – There were no known or sampled contemporary occurrences of this condition.

Bank Cutting – No significant bank cutting is occurring. As noted in "Channel Morphology" organic debris plays a critical role in bank stability. Related information can be found in the "Woody Debris" and "Vegetation" sections that would support the current stable bank conditions.

Bank Mass Wasting – There are no landslides directly entering the stream systems located on Blodgett Forest.

Downcutting – There was no significant downcutting observed. As noted in the "Vstar" section higher values of residual pool sediment may be evidence of incising stream channel associated with higher flow volumes.

Scoured – There are no examples stream channels that have been stripped of gravel and finer bed materials by large flow events or debris torrents, or streamside vegetation being swept away with the channel having a raw eroded appearance.

Organic Debris – See 2nd and 3rd order watershed specific "Woody Debris" section and Table 3: summary of woody debris counts per 100 foot stream segments.

Stream-side Vegetation – See 2nd and 3rd order watershed specific "Vegetation" section for recorded canopy, riparian understory and downed fuels data.

Recent Floods –See 2nd and 3rd order watershed specific "Watershed Characteristics" section. On January 1st and 2nd of 1997 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. On October 23-24, 2010, 8 inches of rain fell in 24 hours with a total of 10 inches in 48 hours. These storm event flows are recorded and can be compared to average summer and winter flows. No significant watershed impacts occurred on Blodgett Forest.

B. Soil Productivity

Soil Productivity Assessment Area

The Soil Productivity Assessment Area will be the area within the Timber Harvest Plan boundary. This area was chosen because these impacts most often occur on-site within the project boundary.

1. **Organic Matter Loss;** within the group selection openings and clearcuts, downed logs and snags will be retained to replenish soil carbon and soil micro-flora/fauna habitat. The surface soil will be kept in place by mitigation measures described in the site preparation addendum.

2. Surface Soil Loss: Most soils on Blodgett Forest were formed in place from granodiorite parent materials. These soils are classified in a developmental sequence by the US Natural Resource Conservation Service (NRCS) Soil Survey as Musick, Holland, and Bighill series in order of descending development. The soil has deeply weathered horizons extending three to more than six feet deep. It has a moderate erosion hazard (almost entirely as surface rill and sheet erosion). To date, minimal evidence of erosion has been observed, isolated to skid trails and main roads. Virtually all of this sediment travels only a short distance before settling out. Watercourse appropriate dispersion devices (hay bales, rocks, slash, undisturbed brush, etc.) will be utilized at the outlets of all drainage structures (culverts, ditch drains etc.). Please see the Road Report in Section V for additional information on road layout and maintenance at Blodgett Forest.

3. **Soil Compaction:** Soil compaction within the compartments is not expected to be significant in this THP since operation will occur during the summer dry period, when soils are nearing depleted of moisture in the upper horizons. Skidding equipment will be required to stay on designated skid trails to minimize soil disturbance in areas of more than 30% slope. Existing skid trails will be re-used where they currently exist, unless they are within a watercourse protection area.

4. **Growing Space Loss:** No new roads or landings are proposed in this THP. Existing skid trails will be re-used where they are currently located, unless within a watercourse protection zone. There will be no significant increase in growing space loss from the proposed operations.

Previous loss of growing space has been mitigated by road decommissioning. Since 1995, 6 miles (15 %) in the lower portion of Blodgett Forest have been abandoned. Abandoned roads are barricaded to exclude vehicle traffic and treated to reduce future erosion.

Treatments include: pulling all culverts and stream crossings, ripping the road surface, partial removal of berms and fill sections, mulching (weed free straw), installation of sediment traps to prevent sediment transport corridors and often tree planting (see Section V Road Report).

C. Biological Resources

The THP area including the area within 1.3 miles of the THP boundary (see Biological and Visual Assessment Map) was selected as the assessment area.
This assessment area will include any potential habitat needs or impacts to biological resources associated with this THP.

C.(1.) and (2.) Primary terrestrial vertebrate assessment was based on the Spotted Owls and Goshawks known to use the area within the past decade. The relatively low percentage of the existing timber available for harvest that will be removed by this project renders any significant adverse effect on other terrestrial vertebrates extremely unlikely. The spotted owl pairs are presumed to have the greatest challenge of finding quality habitat by this project combined with recent past and foreseeable future projects. Please read the Wildlife Section III for background; and the Spotted Owl Section III for specific analysis. The extra mitigation provided by enlarged WLPZ, and snag retention and recruitment in the project area will provide for more suitable habitat. Further, BFRS retains large tanoaks and black oaks and incorporates hardwoods into managed stands to increase spotted owl habitat quality (also see Section II, Item #14f). More than 1000 acres of permanent (no harvesting) quality nesting habitat located in Blodgett Forest ecological reserves and USFS Protected Activity Centers (USFS Sec 28, 30, and 32, T13N R12E) should prevent significant adverse effects. Furthermore, 72 acres of plantations and shelterwood regeneration areas on Blodgett Forest have recently reached the size and canopy cover requirements of "minimal foraging habitat" for spotted owls with another 80 acres expected to meet these requirements within the next 5 years. All special habitat elements will be retained. Projections of the managed and reserve stands on Blodgett Forest shows an overall increase in habitat as the forest approaches regulation.

A pair of Northern Goshawks nested in Section 28 T12N R12E in 1994 according to the USDA Forest Service. This is approximately 1 1/4 mile south of unit 563. This may or may not be the same pair that was detected in Compartment 292 in 2003. To date no nest has been found, but further surveys will be conducted in the future as part of the ongoing wildlife monitoring activities at the research station. Claudia Funari, Wildlife Biologist (Georgetown RD) USFS said that there were no Northern Goshawks known as of 2010 within the Biological Assessment Area of this THP. If a nest site is located near any active or planned harvest activities conducted by Blodgett Forest, actions will be taken to protect the site as required in FPR section 959.3.

C.(3.)(a.)Pools and Riffles, (b.) Large Woody Material and (c.) Near-Water Vegetation

These aquatic and near-water habitat conditions are fully addressed in **A.** Watershed Resources. Further descriptions and measurements can be found in the 2nd and 3rd order watershed descriptions.

C.(4.)(a.) Snags/Den/Nest Trees

This habitat element, existing and proposed for recruitment, is covered in Section II and Section III item 33 Snags.

C.(4)(b.) Downed Large, woody debris

Woody Debris data can be found within 2nd and 3rd order watershed analysis and Section III item 31 Fuel Loading.

C.(4)(c.) Multistory canopy

Multistory canopy is the dominant stand structure on Blodgett Forest. Of the 4270 acres, 70% (2970acres) are dedicated to silvicultural and management practices that provide multistory structure. Silviculture and management to maintain this structure include: single tree and group selection stands; no harvest – reserve stands; structural retention in watercourse and lake protection zones; and increased ground cover and understory retention along class III watercourses.

C.(4.)(d.) Road Density

The only roads open (unrestricted vehicular travel) to the public are Wentworth Springs Rd. (county) and Sand Mountain Blvd. (USFS). All other roads accessing Blodgett Forest are controlled by gates. Vegetative screening is provided for wildlife via the mosaic replication of diverse silvicultural treatments.

Efforts have also been made to enhance and protect aquatic and near-water habitat by decommissioning and relocating roads. Since 1995, Blodgett Forest has taken an active role in abandoning such roads. All substantial road segments formerly located within 200 feet of class I and II watercourses have been abandoned. Some were replaced with alternate routes upslope. .Since 1995, 6 miles (15 %) in the lower portion of Blodgett Forest have been abandoned.

Abandoned roads are barricaded to exclude vehicle traffic and treated to reduce future erosion. Treatments include: pulling all culverts and stream crossings, ripping the road surface, partial removal of berms and fill sections, seed and mulching (grass and weed free straw), installation of sediment traps to prevent sediment transport corridors and often tree planting.

C.(4)(e.) Hardwood Cover

The forest-wide goal is to have about 10% of overall tree density comprised by hardwood species (variability depending on seral stage and demographic attributes of specific species). Planting design, mechanical treatment, and the application of herbicide are reserved as methods for controlling species composition.

Black oaks: Because black oak provides a significant food source for wildlife, it is specifically managed at BFRS so that a sustainable population of black oak in all size classes may develop. In the partial harvest stands (selection, group selection and commercial thinnings), black oaks will be marked in the same manner as conifers. Individuals with low vigor or signs of disease will be marked, while retaining individuals with high snag recruitment potential (large, decadent trees with cavities and large crooks). Groups of black oaks that are being encroached upon by surrounding conifers will be retained, and the encroaching conifers removed. Without thinning of conifers, the black oaks will be overtopped since height growth essentially stops by age 140 at around 80 to 100 feet, while the conifers continue height growth past this age (McDonald, 1969). Individual black oaks in the second-growth matrix at Blodgett are approaching the stand dynamic phase when the intolerant black oaks would die without thinning of surrounding conifers (Edwards, 1957). Black oak individuals within group selection openings and clearcuts will be cut and allowed to sprout. The sprout clumps will be retained into the future by allocating growing space to the clump through cultural practices (i.e. planting and thinning). The retention and allocation of growing space in the matrix forest, combined with the cutting and sprouting of trees in regeneration openings will hopefully result in a more balanced distribution of size classes in the black oak population than currently exists.

C. (4)(f.) Late Seral (Mature) Forest Characteristics

There are currently 276 acres of forest that have Late Seral (Mature) characteristics on Blodgett Forest, none of which are proposed for harvest.

There may be another 100 to 300 acres of forest that have Late Seral (Mature) characteristics that occur on U.S. Forest Service, Davis Trust and Sierra Pacific Industries properties and are within the Biologic Assessment Area. This is a rough estimate of total combined acres.

To provide research and habitat value, Blodgett has designated 19% of its land area as recruitment areas for late seral stage habitat. These areas have not been harvested since UC has owned the property (70+ years). The table below shows stands on Blodgett Forest that currently have late seral stage habitat (LSS), or are reserved for recruitment into late seral stage habitat (LSS Recruitment). Because stands have inherently different rates of change as well as direction of change, some stands already have WHR type SMC 5 or SMC 6 classifications while others are class SMC 4. Over time, the LSS Recruitment stands will likely develop enough large trees (>6 tpa >30" dbh) to meet LSS standards (SMC 6). The exclusion of harvesting activity from these areas facilitate retention of existing LSS habitat and recruitment of habitat via process-based restoration. Data from Compartment 292 are attached below as example of the structure of one of these LSS stands.

We also actively recruit and retain Large Tree Retention (LTR) areas that are managed with periodic low thinnings and/or prescribed burns. These areas are typically very close in structure to Late Seral Stage habitat, but lack under- and mid-story layers and large woody debris. They constitute an important structural type that we manage for. Given the 12-year median point fire return interval that existed at Blodgett prior to fire suppression (Stephens and Collins 2004), this LTR structure was common in dry mixed conifer forests prior to European settlement. Hence our approach in these areas is to take an active structural restoration approach in addition to the process-based approach (sensu Stephenson 1999). Restoration studies using historic data (Stephens and Elliott-Fisk 1998) as well as studies of contemporary reference areas (Stephens et al. 2007) provide general structural targets. While these LTR stands are structurally (and perhaps functionally) distinct from our LSS stands, our wildlife monitoring program does confirm considerable overlap in wildlife species composition between these two stand types. The table below reflects the success of this approach in creating structures with large and decadent trees, as stands with the largest average tree diameters tend to be the Large Tree Retention areas.

Blodgett Classification	Unit	Size Acres	WHR Class	QMD	FPA Classification
LSS Recruitment	I,II Bacon Cr. WLPZ*	26	SMC 4D		
LSS Recruitment	I, II Mutton Cr. WLPZ*	28	SMC 4D		
LSS Recruitment	I, II Gaddis Cr. WLPZ*	72	SMC 4D		
LSS Recruitment	II Deep Cyn Cr. WLPZ*	15	SMC 4D		
LSS Recruitment	II Whaler Cr. WLPZ*	5	SMC 4D		
Large Tree Retention	210	17	SMC 4D	19.4	
Large Tree Retention	211	11	SMC 5D	25.5	
LSS	220	74	SMC 6	18.8	LSS
LSS	292	110	SMC 6	16.8	LSS
Large Tree Retention	250 (HQ Area)	68	SMC 5M	20.3	
LSS	390	30	SMC 6	15.6	LSS

LSS Recruitment	510	35	SMC 6	12.4	LSS
LSS Recruitment	520	27	SMC 6	16.3	LSS
LSS Recruitment	600R	48	SMC 4D	15.6	
LSS Recruitment	630	15	SMC 4D		
LSS Recruitment	650	24	SMC 4M		
LSS Recruitment	1010**	31	SMC 4M	??	
LSS Recruitment	1030**	9	SMC 4M	??	
LSS Recruitment	1070**	24	SMC 4M	??	
LSS Recruitment	1120 (Pilot Cr WLPZ)**	92	SMC 4D	??	
Large Tree Retention	1140	54	SMC 4D	14.9	
LSS Recruitment	1160**	11	SMC 4D	??	

PART OF PLAN

LSS Recruitment Acres:	384 Acres
Currently Meet FPA LSS	276 Acres
Total LSS + LSS Recruitment	660 Acres
Large Tree Retention	150 Acres
Total LSS + LLS + Recruitment + LTR	810 Acres = 19% of total ownership (4270 Acres)

Additional Late Seral Stands (LSS) and Large Tree Retention (LTR)
There are approximately 1300 acres of the 3564 actively managed acres of Blodgett Forest that use even-aged systems. Rotation ages for these even-aged stands range from 75 to 100 years. We anticipate that all even-aged stands on Blodgett Forest will become LTR or LSS stands (by FPA standards) prior to regeneration. Fully managed stands are expected to meet LTR or LSS standards by age 60. This means that, once regulated, anywhere from 20% to 33% (260 to 429 acres) of the even-aged stands on Blodgett Forest will meet LTR or the FPA LSS standards. These stands along with the 150 acres of LTR and 720 acres of LSS and LSS recruitment stands listed above will result in a minimum of 25% of the land on Blodgett Forest meeting LSS or LTR standards at all times after forest regulation.

C. (4.)(g.) Late Seral Habitat Continuity
Late seral habitat continuity is provided by watercourse protection zones. Within Blodgett Forest Bacon Creek, Mutton Creek, Gaddis Creek and Deep Canyon Creek WLPZs either meet or are being recruited to meet late seral habitat.

C. (4.)(h.) Special Habitat Elements
There will be no loss of key habitat. No harvest will occur in areas meeting late seral habitat requirements. No harvest operations will impact meadows that provide critical habitat.

D. Recreational Resources
The recreational assessment area is the logging area plus 300 feet. This assessment area was selected because all associated recreation is light and dispersed, if any impacts were to occur they would be on site or very close to it.

D. (1.) Recreation at Blodgett includes:
- A Walking/running along roads by research staff and visitors.
- B Cross-country skiing and snow shoeing along roads.
- C Wood cutting by permit.
- D Deer and squirrel hunting by permit.
- E Horseback riding along roads.
- F Stream fishing.
- G Swimming/Bathing in Pilot Creek

Activities along roads will not be affected outside of the actual operating period (approximately 3 months or less). For safety, recreationists are prohibited from entering active logging areas. Maps are given out showing safe locations for recreation activity. Recreationists at Blodgett are not only accustomed to a variety of stand structures and compositions created by silvicultural operations, most actually report enjoying the variety. Many visitors to Blodgett come specifically to see the research projects that are occurring in these differing stand structures, and combine recreation with education.

Wood cutting opportunities will be temporarily increased by the harvest. All group B species harvested will be skidded to the landings and decked for sale of fire wood. Wood cutting will be less than potential as all large snags and large downed logs will be retained except those few hazardous to operations. This reduction in potential wood cutting is a necessary compromise to maintain wildlife habitat and soil productivity.

Hunting is not expected to be reduced as mast producing oaks are generally left in the matrix of the units and the mosaic of habitat diversity created with variable retention and small group clearings may actually improve habitat for migratory deer herds. Oak removal in these cleared areas will be considered as necessary to ensure sprout regeneration in order to develop a sustainable age class structure for black oak.

Most of the lands adjacent to the proposed harvest areas are inside Blodgett Forest, or adjacent to Sierra Pacific Industries (SPI), which holds actively managed timberlands that can only be accessed through locked gates. The only current public use in these adjacent areas is by deer and squirrel hunters in the fall who access the area by foot and those passing through on the way to water recreation sites. Therefore this harvest will not affect recreation occurring outside the forest.

Fishing and swimming in Pilot Creek is a significant recreational activity. Most recreationists access Pilot Creek by foot via a Forest Service road to the west of Blodgett Forest. The pedestrians hike approximately 1.5 miles to Blodgett Forest property, where they hike down a foot trail another 0.5 miles to reach Pilot Falls. Pilot Falls is a series of natural waterfalls where swimming is popular. BFRS prohibits camping (via posted signs) in order to reduce pollution to the stream and to reduce fire hazard. BFRS plans to manage recreation to address these two major concerns that threaten the quality of the stream and the surrounding forest lands.

D. (2.) There are no recreational Special Treatment Areas described in the Board rules on the plan area or contiguous to the area.

E. Visual Resources

The visual assessment area is the logging area that is readily visible to significant numbers of people who are no further than three miles from the timber operation. This assessment area was selected because at distances of greater than 3 miles from viewing points activities are not easily discernible. (See Biological and Visual Assessment Map)

E. (1.) There are no Special Treatment Areas designated as such by the Board rules.

E. (2.) Due to the relative isolation of Blodgett there is no location within the assessment area where a significant number of people can view the forest other than along Wentworth Springs Road which is included in this assessment area.

E. (3.) This item does not apply [see answers to E. (1.) and E. (2.)].

F. Vehicular Traffic Impacts

The traffic assessment area involves the first roads not part of the logging area on which logging traffic must travel. This assessment area was selected because any roads beyond the assessment area may or may not be used depending on mill, or multiple mill location. Also, as the distance increases from the assessment area, traffic volumes increase, logging traffic becomes a smaller portion of usual vehicle load.

F. (1.) Wentworth Springs Road (El Dorado County) from the east side of Blodgett Forest to Georgetown (12miles) was chosen as the assessment area.

F. (2.) Wentworth Springs Road is used every year to transport wood products.

F. (3.) There are no significant traffic or maintenance problems within the assessment area.

F. (4.) Normal timber related traffic on Wentworth Springs Road from all sources has been as high as 200 loads per day in the past decade. This operation is expected to generate 2 to 10 loads of logs per day over a 2-3 month period. This is the normal contribution to traffic on this stretch by Blodgett Forest during the summer months. The truck traffic from BFRS has remained constant during the summer months for the past 40+ years.

PRC 4512(c), 4512.5, 4513(b) and 4551(b) Sequestration of Carbon Dioxide Emissions

The assessment area involves the entire atmosphere of planet earth. This assessment area was selected because greenhouse gas and related climate change are global in scale.

The RPF preparing this THP has requested Dr. William Stewart and Dr. Robert York, both RPFs and experts in the field of carbon sequestration as it relates to forest management, to prepare this portion of the plan.

Estimating the carbon sequestration impacts of a timber harvest plan in California
Bill Stewart, UCCE Forestry Specialist, May 2011

Executive Summary

The excel workbook, "GHG calculator for THPs – Blodgett variant III.xls", contains 9 worksheets that estimate the greenhouse gas impacts of a proposed timber harvest plan. The calculations are based on recent publications that cover the full range of carbon sequestration and carbon dioxide and methane emissions. The basic system is described on the 'instructions' worksheet. The 'project summary' page pulls in the more detailed data from the following worksheets to estimate the carbon sequestration impact in metric tonnes of carbon dioxide equivalent (tCO2e) for the estimated volume of sawlogs removed and eventually taxed by the Board of Equalization in board foot quantities. The exact mix and long term fate of the wood products produced from the sawlogs and other wood products sold from the timber harvest plan can only be estimated from state-level and national-level data.

For the proposed 2011 timber harvest plan at Blodgett Forest Research Station, the estimated harvest of 5 million board feet of sawlogs from a mixed conifer forest will provide 85,696 metric tonnes of carbon dioxide equivalent of carbon sequestration. This includes the carbon that will be regrown on the site after the required regeneration as well as the benefits accruing from the harvested wood products. If the timber harvest plan had NOT been undertaken, the forest would have continued to grow, but at a rate that will decrease over time. There would also have been increasing annual deposition of dead wood that would slowly emit carbon dioxide from microbial respiration. In addition, there would be none of the direct and indirect benefits from using wood products and therefore using less non-wood products such as coal and natural gas for energy and cement and steel for construction. Therefore the net benefit of the 5mmbf harvest project is 36,341 metric tonnes of carbon dioxide equivalent of carbon sequestration. The level of climate benefits could have been higher if it was possible to transport some of the logging residues to an energy plant that could sell Renewable Portfolio Standard (RPS) electricity.

Introduction

With the codification of AB 1504 into Public Resources Code sections 4512, 4512.5, 4513, and 4551, the Board of Forestry requires timber harvest plans to address carbon sequestration as per the scoping plan of the California Air Resources Board (ARB). The scoping plan considers the carbon sequestration/emissions from all sectors of the California economy as well as the carbon sequestration/emission impacts of imported goods and services. As noted in PRC section 4512, the forestry sector is the only sector that is a net carbon sequesterer or sink. It also produces renewable energy and building products with very favorable climate benefits, so it is important to use a full carbon sequestration analysis and so avert even greater emissions from capped sectors. The global nature of carbon dioxide emissions and

carbon sequestration makes this CEQA analysis different than state mandated protection for local resources such as "soil, air, fish, wildlife, and water resources" in that simply shifting pressure to another state or nation must be accounted for. Figures 1 and 2 illustrate the linkages that are the backdrop for any individual project. Within the consumer sector the carbon sequestration impacts of a timber harvest plan need to take into account the role of the wood products as well as bioenergy that displace the need for emission intensive alternatives.

Figure 1: Interactions between the three sectors related to forests and forest products

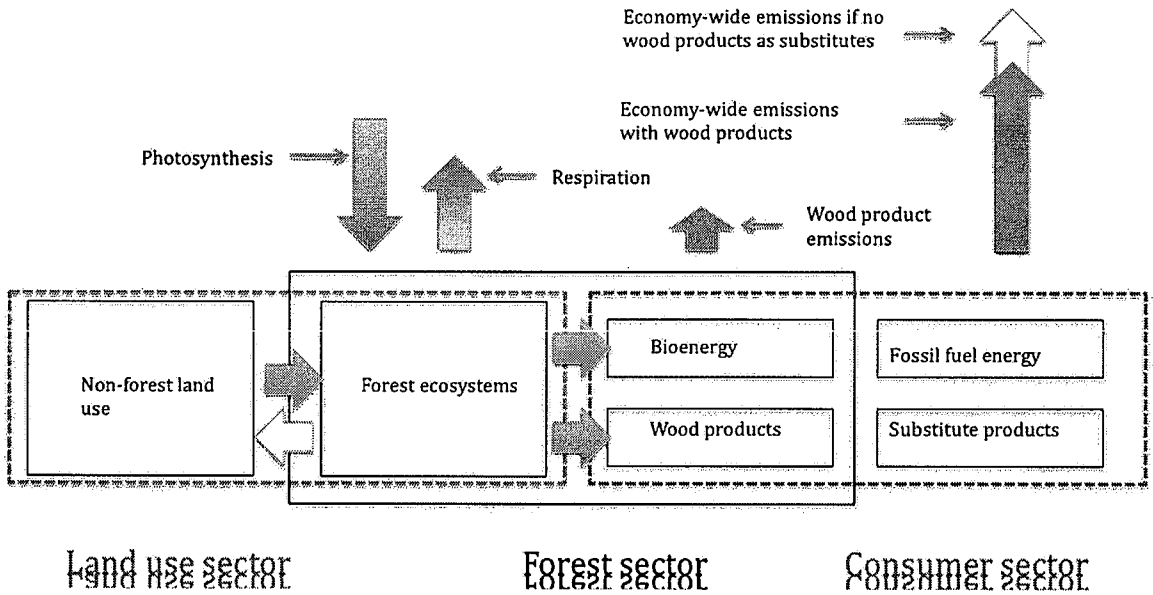


Figure 2: Requirements for a truly unbiased comparison of with and without harvest across both forest and forest product carbon benefit accounting

Forest ecosystem (harvest/regenerate) + bioenergy + wood products	vs.	Forest ecosystem (no harvest) - additional fossil fuel energy - additional substitute products

Adding the 'fossil fuel energy' and 'substitute products' values to both sides of the comparison is an identical formulation and the one that is used in the following analysis.

Figure 3: Requirements for a truly unbiased comparison of with and without harvest across both forest and forest product carbon benefit accounting

Forest ecosystem (harvest/regenerate) + bioenergy + wood products + avoided fossil fuel energy + product substitution benefits	vs.	Forest ecosystem (no harvest)

Carbon sequestration and emissions related to forest management: Forest floor, soil carbon, live tree, dead tree, and other plant-based carbon

Considerable research in managed temperate forests has documented that for soils and the forest floor, the annual flux of carbon releases is relatively constant and not very closely related to forest management focused on sawlog harvests (Kurz 2002, Nave 2010). Considerable CO_2 releases occur from litter, snags and branches left in the forest whether harvested or not. Canadian research and models (Kurz 2002) and a meta analysis of post harvest carbon fluxes (Nave 2010) document relatively small declines in forest floor carbon and relatively stable carbon stored in humus and mineral soil after harvests. The following figure of three types of harvests provides examples of the linkages between harvests and in-forest soil carbon and other organic matter for different silviculture methods used in Eastern Canada.

Figure 4: Paired merchantable wood volume and forest carbon models from Eastern Canada

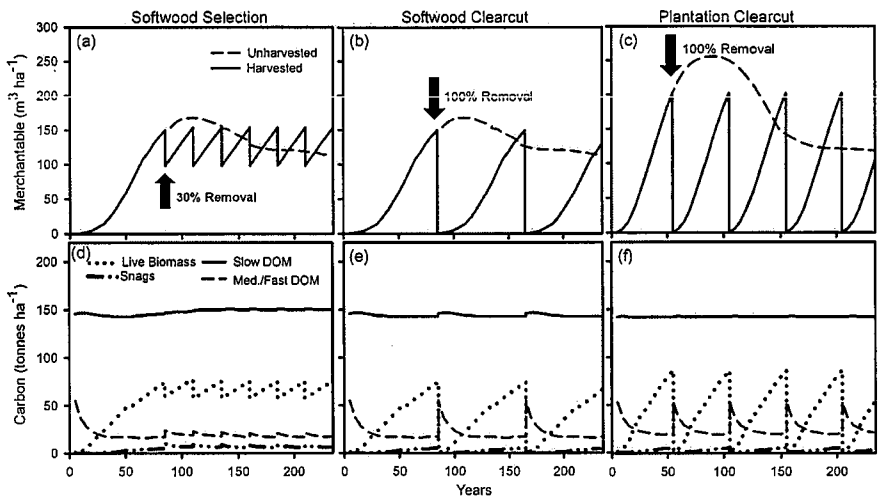


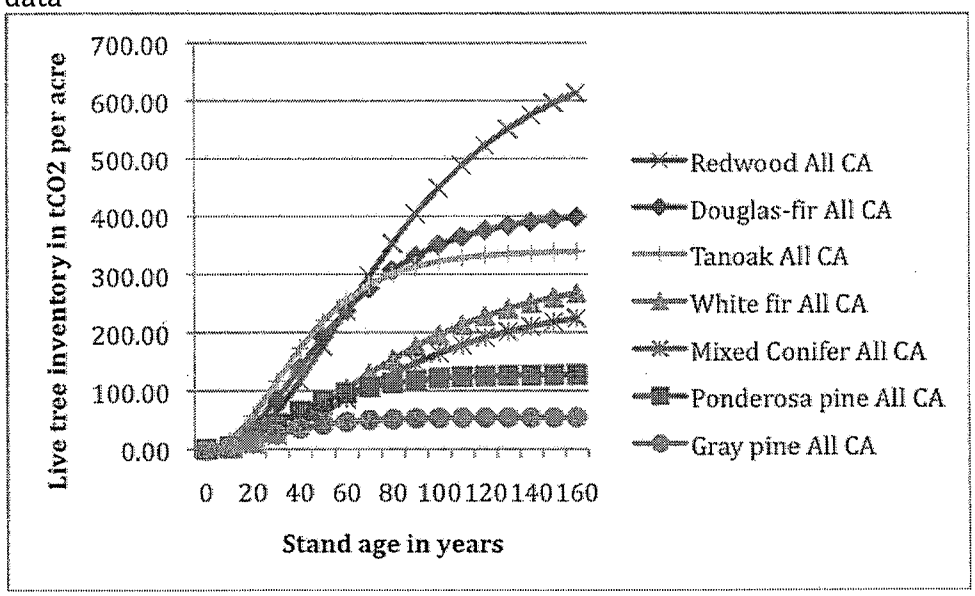
Fig. 3. Stand yields of total merchantable volume (a–c; projected with STAMAN) and carbon stored (d–f; projected with CBM-CFS3) in live biomass, snags (stem and branches), and dead organic matter (DOM) slow (humus and soil C) and medium to fast (litter, roots, etc.) pools for three example stand type and treatment combinations. Dashed lines (a–c) represent volume growth with no harvesting.

Source: Hennigar 2008

The more important component in forest carbon sequestration related to forests is the growth and management of live trees and mortality that occurs within the forest. For regulatory and statewide accounting purposes, a transparent modeling approach using publicly available forest inventory data and based on a logistic growth curve can provide insights that can be applied across a wide range of projects (as opposed to ownership specific data and modeling procedures). Modeling the carbon profile of natural stands of mixed conifers under a mix of harvest regimes spanning the ranging from selection to small clearcuts is a daunting prospect. For California timberland owners, one of the best sources of publicly available data on live tree biomass growth after a harvest is the Carbon On Line Estimator (COLE) that fits FIA data to logistic growth curves (NCASI 2010,

http://www.ncasi2.org/GCOLE/gcole.shtml) The advantage of using these data sets rather than making ownership-specific assumptions on future growth rates is that they are publicly available, constantly improving, and the basis for the U.S. greenhouse gas inventory reporting to the International Program on Climate Change (IPCC) that are provide by the U.S. government (US EPA 2010). Figure 4 compares the logistic growth curves for the major forest types in California based on FIA plot data. Higher quality sites will be higher than the median line for a forest type and lower quality sites will be below the median line but the rate of change (especially for extending the rotation on mature trees and stands) will be driven by the 'b' coefficient within the Von Bertalanffy growth equation; $y = a*(1 - e^{(-b*AGE)})^3$. A high 'b' coefficient results in growth rates that peak much earlier than forest types with a low 'b' coefficient. Comparisons of in-forest carbon stocks for a harvest and regenerate scenario with a longer rotation scenario will be similar for forest types with the same 'b' coefficient.

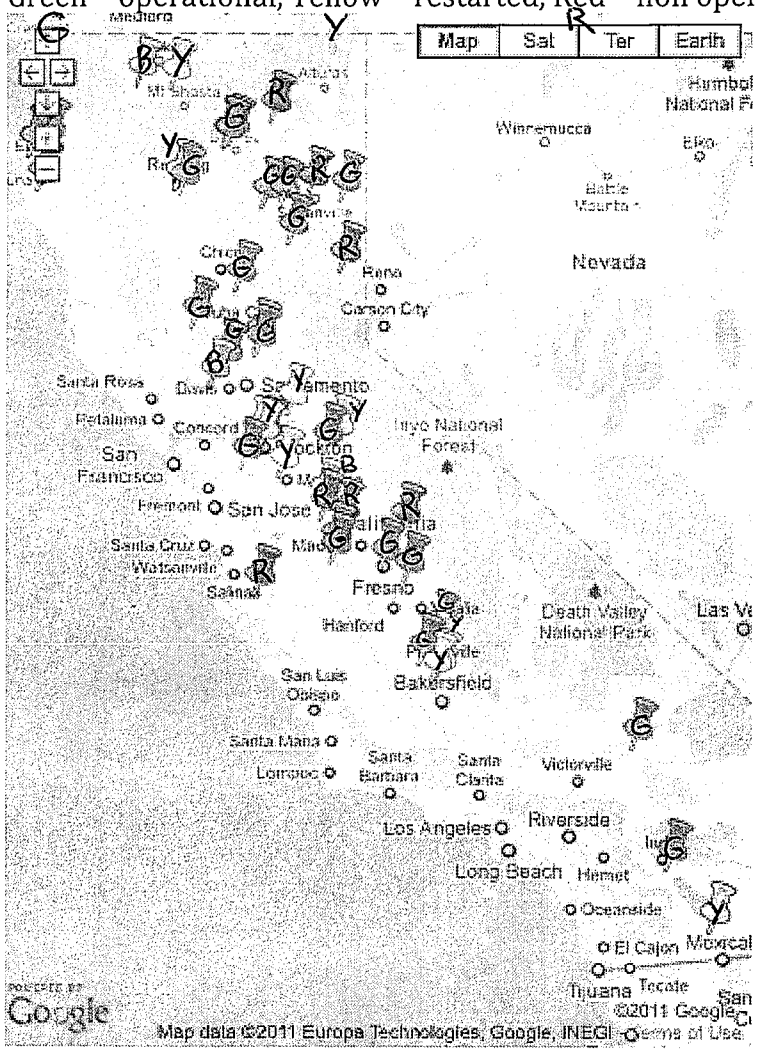
Figure 5: Logistic growth curves for reforested stands in California based on FIA plot data



Utilization of logging residues for energy

For timber harvests within a reasonable haul distance from operating biomass energy plants (shown on FRAP map below), an additional benefit can be obtained from collecting a portion of the logging debris and using it to generate renewable energy. While this is currently not economically feasible for locations in central El Dorado County, achievement of the higher goals for renewable portfolio energy in the AB 32 Scoping Plan may promote the construction of new biomass based energy plants. Sawmill residues that can not be used for higher value products are already used to provide renewable energy. When wood products are eventually discarded, they are also often collected and used for renewable energy.

Figure 6: 2010 Location of woody biomass energy plants in California in May 2011. Green – operational, Yellow – restarted, Red – non operational, Blue - gasification



Source: http://ucanr.org/sites/WoodyBiomass/

Tracking forest carbon once removed from the forest harvest site

The following two figures illustrate the significant difference in estimating the carbon stored directly or indirectly (by displacing fossil fuel based energy) in 100 tons of wood delivered when different assumptions are used. Based on recent mill surveys, Smith (2009) documents only a 1.5 % loss inside of sawmills while the older, historical efficiencies in the 2006 GTR NE 343/DOE 1605b publications assumes as 15.6 % loss rate. Nearly all of California's mill output is lumber and structural panels which have a relatively long half life compared to other wood products such as cardboard or paper. Based on the 80+ year half life for lumber used in buildings and a 50 year half life for lumber used for other purposes (Skog 2008), a 60 year half life is used to estimate wood in use. GTR NE 343/DOE 1605b (Smith 2006) tables correspond to a 25-year half-life. Estimates of post-use based on historic use patterns in GTR NE 343/DOE 1605b assume 34% waste factor while

current and probable future recycling and waste policies in California suggest using estimates of a much more efficient system with less waste. The comparison of product flows based on current data and efficiencies rather than historic data is relevant in that the historic data in GTR NE 343/DOE 1605b is still used as a basis for estimating tradable offsets in the third party Climate Action Reserve (CAR) protocols. Assumptions of inefficient use of products in the sawmills and the consumer sector leads to over-estimates in the climate advantages of not harvesting trees for wood products.

Table 1: Summary of average carbon storage from an initial 100 unit input over 100 years for WOODCARB II (used in Smith 2009 and Skog 2008) and FORCARB I (used in Smith 2006 and DOE 1605b)

Average stored carbon after 100 years, for an initial 100 units	WOODCARB II Smith 2006, Skog 2008	FORCARB I Smith 2006, DOE 1605b
Wood products	49	24
Bioenergy and landfills	47	47
Total	96	71

The impacts of the different measurement approaches are accentuated when methodologies only track carbon in wood products and assume that carbon in bioenergy or landfills will be tracked elsewhere. Unfortunately, the benefits of wood products in use are often ignored. When applied to an individual activity such as a timber harvest plan, it is crucial that a full assessment is utilized to correctly account for impacts and emissions to the atmosphere.

Figure 7: Carbon benefits of delivered sawlogs – current utilization and waste standards

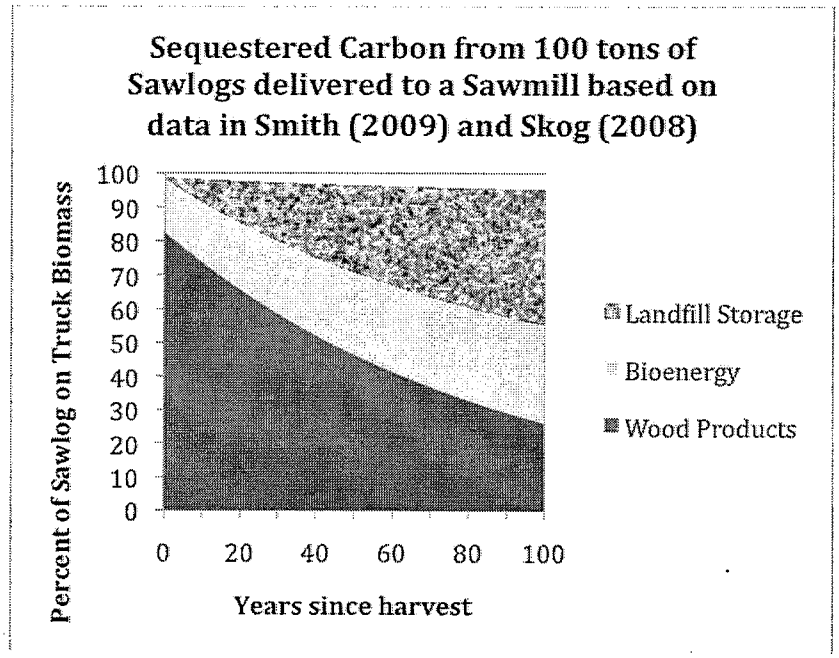
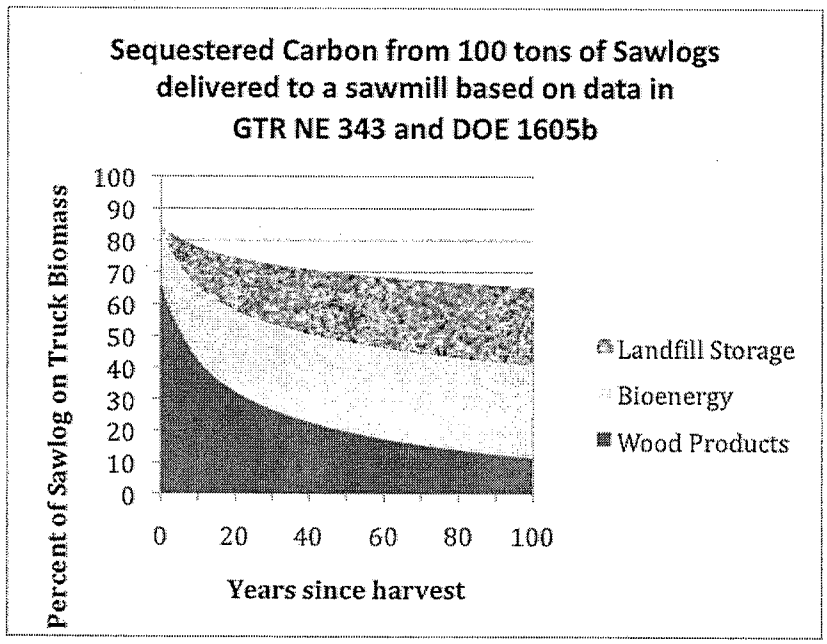


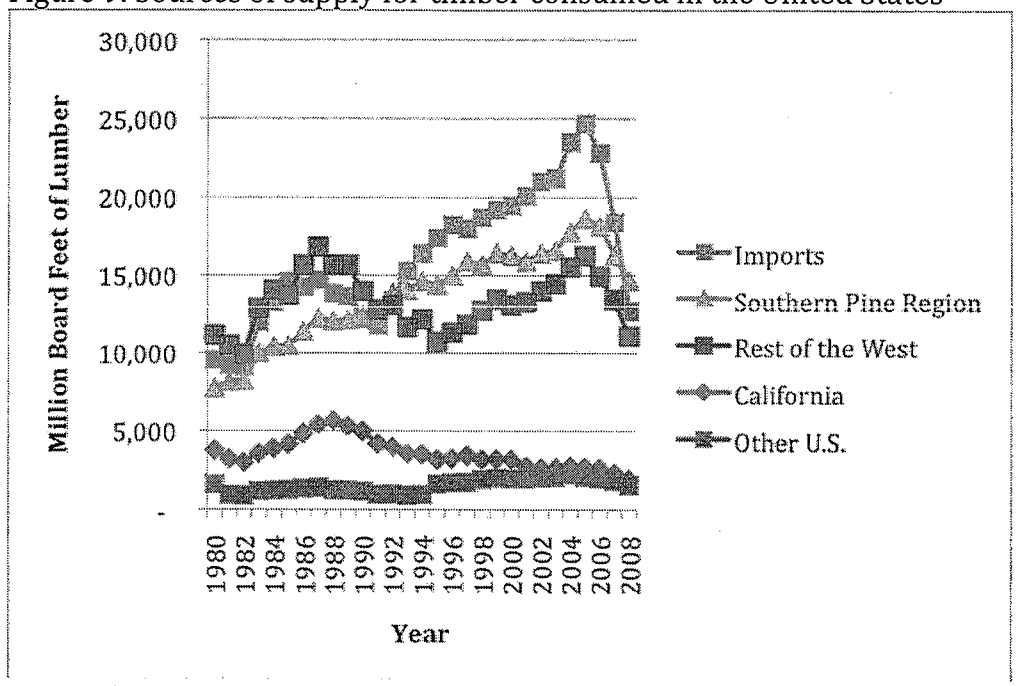
Figure 8: Carbon benefits of delivered sawlogs – historic utilization and waste standards



Market Leakage

Another key issue is that any locally measurable decline in carbon sequestration due to timber harvest in California reduces the need for California consumers to meet their demand for wood products with imports. Since in-state timber harvests in California peaked in 1988, California consumers have become increasingly dependent on wood products from Canada and the Pacific Northwest (Figure 9). While this pattern has had significant positive local impacts in terms of attributes such as the volume of wood sequestered in medium and large trees, it has had zero impact in terms of global forest carbon sequestration or carbon release rates.

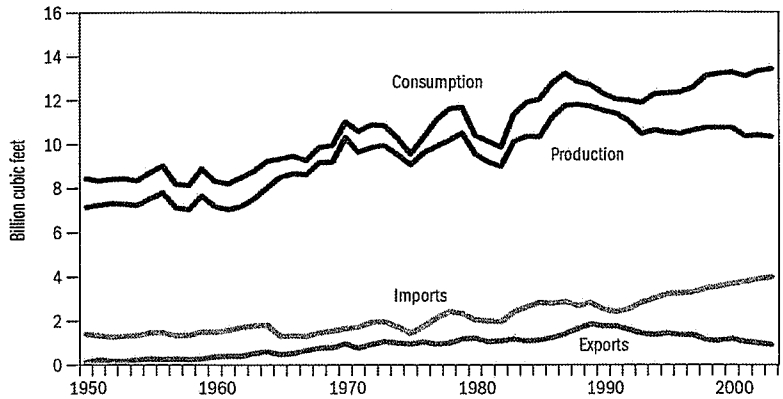
Figure 9: Sources of supply for timber consumed in the United States



Source: Western Wood Products Association (various years)

The pattern of reduced domestic production (lumber and paper products) while consumption has increased is well documented at the national level as shown in Figure 9. Since the mid 1980s, U. S. production has been flat while consumption has increased by around 20%. This gap implies a very high market leakage rate at the national level that has also been econometrically measured by Murray and Wear (2004).

Figure 10: U. S. wood products consumption and production data illustrates market leakage rates near 100 percent



Source: Smith (2009)

When estimating the carbon sequestration impacts of an individual timber harvest plan, it is important to realize that the high rate of market leakage creates a situation where California consumers will drive harvests somewhere else in North America. From a global climate impacts perspective, California consumers will drive forest harvests somewhere – so a local 'no harvest' alternative will always be matched with an additional 'harvest' alternative somewhere else to meet our demand.

Product Substitution Effects

Product substitution effects depend on the mix of wood products (Petersen and Solberg 2003, Lippke and Edmonds 2005, Gerilla 2007; Upton 2008). Wood products that replace emission intensive products such as cement and steel and reduce heating and cooling needs over time can generate very large levels of benefits that have been estimated at two to three times the initial carbon in the wood products. Wood products that replace emission intensive products but do not alter heating and cooling needs over time provide relatively fewer benefits. Based on their reviews of previous studies, both Hennigar (2008) and Ryan (2010) use a 1:1 ratio of additional energy carbon savings for wood products in addition to the carbon initially stored in the products.

Side by side measurement method comparisons

Because the production of bioenergy from logging residues and the type of wood products are made from the harvested sawlogs is out of the control of the forest owner and the timber owner, we use national or regional utilization values as published in the latest US Forest Service publications (e.g. Forest Resources of the United States, GTR-WO-78, Smith 2009) and other refereed publications authored by US Forest Service researchers (e.g. Skog 2008). As illustrated later, these more recent publications have validated national figures on harvested volumes, sawmill

utilization rates, product life span estimates, post consumer waste stream estimates, and landfill carbon storage and emission rates that are more accurate than the historic estimates published in "Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States" GTR-NE-343, Smith 2006). The differences between the current and historic estimates of efficiency are very significant. In all cases, the historic estimates are no longer used for official U.S. publications such as the Greenhouse Gas Inventory produced by the US EPA (EPA 2010) because they falsely portray a resource wasteful system from beginning to end.

Table 2: New and old frameworks for assessing full cycle carbon sequestration effects of a timber harvest

Smith (2009) and Skog (2008)	GTR NE 343 and DOE 1605b
Harvested volumes for sawlog operations	**Harvested volumes for sawlog operations**
79% on trucks, 21% left as logging residues Smith (2009) Table 40	Smith (2006) table C12 suggests 70% on trucks, 30% left as logging residues in Douglas-fir stands
Optional collection of logging residues BCAP II support has increased collection of logging residues near existing plants	**Optional collection of logging residues** Addressed separately in the IPCC 'Energy Sector'
Sawmill conversion of logs into products Smith (2009) (Table 42 and Ch 6)	**Sawmill conversion of logs into products** Smith (2006) (Table 6)
.823 to wood products (.490 to building lumber, .333 to other products)	.675 to wood products (Smith 2006, table 6)
.162 to energy	.170 to energy
.015 to waste	.156 to waste
Life time in use (Skog 2008)	**Life time in use** (Smith 2006) table
Estimated 60 year half life for all wood products	Estimated 25 year half life for all wood products
80 year half life for building lumber	
30-50 year half life for other products	
2.5 year half life for paper products	
Post use (California Biomass Collaborative 2008) estimate of current practices and assumed implementation of AB 32 Scoping Plan's renewable energy and recycling components	**Post use** (Smith 2006, table 6)
20% to energy	22% to energy
60% to landfills	43% to landfills
15% to waste	34% to waste
Landfill emissions	**Landfill emissions**
77% of wood is permanently stored	77% of wood is permanently stored
44% of paper is permanently stored	44% of paper is permanently stored
Product Substitution Benefits Wood Products in Buildings. Other Wood Products. Paper products – No substitution benefits. Overall median estimate of substitution benefits – 1:1 ratio to initial carbon in wood products (Upton 2008, Hennigar 2008 and Ryan 2010)	**Product Substitution Benefits** Ignored

Applying a full cycle approach to carbon sequestration to a timber harvest plan in mixed conifer forests in El Dorado County
("GHG Calculator for THPs – Blodgett variant III " has been emailed to the Review Team Chair by K. Somers the plan preparer)

The method described above for tracking the carbon sequestration benefits of a harvest/regenerating project in California is converted into the spreadsheet named "GHG Calculator for THPs – Blodgett variant". The basic unit of analysis is 100 green tons of sawlogs loaded onto a log truck. All the calculations are based on ratios of this basic unit. Measurements such as 'board feet' or 'cubic feet' are not used because they refer to the final commercial volume of rectangular wood products even when they are applied to standing trees in the forest. The following section describes the worksheets within the package.

Themes and worksheet in "GHG Calculator for THPs – Blodgett variant II"
100 Green ton harvest – provides input for removals in green tons and CO2 conversions
Products in Use – estimates of wood products in use based on Skog (2008)
GTR NE 343 – historic estimates of wood products in use based on Smith (2006)
Comp new v old – compares new v historic estimates of wood products in use
Regenerating forest COLE – provides logistic growth estimates and formulas of live tree carbon for major forest types on private land in California.
80 + 80 yr C seques. – provides 160 years of estimated forest and forest product biomass direct and indirect carbon sequestration benefits
Snags and logs – examples of decay functions for conifer and deciduous down wood

The most 'carbon-efficient' system would involve a timber harvest plan in 1) an area of California where it is economical to collect and haul logging residues to a biomass energy plant, and 2) where all the products go into high value products used in buildings. If 75% of the logging residues could be collected and transported to a wood fired biomass energy plant (a common occurrence on private forest land within 25 miles of the biomass plants identified on the FRAP map), then the only significant initial loss of stored carbon would be the live tree biomass that has been transferred to the dead wood component on in-forest biomass C stores. Unfortunately the limited coverage of biomass energy plants in the Central Sierra Nevada means that this climate benefit will not be achieved during this THP. If the AB 32 scoping plan promotes more producers of renewable energy over the next decade, more effective utilization of the logging residues and some biomass from natural mortality may become a reality.

As noted in the meta-analysis by Nave (2010) and modeled within the CBM-CF3 model (Kurz 2002), the humus and mineral soil carbon storage is invariant to harvests within historically managed forests. At harvest, two streams of carbon are created. The regenerating forest begins with seedlings that are projected to grow following a logistic growth curve. The harvested biomass requires fossil fuel energy

to get to the sawmill where some of it is used to generate energy in the sawmill. The rest of the biomass is converted into a variety of solid wood and reconstituted wood products. As the products reach the end of their useful lifespan and are finally thrown out by consumers, much of this waste stream will be collected and utilized in the extensive network of urban-based biomass-to-energy plants in California. In addition to the carbon stored in products or used for renewable energy, there are also substantial substitution benefits when wood products are used in buildings rather than emission intensive alternatives such as cement, steel, and aluminum in buildings. The carbon savings come both in terms of the initial emissions needed to make cement and steel as well as the energy savings when wood with superior insulating characteristics is used in buildings with large heating and cooling loads. While some wood used in building products have been estimated to generate substitution benefits that are two to three times as great as the initial carbon in the products (Lippke and Edmonds 2005, Gerilla 2007, Petersen and Solberg 2005), a value of one unit of substitution benefits compared to one unit of initial carbon in the product is commonly used (Hennigar 2008, Upton 2008, Ryan 2010). Discounts can be applied to this estimate to assess the life cycle impact of more wood products going into uses other than buildings. Figure 10 and table 3 summarizes the life cycle assessment of direct and indirect sequestration for a timber harvest/regeneration project in a mixed conifer forest. The 'without' project shows a forest stand where annual net growth is slowing down after age 60. The 'with' project shows all the potential benefits from the combined harvested/regenerating project.

The mixed conifer forest data used in Figure 10 is only one of the potential growth rates. As shown in table 3, redwood forests continue to grow rapidly after 80 years while Ponderosa pine stands plateau sooner than the other forests. The key issue is that when the efficient use of harvested products is considered, all the forests show an increase in carbon benefits at harvest and can sustain that advantage as long as the regenerated forest has a growth rate at least equal to the historic growth rate. Forest managers who utilize improved seed sources and silviculture treatments can improve these benefits even more.

Table 3 summarizes the ratio of harvested/regenerating forest to an unharvested forest for three forest types (redwood, mixed conifer, Ponderosa pine) with unique logistic coefficients and three different levels of utilization. The rows in table 3 illustrate that it is possible to generate lower carbon benefit ratios by assuming limited or no substitution benefits. While researchers have pointed out that ignoring substitution benefits would skew the economy wide impacts (Lippke 2008, Taylor 2010), substitution benefits are buried within larger reporting sectors (e.g. building supplies, building energy use) and are often ignored. However, the consideration of substitution benefits will bring the benefit accounting more in line with well-established life cycle methodologies, and will promote more effective carbon sequestration in forest management.

Figure 11: Comparison of total carbon sequestration for harvest/regenerating forest versus an unharvested mature California mixed conifer forest over 160 years

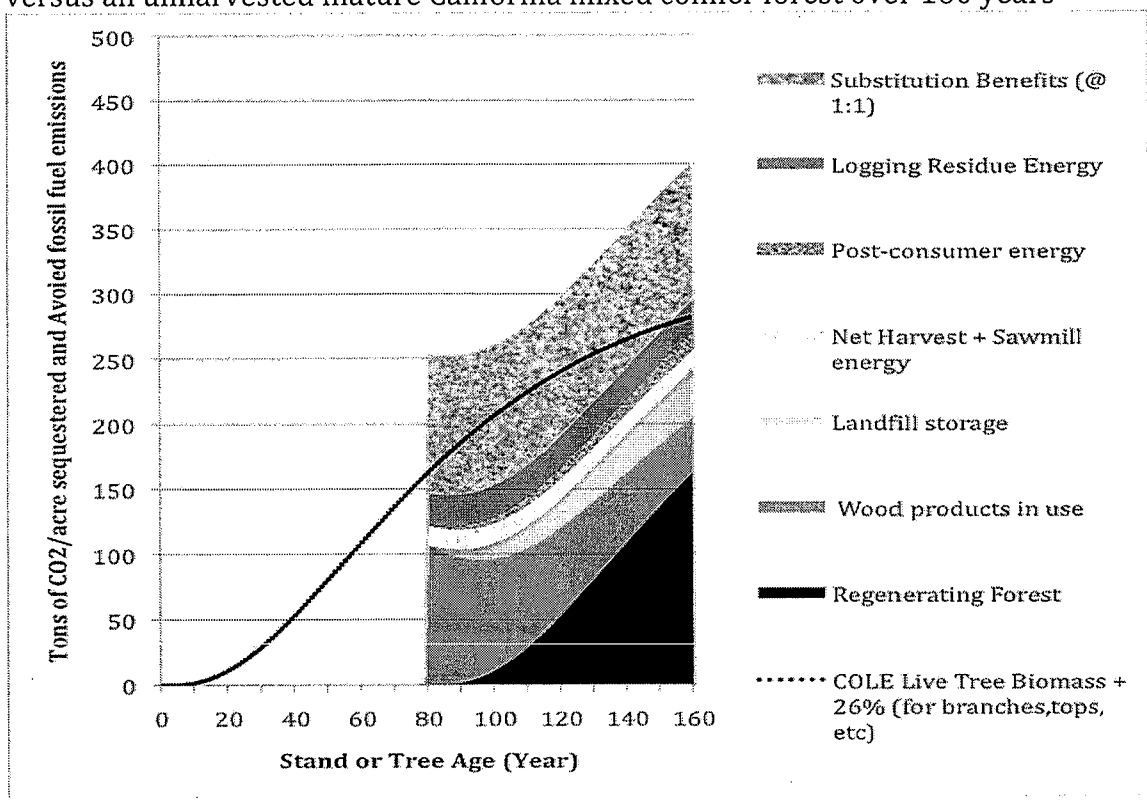


Table 3: Ratio of Harvested/Unharvested carbon sequestration benefits for Year 80-160 period – excluding the CO2 emissions related to microbial respiration of dead wood

Forest Type	Redwood, Mixed Conifer, White fir	Douglas-fir	Ponderosa Pine
Von Bertalanffy growth equation 'b' coefficient	0.02	0.03	0.04
Forest, Product and Landfill Carbon	0.66	0.85	0.99
Bioenergy	0.20	0.24	0.27
Product Substitution Benefits	0.46	0.55	0.60
All Benefit Ratio	1.32	1.64	1.87

When ratios are less than 1.0, the harvested stand scenario sequesters less C than unharvested scenario over the 80-160 year period. When ratios are greater than 1.0, the harvested stand scenario sequesters more C than unharvested scenario Note that inclusion of different levels of utilization and substitution changes the benefit ratio.

What analysis of tractable forest carbon and tractable substitution benefits does not show is the change in the amount of in-forest CO2 emissions related to the microbial respiration related to dead wood decomposition in the forest. While large down

wood has many significant wildlife habitat benefits for many species, there is only limited data that has been collected and analyzed on the rate of down wood production of trees or stands of different ages as well, the decay rate of the wood, and how much of the carbon stays in the soil and how much is released through microbial respiration (Woodall and Westfall, 2009). For this analysis, we assume that the stand from 80-160 years will have a dead wood production/live inventory ratio that is 50% higher than the stands or trees of age 0-80 years. Furthermore, we assume that the downed wood will be transformed via microbial respiration at the rate estimated by Harmon (2001a, 2001b) of 3.2 % loss per year for conifers. At this rate, all the dead wood is counted as an emission of CO2 over the lifetime of the project.

Conclusion

A full assessment of the carbon sequestration impacts of a timber harvest in California requires assessment techniques appropriate for a global circulation system of both greenhouse gases such as carbon dioxide and a global trading network for wood products, energy products, and a wide array of building products. For a timber harvest followed by the regeneration required by state law, analyzing a full rotation is one way to provide an unbiased assessment. Validated estimates of the product flow from the sawlog to the landfill are available from the more recent USFS publications and are a significant improvement over older estimates based on historical utilization standards and mill efficiencies.

For a timber harvest utilizing a variety of silvicultural practices in mixed conifer forests in El Dorado County, the most transparent way to model the growth of the regenerating forest is a logistic growth function based on FIA data (NCASI 2010). Since there is no market for logging residues in El Dorado County, only about half of the potential bioenergy is utilized. We estimate that every equivalent CO_2 ton of biomass that is removed at harvest generates 1.7 units of CO_2 benefits. The scale of the benefits can be scaled up in proportion to the size of the overall project using the conversion of 100 green tons of sawlogs is equal to 82.5 tons of carbon dioxide. Since these benefits are allocated across the regenerating forest, the carbon stored in products and landfills, and the substitution benefits for fossil fuels and fossil fuel intensive products, a comprehensive and unbiased assessment approach looks at global, rather than just local, benefits.

The use of logistic growth curves fitted to local data for relevant forest types illustrates the key variables that are important for estimating the global climate benefits of different forest management strategies. Comparative in-forest carbon is a function of the relative difference in growth rate in young and mature aged stands for all forest types. The utilization of wood residues for bioenergy will be driven by energy policies that favor low net carbon emission energy sources over high carbon emission energy sources. The longevity of storage in products and landfills will be driven by energy and waste disposal policies that should improve the net sequestration of wood products over time. The substitution benefits of wood over

products such as cement and steel will increase in proportion to the effective cost placed on net carbon emissions.

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129.3

Values needed to estimate carbon sequestration impacts of a THP and a 'no action alternative'	
CHOOSE FOREST TYPE BY FOLLOWING INSTRUCTIONS ON 'Regenerating forest (COLE)' sheet	Mixed Conifer All CA
Insert Project Harvest Volume in MMBF	5
Calculated MMBF to Metric Tonne of CO2 conversion ratio	5882
Insert estimate of logging residue that could be collected for energy (0-90%) (impact of project with and without logging residue use is calculated so this percentage is used to the estimate climate impacts if logging residues are collected)	75%
Insert estimate half life of lumber in use in years	60
Post Consumer Use of Lumber	Must sum to 100%
To energy facilities in urban areas	25%
To engineered landfills where ~77% is stable	60%
To uncollected waste (assume this will decrease over time based on consumer focused regulations)	15%

	No Action Alternative, No harvest plus imported products	Smith (2009), WOODCARBII Skog (2008) Project Alternative 21st Century estimates without local energy plant, Harvest, Rengeration, Wood Products and Wood Energy	Smith (2009), WOODCARBII Skog (2008) Project Alternative 21st Century estimates with local energy plant, Harvest, Rengeration, Wood Products and Wood Energy	Smith (2006), FORCARBI, DOE 1605b Alternative B, 20th Century estimates with inefficient sawmills, no RPS energy, and inefficient post-consumer residue collection
Estimated Final Timber Volume in MMBF	0	5	5	5
Estimated Sawlog Volume on Trucks that include non-commercial volume (MMBF*1.49)	0	7.45	7.45	7.45
Estimated Removed Biomass (including logging residue that may or may not be removed) in MMBF equiv.	0	9.4	9.4	9.4
Estimated Removed Biomass in Metric Tonnes of CO2 equivalent (1 metric tonne = 1.1 US ton)	0	43,821	43,821	43,821
Average On-Site Live Tree Carbon Inventory over next 80 years	79,653	21,420	21,420	21,420
Estimated Dead Tree Carbon Emssions from Microbial Respiration over next 80 years	*-30,298*	*-11,471*	*-2,867*	*-11,471*
Harvesting/Regeneration Emissions (3.7% of energy in removed biomass) - highest estimate in Malkki and Virtanen (2003)		*-1,621*	*-1,621*	*-1,621*
RPS (wood) energy for non-RPS energy				
Logging residues (if local plant)		0	8,602	0
Sawmill residues for energy		6,902	6,902	7,450
Post-consumer residues for energy		4,452	4,452	4,615
Wood Products in Use		21,525	21,525	10,517
Substitution Benefits of Wood Materials over lifetime		36,262	36,262	29,579
Wood residues in engineered landfills		8,227	8,227	8,375
TOTAL climate benefits from forest and forest products in metric tonnes of CO2	49,355	85,696	102,902	88,863
TOTAL ignoring all RPS energy (to be used if RPS energy is included as a carbon sequestration benefit in state or national accounting. Not appropriate for a project level analysis.		74,343	82,946	56,799
Net Positive Sequestration or Lost Sequestration compared to no harvest alternative in tCO2e		36,341	53,547	7,443
Ratio of Managed Forest/Unmanaged Forest in terms of Carbon Sequestration including RPS Energy		1.7	2.1	1.4
Ratio of Managed Forest/Unmanaged Forest in terms of Carbon Sequestration IGNORING RPS Energy		1.5	1.7	1.2

Harvest impacts on soil carbon
Robert A. York, RPF 2699
Adjunct Assistant Professor of Forestry

Potential impacts in temperate forests
While impacts of harvesting on above-ground carbon storage and sequestration rates are relatively well-understood, the impacts of harvesting on below-ground carbon are in comparison not well understood. Uncertainties are especially high with respect to long-term (i.e. more than several decades) recovery rates following harvest-related depletions and with respect to the interactions between soil carbon, climate change, and fire effects. Despite these long-term uncertainties, numerous studies on harvest impacts on short-term soil carbon storage exist. Enough information exists to identify the potential impacts of harvesting on soils, and to prescribe mitigation practices where necessary. Nave et al. (2009) have provided the most thorough analysis yet, conducting a meta-analysis of 432 studies of harvest impacts on temperate forests. For this discussion of the impacts of harvesting at Blodgett Forest on soil carbon, we rely on published summaries such as the one provided by Nave et al. to identify potential impacts in the context of other forest types. We also rely on several studies and monitoring efforts that have been done at Blodgett over the past decade by soil scientists and forest ecologists.

Soils can be either a sink or source of carbon, depending on numerous factors such as vegetation type, physical/chemical composition of soil, and disturbance (Lal 2005). Globally, temperate forests lose on average 8% of total soil carbon when the harvesting of biomass occurs (Nave et al. 2009). Losses primarily occur from labile forest floor pools (litter and duff), while no detectable losses tend to occur in mineral soil pools. Although the mechanisms are not well understood, forest floors are more sensitive (in terms of soil C storage) to physical disturbance than are deeper soil horizons.

Potential impacts at Blodgett Forest
Blodgett Forest's soils are generally Ultic Haploxeralfs (Norton and Firestone 1991). In Nave et al.'s meta-analysis, Ultisols were slightly more susceptible to harvest-related carbon loss from shallow mineral soils compared to other soil types. Because of generally-observed short term losses from forest floor impacts and because of the enhanced sensitivity of Ultisol soils, we consider impacts of harvests on soils at Blodgett carefully. While the potential for short-term soil carbon loss exists, there are several reasons why negative impacts from this proposed harvest activities are not expected:

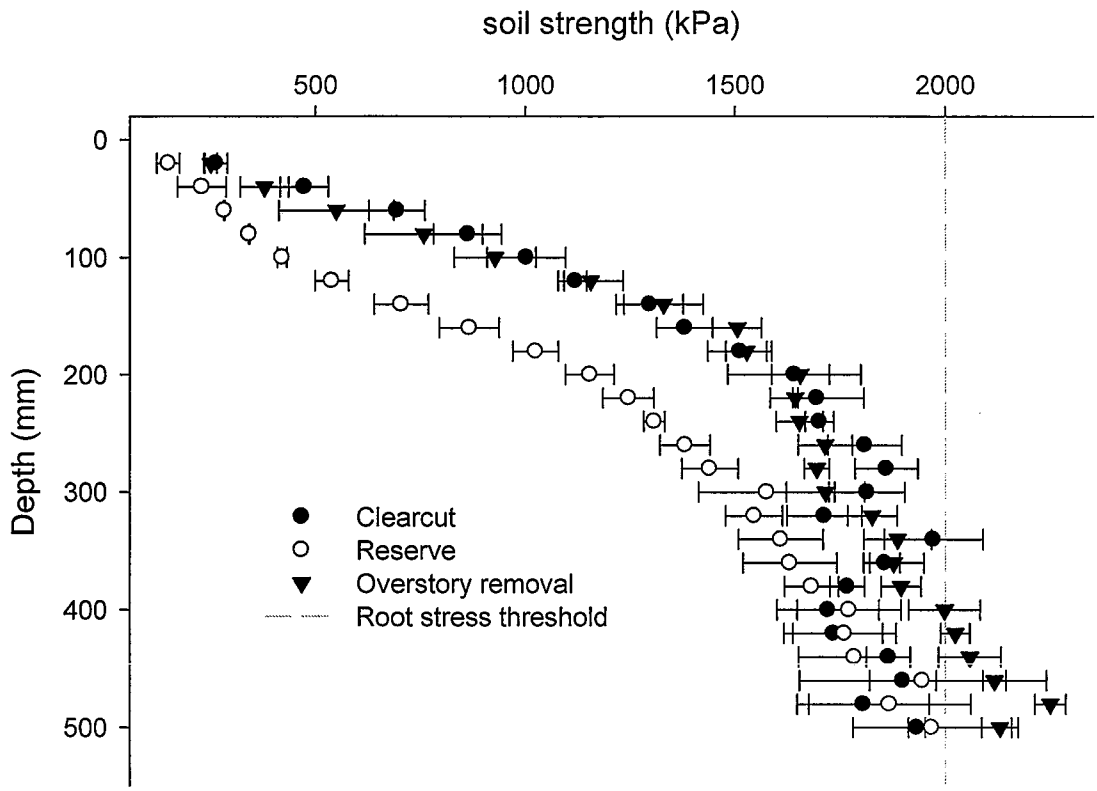
1. **Vegetation type.** Conifer forests retain more carbon in soils during harvesting activity compared to hardwood forests. The higher sensitivity of Ultisol soils is a general observation in both conifer and hardwood forests. When isolated, conifer forests with Ultisols may not have detectable losses from mineral horizons (although this has not been studied). The fact that Blodgett Forest has coniferous cover and that conifer seedlings are planted following creation of canopy openings lowers the sensitivity of Blodgett compared to other Ultisol soils that have hardwood forest cover.

2. **Reductions are transient.** Carbon in forest floors and upper horizons recover more quickly than deep soil horizons following disturbance (Nave et al. 2009). The recovery process is enhanced following planting and intermediate treatments that promote rapid establishment of conifer-dominated forests (Lal 2005, Nave et al. 2009). While precise recovery times are not well understood, in general they are expected to occur prior to when site prepared areas at Blodgett (group selections) will be regenerated. Spodosols are predicted to recover forest floor carbon in 50-70 years following clearcutting (Covington 1981). Ultisols are expected to recover more quickly (Nave et al. 2009).

3. **Site preparation activities are limited spatially and qualitatively.** The majority of areas being proposed for harvest will not have site preparation activity done. Where it is proposed (group selection openings), duff and litter is retained to the extent possible given the type of equipment used. From experience, we expect approximately 50% cover of duff and litter following site preparation.

4. **Measurements of harvest impacts on soil carbon at Blodgett have not detected carbon losses from soils.** Moghaddas and Stephens (2007) found no effect of harvesting treatments on soil carbon (both mineral soil and forest floor carbon). Soil carbon in harvested stands were no different than in control stands. From this empirical evidence alone, we expect no detectable losses of soil carbon from the Blodgett proposed harvests, the majority of which are thinning and selection treatments.

5. **Soil compaction effects are limited.** Soil strength monitoring at Blodgett has detected higher soil strength (a measure of compaction) at the stand level in clearcut and overstory removal stands compared to controls (Figure below). Severe compaction levels (indicated by a 2000 kPa threshold on the graph), however, are surpassed at similar depths for harvested and control stands. Further, compaction effects at the installment of the Long Term Soil Productivity study at Blodgett indicate positive effects of compaction treatments on above-ground biomass production (Powers et al. 2005). Therefore, indications are that the long-term capacity for soil carbon storage in harvested stands at Blodgett will be sustained with high certainty on decadal timescales and with lower certainty on longer timescales.



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Herbicide Use
Herbicides have been used within the plan area in the past. The applications were to previous group selections openings and clearcuts. These were directed foliar hand applications. Herbicides used were glyphosate and or triclopyr.

Herbicides will likely be used within the current plan area and in the future. The applications will likely be in group selections openings and clear cuts. These will likely be directed foliar or hack and squirt hand applications. Herbicides to be used may include glyphosate, imazapyr and triclopyr.

Target species may include grasses, forbs, woody brush and hardwoods.

Potential impacts include: increase in plant species diversity; increase in tree establishment success and increased tree growth; increase likelihood of achieving maximum sustained yield; temporary reduction in fire hazard and available browse.

Pesticide use will comply with the California Department of Pesticide Regulations. The services of a Licensed Pest Control Advisor (PCA) will be required for any pesticide application. The PCA's written recommendations are site and time specific and will be strictly followed. This will ensure the safe and effective use of herbicides and compliance with the California Environmental Quality Act.

(Additional information for glyphosate, imazapyr and triclopyr is located on pages 133.1 to 133.6)

Additional Past Present Future Projects Discussion and Summary of Cumulative Impacts

Blodgett Forest projects and the vast majority of surrounding activities and projects are related to forest management. The extensive list of past present and future projects, both public and private, are found near the beginning of this section - see table Past and Future Activities in planning W/S along with adjacent landowner activities. All resource areas fall into the three planning watersheds with the exception of the Sequestration of Carbon Dioxide Emissions, Visual, Biological and Vehicular Traffic Impact locations. Further past, present and future project assessment can be found, although not labeled as such, within each assessment area such as: Soil Productivity – 4. Growing Space Loss; Biological Resources - C.(1). and (2.); Recreational Resources - D.(1.); and Vehicular Traffic Impacts – F.(4.); PRC 4512(c), 4512.5, 4513(b) and 4551(b) Sequestration of Carbon Dioxide Emissions

Blodgett Forest does not know of any current impacts in any of the above assessment areas outside the boundaries of the research station that could reasonably be expected to combine with the activities on the station to accumulate to cause a significant impact as a result of the proposed operations.

The two largest impacts within all of the assessment areas listed above are likely the town of Quintette and the Georgetown Divide Public Utilities District Water supply conduit. Both of these have been in the greater assessment areas for well over 100 years. Over that time, the permanent population of Quintette shrunk significantly since the turn of the 20th century before stabilizing at its current level. This trend may reverse if the current infrastructure is improved to the point where tele-commuting becomes possible. The GDPUD conduit has been improved considerably since the early 20th century although breaks still occur from time to time which can produce surges of sediment into Pilot Creek.

Extension Service
Department of Agricultural Chemistry
Environmental Toxicology & Chemistry Program
Oregon State University

National Institute of Environmental Health Services
Environmental Health Sciences Center
Community Outreach Program
Oregon State University

Glyphosate

Pesticide Fact Sheet: Forestry Use

Product Information

- Glyphosate is the common name for the active ingredient in many products including Accord **Concentrate**, Accord SP and **Roundup Pro.** These are post-emergence herbicides commonly used in forestry and right-of-way vegetation management. **Roundup Pro and Accord SP are** designed for use strictly on terrestrial applications. **Accord Concentrate** can be used on plants in and around water.

- These products are formulated as salts and sold in liquid form. **Accord SP and Roundup Pro** include a surfactant designed to increase the uptake of glyphosate by plants; **Accord Concentrate** does not contain this surfactant.

- Forestry users typically apply glyphosate by air or ground at .5 to 3 pounds active ingredient per acre. It is a non-selective herbicide that can be applied during the growing season after weeds and woody plants start growing. Glyphosate can be used as a cut stump or injection application containing 50 to 100% active ingredient.

- For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted glyphosate formulations containing surfactant are Toxicity Category II or III, those without surfactant are Toxicity Category IV.

Public Health

- Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

- Based on laboratory studies, glyphosate is classified as practically non-toxic to mammals.

- The primary breakdown product of glyphosate is aminomethylphosphonic acid (AMPA). AMPA is also practically non-toxic to mammals.

- Laboratory tests on rats show that more than 90% of an administered dose is eliminated from the body within 72 hours.

- There is no evidence that glyphosate or AMPA cause birth defects, nerve damage, cancer, or DNA damage.

- The EPA has classified glyphosate as a Class E carcinogen (no evidence of carcinogenicity for humans).

Wildlife Effects

- Based on laboratory and field studies, **Roundup** and **Accord** are classified as practically non-toxic to birds and honeybees.

- While glyphosate ranges from slightly to practically non-toxic to fish, surfactants used in **Roundup Pro** may be toxic to fish and aquatic macroinvertebrates. As a result, **Roundup Pro** is not approved for use in or near water. **Accord Concentrate** is approved for use in and around water because it is formulated without surfactants. However, certain uses may specify the addition of surfactants.

- Glyphosate is not expected to bioaccumulate in wildlife.

Environmental Fate

- Glyphosate is stable in water and stable to breakdown by sunlight. It is degraded by aquatic microorganisms and has a half-life of 14 to 21 days in pond water. It will accumulate in sediments where it is bound.

- The half-life of glyphosate in soil ranges from 2 to 174 days with a typical half-life of 47 days. AMPA has a typical half-life of 118 days (71 to 165 days) in soil. For right-of-way vegetation management, glyphosate is usually applied at higher rates and is

The information in this Fact Sheet does not in any way replace or supersede the information on the pesticide product labelling or other regulatory requirements. Please refer to the pesticide product labelling. Trade name products are mentioned for identification only. This does not mean that OSU Extension Service or the Environmental Health Sciences Center endorse them or intends any discrimination against other products not mentioned.

expected to be much more persistent.

- Despite being highly water soluble, glyphosate and its primary metabolite, AMPA, adsorb readily to organic materials in soils. Therefore, they are unlikely to move through soils and contaminate ground or surface water.

Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of glyphosate and has set a Reference Dose (RfD) for glyphosate of 2.0 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 140 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. The RfD for glyphosate is based on the results of the most sensitive animal studies (rabbit) and includes built-in safety measures.

- EPA has determined that the expected exposure associated with glyphosate in forestry use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

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Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
  1-541-737-5993 Extension Specialist

- Oregon Poison Control
  1-800-222-1222 (National)
  1-503-494-8968 (Portland)
  1-800-452-7165 (Outside Portland)

- Oregon Department of Agriculture
  1-503-986-4550
  1-503-986-4635 (Pesticide Division)

- Oregon Health Division Pesticide Analytical Response Center
  1-503-731-4025 (8 a.m.-5 p.m., M-F)

Washington

- Poison Control Center
  1-800-222-1222 (National)
  1-206-526-2121 (Seattle)
  1-800-732-6985 (Outside Seattle)

- Washington Dept. of Agriculture, Pesticide Management Division
  1-877-301-4555 (toll free)
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- Washington State University Food and Environmental Quality Laboratory
  100 Sprout Road
  Richland, WA 99352-1643
  1-509-372-7462 (phone)
  1-509-372-7460 (fax)

- Washington Department of Health
  1-800-525-0127
  1-360-236-3360 (Pesticide Division)
  1-888-586-9427 (toll free)

Nationwide

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  1-800-858-PEST (7378)
  http://npic.orst.edu/

- Extension Toxicology Network (EXTOXNET)
  http://ace.orst.edu/info/extoxnet/

- DuPont Agricultural Products
  P.O. Box 80038 Wilmington, DE 19880-0038
  1-800-441-7515
  1-800-441-3637 (emergency phone)
  1-302-992-2276 (fax)

Compiled by D. Buchwalter, J. Jenkins, N. Kerkvliet, P. Thompson 12/96
Updated by W. Trevathan 11/02

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Extension Service
Department of Agricultural Chemistry
Environmental Toxicology & Chemistry Program
Oregon State University

National Institute of Environmental Health Services
Environmental Health Sciences Center
Community Outreach Program
Oregon State University

Triclopyr

Pesticide Fact Sheet: Forestry Use

Product Information

- Triclopyr is the active ingredient in several forestry products. Products include **Garlon (3A and 4)**, **Pathfinder II**.

- Triclopyr is a systemic herbicide used for woody plant control in forestry and right-of-way vegetation management.

- Triclopyr-based product formulations may be produced as either amine salts or oil-soluble esters. Formulation differences have important effects on toxicity, environmental activity, and mobility. Some formulations may include an oil-based carrier solvent.

- Typical application rates range from 0.3 to 2.0 pounds of active ingredient per acre. Applications may be made by air, ground spray, basal spray, injection, or applications to cut surfaces.

- For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted triclopyr products are Toxicity Category I (for eye injury), II, or III depending on the formulation.

Public Health

- Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

- Based on laboratory studies, triclopyr is classified as slightly toxic to mammals on a short-term (acute) basis.

- Mammals absorb small amounts of triclopyr and then rapidly eliminate it through the kidneys.

- Triclopyr does not cause birth defects or nerve damage.

- Laboratory tests with pregnant rats showed mild toxicity to the fetus only at very high doses.

- The majority of tests show triclopyr did not cause genetic damage.

- The EPA has classified triclopyr as a Class D carcinogen (not classifiable as a human carcinogen). Available data suggests that triclopyr does not cause cancer.

Wildlife Effects

- Based on laboratory and field studies, triclopyr is classified as slightly to practically non-toxic to birds on a short-term (acute) basis. Investigations of triclopyr- treated areas show no direct toxic effects on birds.

- Triclopyr oil-soluble ester formulations are highly toxic to cold-water fish such as trout and salmon under laboratory test conditions. Amine formulations are practically non-toxic to fish.

- Triclopyr is not expected to accumulate in the fat of wildlife.

Environmental Fate

- In water, triclopyr degrades in sunlight. In one field study, triclopyr applied to lakes disappeared in 4 to 8 days.

- Triclopyr has a 2- to 3-month half-life in dry tree leaves.

- Triclopyr amine salt formulations are more water soluble than the oil-soluble ester formulations and have less of a tendency to bind to organic materials in soils. As a result, amine salts are more mobile in soils than the oil-soluble ester-formulated products.

- The half-life of triclopyr in soils appears to be unrelated to formulation type. It ranges from 79 to 361 days in colder climates. A typical soil half-life under mild conditions is 30 to 46 days. The end products of triclopyr breakdown are carbon dioxide, water, and naturally occurring organic acids.

- Based on their chemical and physical properties, salt formulations of triclopyr are classified as highly

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mobile and can travel with water through soil and enter groundwater. Triclopyr can also move with runoff and enter surface water. Right-of-way uses should be evaluated for potential ground and surface water contamination.

- Ester formulations of triclopyr have low mobility in soil. The risk of groundwater contamination from normal triclopyr ester use is relatively low.

Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of triclopyr. They have also evaluated the toxicity of triclopyr and set a Reference Dose (RfD) of 0.05 mg/kg/day. This RfD corresponds to an intake of 3.5 mg/day for a 154 lb. (70 kg) person. Such an intake reflects the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. The RfD for triclopyr is based on the results of the most sensitive animal studies (dog) and includes factors designed to provide large margins of safety.

- EPA has determined that the expected exposure associated with triclopyr in right-of-way uses will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly treated areas. If you are concerned about exposure, consult the resources listed in **Additional Information**.

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Updated by W. Trevathan 11/02

Additional Information: Oregon

- Oregon State University Extension Environmental Chemistry and Toxicology Program
  1-541-737-5993 Extension Specialist

- Oregon Poison Control
  1-800-222-1222 (National)
  1-503-494-8968 (Portland)
  1-800-452-7165 (Outside Portland)

- Oregon Department of Agriculture
  1-503-986-4550
  1-503-986-4635 (Pesticide Division)

- Oregon Health Division Pesticide Analytical Response Center
  1-503-731-4025 (8 a.m.-5 p.m., M-F)
  1-503-731-4030 (evenings, weekends)

Washington

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Agricultural Chemistry Research and Extension
Department of Environmental and Molecular Toxicology
Oregon State University

PART OF PLAN

National Institute of Environmental Health Services
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Imazapyr

Pesticide Fact Sheet: Forestry Use

Product Information

- Imazapyr is the common name for the active ingredient in the herbicide products **Arsenal** and **Chopper**.

- Imazapyr is a systemic plant growth inhibitor. This chemical is biologically active in plants at low concentrations. Imazapyr is rapidly taken up by the plant, where it inhibits an enzyme essential to plant growth. This enzyme is not present in other organisms.

- Arsenal is a formulated salt of imazapyr (53.1% active ingredient and 46.9% inert ingredients). It is used primarily to control woody plants in forestry. Chopper, also formulated as a salt (27.6% active ingredient, 72.4% inert ingredients), is another formulation of imazapyr.

- Arsenal and Chopper are typically applied at rates of 0.06 to 1.25 pounds of active ingredient per acre. The products can be applied to foliage, freshly cut stumps, injected into trees, or applied to cuts made around the base of a tree.

- Imazapyr may be applied all year, depending on the use. It is often applied aerially in the fall for site preparation and conifer release.

- For comparative purposes, the Environmental Protection Agency (EPA) categorizes pesticides by their short-term toxicity on a scale of I (most toxic) to IV (least toxic). Most undiluted imazapyr formulations are Toxicity Category IV.

Public Health

- Researchers use animal studies to define the potential for a pesticide to cause harmful effects to human health. It is important to know that these tests are carried out using doses high enough to cause toxicity (poisoning). Effects seen at toxic doses in animals are unlikely to occur after short-term, low-level exposure in humans. The level of exposure must be considered to estimate the risk of harmful effects.

- Based on laboratory studies, imazapyr is classified as practically non-toxic to mammals on a short term (acute) basis.

- Rats treated with an oral administration of imazapyr eliminated 87% of the material within 24 hours.

- There is no evidence that imazapyr causes cancer, DNA damage, nerve damage, or birth defects.

- The EPA has classified imazapyr as a Class E carcinogen (no evidence of carcinogenicity for humans).

Wildlife Effects

- Laboratory and field studies indicate that imazapyr is practically non-toxic to fish, birds, and bees on a short-term (acute) basis.

- Imazapyr is toxic to plants at very low concentrations. Applicators should take precautions to minimize drift to non-target areas.

- Imazapyr does not appear to bioaccumulate in animals.

Environmental Fate

- Imazapyr may be persistent in soils. Half-lives range from 14 days to 17 months.

- In forestry dissipation studies, reported values for the half-life of imazapyr range from 14 to 44 days in forest litter, 19 to 34 days in forest soils, and 12 to 40 days on plants.
- Imazapyr is water soluble and does not readily bind to organic

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material in soils. Therefore, it is classified as highly mobile and can travel through soil with water and enter groundwater. It can also move with runoff and enter surface water. Its low application rates minimize potential impacts on surface or groundwater. Forestry uses should be evaluated for potential surface and groundwater contamination.

Risk Assessment

- The EPA has evaluated use practices, environmental fate, potential exposure routes, and toxicity of imazapyr and has set a Reference Dose (RfD) for imazapyr of 2.50 mg/kg/day. A 70 kg (154 lb) person would have an RfD of 175 mg/day. The RfD is the amount of daily pesticide exposure judged to pose no appreciable risk over a 70-year lifetime. Imazapyr's RfD is based on the results of the most sensitive animal studies (dog) and includes built-in safety measures.
- EPA has determined that the expected exposure associated with imazapyr in forestry use will not result in adverse health effects. However, you should take reasonable precautions to avoid exposure. Do not walk through freshly-sprayed vegetation. Do not eat berries, mushrooms, or other edibles, or drink the water from newly-treated areas. If you are concerned about exposure, consult the resources listed in Additional Information.

References

- American Cyanamid Company. 1988. Imazapyr Environmental Fate and Physical Properties Data Summary. American Cyanamid Company. Princeton, NJ.
- Bureau of Land Management. 1991. Vegetation Treatment on BLM Lands in Thirteen Western States, Final Environmental Impact Statement With Appendices. U.S. Department of the Interior. Washington, D.C.
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- U.S. Environmental Protection Agency. 1995. Pesticide Environmental Fate One-Line Summary: Imazapyr. Environmental Fate and Effects Division. Washington, D.C.
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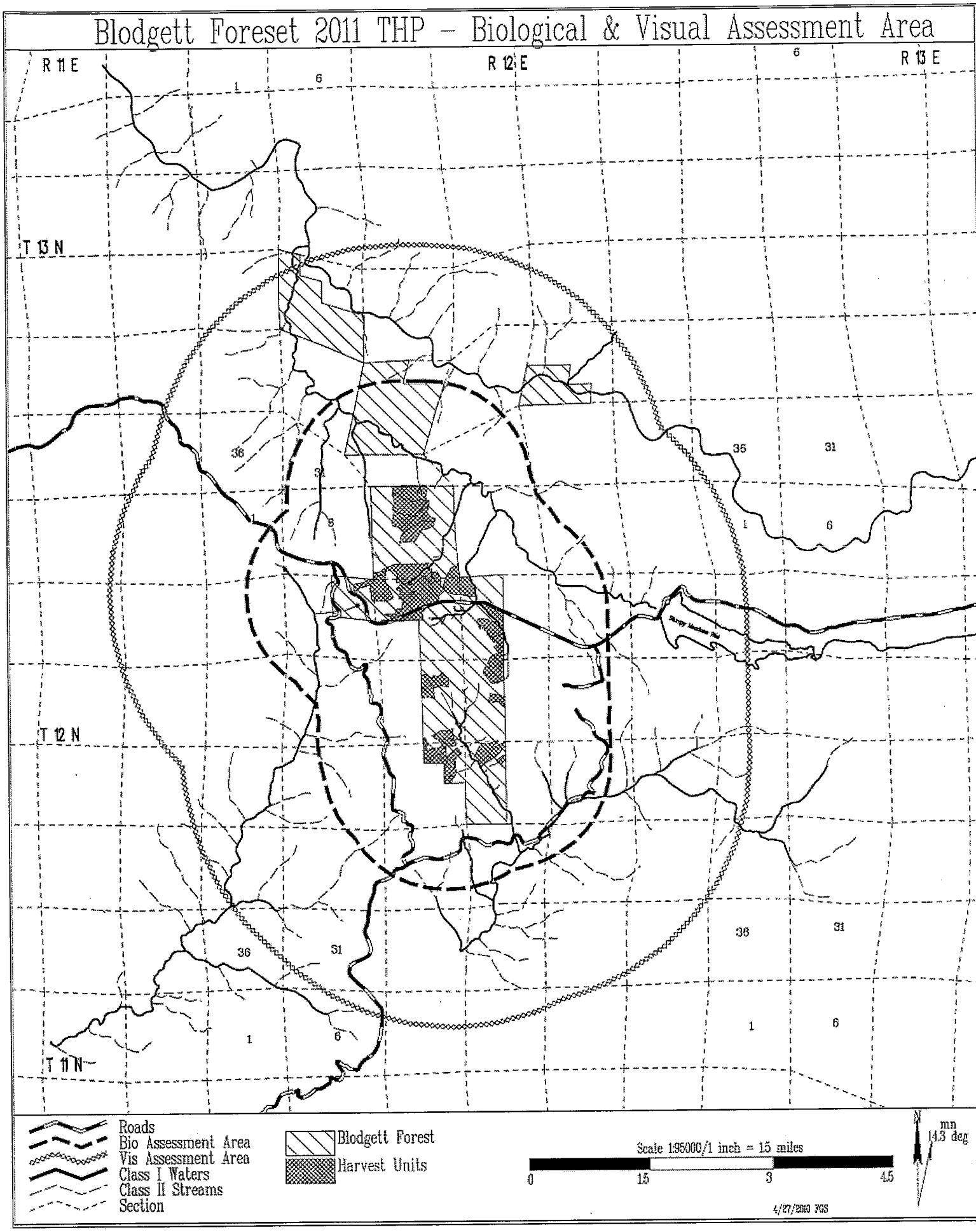
Blodgett Foreset 2011 THP - Biological & Visual Assessment Area
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R 12 E
R 13 E
T 13 N
T 12 N
T 11 N
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Bio Assessment Area
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Class I Waters
Class II Streams
Section
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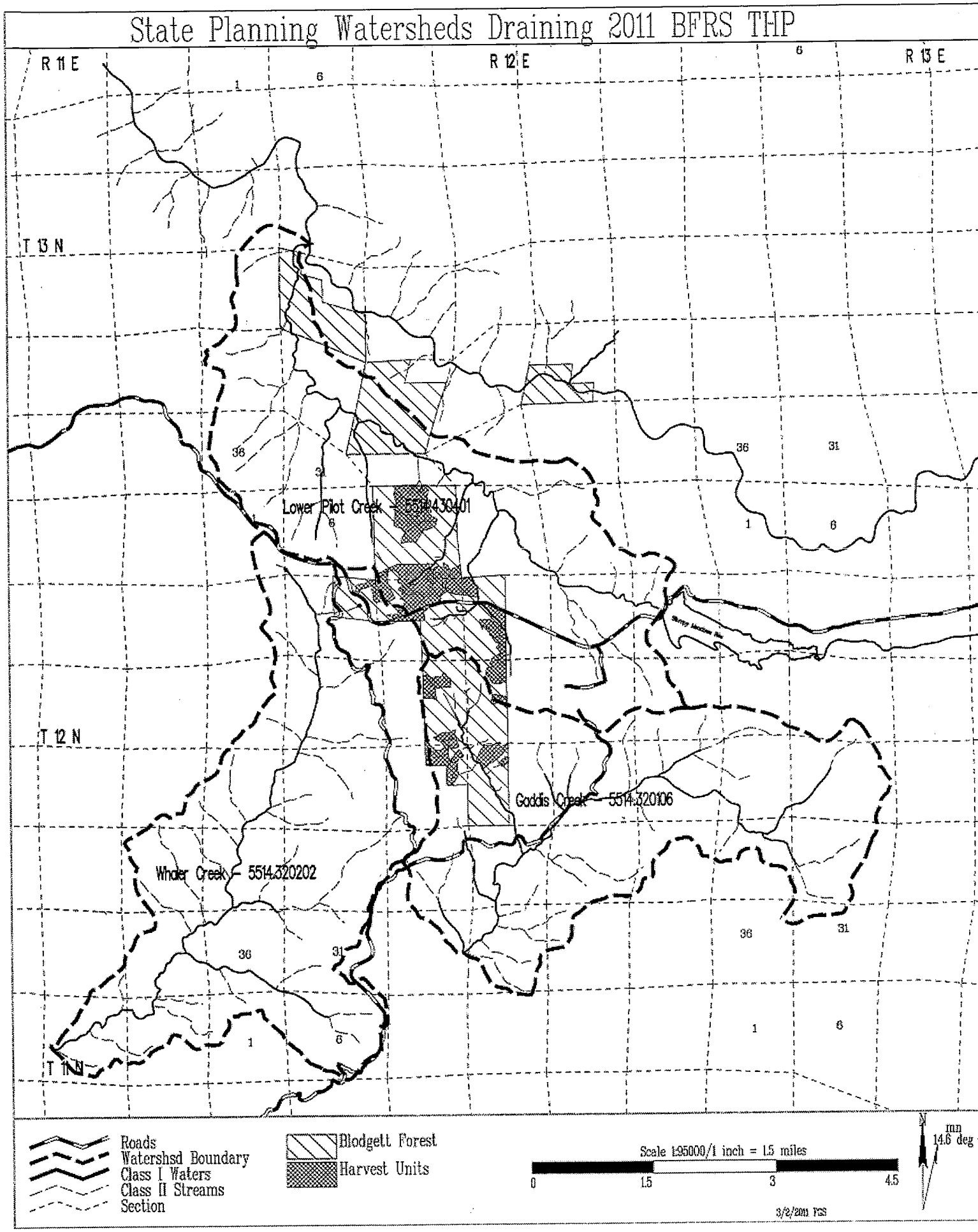
State Planning Watersheds Draining 2011 BFRS THP
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R 13 E
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Goddis Creek - 5514.320106
Whaler Creek - 5514.320202
Roads
Watershsd Boundary
Class I Waters
Class II Streams
Section
Blodgett Forest
Harvest Units
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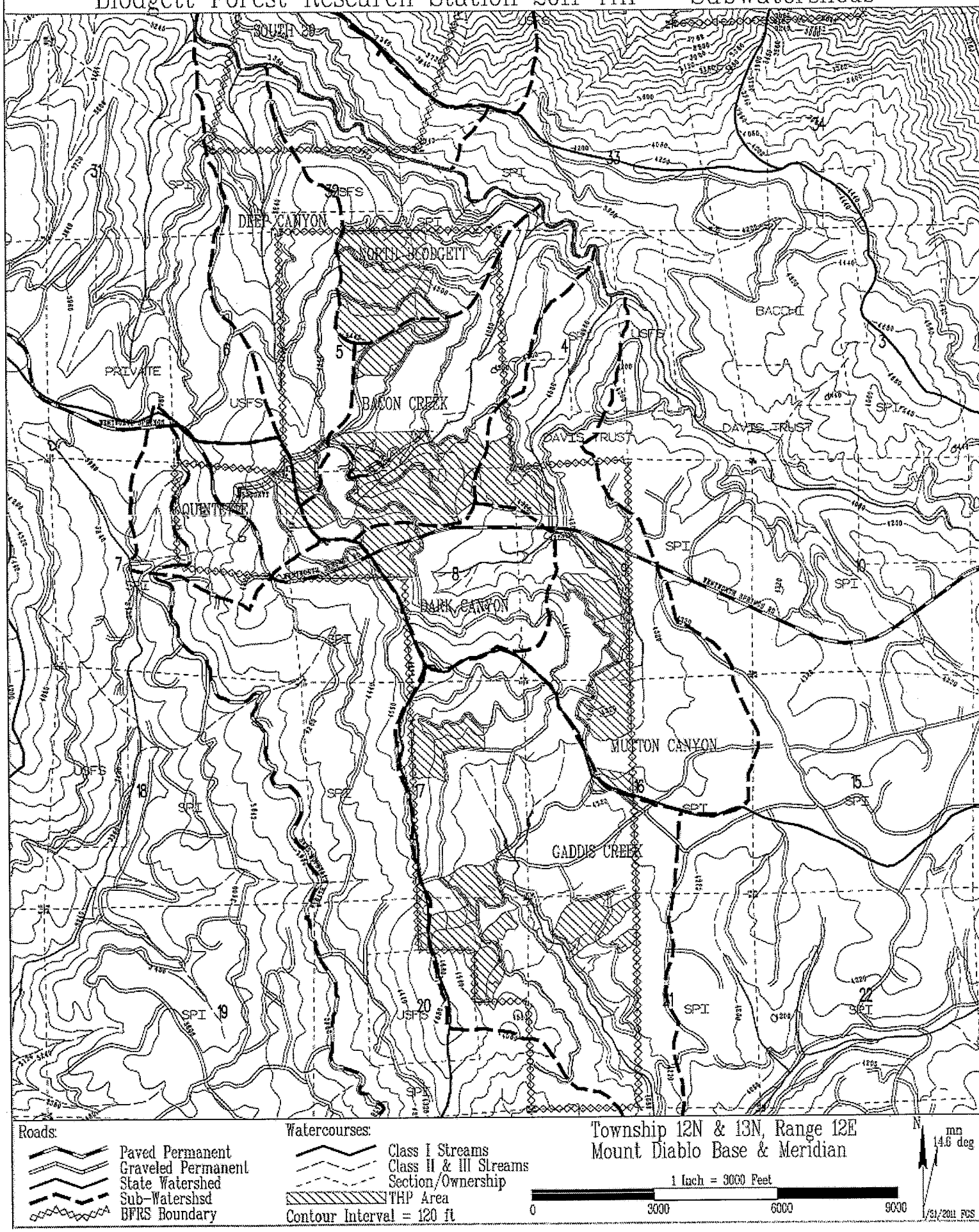
Blodgett Forest Research Station 2011 THP - Subwatersheds



2nd and 3rd order watershed analysis

The following section is a detailed analysis, completed in 1997 and updated in 2003, of the 2nd and 3rd order watersheds in which the 2011 Blodgett Forest THP occurs. All watersheds contain Equivalent Roaded Acre (ERA) analyses and written descriptions of their environments. All watersheds that include class I waters on Blodgett Forest Research Station also include more detailed analyses of in and near stream conditions.

Our analyses of the sub-watersheds that drain Blodgett are included as a surrogate for the impacts of our management activities on the larger state planning watersheds. Blodgett Forest Research Station is located at the headwaters of each of the sub-watersheds described below and therefore does not "inherit" any impacts from upstream activities. We believe that by not creating a significant negative impact at our position in the watersheds that our activities are unlikely to combine with other activities downstream to create a significant impact at the state planning watershed scale. We do not control the actions of the other owners within the watersheds and are not currently aware of any significant impacts elsewhere in these state planning watersheds except Stumpy Meadows Dam, the Georgetown Divide Public Utility District's water supply conduit and the town of Quintette (all in the Lower Pilot Creek watershed) described above. We are committed to managing Blodgett Forest in such a way as to not burden the downstream owners with significant adverse impacts that would limit their management options. Any information that we have that more appropriately applies to the larger assessment areas defined above has already been included in the previous pages. If a significant cumulative impact were to develop in another portion of the watershed then it is unlikely that activities at Blodgett Forest would add in any significant way to its severity.

Bacon Cr. 2nd Order Watershed of Lower Pilot Cr. State Planning Watershed

219 acres in the Bacon Creek sub-watershed are proposed for harvest in this THP. There are 22 acres of Group Selection, 44 acres of Selection, 135 acres of Commercial Thinning, and 18 acres of Shelterwood Removal Step proposed. No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Lower Pilot Creek state planning watershed of which this is a part.

Watershed Characteristics

Bacon Creek drains a 2nd order watershed of approximately 589 acres. It comprises 6% of the 9819 acre Lower Pilot Creek state planning watershed (#5514.430401).78% of the Bacon Creek watershed is managed by Blodgett Forest Research Station (BFRS) with the remaining 22% owned by Sierra Pacific Industries. Elevations over the watershed range from 4560' to 3720'. Slopes across the watershed average 20% ranging from 0 to 50% while those within the WLPZ average approximately 23 %.Soils across the watershed belong to the Holland, Bighill, and Musick series derived from granodiorite parent materials. All three soil types have a maximum erosion hazard classification of moderate (National Cooperative Soil Survey). Mass wasting events are small and exceedingly rare in this watershed. The majority of the watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. Under the BFRS land management allocation plan, 67.7 acres (11%) of the watershed are designated in ecological reserve status. 32.8 acres (5.6%) are located within WLPZs. These designated areas will receive little to no anthropogenic manipulation (except for wildfire suppression). Approximately 80.7 acres (14%) will not be harvested within the next decade because of gaps between cutting cycles. Therefore, at least 26% of the watershed (depending on adjacent landowner activity) will receive little to no manipulation within the next 10 years. BFRS will regenerate approximately 5.2% of the watershed area with clear-felling methods, while 33% will receive some form of partial cutting. Results from an equivalent roaded area analysis indicate that the summed % ERA for the watershed is 14.3% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.). It should be noted that the ERA values are based on speculation of land use activities of neighboring land owners (most heavy impact assumed). 3600 lineal feet of a road within this watershed was abandoned in 2002 by Blodgett Forest Research Station. This will likely decrease the ERA value in the future; after the roadbed is revegetated and the stream banks along pulled crossings stabilize (Klein, 2003).

The current vegetation condition of the area is in part a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi circa 1880, particularly along the drainages. The majority of the watershed was heavily logged between 1901-1912 by the Michigan California Lumber Company. In addition, the upper headwater reaches of the creek was the location of the Barklage sawmill circa 1906-1913. This sawmill used water from Bacon Creek for its milling purposes. The upper portion of the watershed was the location of Old Camp, a narrow gauge railroad logging camp built circa 1901. The Bacon Creek watershed also shows evidence of extensive waterworks and canal construction. The original Georgetown Divide ditch was built through the northern portion of the watershed circa 1852. Presently the Georgetown Divide Public Utility District diverts most flow from Bacon Creek, except during winter high flows, into a municipal water utility conduit. This conduit is a class IV watercourse as defined by the California Forest Practice Rules: 14 CCR 956.5. It should be noted that this diversion structure acts as an effective barrier to fish migrating upwards into the Bacon Creek watershed. The vegetation in the watershed can be classified into 3 states: 75 to 95 year old even aged mixed conifer stands (62%) regenerated from remnants of logging (WHR: SMC 4M/D); 2 to 25 year old even aged well stocked mixed species plantations (20%) with light to moderate shrub cover (SMC 2P-3D); and 75 to 95 year old uneven aged mixed conifer stands (WHR: SMC 4M/D) resulting from single tree selection harvesting (18%).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Bacon Creek watershed is 64 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was .8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. This storm event produced flows of approximately 15cfs.Average yearly precipitation produces flows on Bacon Creek that range between summer flows of 0.3 to 0.6 cfs to winter flows of 3 to 7 cfs on average. Data on air temperatures at the BFRS weather station in the period between 1963-2001 for the month of January show that the average daily minimum temperature is 33°F. The average daily maximum temperature for January is 45°F. The average minimum daily temperature for the month of July is 59°F while the average daily maximum is 82°F.

Channel Morphology

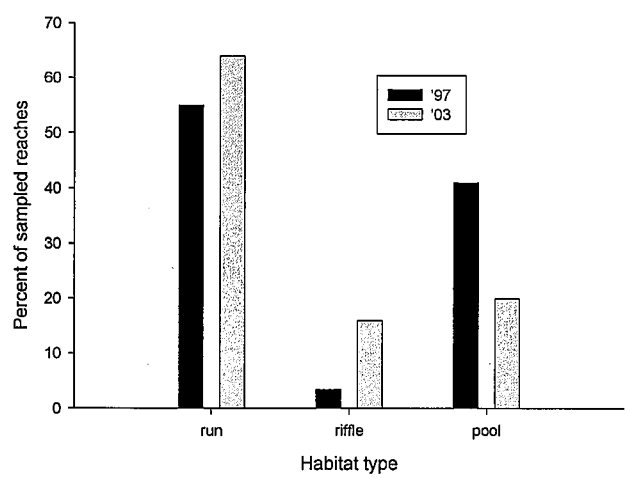
Bacon Creek does not conform to the archetypical stream morphology associated with Sierran streams. This generalized profile describes the headwater regions of streams as having steeper gradients and larger substrate types, transitioning into lesser gradient and smaller substrate types found in the depositional zones of valley bottoms. Bacon Creek originates on the Georgetown Divide, a large flat plateau located between the South Fork of the American River and the Rubicon River. This landform inverts the standard fluvial-geomorphologic profile of a stream as most of the streams originating from the Divide show a significant increase in both volume of flow and fluvial energy as they descend into higher order river canyons. Bacon Creek is a tributary of Pilot Creek. This pattern is important to recognize in that most of Bacon Creek falls within what can be classified as a deposition or transport zone.

Bacon Creek in entirety is 8646 feet long, 6061 feet of which are on Blodgett Forest property. The upper headwater reaches are located within a 20 acre administrative reserve and housing site. The stream in these uppermost reaches has multiple channels and is poorly defined with an extensive lateral floodplain. The channel quickly becomes incised in thick alluvial deposits and can be characterized by a low gradient and moderate entrenchment. The dominant substrate of these upper reaches is sand, generated from the predominant soil types (Holland/Bighill) found in the area. As the stream flows down through the watershed on Blodgett property, flow volume, entrenchment, and stream gradient increases. In addition, substrate complexity increases as the stream flows north through BFRS property. Organic debris plays a critical role in creating bank stability along all of the sampled reaches of Bacon Creek. Bacon Creek can be classified as a Rosgen G5 type stream.

Habitat Typing and Stream Characteristics

Data from 8 permanent stream inventory plots distributed along Bacon Creek were first collected in 1997, and then the plots were re-measured in 2003.Results from the 2003 inventory show that most of the sampled habitat is classified as run, followed by pool then riffle (Fig. 1). The relative distribution of habitat types among the classes changed slightly between 1997 and 2003, but the rankings are the same. The morphological characteristics of these habitat types (Table 1) vary along expected trends from pools to riffles to runs. Note the high amount of variability within each habitat type despite the low stream gradient across the sampled area. This is perhaps due to the highly-variable historic disturbances (allogenic processes) influencing the stream structure, overlaid with variability stemming from natural stream development with time (autogenic processes), and from the imprecision that invariably accompanies measuring subjective categorical variables.

Figure 1. Relative habitat type in 1997 and 2003

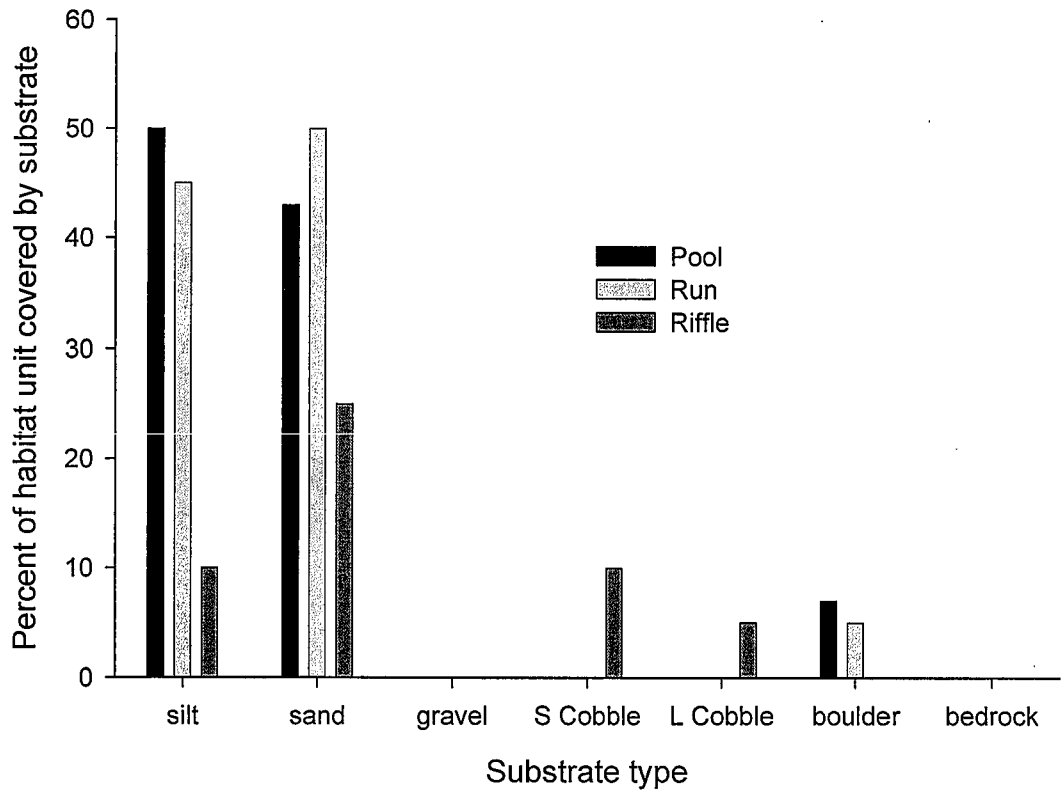


	length (ft)	width (ft)	mean depth (in)	max depth (in)
run	30.8 (17.8)	5.1 (3.5)	3.7 (1.4)	7.5 (3.3)
riffle	17.3 (19.1)	3.9 (3.2)	2.1 (0.4)	3.5 (0.8)
pool	13 (6.7)	5.9 (3.3)	7.7 (2.3)	14.7 (5.3)

Table 2. Morphological summaries of the sampled habitat types on Bacon Creek in 2003. Means are given with standard deviations in parentheses.

Channel substrate tends to vary according to habitat type along predictable patterns (Figs. 2-4). Slow moving pools and runs tend to have relatively more sand and silt, while higher-energy riffles have more cobble substrate. Note that these figures are averages from a sample of the dominant substrate of each habitat unit. Each habitat unit may have a variable mixture of all substrate types. Bacon Creek exhibits a heterogeneous array of substrate types which may indicate a diverse array of habitat types for aquatic flora and fauna.

Figure 2. Percent of pool, runs, and riffles by dominant substrate type.
S Cobble = small cobble; L Cobble = large cobble.



Vstar

An index of fine sediment loads in pools (residual pool volume) is used at BFRS to monitor sediment supply. Measurement of residual pool volume was done for the period 1994 to 1997 using the V* method developed by Hilton and Lisle (1993).

Currently, the average pool in Bacon Creek has 46% of its residual volume filled with fine sediment (stdev= 20.3%). As can be surmised from the standard deviation, this value is highly variable and may have no inherent value except that of a descriptive sense. Similarly, the high variance from year to year precludes any trend analysis from being conclusive. Repeated measures of the same pools over time might eventually result in patterns (or evidence of a lack of pattern). V* values per plot by meter location are summarized in figure 5. A trend worth noting is the correlation between plot location and residual sediment values. Plots located in the upper reaches of the watershed show significantly higher values of residual pool sediment as compared with those lower in the watershed. This may be evidence of an incising stream channel associated with higher flow volumes.

	2003	1997	1996	1995	1994
# pools	8	12	8	10	13
Average (%)	45.6	30.5	27.9	33.2	49
stdev	20.3	21.8	24.8	27.5	27.9

Table 2. Summary of Vstar data for the period, 1994-2003.

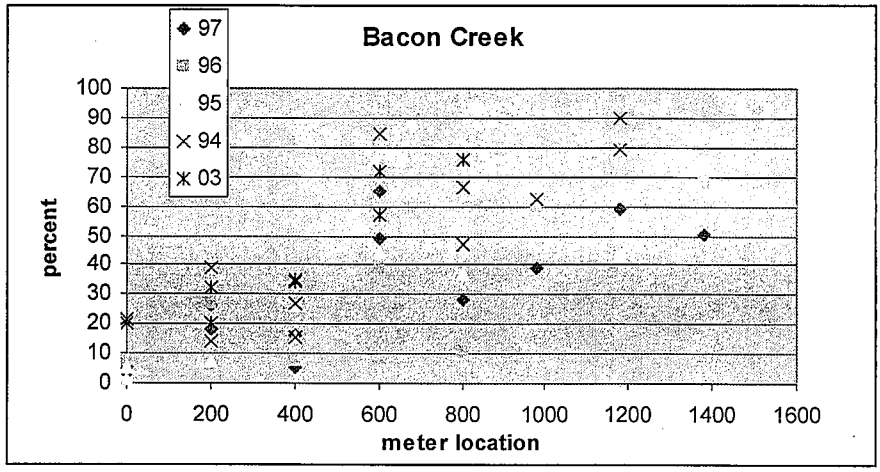


Figure 5: percent of residual pool volume filled with sediment by meter location of plot.

Woody Debris

Another critical component of stream habitat is woody debris loading. Measurements of debris loading were completed for 1994-97, and again in 2003 in Bacon Creek (Table 3). Woody debris was tallied according to size and position in channel, and was mapped according to location within the stream plot. In addition, approximate size and position of debris jams was noted. Debris jams are defined as multiple pieces of woody debris acting as a single blockage to stream flow. Data from 2003 show that Bacon Creek has 1.0 pieces of functional LWD (>20"), 2.9 pieces of functional medium woody debris (8-20"), 1.5 pieces of non-functional LWD, and 2.7 pieces of non-functional MWD per 100 feet of stream. "Functional" woody debris is woody debris located within the active channel of the stream that visibly affects the flow of water. "Non-functional" woody debris is that which is located outside of the active channel but within the bankfull channel width. It is debris that is "poised" to enter the active channel and become functional debris.

Approximately 64% of the pools surveyed within Bacon Creek were attributed to the presence of MWD or LWD. Little data exists on the range of debris loading found in Sierran streams. Relative to coastal streams of the Pacific Northwest, Bacon Creek has high levels of woody debris loading. The assumptions imbedded within this comparison are most likely errant; however, the baseline set of data being formed is an important step in ascertaining an acceptable range in woody debris loading for Sierran streams.

year	functional 8-20"	functional >20"	non-functional 8-20"	non functional >20"
2003	2.9*	1.0*	2.7*	1.5*
1997	5.7*	2.1	5.5*	1.3
1996	3.0	3.0	2.7	2.1
1995	5.7	8.9	3.6	.57
1994	5.7	8.8	1.1	.38

*Values represent debris in the 4-20" size class.

Table 3: summary of woody debris counts per 100 foot stream segment for the period of 1994-2003.

Stream Temperature

Stream temperature was monitored using Hobo temperature recording devices in Bacon Creek during the summer months of 1994 and 1996 following protocols approved by the Fish, Forests, and Farms Community Technical Committee(1996). In 1994 two locations were monitored. One more site was added in 1996. Stream temperatures for both years for all sites average 50.2 degrees F. Maximum temperatures range between 52-59 degrees F. Temperature data for both years at all sites is summarized in table 4. Stream temperature for the months of July through October for sites 1-3 are summarized in figure 6. Research in salmonid biology states that temperatures between 50-63.8 degrees F are optimum rearing temperatures for salmonids. The presence of trout was noted along all reaches of the creek except that of the headwater reaches. Bacon Creek shows no sign of elevated stream temperatures that could have a negative impact on salmonid habitat.

Year	site 1		site 2		site 3	
	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)
1994	50.7	54.5	51.4	58.6	50.7	53.9
1996	49.3	53.4	50.3	55.6	49.0	52.8

Table 4. Summary of average and maximum hobo stream temperatures over summer months, July-September.

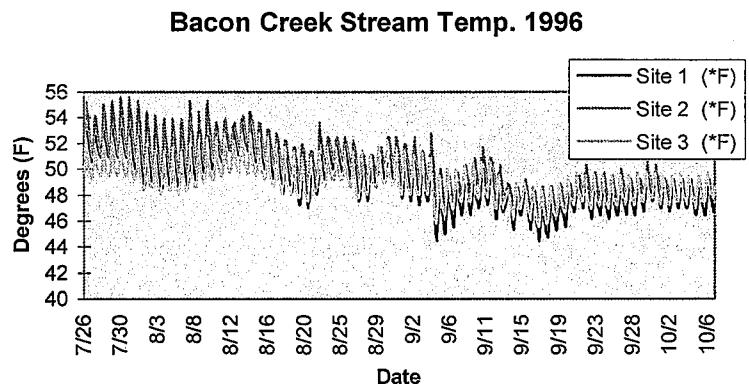


Figure 7. Hobo stream temperature readings for 3 sites for the period of July-October, 1996.

Vegetation

Streamside vegetation plays a critical role in providing habitat cover and stream bank stability. Permanent 1/10th acre vegetation inventory plots were established at all stream plots on Blodgett Forest. This inventory included tagging all trees (>4.5" DBH), establishing 1/100th acre regeneration subplots, recording shrub and forb cover, sampling of downed fuels, and measuring canopy cover.

The vegetation along most of Bacon Creek can be characterized as having a dense multi-layered canopy. Constituents of the Sierra Mixed Conifer group (except Black Oak) comprise the dominant overstory with heights ranging between 70 to 120 feet. The middle canopy layer is comprised of intermediate to suppressed Incense cedar and White fir in the 20 to 40 foot height class. The lower canopy layer is comprised of riparian components such as Pacific Yew, Dogwood, and Alder. This riparian component is particularly dense at the creek-side and becomes distinctively less prominent as distance from the creek increases. This riparian zone extends 40 to 60 feet on average from the stream channel. Canopy cover over the sampled length of the creek averages 84.3%, 24% of which is derived from deciduous trees while 60% is derived from evergreen constituents. Incident solar radiation on the creek surface measured using the Solar Pathfinder is approximately 7.6%. Dense moist conditions along the creek-side support the growth of multiple riparian understory species. These include various ferns, shrubs, and forbs that play an integral role in stabilizing stream banks. Cover of understory species along stream banks averages 67% over the sampled length of the creek. Common understory species include Western Azalea, Twin berry, Twin flower, Sierra Laurel, Boykinia, and California Wood Fern.

Water Quality

Measures of water quality were conducted for Bacon Creek 1994 and 1997. The biotic elements sampled are total coliform, fecal coliform and fecal streptococci. In addition, chemical and mineral characteristics measured were pH, bicarbonate, calcium, magnesium, chlorine, zinc, nitrates, phosphorous, and water hardness. Tolerances for fecal coliform published in the Sacramento-San Joaquin Basin Plan (CRWQB, 1990) state that the fecal coliform concentration based on a minimum of 5 samples over a 30 day period shall not exceed a geometric mean of 200 MPN/100ml, nor shall more than 10% of the samples have values exceeding 400 MPN/100ml. The Sacramento-San Joaquin Basin Plan also lists acceptable limits for a variety of heavy metals including zinc. Acceptable ranges for phosphate and nitrate levels were published by Dunne and Leopold (1978) for forest lakes and rivers. Their findings state that total phosphate levels between .03 and .10 mg/l and nitrate levels between 0.1 to 0.5 mg/l are considered normal for uncontaminated forest streams. Dunne and Leopold noted that streams located within open grazing lands have levels of phosphate that are slightly higher. Data for both biotic and abiotic water quality sampling for 1996 and 1997 are summarized in Appendix B. It should be noted that the levels of phosphorous and nitrate for these two years fall within or below acceptable ranges for uncontaminated streams. It should also be noted that the geometric mean for fecal coliform values for 1996 fall below the 200 MPN/100ml value as stated by the Sacramento-San Joaquin Basin Plan. A peak value of >400 MPN/100ml during one of the sample replicates in 1997 raised the mean fecal coliform count for Bacon Creek over the 200 MPN/100ml threshold. In addition, because of a 200.5 MPN/100ml test ceiling in 1996, it is impossible to ascertain whether >10% of the fecal coliform samples were over the 400 MPN/100ml threshold and thus failed to meet the Basin Plan standards. This test ceiling was raised to 1600 MPN/100ml in 1997; however we are unable to ascertain with any certainty whether Bacon Creek meets the Basin Plan standards for either year.

Turbidity sampling was conducted in Bacon Creek in 1995 and 1996. Turbidity is an optical property of water; however, it is used as an indicator of the relative amount of sediment suspended in streams. It is measured in NTU (nephelometric turbidity units). Measures of suspended sediment are useful in distinguishing between normal influxes of sediment in a stream and major events. It can also be used in monitoring management activities or problem areas. While sporadic episodes of high turbidity have little effect on larger adult salmon and trout, the effect of turbidity on fish in Blodgett streams is unknown. It can be noted that juvenile coho salmon avoid water with turbidities that exceed 70 NTU. Turbidity levels of Bacon Creek were well below this value during even the most intense storm events. Sampling was conducted at two locations on Bacon Creek during periods of high flow and sediment flux (during and after storm events). Data for the months of January and February, 1996 are summarized in Appendix C.

Rapid Bioassessment

An assessment of water quality at a Bacon Creek site using aquatic macroinvertibrates was conducted in 1997 and 1998 as part of a study by UC Berkeley scientists R.B. Del Rosario and V.H. Resh. The following summaries refer to an internal report generated by Rosario and Resh (2000).

Metric	1997 mean	1997 SD	1998 mean	1998 SD
Taxa richness	27	4	26	3
EPT Richness	16	2	16	1
EPT:Chironomid+EPT	0.45	0.14	0.41	0.14
Shannon-Wiener Index	0.67	0.13	0.65	0.14
%Dominant Taxon	53	14	56	13
Hilsenhoff Biotic Index	4.0	0.6	4.2	0.6
% Collectors	58	13	65	13
% Shredders	25	7	20	10
Multimetric Index	81	3	78	1
Habitat Assessment (120 max score)	60		60	

The analysis was based on EPA's "Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertibrates, and Fish" (1999). The different metrics in the above table each reflect a different water quality parameter. In general, higher values indicate higher water quality. Considered in whole, the values reflect a broad assessment water quality. When compared to paired tests of quality from BFRS's other streams during the same years, Bacon Creek is has generally poorer water quality (ranked from 3 to 8 out of 9 sites), although the site is still classified as having "very good water quality" according to Hilsenhoff's biotic index. No significant difference in water quality between 1997 and 1998 was detected (ANOVA protected Tukey test).

APPENDIX A

BACON CREEK
CUMULATIVE EFFECT ANALYSIS
Assumptions:

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65%) will not be disturbed.
2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.
3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.
4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.
5. Regeneration, particularly site preparation, activities in riparian areas will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.
6. Land disturbing activities are distributed throughout the watershed in space and time.
7. Land disturbance (except roads) recovers completely over a 20 year span.

Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
ERA/Watershed Acres x 100% = Percent ERA

BACON CREEK (589 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	**ACRES**	**ERA Factor**	**% ERA**	**Sum % ERA**
Roads	13.8	1.0	2.34	2.34
Previous Decade Regen.	32.4	0.3	1.7	4.04
Previous Decade Selection/Thin	230	0.1	3.9	7.94
Previous Decade Overstory Removal	33	0.15	0.84	8.78
Next Decade Clearcut	0	0.3	0	8.78
Next Decade Selection/Thin	100	0.1	1.7	10.48
Next Decade Overstory Removal	18	0.15	0.45	10.93
Reserve	67.7	0	0	10.93
WLPZ	32.8	0	0	10.93
TOTAL				**10.93**

Appendix B

Summary of water quality data for Bacon Creek, 1996 and 1997.

	P(mg/l)	$N0_3$-N (mg/l)	HCO_3 (meq/l)	Ca (meq/l)	Mg (meq/l)	Cl (meq/l)	Zn (mg/l)	pH	Hard (grains/ gram)
Bacon 1	.08	<.05	.35	.1	.1	<.1	<.02	6.1	.45
Bacon 2	.07	<.05	.28	.1	.1	<.1	<.02	6.8	.45

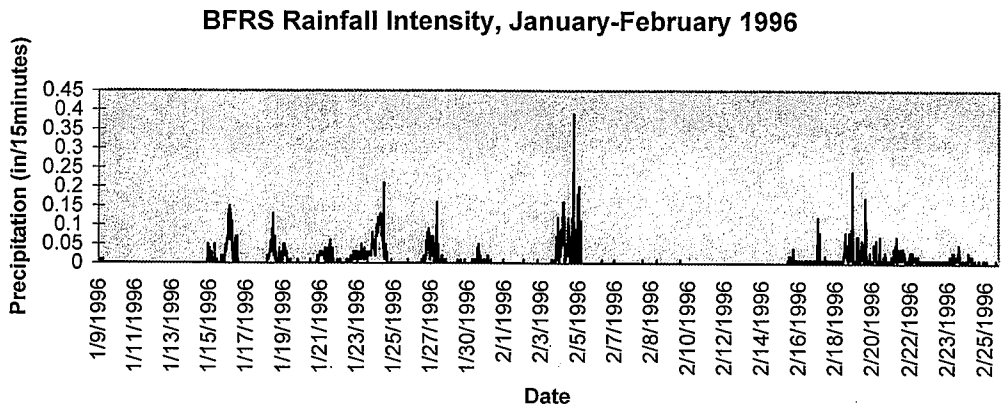
Table 1: Summary of abiotic water quality data for 2 locations on Bacon Creek in 1996.Values are averages from 6 replicate samples taken within a 30 day period.

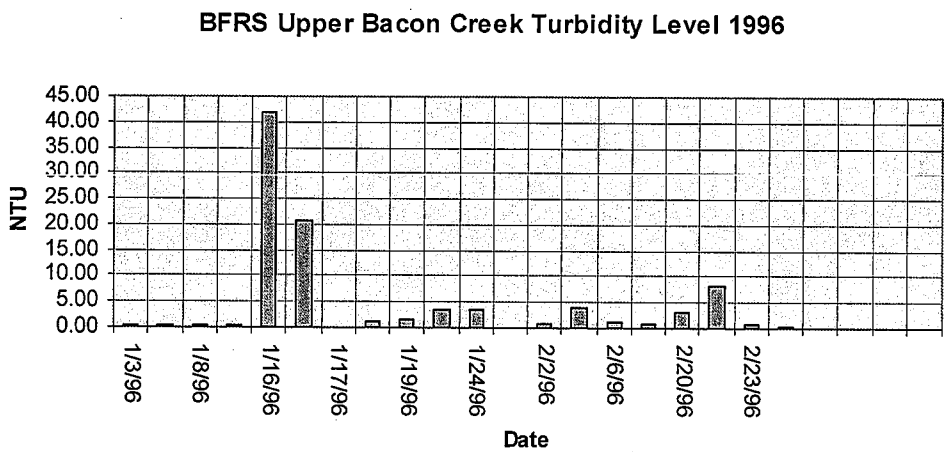
	Total Coliform (MPN/100ml)		Fecal Coliform (MPN/100ml)		Fecal Streptococci (MPN/100ml)	
	1996	1997	1996	1997	1996	1997
Bacon 1	86.8*	na	1.6	na	17	na
Bacon 2	180.9	574	4.3	456	71.7	na

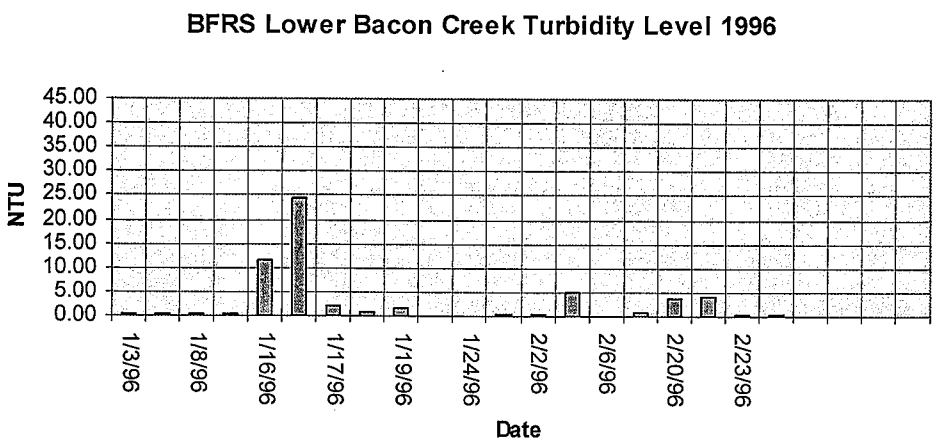
* Test ceiling for samples in 1996 was set at 200.5 MPN/100ml.This ceiling was raised to 1600 MPN/100 ml in 1997.
Table 2: Summary of biotic water quality data for 2 locations on Bacon Creek for 1996 and 1997. Values are averages from 6 replicate samples in 1996, 5 samples in 1997, taken within a 30 day period. Bacon 2 was only location sampled in 1997.

Appendix C

Bacon Creek precipitation and turbidity data, January-February 1996.







Gaddis Creek 2nd order watershed of Gaddis Creek state planning watershed

181 acres in the Gaddis Creek sub-watershed are proposed for harvest in this THP (69 acres selection 20 acres clearcut and 92 acres commercial thin). No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Gaddis Creek state planning watershed of which this watershed is a part.

Watershed Characteristics

Gaddis Creek drains a 2nd order watershed of approximately 1287 acres. It comprises 14% of the 8743 acre Gaddis Creek State Planning Watershed (#5514.320106).80% of the Gaddis creek watershed is managed by Blodgett Forest Research station with the remaining 17% owned by Sierra Pacific Industries and 3% owned by the U.S.F.S. Elevations over the watershed range from 4680' to 3600' with elevations on Blodgett Forest ranging from 4680' to 4080.' Slopes across the watershed average <20% ranging from 0 to 40% while those within the WLPZ average approximately 20% ranging from 3% near the headwaters of Gaddis Creek to 57% near the confluence of Gaddis Creek with Slab Creek. Soils across the watershed are predominantly Musick, Holland, and Bighill series derived from granodiorite parent materials, and Cohasset soils derived from Andesitic lahar. All four soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small and exceedingly rare in this watershed. The entire watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. 105 acres (8.2%) of the watershed are designated in reserve status while 120 acres (9.3%) of the watershed are within WLPZ's. Both of these areas receive little to no anthropogenic manipulation. Approximately 369.3 acres (28.7%) will not be harvested within the next decade. Therefore, approximately 46.2% of the watershed will receive little to no manipulation within the next 10 years. Approximately 2.3% of the watershed will be regenerated while 53.2% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 13.4% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.)

The current vegetation condition of the area is a function of the disturbance history over the watershed. The entire watershed was heavily grazed from 1850 to the present. Archaeological surveys within the watershed discovered sheep pens with artifacts dating as early as the mid 1850's. Seasonal cow and calf grazing has been continuous from circa 1880 to present times. In addition, over 50% of the watershed is recovering from the effects of a wildfire that occurred in 1919. This fire followed extensive timber harvesting from 1900 to 1915. Remnants of narrow gauge railroad lines used in the harvesting are still visible along Gaddis Creek. The west fork of the headwater region of Gaddis Creek has evidence of an abandoned large diversion dam and water ditch that parallels the creek for approximately 3700 feet. This and several channel diversions in the central portion of the watershed show evidence of surface mining circa 1850-1870. The southern half of the watershed within Blodgett forest property boundaries can presently be characterized in three states: 70-80 year old mixed conifer stands approaching canopy closure; 10 to 20 year old well stocked mixed species plantations with moderate to dense shrub cover; and shrub dominated fields with emergent conifer saplings/poles in the regeneration phase. WHR classifications for this area range from SMC 2P to SMC 4D. The northern half of the watershed can be characterized by 80-90 year old mixed conifer stands (SMC 4M/D) regenerated from remnants of logging at the turn of the century.

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Gaddis Creek watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in both seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was .8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. This storm event produced flows of approximately >90 cfs. Average yearly precipitation produces flows on Gaddis Creek that range between summer flows of 1.5 to 3 cfs to winter flows of 15 to 30 cfs on average. Data on air temperatures in the period between 1961-1996 for the month of January show that the average minimum temperature is 33°F. The average maximum temperature for January is 46°F. The average minimum temperature for the month of July is 59°F while the average maximum is 83°F.

Channel Morphology

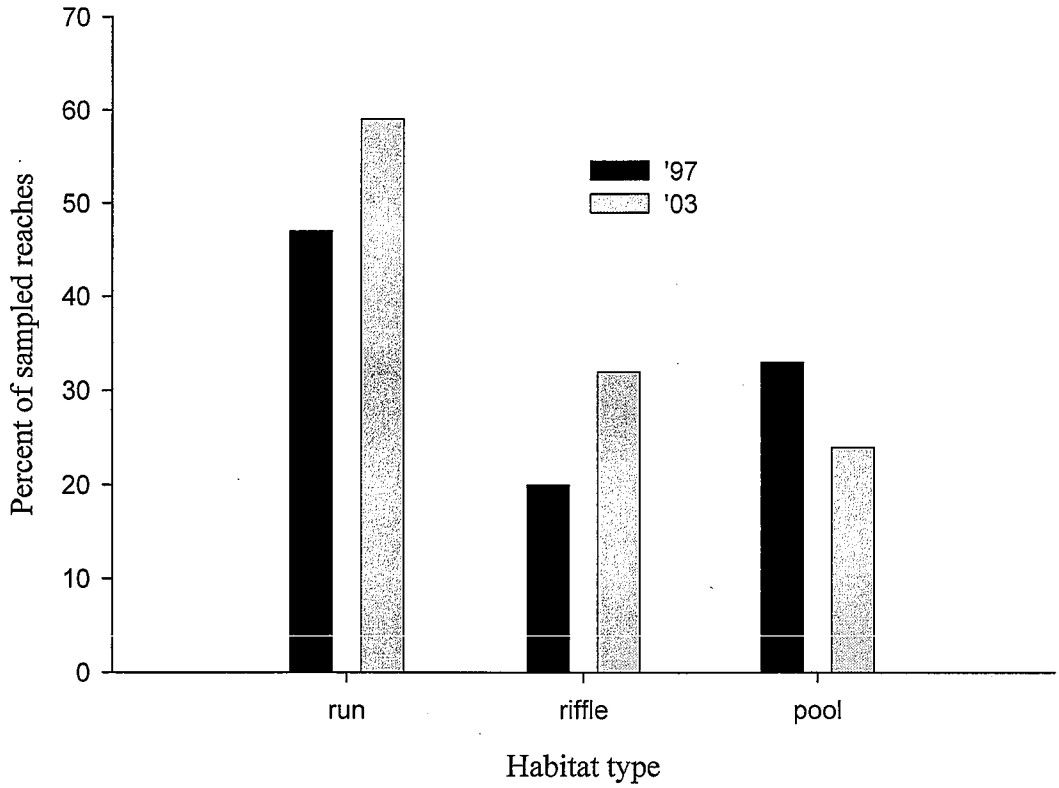
Gaddis Creek does not conform to the archetypical stream morphology associated with Sierra streams. This generalized profile describes the headwater regions of streams as having steeper gradients and larger substrate types, transitioning into lesser gradient and smaller substrate types found in the depositional zones of valley bottoms. Gaddis Creek originates on the Georgetown Divide, a large flat plateau located between the South Fork of the American River and the Rubicon River. This landform inverts the standard fluvial-geomorphological profile of a stream as most of the streams originating from the Divide show a significant increase in both volume of flow and fluvial energy as they descend into higher order river canyons. This pattern is important to recognize in that most of Gaddis Creek on Blodgett property falls within what can be classified as a deposition/transport zone.

Gaddis Creek in entirety is 10,952 feet long, 7819 feet of which are on Blodgett forest property. The channel morphology of Gaddis Creek varies greatly between the upper headwater reaches and the lower sediment transport reaches. At the upper reaches of the creek, water percolating from the ground and several small class III (classifications based on Forest Practice Rules: 14 CCR 956.5) watercourses combine to create the two class II watercourses that comprise the east and west branches of Gaddis Creek. These class II watercourses are poorly entrenched (Rosgen type E) and flow through a series of wetland stringer meadows at a very low gradient (<2%).The dominant substrate of both channels is sand, generated from the predominant soil types (Holland/Bighill) found in the area. Both branches flow for approximately 2620 feet before combining to form the class I portion of Gaddis Creek. This portion of Gaddis Creek becomes more entrenched (Rosgen type G)and becomes steeper in gradient (2-4%) as it flows south through Blodgett forest, exposing a more diverse array of substrate types, predominantly gravels and cobbles. As Gaddis Creek reaches its confluence with Slab Creek its channel morphology changes considerably from the moderate gradient/entrenchment found over most of its length. The channel becomes heavily entrenched and greatly increases in gradient (10-20%) as it plunges over a boulder/bedrock dominated substrate into Slab Creek.

Habitat Typing and Stream Characteristics

Data collected from 17 permanent stream inventory plots in July 1997 and 2003 are used for creating a baseline set of conditions for Gaddis Creek. Results from the 2003 inventory show that approximately 59% of the creek by length can be classified as a run, 32% as riffle, and 24% as a pool (Figure 1). The amount of pools decreased relative to riffles and runs between 1997 and 2003, though not markedly enough to distinguish the difference from subjective sampling error. Summaries for the stream morphological features are given in Table 1 below. Note that these values are averages and express a high level of variability (coefficients of variation are > 30%). This variability is a function of many factors including plot location, stream gradient, woody debris, and surrounding topography.

Figure 1. Relative habitat types in '97 and '03

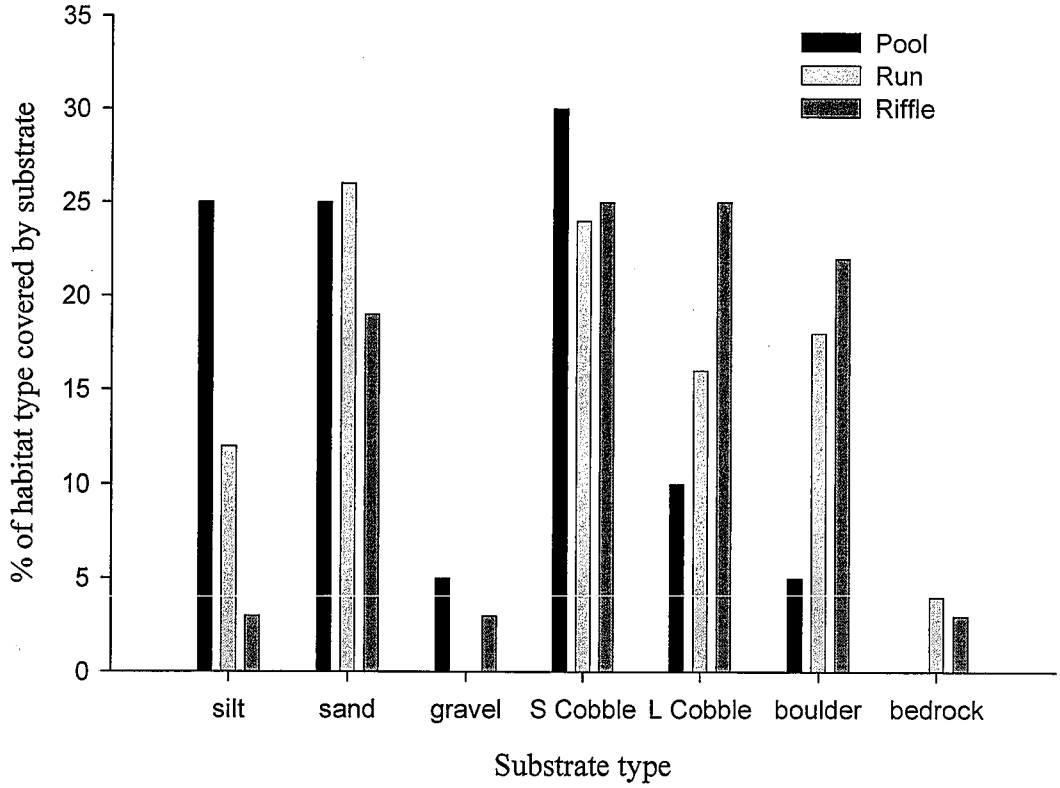


	length (ft)	width (ft)	mean depth (in)
run	28.2 (21.7)	7.0 (2.1)	6.1 (2.1)
riffle	20.3 (14.7)	9.5 (10.4)	3.9 (1.4)
pool	15.1 (6.7)	7.6 (2.3)	9.7 (5.0)

Table 1: summary of average habitat unit dimensions by habitat unit.

In addition to changes in channel substrate based on location in stream profile, channel substrate varies depending on habitat type of stream segment. As noted in Figures 2, both pool and run habitat types show a predominance of smaller substrate types; however, intermediate sizes (gravel to boulder) are all evenly represented. Riffles show a predominance of cobbles. These results are intuitively correct based on the energy regimes that each of these habitats generate. It should be noted however that these figures are averages based on ascertaining the dominant substrate of each habitat unit. Each habitat unit may have a variable mixture of all substrate types. Gaddis Creek exhibits a diverse array of substrate types which potentially indicates a diverse number of habitats for aquatic flora and fauna.

Figure 2. Percent of pool, runs, and riffles dominated by substrate type
S Cobble = small cobble; L Cobble = large cobble



Vstar

Measurements of residual pool volume (V*) were completed for 1994-97 and for 2003 in Gaddis Creek (Table 2). In 2003, the average pool in Gaddis Creek had 29.98% of its residual volume filled with fine sediment (stdev= 31.3%). As can be surmised from the standard deviation, this value is highly variable and may have no inherent value except that of a descriptive sense. V* values per plot by meter location are summarized in Figure 5. These values analyzed within the context of a baseline set of data may give an insight into long term trends of sediment fluxes based on management activities.

	2003	1997	1996	1995	1994
# of pools	10	21	10	11	11
Average (%)	29.9	15.8	2.7	10.2	8.2
stdev	31.3	14.6	3.4	10.2	7.0

Table 2: summary of Vstar data for the period, 1994-1997 and 2003

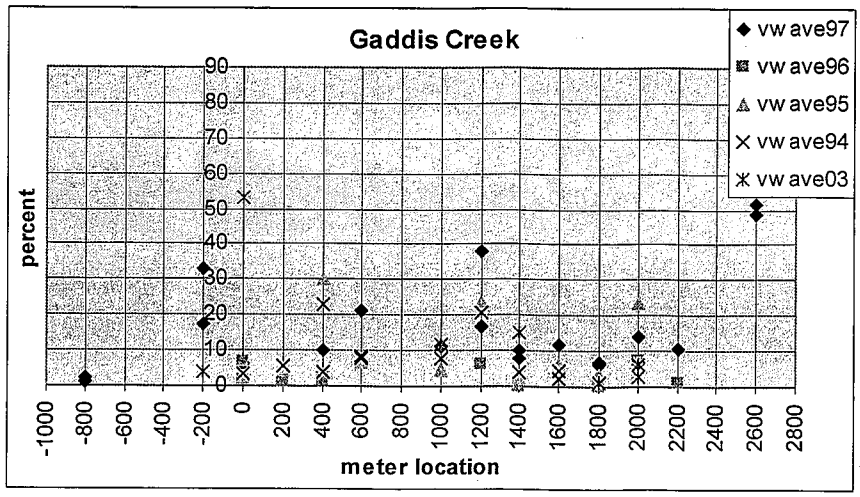


Figure 5: percent of residual pool volume filled with sediment by meter location of plot. Meter location 0 is located at BFRS property boundary.

Woody Debris

Another critical component of stream habitat is that of woody debris loading. Measurements of debris loading were completed in Gaddis Creek (table 3). Woody debris was tallied according to size and position in channel, and was mapped according to location within the stream plot. In addition, approximate size and position of debris jams was noted. Debris jams are defined as multiple pieces of woody debris acting as a single blockage to stream flow. Data from 2003 show that Gaddis Creek has 2.2 pieces of functional LWD (>20"), 4.1 pieces of functional medium woody debris (8-20"), 1.7 pieces of non-functional LWD, and 3.1 pieces of non-functional MWD per 100 feet of stream. On average, the creek had .6 debris jams per 100 feet of stream (stdev=1.0) in 1997. Research suggests that LWD plays a critical role in the formation of pools. Approximately 35% of the pools surveyed within Gaddis Creek were attributed to the presence of LWD. Little data exists on the range of debris loading found in Sierran streams. Relative to coastal streams of the Pacific Northwest, Gaddis Creek has sufficient to high levels of woody debris loading. The assumptions imbedded within this comparison are most likely errant; however, the baseline set of data being formed is an important step in ascertaining an acceptable range in woody debris loading for Sierran streams.

year	functional 8-20"	functional >20"	non-functional 8-20"	non functional >20"
2003	4.1*	2.2	3.1*	1.7
1997	3.5*	.9	2.3*	.8
1996	1.7	.8	1.6	.1
1995	5.1	.4	.6	.4
1994	3.6	2.6^	1.1	.1

*1997 and 2003 values represent debris in the 4-20" size class.
^Debris tally from plots 4 and 6 were dropped due to probable error in values.

Table 3: summary of woody debris counts per 100 foot stream segment for the period of 1994-1997.

Stream Temperature

Stream temperature was monitored using Hobo temperature recording devices in Gaddis Creek during the summer months of 1994 and 1996 following protocols approved by the Fish, Forests, and Farms Community Technical Committee(1996). In 1994 two locations were monitored. Another site was added in 1996. Stream temperatures for both years for all sites average 49.4 degrees F. Maximum temperatures range between 50-57.2 degrees F. Temperature data for both years at all sites is summarized in table 4. Stream temperature for the months of July through October for sites 1-3 are summarized in figure 6. Research in salmonid biology states that temperatures between 50-63.8 degrees F are optimum rearing temperatures for salmonids. The presence of trout was noted along all reaches of the creek except that of the headwater meadow reaches. Gaddis Creek shows no sign of elevated stream temperatures that could have a negative impact on salmonid habitat.

Year	site 1		site 2		site 3	
	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)
1994	47.8	49.8	50.1	55.4	n/a	n/a
1996	49.8	56.3	49.3	55.6	49.8	56.3

Table 4. Summary of average and maximum hobo stream temperatures over summer months, July-September.

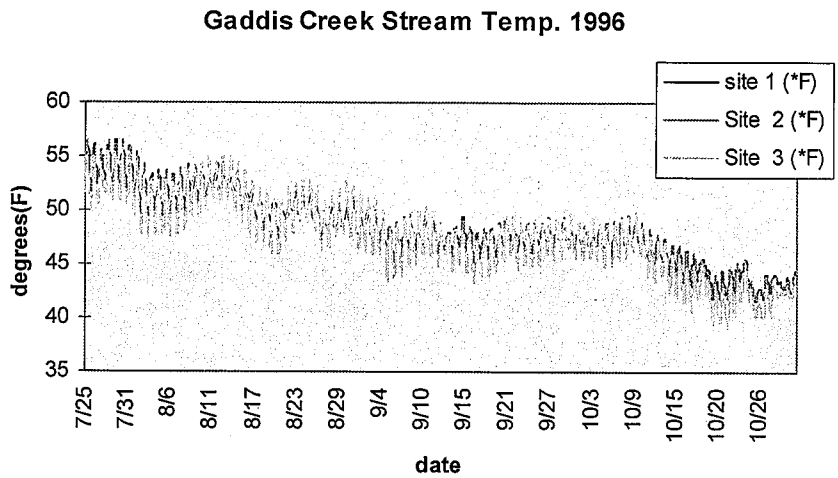


Figure 6. Hobo stream temperature readings for 3 sites for the period of July-October, 1996.

Vegetation

The vegetation along most of Gaddis Creek can be characterized as having a dense multi-layered canopy. Constituents of the Sierra Mixed Conifer group (except Black Oak) comprise the dominant overstory with heights ranging between 70 to 120 feet. The middle canopy layer is comprised of intermediate to suppressed Incense cedar and White fir in the 20 to 40 foot height class. The lower canopy layer is comprised of riparian components such as Pacific Yew, Dogwood, and Alder. This riparian component is particularly dense at the creek-side and becomes distinctively less prominent as distance from the creek increases. This riparian zone extends 40 to 60 feet on average from the stream channel. Canopy cover over the entire length of the creek averages 74%, 16% of which is derived from deciduous trees with the remaining 58% from evergreen components. Incident solar radiation on the creek surface measured using the Solar Pathfinder is approximately 20%. Cover values can further be broken down by dominant vegetation types. The majority of the creek is bound by forest with an average canopy cover value of 79%.The vegetation at the upper headwater reaches is characterized by an open wetland stringer meadow vegetation type with an average cover value of 35%. Dense moist conditions along the creek-side support the growth of multiple riparian understory species. These include various ferns, shrubs, and forbs that play an integral role in stabilizing stream banks. Cover of understory species along stream banks averages 63% over the length of the creek. Common understory species include Western Azalea, Twin berry, Twin flower, Sierra Laurel, Boykinia, and California Wood Fern.

Water Quality

Measures of water quality have been conducted for Gaddis Creek since 1994.The biotic elements sampled are total coliform, fecal coliform and fecal streptococci. In addition, chemical and mineral characteristics measured were pH, bicarbonate, calcium, magnesium, chlorine, zinc, nitrates, phosphorous, and water hardness. Tolerances for fecal coliform published in the Sacramento-San Joaquin Basin Plan (CRWQB, 1990) state that the fecal coliform concentration based on a minimum of 5 samples over a 30 day period shall not exceed a geometric mean of 200 MPN/100ml, nor shall more than 10% of the samples have values exceeding 400 MPN/100ml. The Sacramento-San Joaquin Basin Plan also lists acceptable limits for a variety of heavy metals including zinc. Acceptable ranges for phosphate and nitrate levels were published by Dunne and Leopold (1978) for forest lakes and rivers. Their findings state that total phosphate levels between .03 and .10 mg/l and nitrate levels between 0.1 to 0.5 mg/l are considered normal for uncontaminated forest streams. Dunne and Leopold noted that streams located within open grazing lands, such as is the case with the Gaddis Creek watershed, have levels of phosphate that are slightly higher. Data for both biotic and abiotic water quality sampling for 1996 and 1997 are summarized in Appendix B. It should be noted that the levels of phosphorous and nitrate for these two years fall within or below acceptable ranges for uncontaminated streams. It should also be noted that the geometric mean for fecal coliform values for both 1996 and 1997 fall below the 200

MPN/100ml value as stated by the Sacramento-San Joaquin Basin Plan. However, because of a 200.5 MPN/100ml test ceiling in 1996, it is impossible to ascertain whether >10% of the samples were over the 400 MPN/100ml threshold and thus failed to meet the Basin Plan standards. This test ceiling was raised to 1600 MPN/100ml in 1997 and results show that Gaddis Creek meets the Basin Plan standards this year.

Turbidity sampling was conducted in Gaddis Creek in 1995 and 1996. Turbidity is an optical property of water; however, it is used as an indicator of the relative amount of sediment suspended in streams. It is measured in NTU (nephelometric turbidity units). Measures of suspended sediment are useful in distinguishing between normal influxes of sediment in a stream and major events. It can also be used in monitoring management activities or problem areas. While sporadic episodes of high turbidity have little effect on larger adult salmon and trout, the effect of turbidity on fish in Blodgett streams is unknown. It can be noted that juvenile Coho salmon avoid water with turbidities that exceed 70 NTU. Turbidity levels of Gaddis Creek were well below this value during even the most intense storm events. Sampling was conducted at two locations on Gaddis Creek during periods of high flow and sediment flux (during and after storm events).Data for the months of January and February, 1996 are summarized in Appendix C.

Rapid Bioassessment

An assessment of water quality at two Gaddis Creek sites using aquatic macro invertebrates was conducted in 1997 and 1998 as part of a study by UC Berkeley scientists R.B. Del Rosario and V.H. Resh. The following summaries reference an internal report generated by Rosario and Resh (2000).

Metric	'97 mean	'97 SD	'98 mean	'98 SD	'97 mean	'97 SD	'98 mean	'98 SD
	Site 1				Site 2			
Taxa richness	15	5	26	3	27	4	21	7
EPT Richness	16	2	16	1	14	1	11	4
EPT:Chironomid+EPT	0.45	0.14	0.55	0.31	0.49	0.22	0.55	0.17
Shannon-Wiener Index	0.67	0.13	0.65	0.14	0.76	0.10	0.80	0.06
%Dominant Taxon	53	14	56	13	41	18	31	10
Hilsenhoff Biotic Index	4.0	0.6	4.2	0.6	3.8	0.8	3.0	0.5
% Collectors	58	13	65	13	63	13	60	15
% Shredders	25	7	20	10	15	7	24	11
Multimetric Index	81	3	78	1	78	5	69	8
Habitat Assessment (120 max score)	60		60		60		60	

The analysis was based on EPA's "Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish" (1999). The different metrics in the above table each reflect a different water quality parameter. In general, higher values indicate higher water quality. Considered in whole, the values reflect a broad assessment water quality. When compared to paired tests of quality from BFRS's other streams during the same years, Gaddis Creek has generally moderate water quality. The sites are classified as having "excellent water quality" according to Hilsenhoff's biotic index. In 1997, Gaddis Creek site 1 had some of the lowest indices for water quality, yet other metrics had the highest water quality, suggesting that the site is not significantly impaired.

Roads/Culverts

The Gaddis Creek watershed has undergone a series of road and culvert maintenance and replacement measures over the past 15 years. All class I stream crossings have been replaced within the past 15 years with culverts that are sized to 100 year flood event standards. All of these crossings have been armored and have designed failure points to prevent fill loss. During a possible 100 year storm event that occurred in January 1997, these culverts were estimated to be flowing at 85% to 90% of capacity. In addition, all road segments within 100 feet of the stream channel and/or deemed to be in a sensitive area has been abandoned. This process included removal of all drainage features, ripping, mulching, planting, and blockage of the abandoned section. After abandonment, new road segments were constructed upslope and/or out of sensitive areas (WLPZ). New road segments were constructed using dispersion devices (hay bails, rocks, slash) at outlets of all drainage structures. Within the past ten years 9769 feet of road has been abandoned within the watershed while some 5446 feet has been constructed in less sensitive areas.

In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was first completed in 1994 and re-

measured in 1999. Tonnes of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas, monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspice of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for the Gaddis Creek watershed. This long term project includes creating a baseline set of data for both morphological and biological characteristics including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality(abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level.

APPENDIX A
GADDIS CREEK
CUMULATIVE EFFECT ANALYSIS
Assumptions:

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65%) will not be disturbed.
2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.
3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.
4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.
5. Regeneration, particularly site preparation, activities in riparian areas will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.
6. Land disturbing activities are distributed throughout the watershed in space and time.
7. Land disturbance (except roads) recovers completely over a 20 year span.

Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
ERA/Watershed Acres x 100% = Percent ERA

GADDIS CREEK (1287 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	**ACRES**	**ERA Factor**	**% ERA**	**S % ERA**
Roads	24	1.0	1.86	1.86
Previous Decade Regen.	87	0.3	2.03	3.89
Previous Decade Selection/Thin	472	0.1	3.67	7.56
Previous Decade Overstory Removal	30	0.15	0.35	7.91
Next Decade Clearcut	40	0.3	0.93	8.84
Next Decade Selection/Thin	320	0.1	2.49	11.33
Next Decade Overstory Removal	0	0.15	0	11.33
Reserve	105	0	0	11.33
WLPZ	120	0	0	11.33
TOTAL				**11.33**

Appendix B

Summary of water quality data for Gaddis Creek, 1996 and 1997.

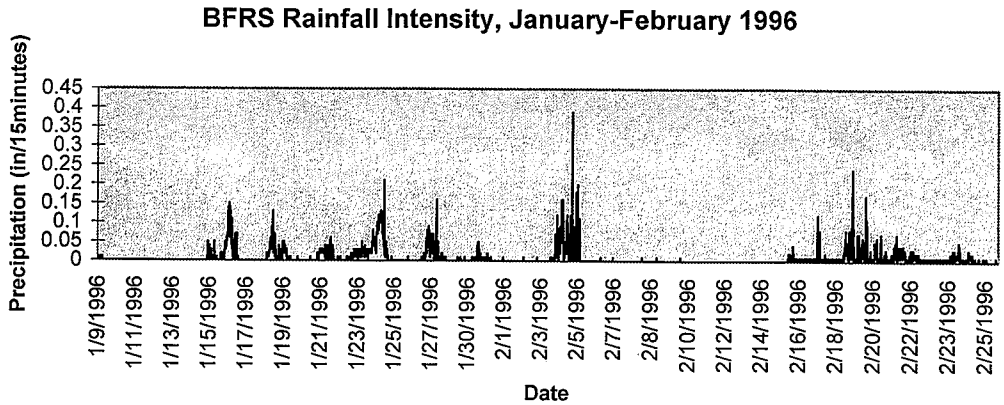
	P(mg/l)	$N0_3$-N (mg/l)	HCO_3 (meq/l)	Ca (meq/l)	Mg (meq/l)	Cl (meq/l)	Zn (mg/l)	pH	Hard (grains/ gram)
Gaddis 1	.06	<.05	.31	.1	.1	<.1	<.02	6.9	.45
Gaddis 2	.05	<.05	.35	.1	.1	<.1	<.02	6.5	.45

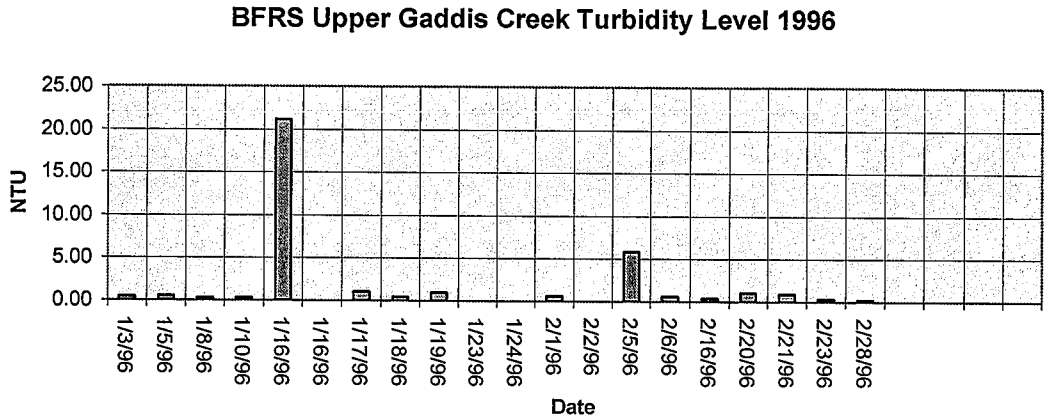
Table 1: Summary of abiotic water quality data for 2 locations on Gaddis Creek in 1996.Values are averages from 6 replicate samples taken within a 30 day period.

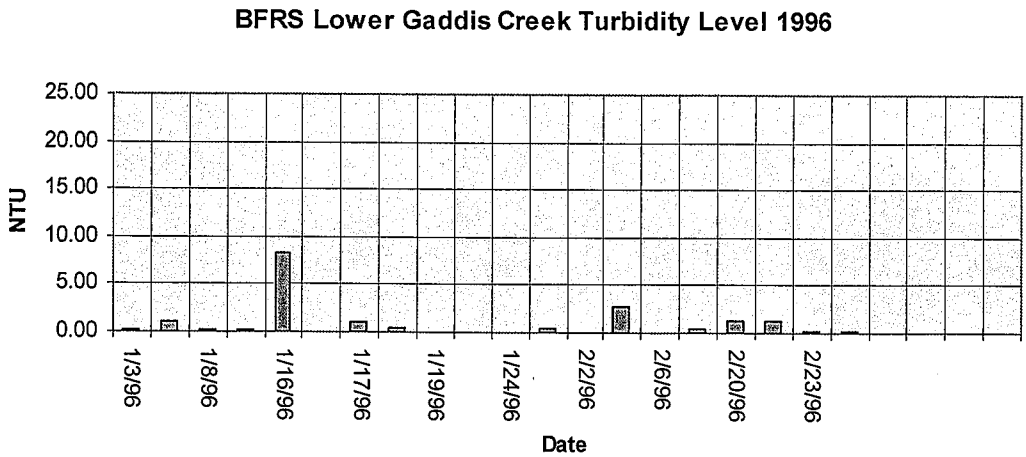
	Total Coliform (MPN/100ml)		Fecal Coliform (MPN/100ml)		Fecal Streptococci (MPN/100ml)	
	1996	1997	1996	1997	1996	1997
Gaddis 1	>200.5*	na	115.5	na	738	na
Gaddis 2	126.5	98	36.1	65	116.6	na

* Test ceiling for samples in 1996 was set at 200.5 MPN/100ml.This ceiling was raised to 1600 MPN/100 ml in 1997.
Table 2: Summary of biotic water quality data for 2 locations on Gaddis Creek for 1996 and 1997. Values are averages from 6 replicate samples in 1996, 5 samples in 1997, taken within a 30 day period. Addis 2 was only location sampled in 1997.

Appendix C: Gaddis Creek precipitation and turbidity data, January-February 1996.







Dark Canyon 2nd order subwatershed of Lower Pilot Creek planning watershed

There are 45 acres of group selection proposed in the Dark Canyon subwatershed in this THP. No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Lower Pilot Creek state planning watershed of which this is a part.

Watershed Characteristics

Dark Canyon Creek drains a 2nd order watershed of approximately 318 acres. It comprises 3.2% of the 9819 acre Lower Pilot Creek state planning watershed # 5514.430401.98% of the Dark Canyon Creek watershed is managed by Blodgett Forest Research station with the remaining 2% owned by Sierra Pacific Industries. Elevations over the watershed range from 4764' to 4160'. Slopes across the watershed average 20% ranging from 0 to 50% while those within the WLPZ average approximately 11 %.Soils across the watershed are predominantly Holland (80%), and Bighill (18%) series derived from granodiorite parent materials, and Jocall (2%) series derived from meta-sedimentary parent material. All three soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small and exceedingly rare in this watershed. The entire watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. 117 acres (37%) of the watershed are designated in reserve status. All WLPZ areas are located within these reserve stands; therefore these areas receive no anthropogenic manipulation. Approximately 36 acres (11%) will not be harvested within the next decade. Therefore, approximately 48% of the watershed will receive little to no manipulation within the next 10 years. Approximately 3% of the watershed will be regenerated while 50% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 8.41% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.)

The current vegetation condition of the area is a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi and John Quinn circa 1880, particularly along the drainages. Seasonal cow and calf grazing has been continuous from circa 1880 to present times. Approximately two thirds of the watershed was heavily logged between 1901-1912 by the Michigan California Lumber Company. Remnants of narrow gauge railroad lines used in the harvesting are still visible along Dark Canyon Creek. The vegetation in the watershed can be classified into 3 states:70 to 80 year old mixed conifer stands (38%) regenerated from remnants of logging (WHR: SMC 4M/D); 6 to 20 year old well stocked mixed species plantations (27%) with light to moderate shrub cover (SMC 2P-3D); and mature mixed conifer stands (35%) with a multi-layered canopy and late seral constituents (SMC 6).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Dark Canyon Creek watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in both seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was .8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. This storm event produced flows of approximately > 35cfs.Average yearly precipitation produces flows on Dark Canyon Creek that range between summer flows of .5 to 1.5 cfs to winter flows of 5 to 20 cfs on average. Data on air temperatures in the period between 1961-1996 for the month of January show that the average minimum temperature is 33°F. The average maximum temperature for January is 46°F. The average minimum temperature for the month of July is 59°F while the average maximum is 83°F.

Channel Morphology

Dark Canyon Creek does not conform to the archetypical stream morphology associated with Sierran streams. This generalized profile describes the headwater regions of streams as having steeper gradients and larger substrate types, transitioning into lesser gradient and smaller substrate types found in the depositional zones of valley bottoms. Dark Canyon Creek originates on the Georgetown Divide, a large flat plateau located between the South Fork of the American River and the Rubicon River. This landform inverts the

standard fluvial-geomorphological profile of a stream as most of the streams originating from the Divide show a significant increase in both volume of flow and fluvial energy as they descend into higher order river canyons. Dark Canyon Creek is a tributary to Mutton Creek a third order stream. This pattern is important to recognize in that all of Dark Canyon Creek falls within what can be classified as a deposition zone.

Dark Canyon Creek in entirety is 3710 feet long, all of which is on Blodgett forest property. There are three short perennial tributaries to Dark Canyon Creek totaling some 1452 feet in length. These tributaries are fed by springs that occur between 4200 and 4350 feet in elevation. At the upper headwater reaches of the main channel of Dark Canyon Creek, the stream flows through Bacchi meadow characterized by a low gradient (1-3%), poor entrenchment, and an extensive lateral floodplain. The stream channel within these upper reaches and along many of the creek's tributaries is not well defined. As the stream flows down through the watershed, flow volume increases and entrenchment values increase; however, stream gradient shows no significant increase (2-4%).In addition, most of the Dark Canyon Creek watershed has poor topographical confinement, thus floodplain widths are large while percent slopes are low. The dominant channel substrate over the entire watershed is sand, generated from the predominant soil types (Holland/Bighill) found in the area. The stream can be classified as a Rosgen G5 stream.

Habitat Typing and Stream Characteristics

Data collected from 6 permanent stream inventory plots in July 1997 is used for creating a baseline set of conditions for Dark Canyon Creek. Results from this inventory show that approximately 64% of the creek by length can be classified as a run, 4.5% as riffle, and 32% as a pool (figure 1). The average pool for the creek can be described as 14 feet long, 4.6 feet wide, and having a mean depth and maximum depth of 9" and 14" respectively. The average run for the creek can be described as 32 feet long, 3.2 feet wide, and having a mean depth and maximum depth of 6" and 10" respectively. The average riffle for the creek can be described as 20 feet long, 3 feet wide, and having a mean depth and maximum depth of 3" and 5" respectively. Note that these values are averages and express a moderate level of variability. This variability is a function of many factors including plot location, stream gradient, woody debris, and surrounding topography. This data is summarized in table 1.

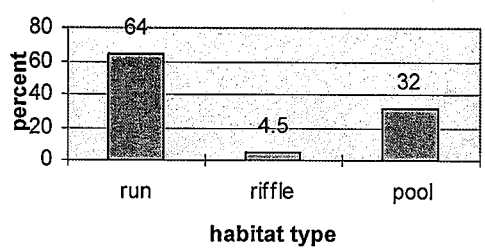


Figure 1: % length of sampled reach by habitat type

	length (feet)	stdev	width (feet)	stdev	mean depth(inches)	stdev	max depth(inches)	stdev
pool	14.3	7.0	4.6	1.2	9.2	3.4	14	3.9
run	31.8	23.3	3.2	.95	5.7	2.1	10.1	4.7
riffle	20.3	n/a	3.3	n/a	2.8	n/a	4.7	n/a

Table 1: summary of average habitat unit dimensions by habitat unit.

Channel substrate shows little variation based on habitat type of stream segment. As noted in figures 2-4 the predominant substrate type of all habitat types is sand. It should be noted however that these figures are averages based on ascertaining the dominant substrate of each habitat unit. Each habitat unit may have a variable mixture of all substrate types. In addition, the sample size of each habitat type is disproportionate with a weighting towards runs. Thus, it is incorrect to assume that 100% of the riffles in the creek have a

dominant substrate of sand. Dark Canyon Creek exhibits a homogenous array of substrate types which may indicate a limited number of habitat types for aquatic flora and fauna.

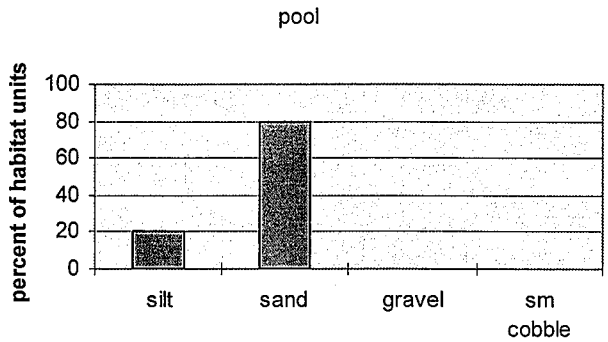


Figure 2: Percent of pools by dominant substrate type

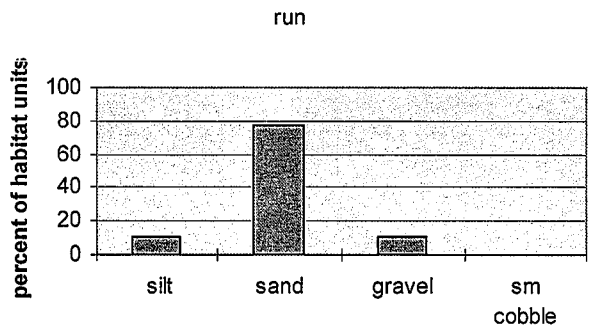


Figure 3: Percent of runs by dominant substrate type.

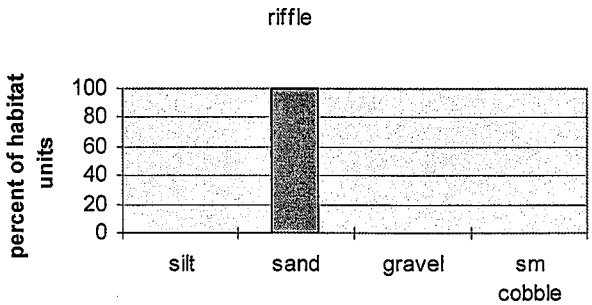


Figure 4: percent of riffles by dominant substrate type

Vstar

Measurements of residual pool volume (V*) were completed in Dark Canyon Creek (table 2).The average pool in Dark Canyon Creek has 45.8% of its residual volume filled with fine sediment (stdev= 10.3%). V* values per plot by meter location are summarized in figure 5. It should be noted that results from an analysis of variance suggest that there was a significant decrease in sediment levels between 1994 and 1995 (p=.05), and 1994 and 1997 (p=.01).It should also be noted that some 3960 feet of road was abandoned along Dark Canyon Creek in 1994.Though no causal relationship can be established, these values analyzed within the context of a baseline set of data may give an insight into long term trends of sediment fluxes based on management activities.

	1997	1996	1995	1994
Average (%)	45.8	n/a	57.3	68.6
stdev	10.3	n/a	9.9	12.6

Table 2: summary of Vstar data for the period, 1994-1997.

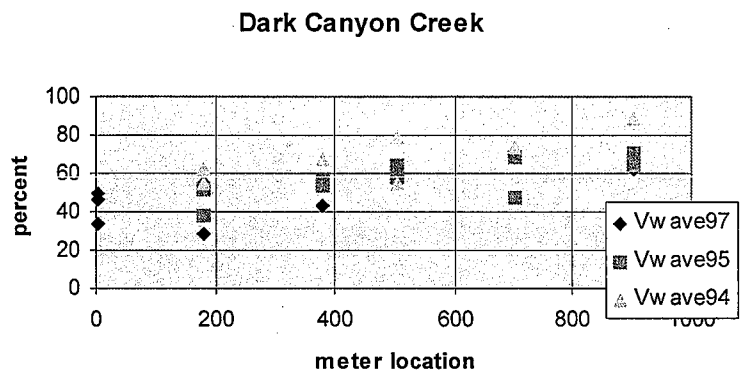


Figure 5: percent of residual pool volume filled with sediment by meter location of plot.

Woody Debris

Another critical component of stream habitat is that of woody debris loading. Measurements of debris loading were completed in Dark Canyon Creek (table 3).Woody debris was tallied according to size and position in channel, and was mapped according to location within the stream plot. In addition, approximate size and position of debris jams was noted. Debris jams are defined as multiple pieces of woody debris acting as a single blockage to stream flow. Data from 1997 show that Dark Canyon Creek has .9 pieces of functional LWD (>20"), 3.5 pieces of functional medium woody debris (8-20"), .8 pieces of non-functional LWD, and 2.3 pieces of non-functional MWD per 100 feet of stream. On average, the creek has 1.3 debris jams per 100 feet of stream (stdev=.85).Research suggests that woody debris plays a critical role in the formation of pools. Approximately 40% of the pools surveyed within Dark Canyon Creek were attributed to the presence of MWD or LWD. Little data exists on the range of debris loading found in Sierran streams. In terms of coastal streams of the Pacific Northwest, Dark Canyon Creek has high levels of woody debris loading. The assumptions imbedded within this comparison are most likely errant; however, the baseline set of data being formed is an important step in ascertaining an acceptable range in woody debris loading for Sierran streams.

year	functional 8-20"	functional >20"	non-functional 8-20"	non functional >20"
1997	5.6*	.5	9.9*	0
1996				
1995	4.6	1.5	1.0	.5
1994	6.1	5.3	2.5	.3

*1997 values represent debris in the 4-20" size class.
Note: measurements of woody debris were not conducted in 1996.

Table 3: summary of woody debris counts per 100 foot stream segment for the period of 1994-1997.

Stream Temperature

Stream temperature was monitored using Hobo temperature recording devices in Dark Canyon Creek during the summer months of 1994 and 1996 following protocols approved by the Fish, Forests, and Farms Community Technical Committee(1996).In 1994 one location was monitored. Two more sites were added in 1996. Stream temperatures for both years for all sites average 50.3 degrees F. Maximum temperatures range between 53-58.4 degrees F. Temperature data for both years at all sites is summarized in table 4. Stream temperature for the months of July through October for sites 1-3 are summarized in figure 6. Research in salmonid biology states that temperatures between 50-63.8 degrees F are optimum rearing temperatures for salmonids. The presence of trout was noted along all reaches of the creek except that of the headwater meadow reaches. Dark Canyon Creek shows no sign of elevated stream temperatures that could have a negative impact on salmonid habitat.

Year	site 1		site 2		site 3	
	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)
1994	49.6	53.0	n/a	n/a	n/a	n/a
1996	52.2	58.4	49.9	54.2	49.3	53.6

Table 4: summary of average and maximum hobo stream temperatures over months, July-September.

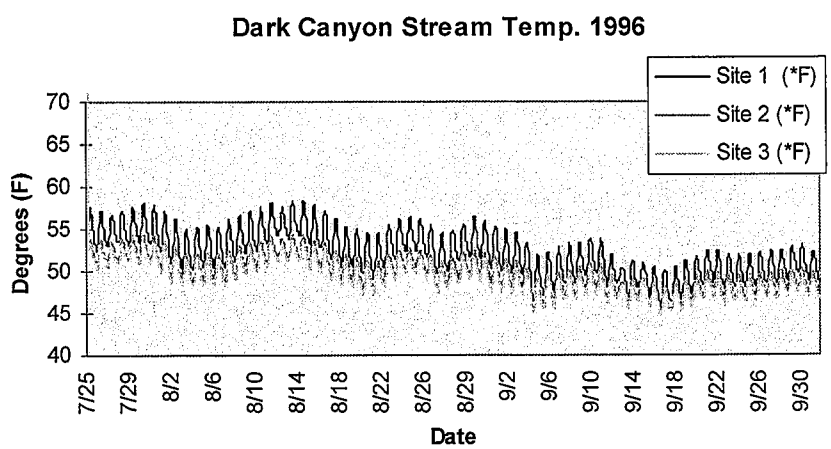


Figure 6: Hobo stream temperature readings for 3 sites for the period of July-October, 1996.

Vegetation

The vegetation along most of Dark Canyon Creek can be characterized as having a dense multi-layered canopy. Constituents of the Sierra Mixed Conifer group (except Black Oak) comprise the dominant overstory with heights ranging between 70 to 120 feet. The middle canopy layer is comprised of intermediate to suppressed Incense cedar and White fir in the 20 to 40 foot height class. The lower canopy layer is comprised of riparian components such as Pacific Yew, Dogwood, and Alder. This riparian component is particularly dense at the creek-side and becomes distinctively less prominent as distance from the creek increases. This riparian zone extends 40 to 60 feet on average from the stream channel. Canopy cover over the entire length of the creek averages 82%, 23% of which is derived from deciduous trees while 59% is derived from evergreen constituents. Incident solar radiation on the creek surface measured using the Solar Pathfinder is approximately 3%. Dense moist conditions along the creek-side support the growth of multiple riparian understory species. These include various ferns, shrubs, and forbs that play an integral role in stabilizing stream banks. Cover of understory species along stream banks averages 55% over the length of the creek. Common understory species include Western Azalea, Twin berry, Twin flower, Sierra Laurel, Boykinia, and California Wood Fern.

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Rapid Bioassessment Protocol

The U.S. Environmental Protection Agency's Rapid Bioassessment Protocol (RBP) Level III (Resh et al. 1995) has been conducted on Dark Canyon Creek for the past 3 years. The RBP III uses the distribution and abundance of fish or benthic macroinvertibrates to assess the ecological status of an aquatic community. Trends or changes in the structure and function of a community may indicate recent anthropogenic disturbances. Incorporation of aquatic organisms to programs that monitor freshwater quality is now

considered preferable to relying solely on traditional chemical and physical tests because, unlike the instantaneous nature of chemical sampling, biomonitoring programs reflect the quality of water during an organism's life. Results from sampling in 1995 show that Dark Canyon Creek has excellent water quality according to Hilsenhoff's Family Biotic Index. In addition, overall RBP metric values indicate Dark Canyon Creek as being relatively unimpacted. RBP III metric values for one site on Dark Canyon Creek are summarized in Appendix D.

Roads/Culverts

The Dark Canyon Creek watershed has undergone a series of road and culvert maintenance and replacement measures over the past 15 years. All class I stream crossings have been replaced within the past 15 years with culverts that are sized to 100 year flood event standards. All of these crossings have been armored and have designed failure points to prevent fill loss. During a possible 100 year storm event that occurred in January 1997, these culverts were estimated to be flowing at 85% to 90% of capacity. In addition, all road segments within 100 feet of the stream channel and/or deemed to be in a sensitive area have been abandoned. This process included removal of all drainage features, ripping, mulching, planting, and blockage of the abandoned section. Within the past ten years 3960 feet of road has been abandoned within the watershed. No new road segments have been built.

In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was last completed in 1994 and is scheduled for remeasurement. Tonnes of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas, monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspice of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for the Dark Canyon Creek watershed. This long term project includes creating a baseline set of data for both morphological and biological characteristics including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality(abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level.

APPENDIX A
DARK CANYON CREEK
CUMULATIVE EFFECT ANALYSIS

A. Assumptions

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65% will not be disturbed).
2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.
3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.
4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.
5. Regeneration, particularly site preparation, activities will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.
6. Land disturbing activities are distributed throughout the watershed in space and time.
7. Land disturbance (except roads) recovers completely over a 20 year span.

B. Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

C.SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
(ERA / Watershed Acres) x 100% = Percent ERA

DARK CANYON CREEK (318 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	**ACRES**	**ERA Factor**	**% ERA**	**S % ERA**
Roads	7.1	1.0	2.23	2.23
Previous Decade Regen.	11	0.3	1.05	3.28
Previous Decade Selection/Thin	50	0.1	1.57	4.85
Previous Decade Overstory Removal	0	0.15	0	4.85
Next Decade Clearcut	0	0.3	0	4.85
Next Decade Selection/Thin	45	0.1	1.42	6.27
Next Decade Overstory Removal	0	0.15	0	6.27
Reserve	105	0	0	6.27
WLPZ	120	0	0	6.27
TOTAL				**6.27**

Appendix B: Summary of water quality data for Dark Canyon Creek, 1996 and 1997.

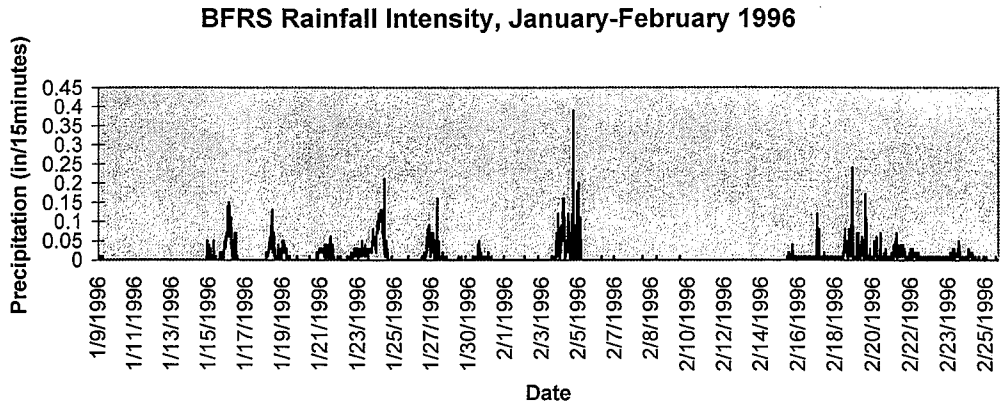
	P(mg/l)	$N0_3$-N (mg/l)	HCO_3 (meq/l)	Ca (meq/l)	Mg (meq/l)	Cl (meq/l)	Zn (mg/l)	pH	Hard (grains/ gram)
Dark 1	.06	<.05	.33	.1	.1	<.1	<.02	6.5	.45

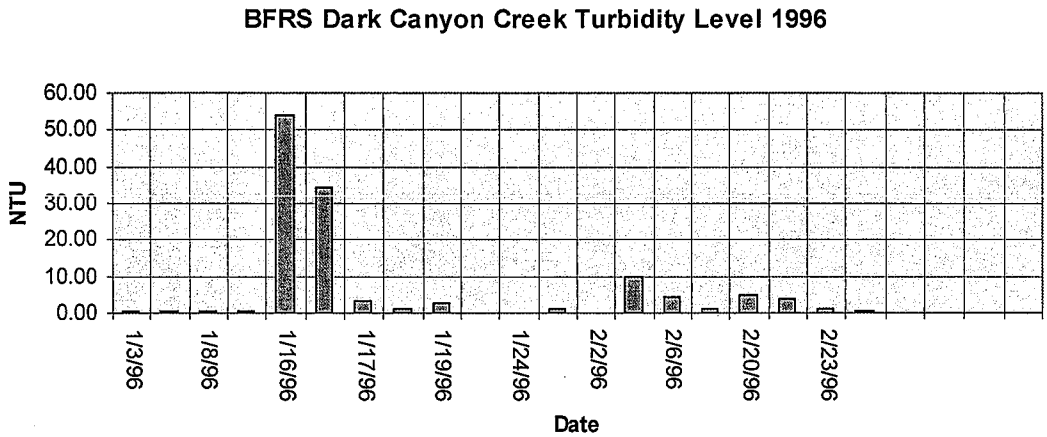
Table 1: Summary of abiotic water quality data for 1 location on Dark Canyon Creek in 1996.Values are averages from 6 replicate samples taken within a 30 day period.

	Total Coliform (MPN/100ml)		Fecal Coliform (MPN/100ml)		Fecal Streptococci (MPN/100ml)	
	1996	1997	1996	1997	1996	1997
Dark 1	110.6*	194.0	1.7	134.3	28.8	na
Dark 2	na	130.0	na	75.5	na	na

* Test ceiling for samples in 1996 was set at 200.5 MPN/100ml.This ceiling was raised to 1600 MPN/100 ml in 1997.
Table 2: Summary of biotic water quality data for 2 locations on Dark Canyon Creek for 1996 and 1997. Values are averages from 6 replicate samples in 1996, 5 samples in 1997, taken within a 30 day period.

Appendix C: Dark Canyon Creek precipitation and turbidity data, January-February 1996.





Appendix D: Rapid Bioassessment Protocol Level III; Average RBP metric values for one site on Dark Canyon Creek, 1995.

	% Dominant Taxon		Richness		EPT Richness	
	average	variance	average	variance	average	variance
Dark Canyon 1	.51	.02	16.4	20.8	10.0	5.0

	EPT:Chironomid+EPT		FBI Score		Scrapers: Filterers+Scrapers	
	average	variance	average	variance	average	variance
Dark Canyon 1	.89	.00	2.49	.02	.19	.02

	Shredders: Total Organisms		Habitat Assessment
	average	variance	(120 maximum)
Dark Canyon 1	.57	.01	65

Mutton Creek 3rd order subwatershed of Lower Pilot Creek state planning watershed

182 acres in the Mutton Creek sub-watershed are proposed for harvest in this THP. There are 60 acres of selection, 45 acres of group selection, and 77 acres of commercial thin. No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Lower Pilot Creek state planning watershed

Watershed Characteristics

Mutton Creek drains a 2nd and 3rd order watershed of approximately 1638 acres. It comprises 18.6% of the 9819 acre Lower Pilot Creek state planning watershed (#5514.430401).Mutton Creek has one major tributary, Dark Canyon Creek. The Dark Canyon watershed is a 2nd order watershed of approximately 318 acres. The remaining 1320 acres comprises the 3rd order portion of the Mutton Creek watershed.44% of the Mutton Creek watershed is managed by Blodgett Forest Research Station with the remaining 56% owned by Sierra Pacific Industries, Davis Trust, and the USFS. Elevations over the watershed range from 4320' to 3720'. Slopes average <10% ranging from 0 to 30% while those within the WLPZ of Mutton Creek can reach 50%.Soils across the watershed belong to the Holland, Bighill, and Musick series derived from granodiorite parent materials, and Cohasset soils derived from Andesitic lahar. All four soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small and exceedingly rare in this watershed. The entire watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. The watershed is split by Wentworth Springs Road, a major thoroughfare on the Georgetown Divide.141.9 acres (8.6%) of the watershed are designated in reserve status. 50 acres (3.1%) are located within WLPZ's. These areas will receive little to no anthropogenic manipulation. Approximately 96 acres (5.8%) will not be harvested within the next decade. Therefore, approximately 17.5% of the watershed will receive little to no manipulation within the next 10 years. Approximately 9.5% of the watershed will be regenerated while 65% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 17.6% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.).It should be noted that these values are based on speculation of land use activities of neighboring land owners.

The current vegetation condition of the area is a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi circa 1880, particularly along the drainages. Seasonal cow and calf grazing has been continuous from circa 1880 to present times. Approximately 85% of the watershed was heavily logged between 1901-1912 by the El Dorado Lumber Company. In addition, evidence of extensive waterworks and canal construction can be found in the Mutton Creek watershed. The original Georgetown Divide ditch was built through the northern portion of the watershed circa 1852.Evidence of the canal can be seen along Mutton Creek. Presently the Georgetown Divide Public Utility District conduit diverts water just above the confluence of Pilot Creek and Mutton Creek. This conduit is a class IV watercourse as defined by the California Forest Practice Rules: 14 CCR 956.5. The vegetation in the watershed can be classified into 3 states: 70 to 80 year old mixed conifer stands (74%) regenerated from remnants of logging (WHR: SMC 4M/D); 6 to 20 year old well stocked mixed species plantations (18%) with light to moderate shrub cover (SMC 2P-3D); and a mature mixed conifer stand (8%) with a multi-layered canopy and late seral constituents (SMC 6).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Mutton Creek watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are

characterized by great variation in both seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was 0.8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. This storm event produced flows of approximately > 35cfs.Average yearly precipitation produces flows on Mutton Creek that range between summer flows of 1 to 2 cfs to winter flows of 10 to 20 cfs on average. Data on air temperatures in the period between 1961-1996 show that the average minimum is 33°F and the average maximum is 46°F in January. The average minimum for the month of July is 59°F while the average maximum is 83°F.

Channel Morphology

Mutton Creek does not conform to the archetypical stream morphology associated with Sierran streams. This generalized profile describes the headwater regions of streams as having steeper gradients and larger substrate types, transitioning into lesser gradient and smaller substrate types found in the depositional zones of valley bottoms. Mutton Creek originates on the Georgetown Divide, a large flat plateau located between the South Fork of the American River and the Rubicon River. This landform inverts the standard fluvial-geomorphological profile of a stream as most of the streams originating from the Divide show a significant increase in both volume of flow and fluvial energy as they descend into higher order river canyons. Mutton Creek is a tributary of Pilot Creek. This pattern is important to recognize in that most of Mutton Creek falls within what can be classified as a deposition or transport zone.

Mutton Creek in entirety is 12,412 feet long, 4166' of which are on Blodgett forest property. 3362' of the upper headwater reaches are located off of Blodgett property on Sierra Pacific Industry Land. The stream originates from a high water table in an approximately 10 year old plantation owned by SPI. The stream flows through a series of stringer meadows characterized by a low gradient (1-3%), poor entrenchment, and an extensive lateral floodplain. The stream channel within these upper reaches and along some of the creek's tributaries is not well defined. The dominant substrate of these upper reaches is sand, generated from the predominant soil types (Holland/Bighill) found in the area. As the stream flows down through the watershed onto Blodgett property, flow volume, entrenchment, and stream gradient increases. In addition, substrate complexity increases as the stream flows north through BFRS property. A distinctive change in substrate types can be seen downstream of the confluence of Mutton Creek and Dark Canyon Creek. After this confluence the stream is 3rd order by definition. Here the sand dominated channel gives way to a cobble and gravel dominated stream interspersed with sand deposits. This may be due in part to the higher energy regimes associated with higher flow volumes. These lower 3rd order reaches of stream can be classified as a Rosgen type G3 while the upper reaches can be classified as a Rosgen type G5.

Habitat Typing and Stream Characteristics

Data collected from 8 permanent stream inventory plots in August 1997 is used for creating a baseline set of conditions for Mutton Creek. Results from this inventory show that approximately 50% of the creek by length can be classified as a run, 10% as riffle and 40% as a pool (figure 1). The average pool for the creek can be described as 21 feet long, 7.2 feet wide, and having a mean depth and maximum depth of 11.8" and 18.1" respectively. The average run for the creek can be described as 29.4 feet long, 6.2 feet wide, and having a mean depth and maximum depth of 6" and 10" respectively. The average riffle for the creek can be described as 22.1 feet long, 7.5 feet wide, and having a mean depth and maximum depth of 4.7" and 7.1" respectively. Note that these values are averages and express a moderate level of variability. This variability is a function of many

factors including plot location, stream gradient, woody debris, and surrounding topography. This data is summarized in table 1.

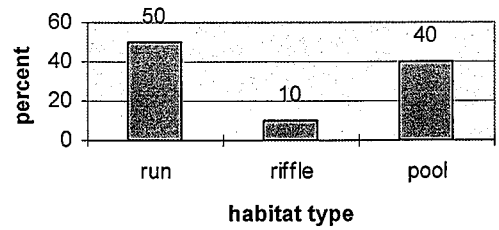


Figure 1: % length of sampled reach by habitat type

	length (feet)	stdev	width (feet)	stdev	mean depth(inches)	stdev	max depth(inches)	stdev
run	29.4	18.4	6.2	1.7	5.9	1.6	10.2	1.4
riffle	22.1	9.5	7.5	2.8	4.7	1.0	7.1	1.4
pool	21.0	10.8	7.2	1.9	11.8	3.5	18.1	4.3

Table 1: summary of average habitat unit dimensions by habitat unit.

Channel substrate shows some dependence based on habitat type of stream segment. As noted in figures 2-4 the predominant substrate type of both pools and runs are silt and sand with smaller constituents of gravel and cobble. Riffles show a predominance of cobbles. These results are intuitively correct based on the energy regimes these habitats generate. It should be noted however that these figures are averages based on ascertaining the dominant substrate of each habitat unit. Each habitat unit may have a variable mixture of all substrate types. Mutton Creek exhibits a heterogeneous array of substrate types which may indicate a diverse array of habitat types for aquatic flora and fauna.

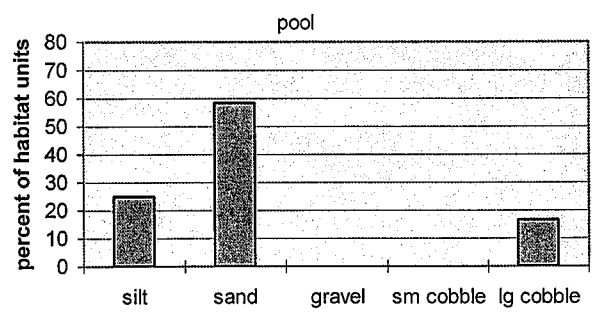


Figure 2: Percent of pools by dominant substrate type

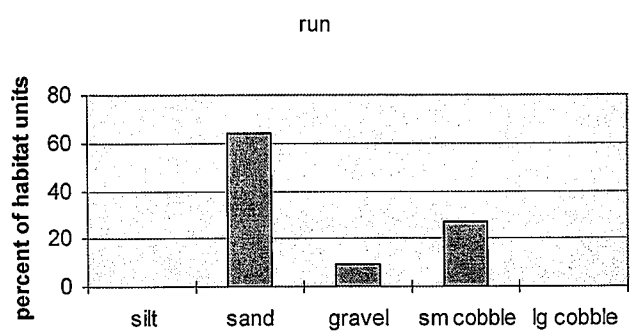


Figure 3: Percent of runs by dominant substrate type.

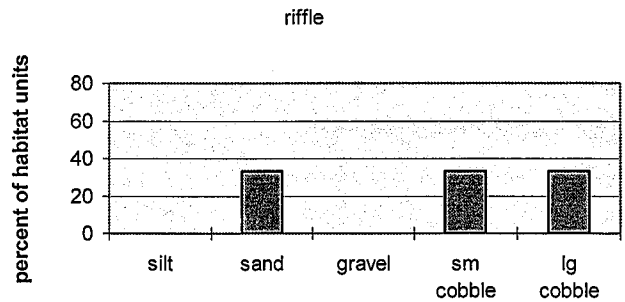


Figure 4: percent of riffles by dominant substrate type

Vstar

Measurements of residual pool volume (V*) were completed in Mutton Creek (table 2).The average pool in Mutton Creek has 33% of its residual volume filled with fine sediment (stdev= 21.3%).As can be surmised from the standard deviation, this value is highly variable and may have no inherent value except that of a descriptive sense. V* values per plot by meter location are summarized in figure 5.These values analyzed within the context of a baseline set of data may give an insight into long term trends of sediment fluxes based on management activities.

	1997	1996	1995	1994
Average (%)	33.2	28.5	31.3	32.5
stdev	21.3	13.4	13.3	21.0

Table 2: summary of Vstar data for the period, 1994-1997.

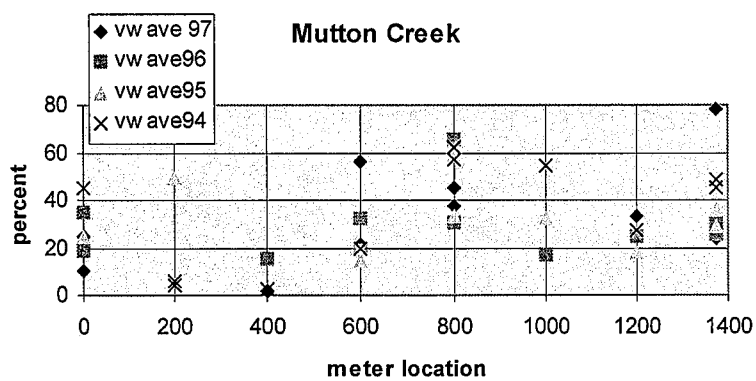


Figure 5: percent of residual pool volume filled with sediment by meter location of plot.

Woody Debris

Another critical component of stream habitat is that of woody debris loading. Measurements of debris loading were completed in Mutton Creek (table 3).Woody debris was tallied according to size and position in channel, and was mapped according to location within the stream plot. In addition, approximate size and position of debris jams was noted. Debris jams are defined as multiple pieces of woody debris acting as a single blockage to stream flow. Data from 1997 show that Mutton Creek has 2.5 pieces of functional LWD (>20"), 9.5 pieces of functional medium woody debris (8-20"), .38 pieces of non-functional LWD, and 8.8 pieces of non-functional MWD per 100 feet of stream. On average, the creek has 1.3 debris jams per 100 feet of stream (stdev=1.7).Research suggests that woody debris plays a critical role in the formation of pools. Approximately 75% of the pools surveyed within Mutton Creek were attributed to the presence of MWD

or LWD. Little data exists on the range of debris loading found in Sierran streams. In terms of coastal streams of the Pacific Northwest, Mutton Creek has high levels of woody debris loading. The assumptions imbedded within this comparison are most likely errant; however, the baseline set of data being formed is an important step in ascertaining an acceptable range in woody debris loading for Sierran streams.

year	functional 8-20"	functional >20"	non-functional 8-20"	non functional >20"
1997	9.5*	2.5	8.8*	.38
1996	10.7	7.1	4.0	1.1
1995	8.6	1.9	1.5	0
1994	6.9	7.4	1.3	.95

*1997 values represent debris in the 4-20" size class.

Table 3: summary of woody debris counts per 100 foot stream segment for the period of 1994-1997.

Stream Temperature

Stream temperature was monitored using Hobo temperature recording devices in Mutton Creek during the summer months of 1994 and 1996 following protocols approved by the Fish, Forests, and Farms Community Technical Committee(1996).In 1994 two locations were monitored. One more site was added in 1996. Stream temperatures for both years for all sites average 50.9 degrees F. Maximum temperatures range between 53-60.6 degrees F. Temperature data for both years at all sites is summarized in table 4. Stream temperature for the months of July through October for sites 1-3 are summarized in figure 6. Research in salmonid biology states that temperatures between 50-63.8 degrees F are optimum rearing temperatures for salmonids. The presence of trout was noted along all reaches of the creek except that of the headwater meadow reaches. Mutton Creek shows no sign of elevated stream temperatures that could have a negative impact on salmonid habitat.

year	site 1		site 2		site 3	
	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)
1994	51.1	57.5	54.0	54.0	n/a	n/a
1996	50.7	60.6	50.2	56.4	48.6	53.9

Table 4: summary of average and maximum hobo stream temperatures over summer months, July-September.

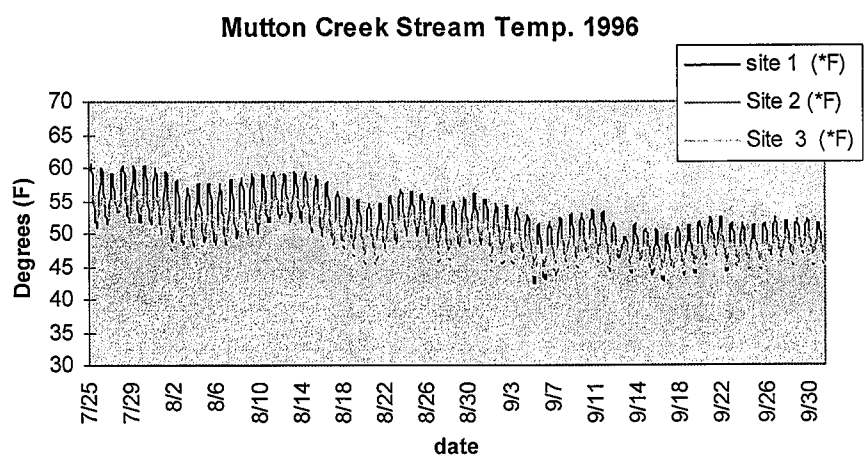


Figure 6: Hobo stream temperature readings for 3 sites for the period of July-October, 1996.

Vegetation

The vegetation along most of Mutton Creek can be characterized as having a dense multi-layered canopy. Constituents of the Sierra Mixed Conifer group (except Black Oak) comprise the dominant overstory with heights ranging between 70 to 120 feet. The middle canopy layer is comprised of intermediate to suppressed Incense cedar and White fir in the 20 to 40 foot height class. The lower canopy layer is comprised of riparian components such as Pacific Yew, Dogwood, and Alder. This riparian component is particularly dense at the creek-side and becomes distinctively less prominent as distance from the creek increases. This riparian zone extends 40 to 60 feet on average from the stream channel. Canopy cover over the sampled length of the creek averages 72%, 13% of which is derived from deciduous trees while 59% is derived from evergreen constituents. Incident solar radiation on the creek surface measured using the Solar Pathfinder is approximately 11.3%. Dense moist conditions along the creek-side support the growth of multiple riparian understory species. These include various ferns, shrubs, and forbs that play an integral role in stabilizing stream banks. Cover of understory species along stream banks averages 74% over the sampled length of the creek. Common understory species include Western Azalea, Twin berry, Twin flower, Sierra Laurel, Boykinia, and California Wood Fern.

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Roads/Culverts

The Mutton Creek watershed has undergone a series of road and culvert maintenance and replacement measures over the past 15 years. All class I stream crossings have been replaced within the past 15 years with culverts that are sized to 100 year flood event standards. All of these crossings have been armored and have designed failure points to prevent fill loss. During a possible 100 year storm event that occurred in January 1997, these culverts were estimated to be flowing at 85% to 90% of capacity. In addition, all road segments within 100 feet of the stream channel and/or deemed to be in a sensitive area have been abandoned. This process included removal of all drainage features, ripping, mulching, planting, and blockage of the abandoned section. After abandonment, new roads segments were constructed upslope and/or out of sensitive areas (WLPZ).New road segments were constructed using dispersion devices (hay bales, rocks, slash) at outlets of all drainage structures. Within the past five years 7848 feet of road has been abandoned within the watershed while 1857 feet have been constructed.

In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was first completed in 1994 and remeasured in 1999.Tonnes of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas, monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspice of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for the Mutton Creek watershed. This long term project includes creating a baseline set of data for both morphological and biological characteristics including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality(abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level.

APPENDIX A
MUTTON CREEK
CUMULATIVE EFFECT ANALYSIS

Assumptions:

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65%) will not be disturbed.
2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.
3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.
4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.
5. Regeneration, particularly site preparation, activities in riparian areas will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.
6. Land disturbing activities are distributed throughout the watershed in space and time.
7. Land disturbance (except roads) recovers completely over a 20 year span.

Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
ERA/Watershed Acres x 100% = Percent ERA

MUTTON CREEK (1320 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	**ACRES**	**ERA Factor**	**% ERA**	**S % ERA**
Roads	12.9	1.0	0.98	0.98
Previous Decade Regen.	*53	0.3	1.2	2.18
Previous Decade Selection/Thin	135	0.1	1.02	3.2
Previous Decade Overstory Removal	0	0.15	0	3.2
Next Decade Clearcut	0	0.3	0	3.2
Next Decade Selection/Thin	364	0.1	2.76	5.96
Next Decade Overstory Removal	0	0.15	0	5.96
Reserve	24.5	0	0	5.96
WLPZ	50	0	0	5.96
TOTAL				**5.96**

* includes 35 acres SPI

Appendix B: Summary of water quality data for Mutton Creek, 1996 and 1997.

	P(mg/l)	$N0_3$-N (mg/l)	HCO_3 (meq/l)	Ca (meq/l)	Mg (meq/l)	Cl (meq/l)	Zn (mg/l)	pH	Hard(grains/gram)
Dark 1	.05	<.06	.30	.1	.1	<.1	<.03	6.3	.45

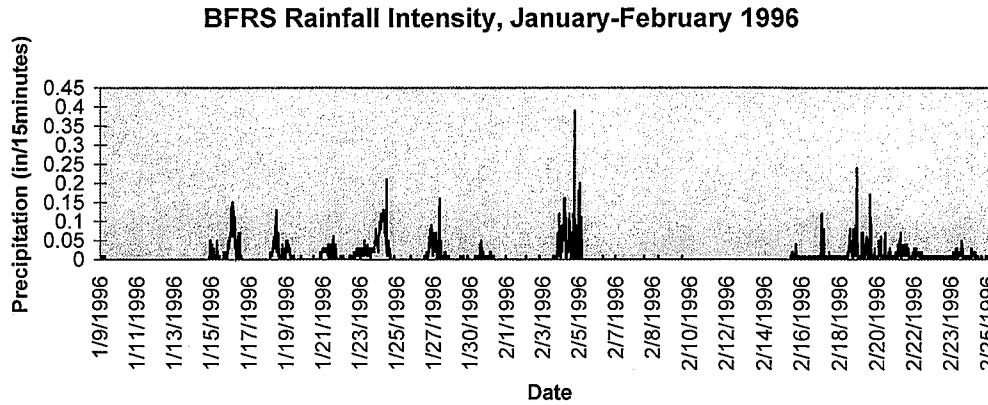
Table 1:Summary of abiotic water quality data for 1 location on Mutton Creek in 1996.Values are averages from 6 replicate samples taken within a 30 day period.

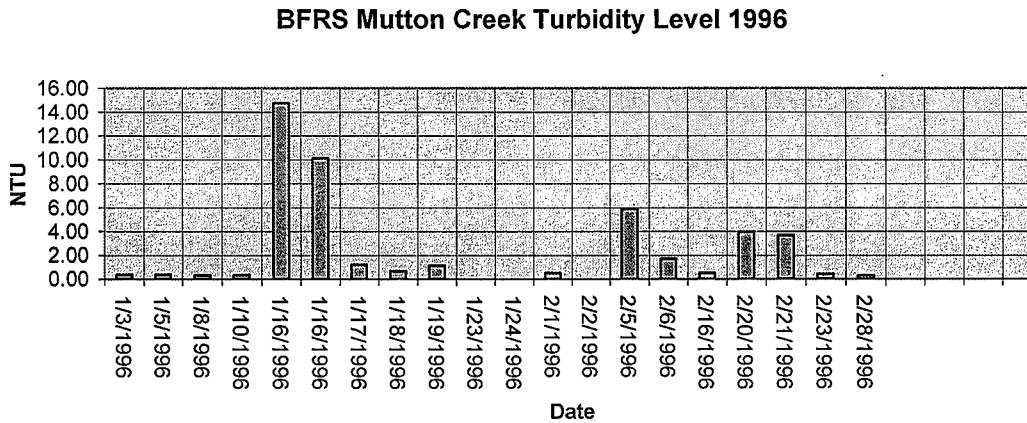
	Total Coliform (MPN/100ml)		Fecal Coliform (MPN/100ml)		Fecal Streptococci (MPN/100ml)	
	1996	1997	1996	1997	1996	1997
Mutton 1	153.9*	246	15.3	192.8	20.2	na

* Test ceiling for samples in 1996 was set at 200.5 MPN/100ml.This ceiling was raised to 1600 MPN/100 ml in 1997.

Table 2: Summary of biotic water quality data for 1 location on Mutton Creek for 1996 and 1997. Values are averages from 6 replicate samples in 1996, 5 samples in 1997, taken within a 30 day period.

Appendix C: Mutton Creek precipitation and turbidity data, January-February 1996.





Appendix D: Rapid Bioassessment Protocol Level III; Average RBP metric values for one site on Mutton Creek, 1995.

	% Dominant Taxon		Richness		EPT Richness	
	average	variance	average	variance	average	variance
Mutton 1	.40	.01	16.2	6.7	11.8	1.2

	EPT:Chironomid+EPT		FBI Score		Scrapers: Filterers+Scrapers	
	average	variance	average	variance	average	variance
Dark Canyon 1	.89	.00	2.67	.03	.42	.02

	Shredders: Total Organisms		Habitat Assessment
	average	variance	(120 maximum)
Dark Canyon 1	.51	.01	90

Quintette 2nd order subwatershed of Whaler Creek state planning watershed

38 acres in the Quintette sub-watershed are proposed for harvest in this THP. There are approximately 8 acres of commercial thinning and 30 acres of selection proposed. No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Whaler Creek state planning watershed.

Watershed Characteristics

Quintette watershed is a 2nd order watershed of approximately 356 acres. It comprises 3.5% of the 10204 acre Whaler Creek state planning watershed (5514.430401). 54.5% of the Quintette watershed is managed by Blodgett Forest Research Station. The remaining area is split between Sierra Pacific Industries (27.5%), the U.S.F.S. (12.4%), and small private owners (5.6%).Elevations over the watershed range from 3720' to 4560'. Slopes across the watershed average 20% ranging from 0 to 40% while those within the WLPZs of the class II watercourses starting on Blodgett Forest may be steeper for short stretches. Soils across the watershed belong to the Holland, Bighill, and Musick series derived from granodiorite parent materials and McCarthy-Crozier series derived from andesitic lahar. All soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small and exceedingly rare in this watershed. The majority of the watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. The Quintette watershed is defined by two class II drainages that fork about 100 feet east of where they flow into the main channel of Whaler Creek.102 acres (28.7%) of the watershed are designated in reserve status. These areas will receive little to no anthropogenic manipulation. Approximately 44 acres (12.4%) are not likely to be harvested within the next decade. Therefore, approximately 41% of the watershed will receive little to no manipulation within the next 10 years. Approximately 22% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 6.8% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.). It should be noted that these values are based on speculation of land use activities of neighboring land owners.

The current vegetation condition of the area is a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi circa 1880, particularly along the drainages. The majority of the watershed was heavily logged between 1901-1912 by the Michigan California Lumber Company. Evidence of narrow gauge railroad logging used during the time can still be found in the watershed. The Quintette watershed also shows evidence of extensive waterworks and canal construction. Several small springs were tapped at various times since the mid 1800s for mining purposes and more recently as domestic water supplies for the residents of Quintette. One of these springs is on Blodgett Forest Property in the watershed and is the current water supply for the Quintette Service Corporation which supplies water to about half of the current residents of Quintette. This conduit is a class IV watercourse as defined by the California Forest Practice Rules: 14 CCR 956.5. The vegetation in the watershed can be classified into 3 states: managed 70 to 90 year old even aged mixed conifer stands (50%) regenerated from remnants of logging with a mature shrub component particularly in the less dense stands (WHR: SMC 4P/D, and SMC 5D/6); 15 to 20 year old even aged well stocked mixed species plantations (21%) with moderate to heavy shrub cover (SMC 2P-3D); and residual reserve stands (29%) of late seral characteristics (SMC 6).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Quintette watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in both seasonal totals, intensity,

and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 39 year period was 7.5 inches. The maximum 1 hour rainfall intensity was 0.80 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. Data on air temperatures in the period between 1961-1999 for the month of January show that the average minimum temperature is 33°F. The average maximum temperature for January is 46°F. The average minimum temperature for the month of July is 59°F while the average maximum is 83°F.

Roads/Culverts

There are currently 4.75 miles of roads in the watershed. Two miles of these are paved and/or chip sealed of which 1.5 miles are maintained by El Dorado County and the remainder is maintained by the US Forest Service. Two miles of soil surface roads are owned and maintained by Blodgett Forest Research Station. These roads have undergone a series of road and culvert maintenance and replacement measures over the past 15 years. During a possible 100 year storm event that occurred in January 1997, the culverts on all the roads in the watershed were able to handle the flow. No new roads have been built in the watershed during the past decade and no new road construction is anticipated in the near future.
For Blodgett Forest roads, In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was first completed in 1994 and remeasured in 1999. Tons of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas, monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspices of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for all of its watersheds. This long term project includes creating a baseline set of data for both morphological and biological characteristics of all the Class I watersheds including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality(abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level. This detailed information is available for all class I watercourse reaches on the forest.

APPENDIX A
QUINTETTE WATERSHED
CUMULATIVE EFFECT ANALYSIS
A. Assumptions

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65% will not be disturbed).

2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.

3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.

4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.

5. Regeneration, particularly site preparation, activities will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.

6. Land disturbing activities are distributed throughout the watershed in space and time.

7. Land disturbance (except roads) recovers completely over a 20 year span.
B. Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

C.SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
(ERA / Watershed Acres) x 100% = Percent ERA

QUINTETTE WATERSHED (356 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	ACRES	ERA Factor	% ERA	S % ERA
Roads	4.8	1.0	1.3	1.3
Previous Decade Regen.	0	0.3	0	1.3
Previous Decade Selection/Thin	*175	0.1	4.9	6.2
Previous Decade Overstory Removal	0	0.15	0	6.2
Next Decade Clearcut	10	0.3	0.8	7.0
Next Decade Selection/Thin	**85	0.1	2.4	9.4
Next Decade Overstory Removal	0	0.15	0	9.4
Reserve	32.5	0	0	9.4
WLPZ	26.7	0	0	9.4
TOTAL				**9.4**

* includes 100 acres USFS ** include 10 acres SPI

Deep Canyon 3rd order subwatershed of Lower Pilot Creek planning watershed

20 acres in the Gaddis Creek sub-watershed are proposed for harvest in this THP. There are approximately 15 acres of selection and 5 acres commercial thin proposed. No significant impact is expected to occur as a result of this harvest. Therefore, no impacts are expected to accumulate to result in a significant impact to the greater Lower Pilot Creek state planning watershed.

Watershed Characteristics

Deep Canyon Creek drains a 3rd order watershed of approximately 561 acres. It comprises 6.4% of the 9819 acre Lower Pilot Creek state planning watershed # 5514.430401. 51% of the Deep Canyon watershed is managed by Blodgett Forest Research station with the remaining 49% owned by Sierra Pacific Industries and the USFS. Elevations over the watershed range from 3240' to 4560'. Slopes across the watershed average 30% ranging from 0 to 100% while those within the WLPZ average approximately 63 %. Soils across the watershed belong to the Holland, Bighill, and Musick series derived from granodiorite parent materials, and McCarthy-Crozier soils derived from Andesitic lahar. The majority of these soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small and exceedingly rare in this watershed. The entire watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. 19.1 acres (3.4%) of the watershed are designated in reserve status. The majority of area within the WLPZ of this watershed are located within these reserve stands. These areas will receive little to no anthropogenic manipulation. Approximately 22.9 acres (4.1%) will not be harvested within the next decade. Therefore, approximately 7.5% of the watershed will receive little to no manipulation within the next 10 years. Approximately 0.3% of the watershed will be regenerated while 48% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 11.4% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.). It should be noted that these values are based on speculation of land use activities of neighboring land owners.

The current vegetation condition of the area is a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi circa 1880, particularly along the drainages. The majority of the watershed was logged between 1901-1912 by the Michigan California Lumber Company. Evidence of narrow gauge railroad logging used during the time can still be found in the watershed. The Deep Canyon watershed also shows evidence of extensive waterworks and canal construction. The original Georgetown Divide ditch was built through the southern portion of the watershed circa 1852. Presently the Georgetown Divide Public Utility District municipal water conduit flows through the central portion of the watershed after diverting water from both Pilot and Bacon Creek. This conduit is a class IV watercourse as defined by the California Forest Practice Rules: 14 CCR 956.5. The vegetation in the watershed can be classified into 4 states: 70 to 90 year old even aged mixed conifer stands (84%) regenerated from remnants of logging with a mature shrub component particularly in the less dense stands (WHR: SMC 4P/D); 1 to 5 year old even aged mixed species plantations (11%-SMC 2P); 70 to 90 year old uneven aged mixed conifer stands (2% -WHR: SMC 4M/D) resulting from single tree selection harvesting; and small residual stands of late seral characteristics (3%-SMC 6).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the Deep Canyon watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in both seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was .8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. This storm event produced flows of approximately > 35cfs. Average yearly precipitation produces flows on Deep Canyon Creek that range between summer flows of 0.3 to 0.5 cfs to winter flows of 3 to 7 cfs on average. Data on air temperatures in the period between 1961-1996 for the month of January show that the average minimum temperature is 33°F. The average maximum temperature for January is 46°F. The average minimum temperature for the month of July is 59°F while the average maximum is 83°F.

Channel Morphology

Deep Canyon Creek does not conform to the archetypical stream morphology associated with Sierran streams. This generalized profile describes the headwater regions of streams as having steeper gradients and larger substrate types, transitioning into lesser gradient and smaller substrate types found in the depositional zones of valley bottoms. Deep Canyon Creek originates on the Georgetown Divide, a large flat plateau located between the South Fork of the American River and the Rubicon River. This landform inverts the standard fluvial-geomorphological profile of a stream as most of the streams originating from the Divide show a significant increase in both volume of flow and fluvial energy as they descend into higher order river canyons. Deep Canyon Creek is a tributary of Pilot Creek. This pattern is important to recognize in that most of Deep Canyon Creek falls within what can be classified as a deposition or transport zone.

Deep Canyon Creek in entirety is 9266 feet long, 3023' of which are on Blodgett forest property. 730' of the upper headwater reaches are located on Blodgett property and are classified as a class II stream (classification based on California Forest Practice Rules: 14 CCR 956.5). The stream channel within these upper reaches has a low gradient and is not well defined. The dominant substrate of these upper reaches is sand, generated from the predominant soil types (Holland/Bighill) found in the area. As the stream flows down through the watershed across the property boundary, flow volume, entrenchment, and stream gradient increases. The majority of the creek between the headwater reaches and the last 1000 feet can be characterized as alternating between segments of steep (4-10%), highly entrenched, cobble dominated reaches (Rosgen A3), and segments of moderate gradient (<4%), highly entrenched, sand and cobble dominated reaches (Rosgen G3/G5). The last 1000 feet of the creek before its confluence can be characterized by high gradient (>10%), high entrenchment, and bedrock and boulder dominated substrate (Rosgen A1a+, A2a+). The majority of the creek shows heavy topographical confinement.

Habitat Typing and Stream Characteristics

Data collected from 4 permanent stream inventory plots in August 1997 and 15 permanent plots in 1996 are used for creating a baseline set of conditions for Deep Canyon Creek. Results from this inventory show that approximately 59% of the creek by length can be classified as a run, 36% as riffle, and 5.3% as a pool (figure 1). The average pool for the creek can be described as 14 feet long, 5.6 feet wide, and having a mean depth and maximum depth of 8" and 12" respectively. The average run for the creek can be described as 31 feet long, 4 feet wide, and having a mean depth and maximum depth of 5" and 9" respectively. The average riffle for the creek can be described as 24 feet long, 7 feet wide, and having a mean depth and maximum depth of 4.6" and 8" respectively. Note that these values are averages and express a moderate level of variability. This variability is a function of many factors including plot location, stream gradient, woody debris, and surrounding topography. This data is summarized in table 1.

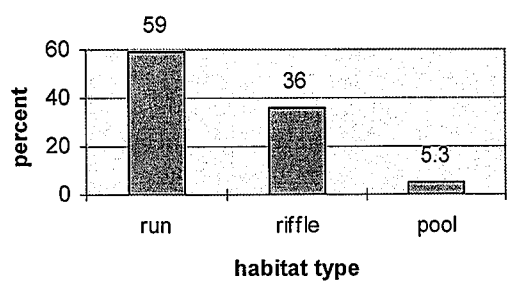


figure 1: % length of sampled reach by habitat type

	length (feet)	stdev	width (feet)	stdev	mean depth(inches)	stdev	max depth(inches)	stdev
run	30.7	14.7	4.2	1.2	5.2	1.5	8.9	2.9
riffle	23.8	9.7	7.1	4.6	4.6	1.1	7.9	1.4
pool	13.8	na	5.6	na	7.9	na	11.8	na

table 1: summary of average habitat unit dimensions by habitat unit.

Channel substrate shows some dependence based on habitat type of stream segment. As noted in figures 2-4 the predominant substrate type of both pools and runs is sand with smaller constituents of cobble and boulder. One pool was sampled in 1997, thus the sample size of each habitat type is disproportionate. Therefore, it is incorrect to assume that 100% of the pools in the creek have a dominant substrate of sand. Riffles show an even distribution of gravel, cobble, boulder, and bedrock. These results are intuitively correct based on the energy regimes these habitats generate. It should be noted however that these figures are averages based on ascertaining the dominant substrate of each habitat unit. Each habitat unit may have a variable mixture of all substrate types. Deep Canyon Creek exhibits a heterogeneous array of substrate types which may indicate a diverse array of habitat types for aquatic flora and fauna.

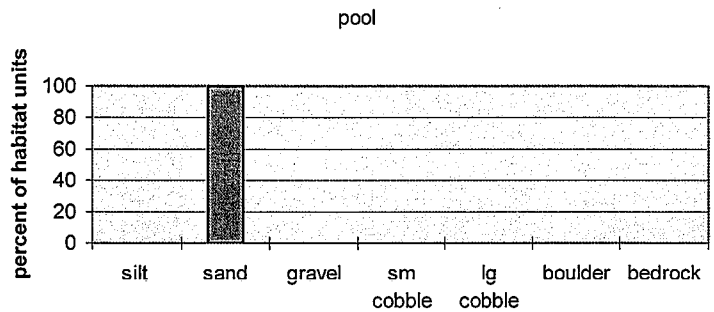


figure 2: Percent of pools by dominant substrate type

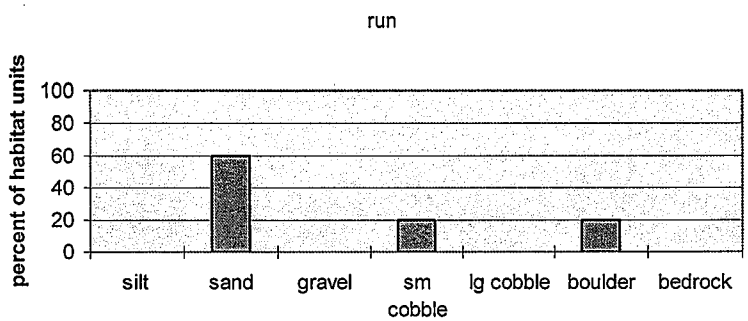


figure 3: Percent of runs by dominant substrate type.

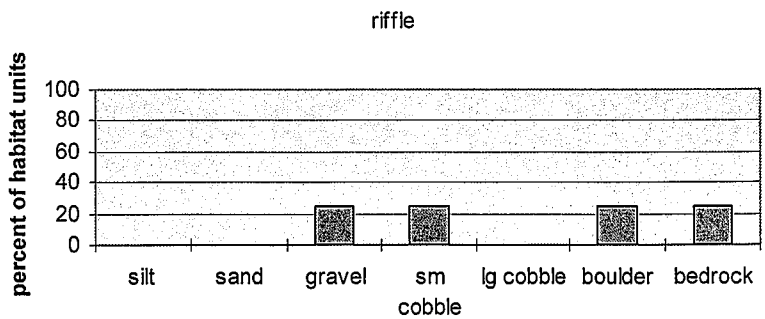


figure 4: percent of riffles by dominant substrate type

Vstar

Measurements of residual pool volume (V*) were completed for the 2 years in Deep Canyon Creek (table 2). The average pool in Deep Canyon Creek has 29.2% of its residual volume filled with fine sediment (stdev= 32.1%). As can be surmised from the standard deviation, this value is highly variable and may have no inherent value except that of a descriptive sense. In addition, it should be noted that only 1 pool was sampled in 1997. V* values per plot by meter location are summarized in figure 5. These values analyzed within the context of a baseline set of data may give an insight into long term trends of sediment fluxes based on management activities.

	1997	1996
Average (%)	27.9	29.2
stdev	na	32.1

table 2: summary of Vstar data for the period, 1994-1997.

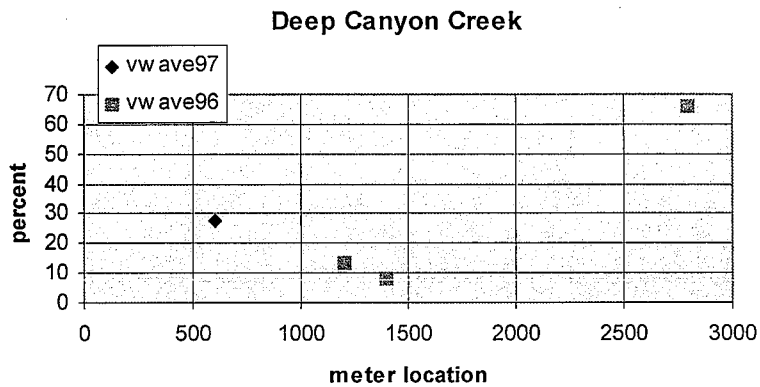


figure 5: percent of residual pool volume filled with sediment by meter location of plot.

Woody Debris

Another critical component of stream habitat is that of woody debris loading. Measurements of debris loading were completed for the 2 years in Deep Canyon Creek (table 3). Woody debris was tallied according to size and position in channel, and was mapped according to location within the stream plot. In addition, approximate size and position of debris jams was noted. Debris jams are defined as multiple pieces of woody debris acting as a single blockage to stream flow. Data from 1997 show that Deep Canyon Creek has 1.9 pieces of functional LWD (>20"), 5.7 pieces of functional medium woody debris (4-20"), 1.5 pieces of non-functional LWD, and 5.7 pieces of non-functional MWD per 100 feet of stream. On average, the creek has 1.5 debris jams per 100 feet of stream (stdev=1.8). Research suggests that woody debris plays a critical role in the formation of pools. The percentage of pools attributed to the presence of woody debris cannot be calculated for Deep Canyon Creek because only one pool was sampled in 1997. Little data exists on the range of debris loading found in Sierran streams. In terms of coastal streams of the Pacific Northwest, Deep Canyon Creek has high levels of woody debris loading. The assumptions imbedded within this comparison are most likely errant; however, the baseline set of data being formed is an important step in ascertaining an acceptable range in woody debris loading for Sierran streams.

year	functional 8-20"	functional >20"	non-functional 8-20"	non functional >20"
1997	5.7*	1.9	5.7*	1.5
1996	7.2	2.6	3.0	2.3

*1997 values represent debris in the 4-20" size class.

Table 3: summary of woody debris counts per 100 foot stream segment for the period of 1996 and 1997.

Stream Temperature

Stream temperature was monitored using Hobo temperature recording devices in Deep Canyon Creek during the summer months of 1996 following protocols approved by the Fish, Forests, and Farms Community Technical Committee (1996). Stream temperatures for all sites average 49.6 degrees F. Maximum temperatures range between 52.5-53.9 degrees F. Temperature data for 1996 at both sites is summarized in table 4. Stream temperature for the months of July through October for sites 1-2 are summarized in figure 6. Research in salmonid biology states that temperatures between 50-63.8 degrees F are optimum rearing temperatures for salmonids. Although trout have not been observed in the creek, conditions for their presence are presumed to be met. Deep Canyon Creek shows no sign of elevated stream temperatures that could have a negative impact on salmonid habitat.

year	site 1		site 2	
	Avg (°F)	Max(°F)	Avg (°F)	Max(°F)
1996	49.7	52.5	49.5	53.9

table 4: summary of average and maximum hobo stream temperatures over summer months, July-September.

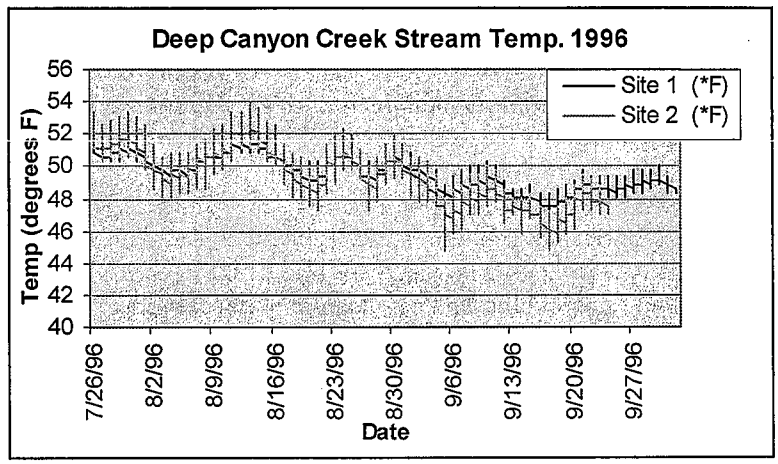


figure 6: Hobo stream temperature readings for 2 sites for the period of July-October,1996.

Vegetation

The vegetation along most of Deep Canyon Creek can be characterized as having a dense multi-layered canopy. Constituents of the Sierra Mixed Conifer group (except Black Oak) comprise the dominant overstory with heights ranging between 70 to 120 feet. The middle canopy layer is comprised of intermediate to suppressed Incense cedar, Big leaf maple, Alder, and Tan Oak in the 40 to 80 foot height class. The lower canopy layer is comprised of riparian components such as Pacific Yew, Dogwood, and Alder. This riparian component is particularly dense at the creek-side and becomes distinctively less prominent as distance from the creek increases. This riparian zone extends 40 to 60 feet on average from the stream channel. Canopy cover over the sampled length of the creek averages 92%, 54% of which is derived from deciduous trees while 38% is derived from evergreen constituents. Incident solar radiation on the creek surface measured using the Solar Pathfinder is approximately 1%. Dense moist conditions along the creek-side support the growth of multiple riparian understory species. These include various ferns, shrubs, and forbs that play an integral role in stabilizing stream banks. Cover of understory species along stream banks averages 69% over the sampled length of the creek. Common understory species include Western Azalea, Twin berry, Thimbleberry, Sierra Laurel, Boykinia, California Chestnut, and California Wood Fern.

Water Quality

Measures of water quality have been conducted for Deep Canyon Creek since 1996. The biotic elements sampled are total coliform, fecal coliform and fecal streptococci. In addition, chemical and mineral characteristics measured were pH, bicarbonate, calcium, magnesium, chlorine, zinc, nitrates, phosphorous, and water hardness. Tolerances for fecal coliform published in the Sacramento-San Joaquin Basin Plan (CRWQB, 1990) state that the fecal coliform concentration based on a minimum of 5 samples over a 30 day period shall not exceed a geometric mean of 200 MPN/100ml, nor shall more than 10% of the samples have values exceeding 400 MPN/100ml. The Sacramento-San Joaquin Basin Plan also lists acceptable limits for a variety of heavy metals including zinc. Acceptable ranges for phosphate and nitrate levels were published by Dunne and Leopold (1978) for forest lakes and rivers. Their findings state that total phosphate levels between .03 and .10 mg/l and nitrate levels between 0.1 to 0.5 mg/l are considered normal for uncontaminated forest streams. Dunne and Leopold noted that streams located within open grazing lands have levels of phosphate that are slightly higher. Data for both biotic and abiotic water quality sampling for 1996 and 1997 are summarized in Appendix B. Levels of phosphorous and nitrate for these two years fall within or below acceptable ranges for uncontaminated streams. It should be noted that the geometric mean for fecal coliform values for 1996 and 1997 fall below the 200 MPN/100ml value as stated by the Sacramento-San Joaquin Basin Plan. It should also be noted that because of a 200.5 MPN/100ml test ceiling in 1996, it is impossible to ascertain whether >10% of the fecal coliform samples were over the 400 MPN/100ml threshold and thus failed to meet the Basin Plan standards. This test ceiling was raised to 1600 MPN/100ml in 1997; however we are unable to ascertain with any certainty whether Deep Canyon Creek meets the Basin Plan standards for 1996.

Roads/Culverts

The Deep Canyon Creek watershed has undergone a series of road and culvert maintenance and replacement measures over the past 15 years. All class I stream crossings have been replaced within the past 15 years with culverts that are sized to 100 year flood event standards. All of these crossings have been armored and have designed failure points to prevent fill loss. During a possible 100 year storm event that occurred in January 1997, these culverts were estimated to be flowing at 85% to 90% of capacity. In addition, all road segments within 100 feet of the stream channel and/or deemed to be in a sensitive area have been abandoned. This process included removal of all drainage features, ripping, mulching, planting, and blockage of the abandoned section. Within the past fifteen years 1089 feet of road has been abandoned within the watershed while no new road segments have been built.

In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was last completed in 2003 and is scheduled for a remeasurement. Tonnes of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas, monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspice of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for the Deep Canyon watershed. This long term project includes creating a baseline set of data for both morphological and biological characteristics including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality (abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level.

DEEP CANYON CREEK
CUMULATIVE EFFECT ANALYSIS

A. Assumptions

1. Sensitive areas (riparian zones, inner gorge, landslides slopes >65% will not be disturbed).
2. The Forest Practices Act constitutes acceptable best management practices for individual THPs.
3. An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.
4. The risk of initiating SACE increases as this upper limit is closely approached or exceeded.
5. Regeneration, particularly site preparation, activities will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.
6. Land disturbing activities are distributed throughout the watershed in space and time.
7. Land disturbance (except roads) recovers completely over a 20 year span.

B. Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

C. SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
(ERA / Watershed Acres) x 100% = Percent ERA

DEEP CANYON CREEK (561 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	**ACRES**	**ERA Factor**	**% ERA**	**S % ERA**
Roads	9.3	1.0	1.7	1.7
Previous Decade Regen.	37	0.3	1.9	3.6
Previous Decade Selection/Thin	163	0.1	2.9	6.5
Previous Decade Overstory Removal	0	0.15	0	6.5
Next Decade Clearcut	0	0.3	0	6.5
Next Decade Selection/Thin	268	0.1	4.8	11.3
Next Decade Overstory Removal	0	0.15	0	11.3
Reserve	19.2	0	0	11.3
WLPZ	Na	0	0	11.3
TOTAL				**11.3**

Summary of water quality data for Deep Canyon Creek, 1996 and 1997.

	P(mg/l)	$N0_3$-N (mg/l)	HCO_3 (meq/l)	Ca (meq/l)	Mg (meq/l)	Cl (meq/l)	Zn (mg/l)	pH	Hard (grains/ gram)
Deep Canyon	<.05	<.05	.2	.1	.1	<.1	<.02	6.8	.45

Table 1: Summary of abiotic water quality data for 1 location on Deep Canyon Creek in 1996. Values are averages from 6 replicate samples taken within a 30 day period.

	Total Coliform (MPN/100ml)		Fecal Coliform (MPN/100ml)		Fecal Streptococci (MPN/100ml)	
	1996	1997	1996	1997	1996	1997
Deep Canyon 1	175.9*	108.6	74.1*	19.8	191	na

* Test ceiling for samples in 1996 was set at 200.5 MPN/100ml. This ceiling was raised to 1600 MPN/100 ml in 1997.

Table 2: Summary of biotic water quality data for 1 location on Deep Canyon Creek for 1996 and 1997

North Blodgett Watershed 2nd order subwatershed of Lower Pilot Creek planning watershed

Watershed Characteristics

North Blodgett watershed is a 2rd order watershed of approximately 446 acres. It comprises 4.5% of the 9819 acre Lower Pilot Creek state planning watershed # 5514.430401 59% of the North Blodgett watershed is managed by Blodgett Forest Research station with the remaining 41% owned by Sierra Pacific Industries and the U.S.F.S. Elevations over the watershed range from 3240' to 4440'. Slopes across the watershed average 30% ranging from 0 to 100% while those within the WLPZ bordering Pilot Creek average approximately 64 %. Soils across the watershed belong to the Holland, Bighill, and Musick series derived from granodiorite parent materials and McCarthy-Crozier series derived from andesitic lahar. All soil types have a maximum erosion hazard classified in the National Cooperative Soil Survey as moderate. Mass wasting events are small, and exceedingly rare in this watershed. The majority of the watershed is in TPZ zoning and dedicated to wildland research or natural resource management activities. The northern boundary of the North Blodgett watershed is defined by approximately 9000 feet of Pilot Creek. 32.5 acres (7.3%) of the watershed are designated in reserve status. All WLPZ areas are located within these reserve stands. These areas will receive little to no anthropogenic manipulation. Approximately 50.4 acres (11.3%) will not be harvested within the next decade. Therefore, approximately 18.6% of the watershed will receive little to no manipulation within the next 10 years. Approximately 6% of the watershed will be regenerated while 16.2% will receive some form of partial cutting. Results from an equivalent roaded area analysis state that the summed % ERA for the watershed is 9.1% (Threshold Significant Adverse Cumulative Effects levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at 20% ERA.). It should be noted that these values are based on speculation of land use activities of neighboring land owners.

The current vegetation condition of the area is a function of the disturbance history over the watershed. The watershed was grazed by William Bacchi circa 1880, particularly along the drainages. The majority of the watershed was heavily logged between 1901-1912 by the Michigan California Lumber Company. Evidence of narrow gauge railroad logging used during the time can still be found in the watershed. The North Blodgett watershed also shows evidence of extensive waterwork and canal construction. The original Georgetown Divide ditch was built through the central portion of the watershed circa 1852. Presently the Georgetown Divide Public Utility District municipal water conduit flows through the northern portion of the watershed after diverting water from both Pilot and Bacon Creek. This conduit is a class IV watercourse as defined by the California Forest Practice Rules: 14 CCR 956.5. The vegetation in the watershed can be classified into 3 states: 70 to 90 year old even aged mixed conifer stands (84%) regenerated from remnants of logging with a mature shrub component particularly in the less dense stands (WHR: SMC 4P/D); 6 to 20 year old even aged well stocked mixed species plantations (10%) with moderate to heavy shrub cover (SMC 2P-3D); and small residual stands (6%) of late seral characteristics (SMC 6).

The climate of the watershed is Mediterranean in character with warm dry summers and cool wet winters. The average annual precipitation for the North Blodgett watershed is 63 inches, 90% of which occurs between the months of October and April. Of this precipitation 15 to 20% occurs in the form of snow. Precipitation levels are characterized by great variation in both seasonal totals, intensity, and type. Most storm events are generated from Pacific fronts, are subject to jet-stream currents, and are cyclical in nature. The maximum 24 hour rainfall intensity measured over a 36 year period was 7.5 inches. The maximum 1 hour rainfall intensity was .8 inches. Extreme flood peaks can be generated in these areas when warm rains fall on transient snow packs. This occurred on January 1st and 2nd of 1997 when 10 inches of precipitation fell on 2 feet of snow within a 36 hour period. Data on air temperatures in the period between 1961-1996 for the month of January show that the average minimum temperature is 33°F. The average maximum temperature for January is 46°F. The average minimum temperature for the month of July is 59°F while the average maximum is 83°F.

Roads/Culverts

The North Blodgett watershed has undergone a series of road and culvert maintenance and replacement measures over the past 10 years. Several stream crossings have been replaced within the past 15 years with culverts that are sized to 100 year flood event standards. All Class II and higher crossings on Blodgett Forest have been armored and have been installed with designed failure points to prevent fill loss. All the culverts in this watershed on Blodgett Forest survived a possible 100 year storm event that occurred in January 1997. Within the past ten years, .4 acres of road have been constructed in the North Blodgett watershed. New road segments were constructed using dispersion devices (haybales, rocks, slash) at outlets of all drainage structures. This road is also graveled to further reduce sediment losses from the road surface.

In addition to proper maintenance which includes an annual fall inspection and cleaning of culverts, all roads within the watershed have undergone a road survey to quantify surface erosion. This survey was last completed in 2003 and is scheduled for a remeasurement. Tons of soil lost per acre of road was calculated by measuring rill width and depth along given transects on the road surface. Results from the road survey are used in designating sensitive areas,

monitoring road condition, and for scheduling road maintenance activities. Every permanent drainage device (culvert, rocked dip) has been geolocated by GPS. Each device is marked with a labeled post to facilitate annual inspections and maintenance.

Long Term Monitoring

As a field station under the auspice of the University of California, Blodgett Forest Research Station is actively involved in creating a long term monitoring program for the North Blodgett watershed. This long term project includes creating a baseline set of data for both morphological and biological characteristics of Pilot Creek including channel morphology, habitat typing, measures of sediment flux (Vstar), woody debris, stream temperature, water quality(abiotic and biotic), road surveys, and vegetation inventory. This data in conjunction with precipitation data, stream flow data, and trends in forest management may give an insight into processes at the watershed level.

APPENDIX A
NORTH BLODGETT WATERSHED
CUMULATIVE EFFECT ANALYSIS
A. Assumptions

1.Sensitive areas (riparian zones, inner gorge, landslides slopes >65% will not be disturbed).

2.The Forest Practices Act constitutes acceptable best management practices for individual THPs.

3.An upper limit of total watershed disturbance without significant adverse cumulative effects (SACE) exists.

4.The risk of initiating SACE increases as this upper limit is closely approached or exceeded.

5.Regeneration, particularly site preparation, activities will strive to maintain >50% cover of vegetation (live and dead) and >2mm stones.

6.Land disturbing activities are distributed throughout the watershed in space and time.

7.Land disturbance (except roads) recovers completely over a 20 year span.
B. Approach to SACE disturbance levels will be estimated by use of the equivalent road acre (ERA) system. ERA disturbance coefficients are developed which describe site effects in terms of the number of acres of road required to produce an equivalent effect averaged over a 20 year span.

Activity	ERA Coefficient
Unsurfaced Roads	1.00
Tractor Clearcut	0.30
Tractor Overstory Removal	0.15
Selection/Sanitation Salvage/Thin	0.10

C. SACE levels for relatively low sensitivity 2nd and 3rd order watersheds have been locally estimated at about 20% ERA.
(ERA / Watershed Acres) x 100% = Percent ERA

NORTH BLODGETT WATERSHED(446 ACRES) ERA (2011) PROJECTION (PERIOD 2001 TO 2021)

ACTIVITY	ACRES	ERA Factor	% ERA	Ś % ERA
Roads	10.1	1.0	2.3	2.3
Previous Decade Regen.	20 (SPI)	0.3	1.3	3.6
Previous Decade Selection/Thin	72	0.1	1.6	5.2
Previous Decade Overstory Removal	8	0.15	0.3	5.5
Next Decade Clearcut	12	0.3	0.8	6.3
Next Decade Selection/Thin	122	0.1	2.7	9.0
Next Decade Overstory Removal	0	0.15	0	9.0
Reserve	32.5	0	0	9.0
WLPZ	26.7	0	0	9.0
TOTAL				**9.0**

Blodgett Forest Research Station 2011 THP

SECTION V

Attachments

Item 17 Estimated Soil Erosion Hazard Worksheets	Page 192
RPF, Plan Submitter, Timberland Owner Responsibility Acknowledgement	Page 196
Letter to Plan Submitter	Page 198
Notice of Intent	Page 200
Item 12 land owners within 300 ft. of the THP	Page 201
Item 28 Proof of Publication	Page 202
Landowner Notification	Page 203
Response from Landowner	Page 208
10-year activity Maps	Page 211
LTO Contract	Page 219
Plants Found on Blodgett Forest	Page 231
Birds Found on Blodgett Forest	Page 238
Mammals Found on Blodgett Forest	Page 238
Reptiles Found on Blodgett Forest	Page 239
Amphibians Found on Blodgett Forest	Page 239
Northern Goshawk Survey, BFRS, July 2008	Page 240
BFRS Roads Report	Page 245

ITEM #17 ESTIMATED SOIL EROSION HAZARD CHART

Chart A. Compartments 151,251,280,360,370,371,420,530,553,560,561,563,640,and 653

ESTIMATED SURFACE SOIL EROSION HAZARD STATE OF CALIFORNIA RM-87 BOARD OF FORESTRY

SOIL FACTORS (by series): (4/84) A = Holland-Bighill: Comp 360,370,371,553,561,640,653 (Com. Thin); B = Holland-Bighill: 420 (Group Sel); C = Holland : Comp. 151,251,280,532,560,563 (Com. Thin.).

A. SOIL TEXTURE				FACTOR RATING BY AREA			
A.SOIL TEXTURE	Fine	Medium	Course	A	B	C	
1.DETACHABILITY	Low	Moderate	High				
rating	1-9	10-18	19-30	19	19	19	
2.PERMEABILITY	Slow	Moderate	Rapid				
rating	5-4	3-2	1	2	2	2	

B. DEPTH OF RESTRICTIVE LAYER							
	Shallow	Moderate	Deep				
	1-19 in	20-39 in	40-60 in				
rating	15-9	8-4	3-1	3	3	2	

C. PERCENT SURFACE COURSE FRAGMENTS GREATER THAN 2 mm IN SIZE INCLUDING ROCKS AND STONES												
	Low	Medium	High									
	10-39%	40-70%	71-100%									
rating	10-6	5-3	3-1	7	7	10	8		A	B	C	
SUBTOTAL =>									31	31	33	

II. SLOPE FACTOR Averages per compartment from 6 X 6 chain systematic samples,										
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	>71%				
rating	1-3	4-6	7-10	11-15	16-25	26-35	5	5	4	

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE							
	Low	Moderate	High			-	
	0-40%	41-80%	81-100%				
rating	15-8	5-3	3-1	3	4	3	

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)								
	Low	Moderate	High	Extreme				
	30-39	40-59	60-69	70-80				
rating	1-3	4-7	8-11	12-15	13	13	13	
TOTAL SUM OF FACTORS =>					52	53	53	

EROSION HAZARD RATING								
	<50	50-65	66-75	>75				
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)				
	THE DETERMINATION IS =>				M	M	M	

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ITEM #17 ESTIMATED SOIL EROSION HAZARD CHART
Chart B. Compartments 20, 40, 70, 100, 250, 431, 470, and 471

ESTIMATED SURFACE SOIL EROSION HAZARD STATE OF CALIFORNIA RM-87 BOARD OF FORESTRY

SOIL FACTORS (by series): (4/84) D = Holland-Musick: Comp 70, 100, 470, 471 (Single Tree Selection); E = Holland-Musick: Comp . 20, 40 (Group Selection.); F = Cohasset : Comp. 431 (Commercil Thin); G = Holand-Musick: Comp. 250 (Commercial Thin)

A. SOIL TEXTURE				FACTOR RATING BY AREA			
A.SOIL TEXTURE	Fine	Medium	Course	D	E	F	G
1.DETACHABILITY	Low	Moderate	High				
rating	1-9	10-18	19-30	19	19	17	19
2.PERMEABILITY	Slow	Moderate	Rapid				
rating	5-4	3-2	1	2	2	3	2

B. DEPTH OF RESTRICTIVE LAYER							
	Shallow	Moderate	Deep				
	1-19 in	20-39 in	40-60 in				
rating	15-9	8-4	3-1	3	3	2	3

C. PERCENT SURFACE COURSE FRAGMENTS GREATER THAN 2 mm IN SIZE INCLUDING ROCKS AND STONES												
	Low	Medium	High									
	10-39%	40-70%	71-100%									
rating	10-6	5-3	3-1	7	7	8	7		D	E	F	G
SUBTOTAL =>									31	31	30	31

II. SLOPE FACTOR Averages per compartment from 6 X 6 chain systematic samples,										
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	>71%				
rating	1-3	4-6	7-10	11-15	16-25	26-35	3	3	2	2

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE							
	Low	Moderate	High			-	
	0-40%	41-80%	81-100%				
rating	15-8	5-3	3-1	3	4	3	3

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)								
	Low	Moderate	High	Extreme				
	30-39	40-59	60-69	70-80				
rating	1-3	4-7	8-11	12-15	13	13	13	13
TOTAL SUM OF FACTORS =>					50	51	48	49

EROSION HAZARD RATING								
	<50	50-65	66-75	>75				
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)				
	THE DETERMINATION IS =>				M	M	L *	L *

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*** F (compartment 431) and G (compartment 250) will be treated as Moderate Erision Hazard for this Timber Harvest Plan.**

ITEM #17 ESTIMATED SOIL EROSION HAZARD CHART

Chart C. Compartments 160, 230, 270, and 540

ESTIMATED SURFACE SOIL EROSION HAZARD STATE OF CALIFORNIA RM-87 BOARD OF FORESTRY

SOIL FACTORS (by series): (4/84) H = Holland-Bighill: Comp 540 (Selection); I = Holland: Comp 270 (Group Sel); J = Holland : Comp. 160, 230 (Selection).

A. SOIL TEXTURE				FACTOR RATING BY AREA		
A.SOIL TEXTURE	Fine	Medium	Course	H	I	J
1.DETACHABILITY	Low	Moderate	High			
rating	1-9	10-18	19-30	19	19	19
2.PERMEABILITY	Slow	Moderate	Rapid			
rating	5-4	3-2	1	2	2	2

B. DEPTH OF RESTRICTIVE LAYER						
	Shallow	Moderate	Deep			
	1-19 in	20-39 in	40-60 in			
rating	15-9	8-4	3-1	3	2	2

C. PERCENT SURFACE COURSE FRAGMENTS GREATER THAN 2 mm IN SIZE INCLUDING ROCKS AND STONES										
	Low	Medium	High							
	10-39%	40-70%	71-100%							
rating	10-6	5-3	3-1	7	10	10		H	I	J
SUBTOTAL =>								31	33	33

II. SLOPE FACTOR Averages per compartment from 6 X 6 chain systematic samples,									
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	>71%			
rating	1-3	4-6	7-10	11-15	16-25	26-35	5	3	6

III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE						
	Low	Moderate	High			-
	0-40%	41-80%	81-100%			
rating	15-8	5-3	3-1	3	4	3

IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)							
	Low	Moderate	High	Extreme			
	30-39	40-59	60-69	70-80			
rating	1-3	4-7	8-11	12-15	13	13	13
TOTAL SUM OF FACTORS =>					52	53	55

EROSION HAZARD RATING							
	<50	50-65	66-75	>75			
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)			
	THE DETERMINATION IS =>				M	M	M

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ITEM #17 ESTIMATED SOIL EROSION HAZARD CHART

Chart D. Compartments 90 and 530

ESTIMATED SURFACE SOIL EROSION HAZARD STATE OF CALIFORNIA RM-87 BOARD OF FORESTRY

SOIL FACTORS (by series): (4/84) K = Holland-Musick: Comp 90 (Clearcut); L = Holland : Comp. 530 (Clearcut); M = Holland: 150 (Shelter Wood Removal)

A. SOIL TEXTURE				FACTOR RATING BY AREA							
A.SOIL TEXTURE	Fine	Medium	Course	K	L	M					
1.DETACHABILITY	Low	Moderate	High								
rating	1-9	10-18	19-30	19	19	19					
2.PERMEABILITY	Slow	Moderate	Rapid								
rating	5-4	3-2	1	2	2	2					
B. DEPTH OF RESTRICTIVE LAYER											
	Shallow	Moderate	Deep								
	1-19 in	20-39 in	40-60 in								
rating	15-9	8-4	3-1	3	2	2					
C. PERCENT SURFACE COURSE FRAGMENTS GREATER THAN 2 mm IN SIZE INCLUDING ROCKS AND STONES											
	Low	Medium	High								
	10-39%	40-70%	71-100%								
rating	10-6	5-3	3-1	7	10	10			K	L	M
SUBTOTAL =>									31	33	33
II. SLOPE FACTOR	Averages per compartment from 6 X 6 chain systematic samples,										
Slope	5-15%	16-30%	31-40%	41-50%	51-70%	>71%					
rating	1-3	4-6	7-10	11-15	16-25	26-35			6	5	5
III. PROTECTIVE VEGETATIVE COVER REMAINING AFTER DISTURBANCE											
	Low	Moderate	High								-
	0-40%	41-80%	81-100%								
rating	15-8	5-3	3-1						9	9	5
IV. TWO-YEAR, ONE-HOUR RAINFALL INTENSITY (Hundredths Inch)											
	Low	Moderate	High	Extreme							
	30-39	40-59	60-69	70-80							
rating	1-3	4-7	8-11	12-15					13	13	13
TOTAL SUM OF FACTORS =>									59	60	56
EROSION HAZARD RATING											
	<50	50-65	66-75	>75							
	LOW (L)	MODERATE (M)	HIGH (H)	EXTREME (E)							
THE DETERMINATION IS =>									M	M	M

7540-130-0435

MAY 5 2011

State of California
Department of Forestry and Fire Protection

(Administrative Use Only-Area_____)
(Plan No._____)
(Date Received_____)
(Amendment Number_____)

LICENSED TIMBER OPERATOR RESPONSIBILITY ACKNOWLEDGEMENT

(As per 14 CCR §§ 1035.3(a)(1)-(2), 1092.14(a)(1)-(2).)

Harvesting Plan Number: _____

Licensed Timber Operator Information

Name: _____UNKNOWN AT THIS TIME_____

Street Address/PO Box: _____ City: _____ Zip Code: _____

Telephone Number: _____ LTO Number: _____

I hereby agree to abide by the terms and specifications of the plan. I have read and understand my responsibility as LTO, as described under 14 CCR §§ 1022.4, 1090.12 and 1092.14. I agree to fulfill my responsibilities as an LTO as they pertain to this plan.

LTO Signature: _____Title: _____

Responsible On-Site Contact (if different)

Name: _____

Printed Name: _____ Date: _____

Street Address/PO Box: _____ City: _____ Zip:_____

Telephone Number: _____

REGISTERED PROFESSIONAL FORESTER (RPF) RESPONSIBILITY ACKNOWLEDGEMENT

(As per Section 1035.1 Title 14, CCR)

RPF Certified to Provide Professional Advice:

Name: Ken Somers

Street Address/PO Box: 4501 Blodgett Forest Road City: Georgetown Zip Code: 95634

Telephone Number: 530-333-4475 RPF Number: 2381

As of January 1, 2001, I have read and understand my responsibility as RPF, as described under 14 CCR 1035.1(a-g). I agree to fulfill my responsibilities as an RPF as they pertain to this plan.

[X] Yes [ ] No I have been retained as the RPF, available to provide professional advice to the licensed timber operator and timberland owner upon request throughout the active timber operations regarding: (1) the plan, (2) the forest practice rules, (3) and other associated regulations pertaining to timber operations.

RPF Signature: _____

PLAN SUBMITTER RESPONSIBILITY ACKNOWLEDGEMENT

(As per Section 1035 Title 14, CCR)

Plan Submitter

Name: Robert A. York, Forest Manager, University of California Berkeley, Center for Forestry

Street Address/PO Box: 4501 Blodgett Forest Road City: Georgetown Zip Code: 95634

Telephone Number: 530-333-4475

As of January 1, 2001, I have read and understand my responsibilities as Plan Submitter as described under 14 CCR 1035. I certify that I have fulfilled my legal obligation as stated in the forest practice rules, and agree to fulfill my responsibility as the plan submitter as it pertains to this plan.

[X] Yes [ ] No I have retained the services of an RPF to provide professional advice to the LTO and timberland owner upon request throughout active timber operations regarding: (1) the plan, (2) the forest practice rules, (3) and other associated regulations pertaining to timber operations.

[ ] Yes [X] No I have authorized the timberland owner, _____ to perform the services of a professional forester, understanding that the services will be provided personally on lands owned by the timberland owner.

Plan Submitter Signature: _____

TIMBERLAND OWNER RESPONSIBILITY ACKNOWLEDGEMENT

(As per Section 1035(d)(2)(B) Title 14, CCR)

Timberland Owner

Name: University of California, Center for Forestry, Blodgett Forest Research Station

Street Address/PO Box: 4501 Blodgett Forest Road City: Georgetown Zip Code: 95634

Telephone Number: 530-333-4475

As of January 1, 2001, I have read and understand my responsibilities as timberland owner as described under 14 CCR 1035(d)(2)(A – C). I certify that I have fulfilled my legal obligation as stated in the forest practice rules, and agree to fulfill my responsibilities as the timberland owner as it pertains to this plan.

I understand that I have been authorized by the plan submitter to perform the services of a professional forester pursuant to the Landowner exception in Public Resources Code Section 757, and such services will be personally performed only on those lands that I own.

Timberland Owner's Signature: _____

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COLLEGE OF NATURAL RESOURCES
CENTER for FORESTRY
BLODGETT FOREST RESEARCH STATION

phone: 530-333-4475
Fax: 530-333-2012
e-mail: ksomers@berkeley.edu

01/07/11

Robert York
Forest Manager, Center for Forestry
4501 Blodgett Forest Road
Georgetown, CA 95634-9255

Dear Mr. York:

I am writing to inform you of your responsibilities as plan submitter for the 2011 Blodgett Forest Timber Harvest Plan (THP in preparation). Your responsibilities are described in the California Forest Practice Rules, the text of which I have provided below.

I will provide you with a copy of the THP prior to submitting for your signature.

Sincerely,

Ken Somers,
Registered Professional Forester #2381
Center for Forestry
Blodgett Forest Research Station

Attachment: **1035 Plan Submitter Responsibility**

ATTACHMENT:

Title 14, California Code of Regulations

1035 Plan Submitter Responsibility

The plan submitter, or successor in interest, shall:

(a) Ensure that an RPF conducts any activities which require an RPF.

(b) Provide the RPF preparing the plan or amendments with complete and correct information regarding pertinent legal rights to, interests in, and responsibilities for land, timber, and access as these affect the planning and conduct of timber operations.

(c) Sign the THP certifying knowledge of the plan contents and the requirements of this section.

(d) **(1)** Retain an RPF who is available to provide professional advice to the LTO and timberland owner upon request throughout the active timber operations regarding:

A) the plan,

B) the Forest Practice Rules, and

C) other associated regulations pertaining to timber operations,

(2) The plan submitter may waive the requirement to retain an RPF to provide professional advice to the LTO and timberland owner under the following conditions:

A) the plan submitter provides authorization to the timberland owner to provide advice to the LTO on a continuing basis throughout the active timber operations provided that the timberland owner is a natural person who personally performs the services of a professional forester and such services are personally performed on lands owned by the timberland owner;

B) the timberland owner agrees to be present on the logging area at a sufficient frequency to know the progress of operations and advise the LTO, but not less than once during the life of the plan; and

C) the plan submitter agrees to provide a copy of the portions of the approved THP and any approved operational amendments to the timberland owner containing the General Information, Plan of Operations, THP Map, Yarding System Map, Erosion Hazard Rating Map and any other information deemed by the timberland owner to be necessary for providing advice to the LTO regarding timber operations.

(3) All agreements and authorizations required under 14 CCR § 1035(d)(2) shall be documented and provided in writing to the Director to be included in the plan.

(e) Within five working days of change in RPF responsibilities for THP implementation or substitution of another RPF, file with the Director a notice which states the RPF's name and registration number, address, and subsequent responsibilities for any RPF required fieldwork, amendment preparation, or operation supervision. Corporations need not file notification because the RPF of record on each document is the responsible person.

(f) Provide a copy of the portions of the approved THP and any approved operational amendments to the LTO containing the General Information, Plan of Operations, THP Map, Yarding System Map, Erosion Hazard Rating Map and any other information deemed by the RPF to be necessary for timber operations .

(g) Notify the Director prior to commencement of site preparation operations. Receipt of a burning permit is sufficient notice.

(h) Disclose to the LTO, prior to the start of operations, through an on-the-ground meeting, the location and protection measures for any archaeological or historical sites requiring protection if the RPF has submitted written notification to the plan submitter that the plan submitter needs to provide the LTO with this information.

NOTICE OF INTENT TO HARVEST TIMBER

A Timber Harvesting Plan (Plan) or Amendment has been submitted to the California Department of Forestry & Fire Protection (CAL FIRE). CAL FIRE will be reviewing the proposed timber operation for compliance with State law and rules of the Board of Forestry and Fire Protection. The following briefly describes the proposed timber operation and where and how to get more information. In accordance with the timeline stated under Public Resources Code Section 4582.7, you may submit written public comments on the Plan or Amendment for CAL FIRE to consider.

This notice applies to (select one below):

[X] New Timber Harvesting Plan [ ] Amendment to an Approved Timber Harvesting Plan

Applicant Information (Timberland Owner(s), Registered Professional Forester who prepared the plan and Plan Submitter should match those listed in the plan or amendment.)

1. The name(s) of the Timberland Owner(s) where timber operations are to occur: **U C Berkeley, Center for Forestry, BFRS**

2. Registered Professional Forester who prepared the plan or amendment: **Ken Somers, RPF 2381**

   Registered Professional Forester Phone (optional): **530 333-4475 UCB, Center for Forestry, Blodgett Forest Research Station**

3. The name of the Plan or Amendment Submitter: **Robert A. York, Forest Manager, U C Berkeley, Center for Forestry, BFRS**

Project Summary (County, legal description, acres proposed to be harvested and treatments to be used should match those listed in the plan or amendment.)

4. Location of the proposed timber operation (county, legal description, approximate direction & approximate distance of the timber operation from the nearest community or well-known landmark):
   El Dorado County, Portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21, T12N, R12E, Mount Diablo B&M,
   approximately 12 miles east of Georgetown via Wentworth Springs Road.

5. The name of, and distance from, the nearest perennial stream and major watercourse flowing through or downstream from the timber operation:
   Gaddis Creek Flows through the southern portion of the plan and is adjacent to compartment 640. Mutton Creek, a tributary to Pilot Creek, flows through the northern portion of the plan and is adjacent to compartments 160, 360, 370 & 371.

6. Acres proposed to be harvested: **808**

7. The regeneration methods and intermediate treatments to be used:
   319 acres Commercial Thinning, 243ac. Selection, 196ac. Group Selection, 18ac. Shelterwood Removal Step, 32ac. Clearcut.

8. [X] Yes [ ] No Is there a known overhead power line, except lines from transformers to service panels, within the plan area?

Public Information: The review times allowed for CAL FIRE to review the proposed timber operation are variable in length, but limited. To ensure CAL FIRE receives your comments please read the following:

The estimated earliest possible date CAL FIRE may **APPROVE** the Plan or Amendment is: **03/31/2011**
(This date is 15 calendar days from receipt of the Plan or Amendment by CAL FIRE, except in counties for which special rules have been adopted where the earliest date is 45 calendar days after receipt.)

NOTE: THE ESTIMATED EARLIEST APPROVAL DATE IS PROBABLY NOT THE ACTUAL APPROVAL DATE. Normally, a much longer period of time is available for public comment and preparation of CAL FIRE's responses to public comments. Please check with CAL FIRE, prior to the above listed date, to determine the actual date that the public comment period closes.

The public may review, or purchase a copy of, the Plan or Amendment at the CAL FIRE Review Team Office shown below. The cost to obtain a copy is 10 cents for each page, $2.50 minimum per request. The cost to obtain a copy of this plan or amendment is: _____
(to be completed by CAL FIRE upon receipt of plan).

Questions or concerns regarding this plan should be directed to the CAL FIRE Review Team Office shown below or emailed to **FresnoPublicComment@fire.ca.gov** for incorporation into an Official Response Document. Please include the plan number on all correspondence.

Forest Practice Program Manager
CAL FIRE
1234 East Shaw Avenue
Fresno, CA 93710
(559) 222-3714

The plan may be viewed online at ftp://thp.fire.ca.gov/THPLibrary/Sierra_Southern_Region

A map showing the approximate boundary of the THP area, a map legend, and a scale is attached to help in locating where the proposed timber operation is to occur.

For CAL FIRE Use Only

Timber Harvest Plan Number: 2011 THP Date of Receipt:

ITEM #12: NOTICE OF INTENT (NOI on pg. 200 was sent with notification letters on 12/10/10. The NOI posted and submitted with the THP has an earliest approval date of 4/20/11, not 3/31/11.)

Landowners within 300 feet of proposed Timber Harvest Plan:

Mr. Palmer, Trustee
The Davis Trusts
108 Rock Canyon Ct.
Folsom, Ca. 95630

Rich Wade, Manager
Sierra Pacific Industries
PO Box 680
Camino, CA 95709

USDA Forest Service
El Dorado National Forest
Georgetown Ranger District
7600 Wentworth Springs Road
Georgetown, CA 95634

Mr. Phillip Fischbach
The Davis Trust
2624 Riviera Circle
El Dorado Hills, CA 95762

Mr. Palmer is no longer the Davis Trusts contact, Mr. Fischbach is. (See attached correspondence following letters)

Letters, a THP Map and a Notice of Intent were sent to each of the above parties. This information was also sent, out of courtesy, to the Georgetown Divide Public Utilities District and the Quintette Service Corporation.

ITEM #28 LANDOWNER NOTIFICATION:
All neighbors were notified via letter (copies below) of our proposed timber harvest plan, whether located 1000 feet downstream or not. Mr. Phillip Fischbach did respond (copy below). He confirmed that the proposed timber operations would not affect their water.

A request for information was also published in the Georgetown Gazette (copy below, and proof of publication on the following page) with no responses yet received.

NOTICE OF TIMBER OPERATION AND REQUEST FOR INFORMATION

Blodgett Forest Research Station is preparing a Timber Harvest Plan for portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21, Township 12N, Range 12E, MDB&M of Blodgett Forest. Effected watercourses are Gaddis Creek, as well as three tributaries of Pilot Creek: Mutton, Bacon, and an unamed creek. Blodgett Forest is roughly 12 miles east of Georgetown via Wentworth Spring Road. Anyone owning or accessing a domestic water source within 1000 feet of these Sections is asked to advise Blodgett Forest of the domestic water source location within 10 days of this publication date so that appropriate mitigations can be incorporated into the Harvest Plan to fully protect the beneficial uses of water.

Ken Somers RPF# 2381
Blodgett Forest Research Station
4501 Blodgett Forest Road
Georgetown, CA 95634
Tel (530)333-4475
e-mail: bfrs@berkeley.edu

This space for the County Clerk's Filing Stamp

GEORGETOWN GAZETTE

PROOF OF PUBLICATION
(2015.5 C.C.P.)

Proof of Publication of:

STATE OF CALIFORNIA
County of El Dorado

I am a citizen of the United States and a resident of the County aforesaid; I'm over the age of eighteen years, and not a party to or interested in the above-entitled matter. I am a principal agent of and/or the publisher of the El Dorado Gazette, Georgetown Gazette & Town Crier, a newspaper of general circulation printed and published once each week in the town of Georgetown, Ponderosa Judicial District, County of El Dorado, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court to the County of El Dorado, State of California, under the date of April 3, 1970, Case Number 18589; that the notice, of which the attached is a printed copy (set in type no smaller than non-pareil), has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to-wit:

1/20

All in the year 2011

I certify (or declare) under penalty of perjury that the foregoing is true and correct.
Dated at Placerville, California, this
day of **January 20, 2011**

P. Donell
Signature

NOTICE OF TIMBER OPERATION AND REQUEST FOR INFORMATION

Blodgett Forest Research Station is preparing a Timber Harvest Plan for portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21, Township 12N, Range 12E, MDB&M of Blodgett Forest. Effected watercourses are Gaddis Creek, as well as three tributaries of Pilot Creek: Mutton, Bacon, and an unnamed creek. Blodgett Forest is roughly 12 miles east of Georgetown via Wentworth Spring Road. Anyone owning or accessing a domestic water source within 1000 feet of these Sections is asked to advise Blodgett Forest of the domestic water source location within 10 days of this publication date so that appropriate mitigations can be incorporated into the Harvest Plan to fully protect the beneficial uses of water.

Ken Somers RPF# 2381
Blodgett Forest Research Station
4501 Blodgett Forest Road
Georgetown, CA 95634
Tel (530)333-4475
e-mail: bfrs@berkeley.edu

01/20 02532162

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BLODGETT FOREST RESEARCH STATION

4501 Blodgett Forest Road
Georgetown, CA 95634-9225

Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Patrica Trimble, District Ranger
USFS Georgetown Ranger District
7600 Wentworth Springs Road
Georgetown, CA 95634

Dear Ms. Trimble,

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N, Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations.

A review of our 2008 records indicates that you do not have any domestic water supplies within 1,000 feet of the proposed operations. If this is not correct we need to hear from you in order to properly design the timber harvest to fully protect domestic water supplies.

Enclosed is a Notice of Timber Harvesting Operations which gives a general legal description as well as acreage involved and planned silvicultural regeneration methods to be utilized. Also enclosed is a map showing the location of the operations.

The Forest Practice Regulations provide you with ten days to advise us about the existence of domestic water supply sources. Please direct your response to the above address.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions of the area. Specifically, we are interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality and recreational value. Since you and many of your employees have intimate knowledge of most of the Georgetown Divide area, we would appreciate knowing your views on changes in the above conditions, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station

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4501 Blodgett Forest Road
Georgetown, CA 95634-9225

Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Rich Wade, Manager
Sierra Pacific Industries
PO Box 680
Camino, CA 95709

Hi Rich,

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations, however we are also interested in any other information that you can provide that will help us in the development of our Cumulative Affects section of this THP.

A review of our 2008 records indicates that you do not have any domestic water supplies within 1,000 feet downstream of the proposed operations. As you know, if this is not correct we need to hear from you in order to properly design the timber harvest to fully protect domestic water supplies.

Enclosed is a Notice of Timber Harvesting Operations which gives a general legal description as well as acreage involved and planned silvicultural regeneration methods to be utilized. Also enclosed is a map showing the location of the operations. The Forest Practice Regulations provide you with ten days to advise us about the existence of domestic water supply sources. Please direct any response to the above address.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions of the area. Please let us know about any none proprietary information that you have about any proposed operations that your company is planning in the Lower Pilot Creak or Gaddis Creek state planning watersheds. We are also interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality and recreational value. Since you and many of your employees have intimate knowledge of most of the Georgetown Divide area, we would appreciate knowing your views on changes in the above conditions, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station

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4501 Blodgett Forest Road
Georgetown, CA 95634-9225

Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Quintette Service Corporation
P.O. Box 1535
Georgetown, CA 95634

Dear Quintette Service Corporation:

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N, Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations. No Portion of this year's operation occurs upstream of your domestic water source, but we always like to inform our neighbors of our activities

Enclosed is a Notice of Timber Harvesting Operations which gives a general legal description as well as acreage involved and planned silvicultural regeneration methods to be utilized. Also enclosed is a map showing the locations of the operation. The Forest Practice Regulations provide you with ten days to advise us about the existence of any other domestic water supply sources or concerns. Please direct any response to the above address.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions of the area. Specifically, we are interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality, and recreational value. Since the Quintette Service Corporation has a vital interest in the watersheds near Blodgett Forest, we would appreciate knowing your views on watershed conditions, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station

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4501 Blodgett Forest Road
Georgetown, CA 95634-9225

Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Henry White
Georgetown Divide Public Utilities District
PO Box 4240
Georgetown, CA 95634

Dear Mr. White:

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N, Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations. This current Harvest Plan doesn't contain any harvest areas with 1000 feet of the utility districts water supply channel, but we like to keep our neighbors informed of our operations.

Enclosed is a Notice of Intent to Harvest Timber which gives a general legal description as well as acreage involved and planned silvicultural regeneration methods to be utilized. Also enclosed is a map showing the location of the operations.

The Forest Practice Regulations provide you with ten days to advise us about the existence of any additional domestic water supply sources. Please direct your responses to the above address. If you have any concerns about the proposed operations, please give us a call and we will arrange a time when we can meet on site and look directly at the areas involved.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions or the area. Specifically, we are interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality and recreational value. Since the Georgetown Public Utility District has a vital interest in the watersheds of the Georgetown Divide area, we would appreciate knowing your views on watershed conditions, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station

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Georgetown, CA 95634-9225

Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Mr. Palmer, Trustee
The Davis Trust
108 Rock Canyon Ct.
Folsom, CA 95630

Dear Mr Palmer

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N, Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations.

A review of our 2008 records indicates that you do not have any domestic water supplies within 1,000 feet of the proposed operations along Mutton Creek. If this is not correct we need to hear from you in order to properly design the timber harvest to fully protect domestic water supplies.

Enclosed is a map showing the location of the proposed harvest units and the type of harvesting method to be used. Compartment 160 is adjacent to the southern portion of your property in Section 4 and the operations in it are the only ones that are likely to affect your property in any way. Also enclosed is a Notice of Timber Harvesting Operations which gives a general legal description as well as acreage involved.

The Forest Practice Regulations provide you with ten days to advise us about the existence of domestic water supply sources. Please feel free to contact me by phone, e-mail, or mail if our information is wrong or if you have any other questions about the proposed operations.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions of the area. Specifically, we are interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality and recreational value. Since many of the Davis Trusts family members use the area for recreation, we would appreciate knowing your views on changes in visual quality and recreational value, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station

Ken,

I have reviewed the attached document dated 12/10/10 regarding the subject Timber Harvesting Plan. Both the primary and secondary water supply sources for our cabin are located within the Pilot Creek watershed (see attached plan) and will be unaffected by your timber operations in the Mutton Creek watershed. We take no exceptions to your Timber Harvesting Plan.

Relative to the last paragraph of your letter, our family continues to appreciate the relations we have maintained with the Blodgett operations and management over the years. One immediate point of interest to us relates to our access through your property on Bacchi Ranch Road. As you are aware, Blodgett conducted some selective logging in this area last year resulting in 2 burn piles. We will be having a family wedding (Sarah Fischbach) at our cabin on June 4, 2011. Anything that you could do to clean up the residual burn piles, prior to that date, would be appreciated.

Lastly, your letter to us was addressed to Mr. Palmer, Trustee. Since Virginia has passed on and Frank Palmer is no longer a part of the trust, I would suggest that future correspondence of this nature be sent to me. My contact information is as follows.

Phillip Fischbach
2624 Riviera Circle
El Dorado Hills, Ca. 95762
(916) 933-2910 (home)
(916) 952-5391 (cell)

Thank you for this information. Please feel free to contact me if you have questions or comments on this subject.

Phil

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Phone: (530) 333-4475
Fax: (530) 333-2012
e-mail: ksomers@berkeley.edu

12/10/10

Mr. Palmer, Trustee
The Davis Trust
108 Rock Canyon Ct.
Folsom, CA 95630

Dear Mr Palmer

Please be advised that we are preparing our 2011 timber harvesting project at Blodgett Forest. This project will take place in portions of Sections 5, 7, 8, 9, 16, 17, 20 and 21 of Township 12N, Range 12E, Mount Diablo Base and Meridian. State law requires us to notify landowners within 1,000 feet downstream from the proposed operations. The purpose of the notification is to determine if there are any domestic water supplies within 1,000 feet of the operations.

A review of our 2008 records indicates that you do not have any domestic water supplies within 1,000 feet of the proposed operations along Mutton Creek. If this is not correct we need to hear from you in order to properly design the timber harvest to fully protect domestic water supplies.

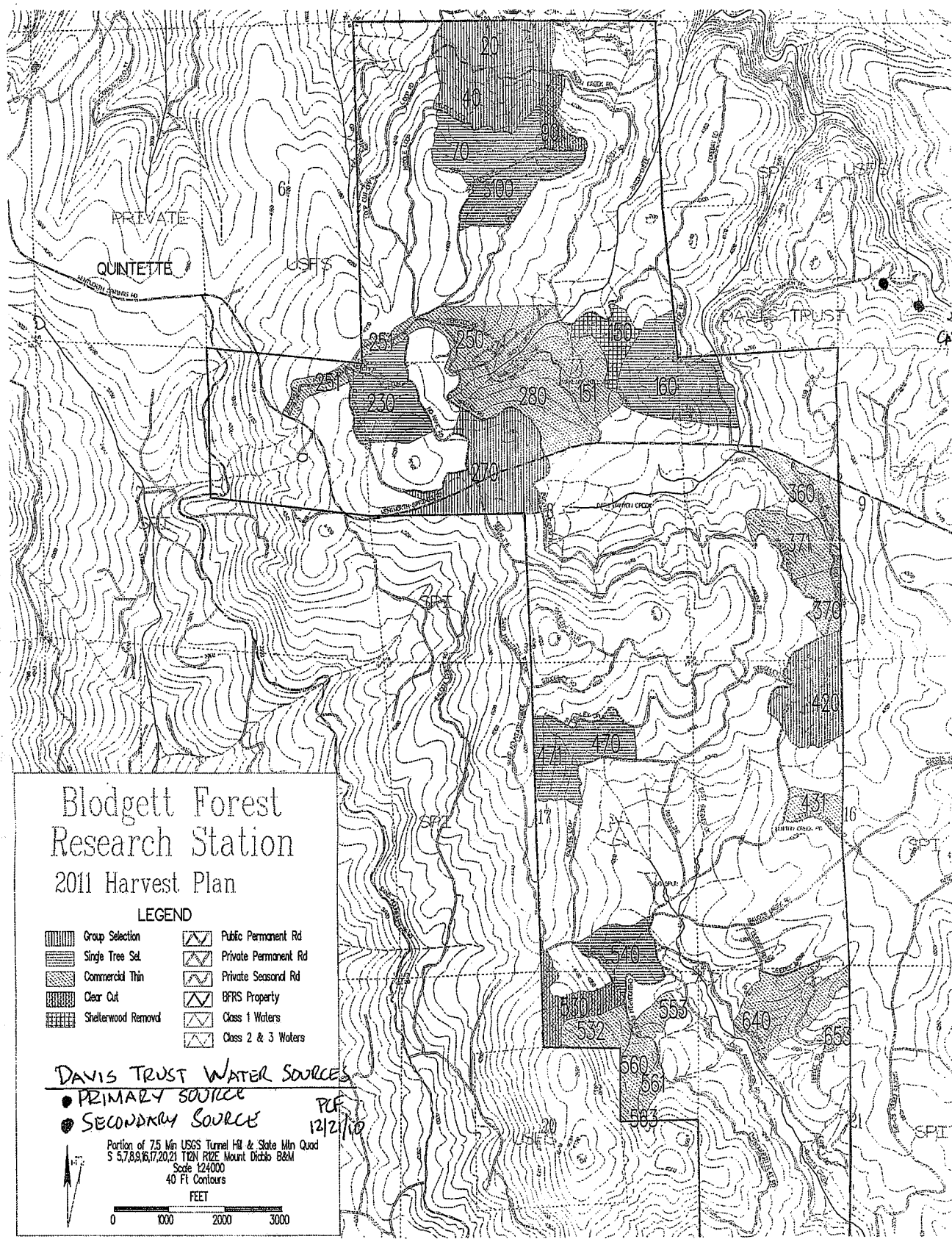
Enclosed is a map showing the location of the proposed harvest units and the type of harvesting method to be used. Compartment 160 is adjacent to the southern portion of your property in Section 4 and the operations in it are the only ones that are likely to affect your property in any way. Also enclosed is a Notice of Timber Harvesting Operations which gives a general legal description as well as acreage involved.

The Forest Practice Regulations provide you with ten days to advise us about the existence of domestic water supply sources. Please feel free to contact me by phone, e-mail, or mail if our information is wrong or if you have any other questions about the proposed operations.

As part of the increased scope of our analysis of the cumulative effects our activities have on the local region, we are soliciting comments (positive and negative) from our neighbors on the general conditions of the area. Specifically, we are interested in any observations you may have on trends in wildlife abundance, watershed condition, visual quality and recreational value. Since many of the Davis Trusts family members use the area for recreation, we would appreciate knowing your views on changes in visual quality and recreational value, as well as any other comments you may want to make.

Sincerely,

Ken Somers
Registered Professional Forester
Blodgett Forest Research Station


Blodgett Forest
Research Station
2011 Harvest Plan
LEGEND
Group Selection
Single Tree Sel.
Commercial Thin
Clear Cut
Shelterwood Removal
Public Permanent Rd
Private Permanent Rd
Private Seasonal Rd
BFRS Property
Class 1 Waters
Class 2 & 3 Waters
DAVIS TRUST WATER SOURCES
PRIMARY SOURCE
SECONDARY SOURCE
PCF 12/2/10
Portion of 7.5 Min USGS Tunnel Hill & Slate Mtn Quad
S 5,7,8,9,16,17,20,21 T12N R12E Mount Diablo B&M
Scale 1:24000
40 Ft Contours
FEET
0 1000 2000 3000
PRIVATE
QUINTETTE
USFS
DAVIS TRUST
SPIT
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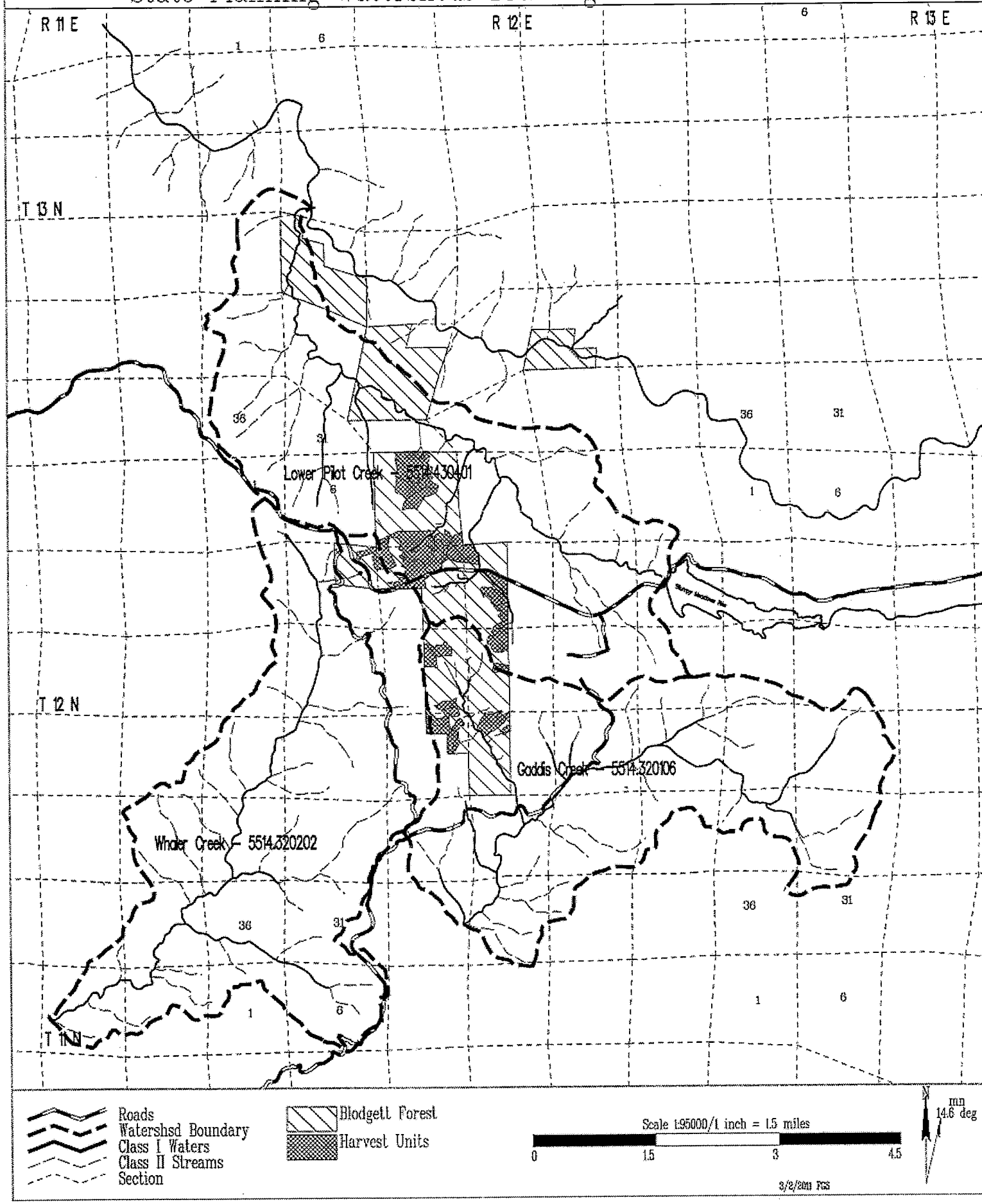
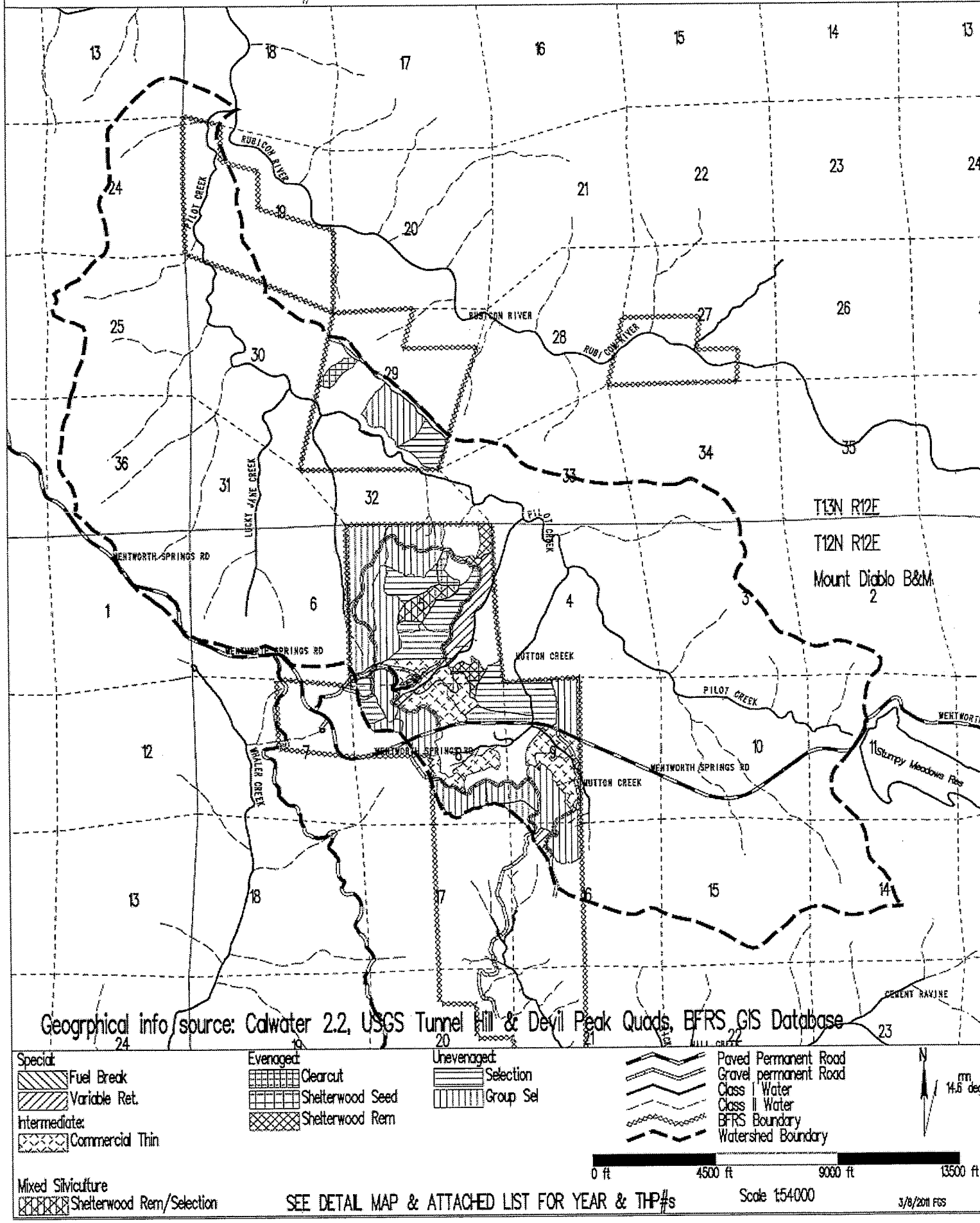
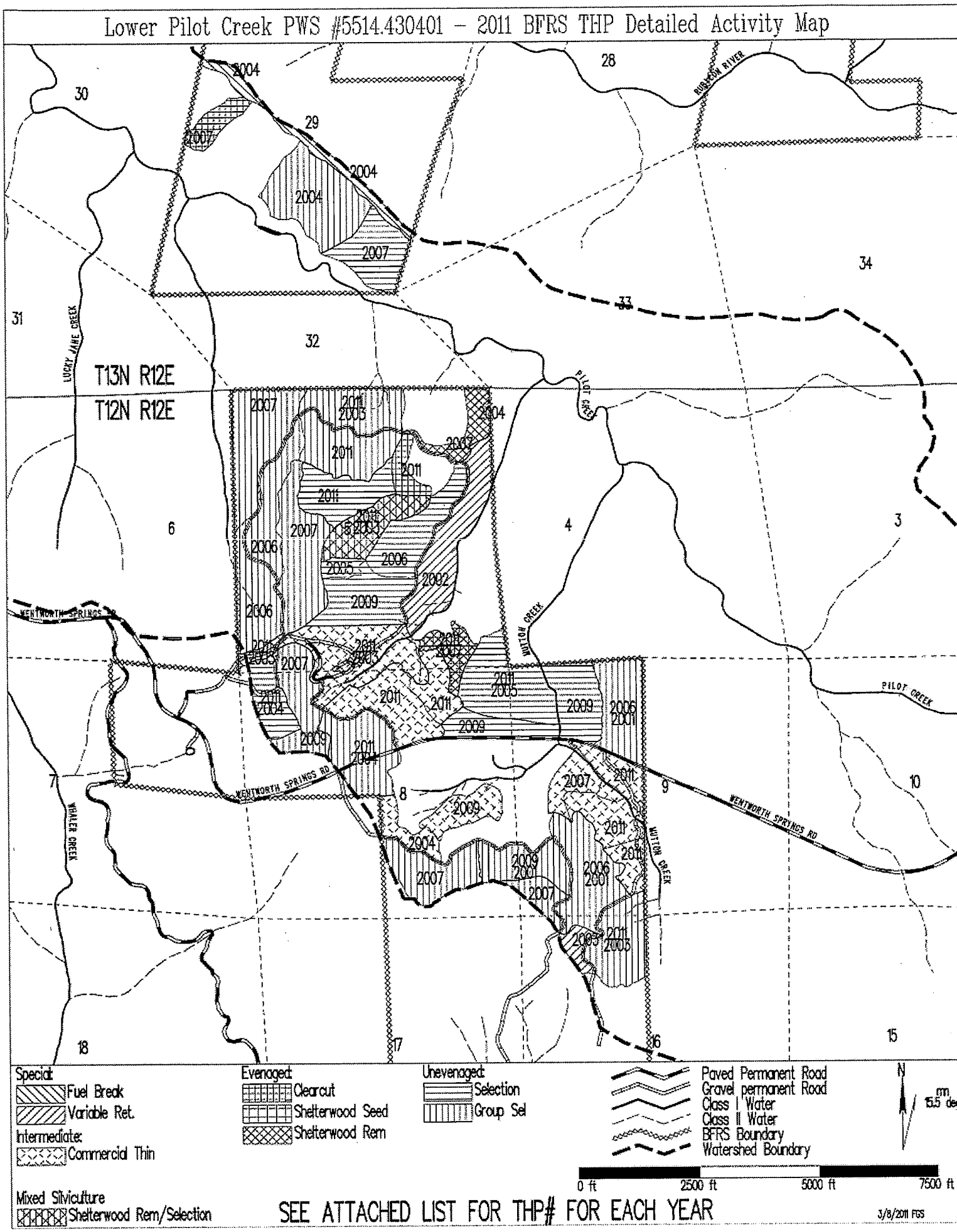
563

State Planning Watersheds Draining 2011 BFRS THP

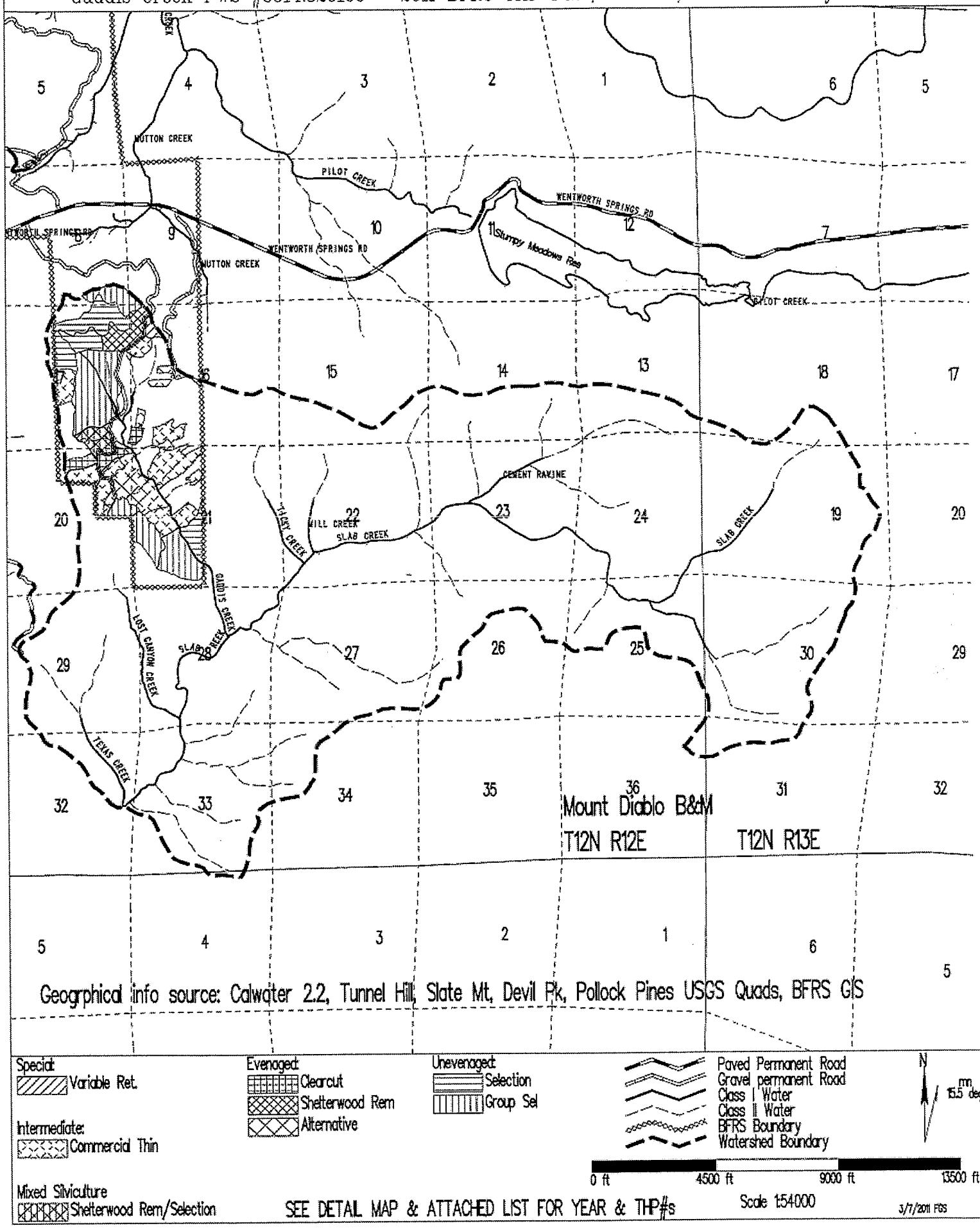


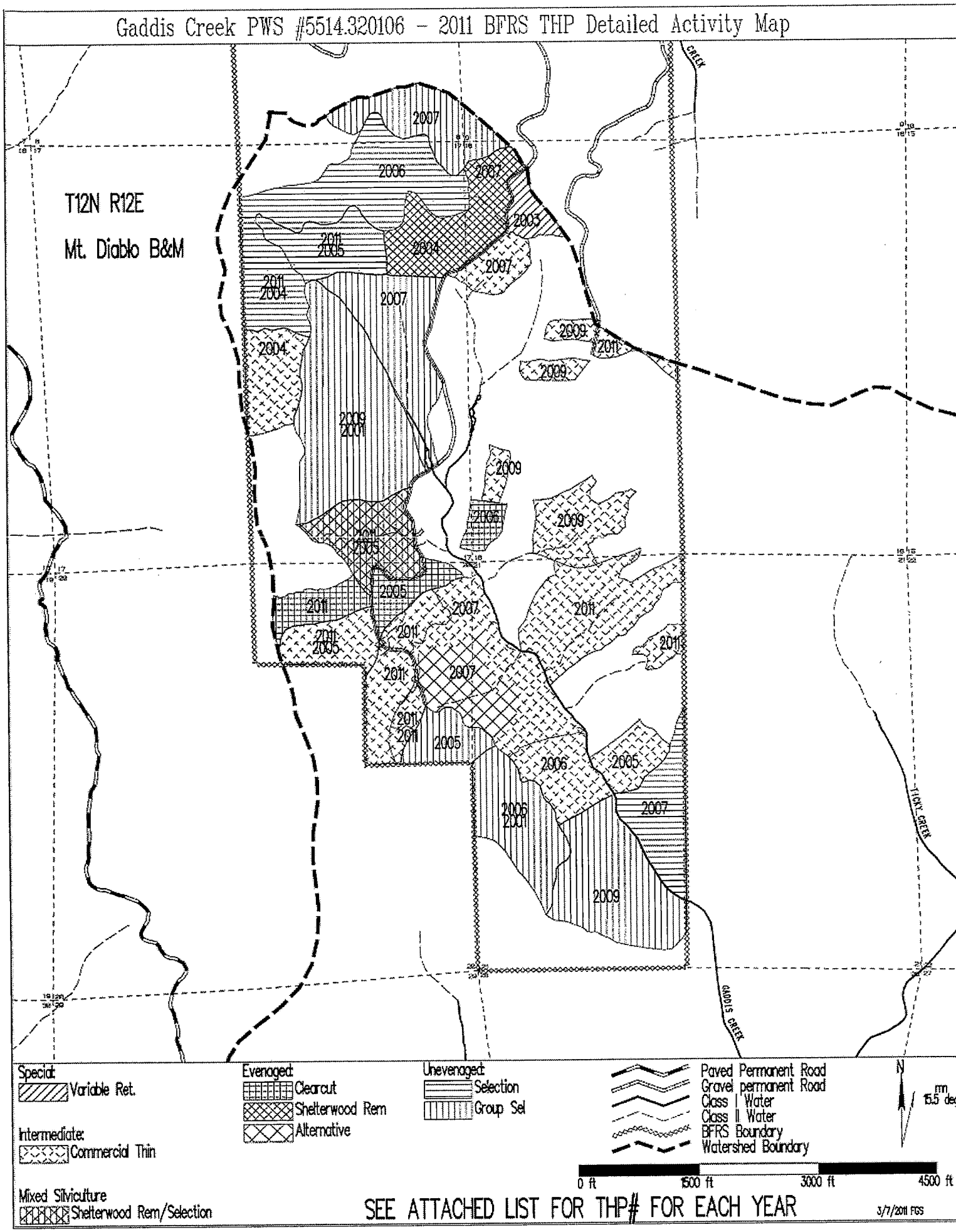
Lower Pilot Creek PWS #5514.430401 – 2011 BFRS THP Past, Present, & Future Projects



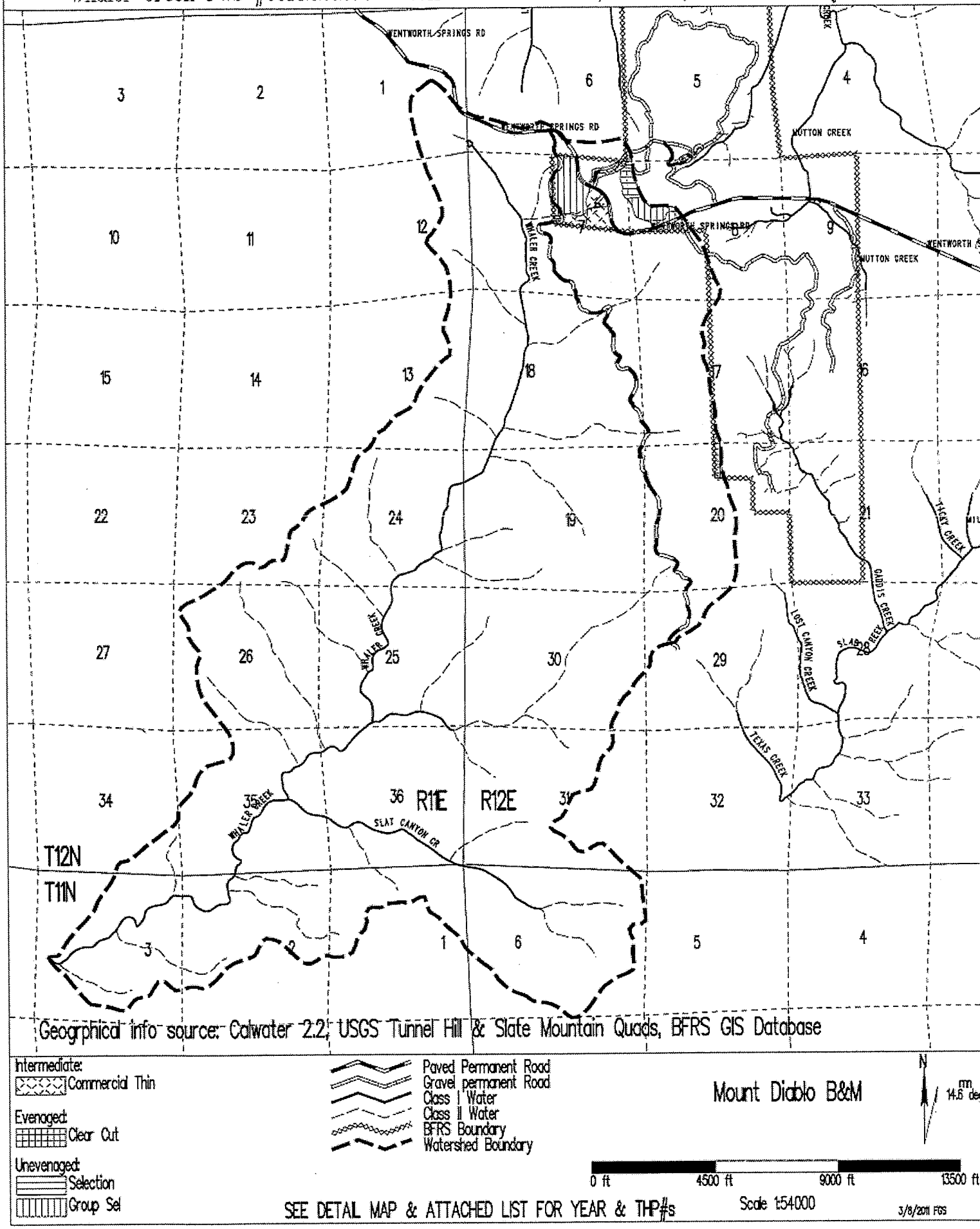

Lower Pilot Creek PWS #5514.430401 - 2011 BFRS THP Detailed Activity Map
T13N R12E
T12N R12E
RUBICON RIVER
LUCKY JANE CREEK
PILOT CREEK
WHITTON CREEK
WENTWORTH SPRINGS RD
WHEELER CREEK
Special:
Fuel Break
Variable Ret.
Intermediate:
Commercial Thin
Evenaged:
Clearcut
Shelterwood Seed
Shelterwood Rem
Unevenaged:
Selection
Group Sel
Mixed Silviculture
Shelterwood Rem/Selection
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
cm
15.5 deg
0 ft
2500 ft
5000 ft
7500 ft
SEE ATTACHED LIST FOR THP# FOR EACH YEAR
3/8/2011 FGS

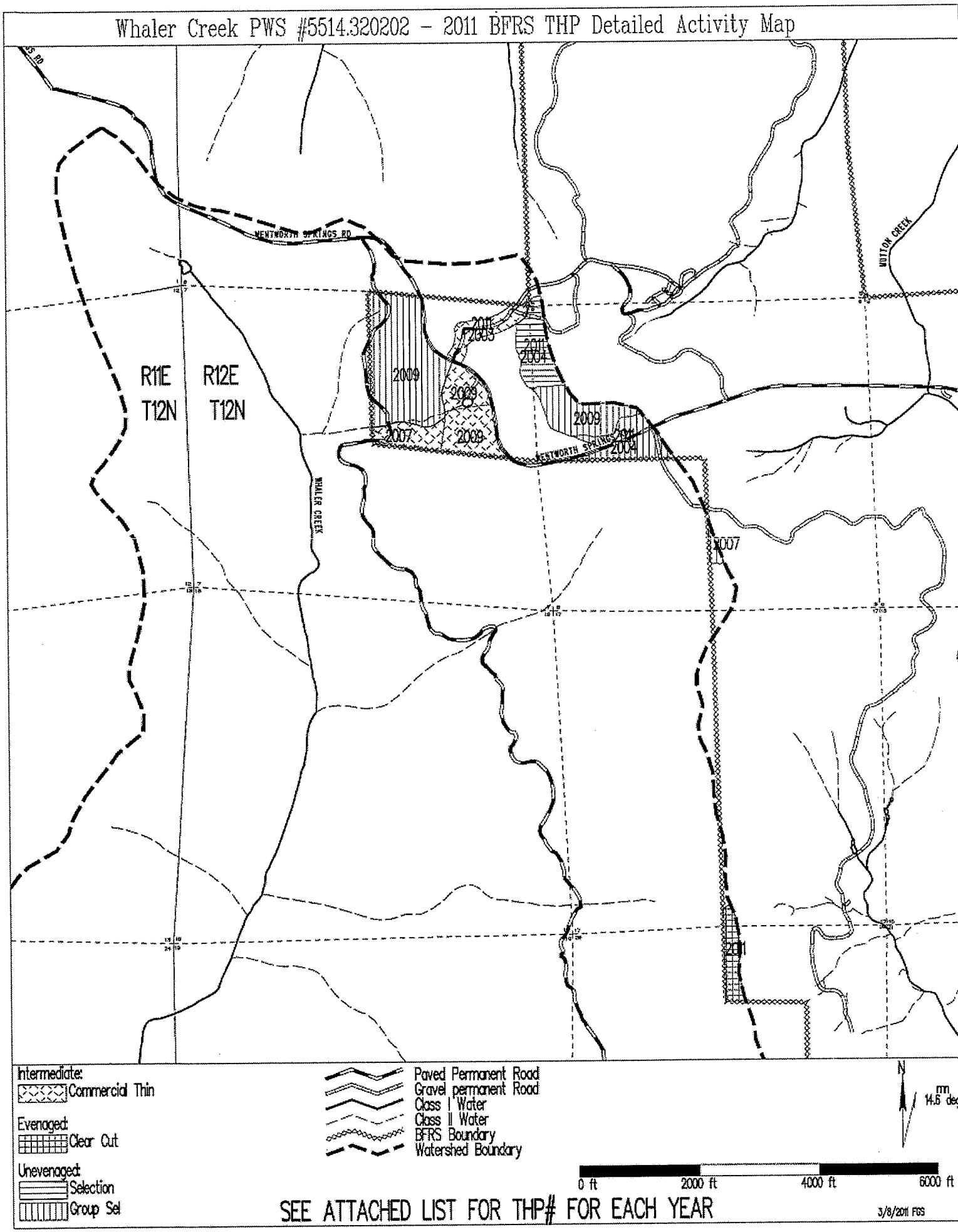
Gaddis Creek PWS #5514.320106 - 2011 BFRS THP Past, Present, & Future Projects




Gaddis Creek PWS #5514.320106 - 2011 BFRS THP Detailed Activity Map
T12N R12E
Mt. Diablo B&M
GADDIS CREEK
TICKY CREEK
Special:
Variable Ret.
Intermediate:
Commercial Thin
Mixed Silviculture
Shelterwood Rem/Selection
Evenaged:
Clearcut
Shelterwood Rem
Alternative
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
15.5 deg
0 ft
1500 ft
3000 ft
4500 ft
SEE ATTACHED LIST FOR THP# FOR EACH YEAR
3/7/2011 FGS

Whaler Creek PWS #5514.320202 – 2011 BFRS THP Past, Present, & Future Projects




Whaler Creek PWS #5514.320202 - 2011 BFRS THP Detailed Activity Map
WENTWORTH SPRINGS RD
MUTTON CREEK
WHALER CREEK
R11E
T12N
R12E
T12N
2009
2009
2009
2009
2007
2011
2004
2004
2007
2011
Intermediate:
Commercial Thin
Evenaged:
Clear Cut
Unevenaged:
Selection
Group Sel
Paved Permanent Road
Gravel permanent Road
Class I Water
Class II Water
BFRS Boundary
Watershed Boundary
N
mn
14.6 deg
0 ft
2000 ft
4000 ft
6000 ft
SEE ATTACHED LIST FOR THP# FOR EACH YEAR
3/8/2011 FGS

Blodgett Forest Research Station Past Present and Future Projects List

YEAR	THP Number
2000	4-00-27/ELD-17
2001	4-01-24/ELD-14
2002	4-02-21/ELD-09
2003	4-03-21/ELD-11
2004	4-04-12/ELD-07
2005	4-05-20/ELD-11
2006	4-06-03/ELD-2
2007	4-07-11/ELD-6
2009	4-08-27/ELD-15
2011	4-11-??/ELD-??
0	Likely Future Thinnings in Compartments not treated in 2000-2011

NOTE: ALL Units treated with Uneven-aged management systems (Selection, Group Selection) are managed on a nominal 10-year cutting cycle. These units are treated with a commercial uneven-aged harvest treatment every 10 +/- 2 years.

All merchantable Evenaged units will receive a Commercial Thinning entry every 10 to 20 years until they reach rotation age at which time they will be regenerated using a clearcut, shelterwood seed step, or variable retention harvest. The exact timing of these commercial thinnings and regeneration entries is not known and therefore only units that are likely to be entered in the next 5 to 10 years have been shown on the maps with the label "0".

Blodgett Forest Research Station has harvested an average of 1.8 Million Board Feet per year over the past 53 years. We intend to continue harvesting at a similar rate into the foreseeable future. Total growth on the forest continues to outpace harvest volumes by a substantial margin. Current standing inventory on the acres owned since the 1960s has more than doubled over last 50 years despite the annual harvest program.

TIMBER HARVESTING AGREEMENT

BETWEEN

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

AND

???????

THIS AGREEMENT is made and entered into this ____ the day of **2011** by and between **THE REGENTS OF THE UNIVERSITY OF CALIFORNIA**, a California corporation hereinafter called "University", and **???????**, a Licensed Timber Operator (#**???**), having a principal place of business at **?????**, hereinafter called "Contractor".

WITNESSETH:

WHEREAS, University owns certain forest land and the forest growth thereon as shown on maps in Appendix A, attached and described as Section 5, NE 1/4 Sec. 7, E 1/2 and NW 1/4 Sec. 8, W 1/2 Sec. 9, W 1/2 Sec. 16, E 1/2 Sec. 17, E 1/2 NE 1/4 and NW 1/4 NE 1/4 Sec. 20, and W 1/2 Sec. 21, all in T12N R12E and Section 19 and Section 29 in T13N, R12E, M.D.B. and M and desires to manage the forest growth and forest land on portions of above mentioned in T12N R12E T13N and R12E, M.D.B. and M. And

WHEREAS, Contractor is an independent contractor engaged in logging, log hauling, and other services in the management of forest growth and forest lands; and

WHEREAS, the forest growth to be managed hereunder is on University's Blodgett Forest Research Station, which fact requires that particular care be taken by Contractor in the removal of said forest growth in order to provide for:

1. Close adherence to provisions of the Timber Harvesting Plans in order to provide and preserve research opportunities incorporated in the harvesting plans;

2. Maintenance of low fire hazards;

3. Prevention of injury to residual trees and young growth;

4. Creation of conditions favorable to improvement of forest growth; and

WHEREAS, Contractor recognized the special nature of the harvesting operations and wishes to perform certain forest management services hereinafter described.

NOW, THEREFORE, in consideration of the mutual covenants, conditions and terms hereinafter set forth, and for the other good and valuable consideration, the parties hereto hereby agree as follows:

I. Scope of Work:

A. Contractor agrees to perform work as specified and directed by University's Forest Manager, within each special area and at times designated by University. University shall pay Contractor for such work at the rates shown in Price Schedule below.

B. Logging includes move-in, set-up, skid trail and landing construction, falling, limbing, bucking, skidding, sorting, decking, loading; haul road and landing maintenance and restoration, waterbarring, slash and snag clean-up.

C. Log hauling begins with logs loaded on trucks and includes transportation to log buyers yard, scaling time, unloading time, waiting to unload, and return.

D. The work may include extra snag and timber falling, extra slash clean-up, site preparation work, extra road construction, extra road maintenance, equipment maintenance and repair, and other site improvement treatments. Such work is to be performed only under written request by the Forest Manager.

II. Price Schedule:

A. Contractor agrees at its own expense for the price herein stated, to do all the things necessary to log and deliver the timber, hereinafter mentioned, and to maintain all roads used in the logging operation, and to perform other work hereinabove described as requested by University.

B. Contractor agrees to deliver logs to either University's landings or any other destination designated by the University at rates stated below.

C. University agrees to pay Contractor for the logging of such logs at the following prices:

(1) Sawlogs to 8" d.i.b (per gross MBF Scribner short log scale) on truck (except cedar 6" top) and preferred log lengths of pines and firs to 6" top	$??.00/MBF
(2) Pulp and hog fuel logs to 6" d.o.b. (per ton)	$??.00/ton
(3) Fuelwood to 6" d.o.b.(per ft.^{3} in roadside deck) and	$??.00/cubic ft^3
(per cord) (Fixed Price, not negotiated)	$??.00/cord
(4) Cull logs in roadside deck (per gross MBF short log scale)	$??.00/MBF

D. University agrees to pay Contractor for sorting and loading logs from roadside decks produced by University's staff and equipment or by other means:

(1) Loading sawlogs (per gross MBF short log Scribner scale)	$??.00/MBF
(2) Loading fuelwood, pulp, and hog fuel (per ton)	$??.00/ton
(3) Poles (per lineal foot) on truck	$??/lineal foot

E. University agrees to pay Contractor for hauling logs from landings to buyer in the following areas:

TRUCKING RATE SCHEDULE

	Sawlogs per Gross MBF Scribner Short Log Scale
(Mill)	$??.00/MBF
(Mill)	$??.00/MBF
(Mill)	$??.00/MBF

This rate assumes average round trip haul times from Blodgett Forest utilizing a $??.00 per hour rate for log truck and operator. The round trip haul times and log truck hourly rate are estimated by Contractor and are for informational purposes only.

F. University agrees to pay contractor for the use (other than specified logging and log hauling) of Contractor's labor and equipment including qualified operator to perform various forestry services:

LABOR AND EQUIPMENT RATE SCHEDULE

Item	Hourly Rate in Dollars Per Hr.
1. Timber Cutter, including saw and associated supplies	$??.00 /hr
2. Laborer	$??.00/hr
3. Mechanic	$??.00/hr
4. Welder	$??.00/hr
5. Water Tender, plus Operator	$??.00/hr
6. Front End Loader, plus Operator	$??.00/hr
7. Tractor: D-6, TD-15, JD750 or equivalent with Brushrake, Rippers and Operator	$??.00/hr
8. Road Grader with Operator	$??.00/hr

III. Payment Schedule:

A. Payment to Contractor for logging, log loading, log hauling and other services performed in accordance with this Agreement from the 1st through the 15th of the month shall be made after the logs have been scaled and within ten (10) days after receipt of an itemized invoice. Payment to Contractor for logging, log loading, log hauling and other services performed in accordance with this Agreement from the 16th through the end of the month shall be made after the logs have been scaled and within ten (10) days after receipt of an itemized invoice. Such invoices must have identical scales of logs delivered by Contractor to the scaling reports from University's log scaler.

B. University shall retain four dollars ($4.00) per thousand board feet and fifty cents ($0.50) per ton from each payment due hereinabove and the amount of such retention shall be paid to the Contractor at the end of the contract in the event it has performed its obligations hereunder in accordance with all the terms of this contract. Otherwise such amount shall be applied to the cost of any damages suffered by the University for failure of Contractor to perform its obligations hereunder except that such amount retained shall not delimit the University's damages in the event that they are in excess of such retained amount. Payment of such sum shall not be required, however, prior to the expiration of the timely filing of loggers', mechanics', materialmen's, and other liens against the University or its property by reason of any actions, conduct of work of Contractor, and other persons performing any of the operations of Contractor under this Agreement.

C. University reserves the right, at its sole discretion, to withhold payment to Contractor of all payment for logs delivered which are rejected by log buyers as not meeting specifications of University. University further reserves the night, at its sole discretion, to withhold payment to Contractor of an additional five hundred dollars per thousand board feet ($500.00/MBF) gross shortlog Scribner scale for any materials delivered which do not meet the specifications of University.

D. In the event of any loggers' lien filed on any of the logs hauled hereunder or the products manufactured therefrom, or any other claims made against University, including claims under mechanics' and materialmen's law of the State of California by reason of any obligations of the Contractor, University shall have the night to withhold the amount of such claim from any amount due the Contractor to and until the validity of such claim is finally determined, and in the event such claim is determined to be legally valid University shall have the right to pay the amount thereof to the party asserting the claim.

E. It is understood and agreed that Contractor is and shall be considered for all purposes an independent contractor, and is not and shall not be considered for any purpose an agent or employee of University, nor shall Contractor's agents, servants, or employees be considered agents, servants, or employees of University. Contractor shall have complete control over employment of persons in the performance of this contract, including sub-contractor and employees of subcontractors. Contractor shall maintain such licenses or other certificates required by law, and will pay or cause to be paid all business taxes or similar fees consistent with its classification as an independent contractor.

F. Contractor shall skid to the landing and haul to the proper destination, all pine logs felled hereunder within ten (10) days, and all fir and cedar logs felled hereunder within thirty (30) days, to prevent staining or checking. In the event that logs are allowed to

blue stain (other than logs cut from snags) or to sun check, Contractor agrees that University reserves the right, at its sole discretion, to withhold payment to the contractor of $210.00/MBF for any logs that are allowed to blue stain or to sun check.

IV. Timber:

A. When used herein the term "timber" shall be deemed to mean only those conifer and hardwood trees on University's land, as described herein, which have been marked for cutting by the University's representative as prescribed herein as well as all products which may be produced from said trees.

B. For purposes of this Agreement a sawlog shall be deemed as such if not less than-ten (10') feet in length (scale length), at least six (6") inches scaling diameter at the small end, and have a net scale of at least ten (10) board feet. A sawlog shall contain at least twenty-five (25%) percent of its gross scale as net scale. A pulplog contains less than twenty-five (25%) percent of its gross scale as net sawlog scale and is at least fifty (50%) percent chippable. Fuelwood shall be deemed any oak log, bolt, or splitwood not less than ten (10") inches in length and at least three (3") inches in diameter at the small end.

C. Scaling and measurement of logs and fuelwood to be removed shall be performed by a qualified scaler designated by University. Scaling will be done at the log purchaser's delivery yard or the woods landing or at a convenient location mutually agreed upon between the parties hereto, and will be done according to standard scaling practices as set forth by the National Forest Scaling Handbook and its revisions. This publication provides techniques and procedures to be used for all phases of merchantable timber volume determination and will be the final authority for all scaling relative to this Agreement. In addition, the Contractor agrees to the following specific scaling requirements:

1) Sawlogs shall be scaled by the Scribner Decimal C. Short Log Rule.

2) Pine and cedar sawlogs over 16'6" feet long, and fir sawlogs over 20'6", shall be measured as two or more logs. Average diameter of the large and small ends of long logs, or normal 2" taper for butt logs, except Cedar shall be 3" taper, shall be used to determine the scaling diameter of the middle cuts in multiple-length logs.

3) Sawlog lengths shall be measured to the nearest even foot, plus trim.

4) Trimming allowance shall not be less than four inches (4"), and shall not exceed six (6") inches per sixteen (16') feet of log length; logs overrunning the specified trimming allowance shall be scaled to the last shorter foot in length.

5) Inherent visible defect-deduction as defined in said Handbook shall be deducted from the gross scale.

6) Individual truckload trip tickets with the species of each log shall be furnished by Contractor to University daily during the active life of the operation. Contractor shall report to University the number of loads and-number of logs by species for each truck carrying each load of logs daily. Contractor shall indicate the management compartment from which each individual truckload was removed.

7) University reserves the right to check-scale logs and fuelwood at any point including after the time the logs are placed in the log storage of the receiving mill, or fuelwood storage lot.

8) If, in the opinion of University and/or its agent, there is reason to doubt the reasonable accuracy of trip tickets, and if any alleged discrepancies or improper practices are not immediately rectified after notice to the Contractor of the same, it shall be the right of University to cause the Contractor's operations hereunder to be discontinued until assurance has been given that such discrepancies have been adjusted and such practices have been discontinued.

D. All trees to be cut or harvested will be marked with a BLUE horizontal paint band at eye height by University or otherwise designated by University. Any tree not specifically designated for harvest which must be cut or otherwise felled or removed, shall be cut, felled or removed by Contractor only after permission of University is granted. Any tree not specifically designated for harvest which is unavoidably damaged in construction or logging may be marked for cutting by University at its sole discretion, to be cut, then logged as merchantable timber by Contractor.

E. Contractor shall not cut or unnecessarily damage live trees not specifically marked by University as hereinabove provided, and any trees so cut or damaged shall be logged and hauled by Contractor at the sole discretion of University, and Contractor shall not be paid for such logs. University's decision shall be final and conclusive as to whether such cutting and/or damage was unnecessary or unavoidable.

F. Trees, logs, and portions of logs specifically designated for harvest by University which may be left unlogged or cut but not delivered to University's log buyer by Contractor will be scaled by University. Contractor will be billed for such trees or logs at the price University would be paid for such trees or logs when delivered to University's log buyers. Contractor will not be paid for any logging or hauling costs associated with such trees or logs.

V. Risk of Loss

Contractor shall at his own risk and expense, during the term hereof, cut, log, and remove all merchantable timber marked as provided herein. Upon removal from University's land, risk of loss of said merchantable timber shall automatically pass to Contractor. Contractor shall be liable to University for any and all logs lost or damaged in transit and shall promptly reload and deliver any lost or spilled logs. If Contractor fails to comply within forty-eight (48) hours, University shall have the right, at its option, to pick up and deliver such logs. Contractor shall be responsible for the reasonable costs therefore, and payment shall be due forthwith.

VI. Conduct of Operations:

A. Contractor acknowledges that he has examined both University's lands on which his operations are to be conducted and the timber to be removed; is satisfied therewith, and does not base his conclusions on any representation made by University or University's representatives with respect thereto.

B. University hereby grants to Contractor permission and authority to enter upon University's land to the extent that such entry is required and necessary in Contractor's operations hereunder, but Contractor in his operations shall use roads already constructed for access to University's land. University retains all night to temporarily deny Contractor permission and authority to enter upon University's lands when weather creates conditions of extreme fire hazard or extreme soil compaction or

erosion hazard or as required to meet University's research goals. Determination of such weather conditions and research goals are at the exclusive discretion of University.

C. Contractor shall give written notice to University fifteen (15) days before commencing his operation hereunder and at that time shall submit to University in detail, a proposed schedule of construction and logging equipment to be used. Contractor shall not commence any operations prior to signing a copy of the Timber Harvest Plan and a review of operating procedures and applicable forest practice rules with University. This review will be at the site of each Timber Harvest Plan area. This field review must include all contractor's employees, sub-contractors and their employees. This plan must be approved by University before any logging or construction operations are commenced hereunder and any anticipated deviation from the proposed plan must receive prior written approval of University.

D. Contractor shall conduct all operations hereunder in a prudent manner and shall fully and promptly comply with the California Forest Practice Rules for the Southern Forest District and with all laws, rules, regulations and ordinances or competent governmental authorities applicable to Contractor's operations hereunder. Contractor shall be solely responsible for any and all fines, costs of corrective actions, and cost of environmental damage determined by inspections of competent government authorities to be a result of Contractor's operations. While on University's land, Contractor shall take all reasonable actions to prevent and suppress fires thereon. Contractor is obliged to provide any and all equipment and personnel working at Blodgett Forest for fire suppression on University's Blodgett Forest property.

E. Contractor will follow and use the marked location in the field of all spur roads, landing areas, and skid trails whose planned locations are recognized by the Contractor as a vital part of the study features of the harvesting operations by University. Tractors yarding logs will proceed by the most direct route to the nearest designated skid trail and thereafter follow the skid trail to the landing.

F. Contractor will restore to original or improved useful condition all public and private roads used and/or damaged by the Contractor in carrying out this operation.

G. Contractor shall not operate equipment; cut, fell, load, skid or haul logs or trees in, across or through any spring, watercourse, watercourse protection zone, equipment limitation zone, meadow, neighbors' property, or camp area except on existing roads. All reasonable efforts will be taken by Contractor to prevent unnecessary widening and extension of skid trails and to protect all young growth. Contractor shall conduct his logging operations so as to minimize soil erosion and shall perform erosion control work which shall consist of constructing adequate waterbars on skid trails and temporary roads to dispose of surface waters with a minimum of erosion damage. Location of such works and devices may be indicated by University. Contractor shall at Contractor's own risk and expense during the term hereof remove any temporary culvert or fill placed by Contractor in any drainage channel and shall perform the necessary control work to minimize soil erosion in the area of such removal.

H. Tops of all felled trees, merchantable or otherwise, shall be 100% limbed to permit the tree trunks and limbs to lie in contact with the ground within the fire protection zone. Poles and young growth damaged in logging or construction operations shall be completely felled and lopped such that no portion of such material is beyond 24" from the ground surface. Limbing shall be defined as severing all limbs from the stem of the tree. All slash, brush, bark or slabs which may accumulate within twenty-five

(25') feet of any landing or in any road (not to be abandoned), including cut and fell banks, ditches and drainage features, shall be piled in clearings in such a manner as to facilitate burning by University. The Forest Manager may limit the use of equipment used to pile slash.

I. Contractor shall at his own risk and expense during the term hereof dispose of any snags at such time and in such manner as may be required for safety reasons (as determined solely by contractor) and fire hazard as defined in the Timber Harvest Plan by the Southern District Forest Practice Rules and any tree on the sale area where logging is in progress which becomes infested with insects or disease as determined by University.

J. Contractor shall in no event cut down any timber or other growth or perform any operations whatsoever on any land of University other than the land herein described, without the written consent of University.

K. Fuel drums, broken equipment, trash and other non-forest debris resulting from the logging operation hereunder including litter by personnel shall be removed from the property upon completion of logging operations at any given unit prior to moving operations to a new location.

L. All property lines are flagged and/or painted red. Trees should not be felled across property lines. If felling across property lines appears necessary or if trees inadvertently fall across property lines the Forest Manager must be immediately contacted. All slash across property lines must be moved back to Blodgett Forest and lopped down to within 18" of the ground. Equipment may not be operated across property lines. Contractor will be held solely responsible for trespass across any property lines.

M. All unit boundaries are flagged with pink flagging printed with "Timber Harvest Boundary". All harvesting operations should be contained within unit boundaries. Contact the Forest Manager in advance if operations need to cross unit boundaries.

N. All roads used by the Contractor shall be maintained by the Contractor. All haul roads will be watered (at least daily, except during rainy days) so as to adequately maintain the road surfaces and to keep dust to a minimum. Maintenance shall include restoring existing drainage structures (pull ditches, dig culvert inlets to four (4') foot diameter, regrade dips and leadoffs, replace damaged culverts, and culvert outlet energy dissipaters), and restoring the road to its original cross section using methods approved by the Forest Manager. Gravel shall be carefully bladed off road segments used for skid trails or landings before such use. Gravel is to be stored and then returned to the road surface after logging by the Contractor. Logging activities may be halted whenever the Forest Manager determines that excessive damage may occur to streams or roads softened by wet weather or which have become too dusty due to Contractor neglect of proper road maintenance procedures. Items relating to road restoration must be completed during the term of the contract. Should Contractor not comply with all specifications, University shall complete work at Contractor's expense.

O. All landings and skid trails must have prior approval of the Forest Manager. Landings and skid trails shall not be located within Watercourse Protection Zones, Equipment Limitation Zones, or meadows. Skid trails and landings shall be properly drained and landing slash cleared and piled by Contractor for safe and convenient burning by University. Skid trails should be located to minimize damage to the

residual stand. Forest Manager may limit the number of logs hooked per turn so as to minimize residual damage. Skid trails must not be located within 25 feet of the bottom of ephemeral draws. Skidding should not occur anywhere that a properly drained waterbar cannot be constructed. Soil crossings constructed across dry draws must be cleaned out.

P. Skidder blades and integral blades less than eight feet (8') in width are acceptable on tractors.

Q. Forest Manager may flag locations of skid trail waterbars. In any event waterbarring must meet State requirements. Refer to State Forest Note #65 for construction procedures.

R. Contractor shall not have more than three landings and associated cutting units active at one time.

S. Watercourse Protection Zones and Equipment Limitation Zones of between twenty-five (25') and three-hundred (300') feet in width will be flagged with blue/white stripe flagging printed "Watercourse and Lake Protection Zone" where required for water protection. Equipment limitation zones of between 25 feet and 100 feet in width will be flagged with blue/white stripe flagging where required for watercourse protection. No equipment may operate below these flaglines and no side cast from skidding, road maintenance or landing maintenance may fall below the flagline. The Contractor will be assessed damages of $ 500/entry for each unauthorized entry into these protection zones. Any debris that enters a watercourse as a result of a Contractor's activities shall be removed the same day of entry. The Contractor will also be required to perform all mitigation measures and pay all fines required by the State as a result of its activities in such zones.

T. End lining should be employed in cases where residual timber and advanced regeneration can be saved from damage by such technique. Skidding equipment may not leave designated skid trails without prior permission of the Forest Manager in designated units. Skidding and falling may not be conducted in or through group selection areas currently occupied by established seedlings and saplings.

U. Timber designated for harvesting may be designated as follows:

(1) Marked with a BLUE paint, horizontal stripe at eye height.

(2) A merchantable tree within flagged boundaries of clearcut.

(3) A merchantable tree not marked to be saved (S) within the flagged boundaries of a seed tree, shelterwood, or overstory removal harvest.

The Forest Manager will define in the attached Appendix B the type of harvesting intended for each unit. All merchantable trees so designated must be cut and yarded to a landing. Trees not so designated should in no circumstances be cut or damaged. Falling practices will be closely observed, and excessive falling damage will not be accepted. Forest Manager may require cutters to cease work whenever a merchantable residual tree is damaged until such time that a replacement tree may be designated. Stage felling will be used where appropriate and may be required by the Forest Manager. Any merchantable tree not specifically designated for cutting, damaged in the course of logging, shall, at the discretion of the Forest Manager, be cut, removed, and hauled to market by the Contractor. Such trees, deemed by the

Forest Manager to have been damaged by careless or poor logging practices, shall be cut, and delivered in accordance with the terms of the Agreement at no cost to University. The Forest Manager may require falling and 100% limbing of non-merchantable trees which have been damaged through careless or poor logging as judged by the Forest Manager. The Forest Manager may require carelessly damaged trees to be left standing as snag recruitment. The contractor may be assessed $500/tree for each unmarked merchantable tree deemed (at Forest Manager's sole discretion) to have been carelessly damaged during logging operations.

V. Maximum stump height should be 12" or less. If necessary, clear stumps, rocks or log obstructions before felling. Humboldt undercuts should be used where feasible.

W. All bucking measurements should be made with steel tape and a marking keel to ensure log lengths within plus or minus one-inch (1") of the correct length. All cuts should be at right angles to the log. Limbs should be cut flush so as not to leave stubs or ears on the log. Butt cuts should be cleaned of holding wood and cut square. The stump pull shall be removed from stumps. Both ends of all sawlogs must be bucked so that they can be branded and properly scaled. The Forest Manager will provide each of Contractor's employees and sub-contractors with a complete description of log manufacture specifications for each harvesting unit. To ensure log accountability all logs must be branded "B" on both ends before being loaded. There must never be more than one truckload of unbranded logs on any landing of any unit. Each log truck must have a properly filled out trip ticket before the truck leaves the unit. A large "B" must be painted on the front and back end of one log on the left side of each load before the truck leaves the unit. University will provide the paint and brand. Log truck drivers must comply with procedural rules developed at each log buyer's unloading yard.

X. Removal of logs, fuelwood and/or timber hereunder shall be at the Contractor's sole risk and expense. Any damage done by Contractor to any and all persons or property in his operations hereunder shall be paid for by Contractor.

VII. Right to Stop Work:

In the event the Contractor shall fail to perform any of the terms, conditions, or covenants of this Agreement or otherwise shall be in default hereunder, or, if, in the opinion of a duly authorized representative of University, Contractor's continued performance hereunder would constitute a hazard to University's property, researchers, timber or facilities, then, and in such event, University, in addition to any and all other rights and remedies it might enjoy, either at law or in equity, shall have the right, at its election, by giving written notice thereof to Contractor, to stop Contractor's performance hereunder until such time as University, at its sole discretion, shall have determined that any such default, defect or hazard has been cured or eliminated. In addition to the foregoing right to halt Contractor's performance, University shall also have the right to terminate said performance completely in the event University, at its sole discretion, shall determine that such termination is necessary for its protection or the protection of third persons or property.

VIII. Indemnification:

A. University shall defend, indemnify and hold Contractor harmless from and against any and all liability, loss, expense, attorney's fees, or claims for injury or damages arising out of the performance of this Agreement but only in proportion to and to the extent such liability, loss, expense, attorney's fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of University, its officers, agents, or employees.

Contractor shall defend, indemnify and hold the University harmless from and against any and all liability, loss, expense, attorney's fees, or claims for injury or damages arising out of the performance of this Agreement but only in proportion to and to the extent such liability, loss, expense, attorney's fees, or claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of Contractor, its officers, agents, employees, or subcontractors.

B. University shall also indemnify Contractor against any and all claims or liens that may be asserted or filed against Contractor or against its premises for or on account of any failure, neglect, or refusal on the part of University to pay for labor, power, or equipment employed by University in its operations.

C. Contractor shall also indemnify University against any and all claims or liens that may be asserted or filed against University or against its premises for or on account of any failure, neglect, or refusal on the part of Contractor to pay for labor, power, or equipment employed by Contractor in its operations hereunder.

IX. Insurance:

A. Contractor shall take all reasonable precautions in the performance of the work under this Agreement to protect the health and safety of its employees, employees of the University of California and of members of the public and to minimize danger from all hazards to life and property and shall comply with all health, safety, and fire protection regulations and the requirements of the State of California and the instructions of University, and shall maintain, with companies satisfactory to University, at least the following insurance coverage at all times during the performance of this Agreement.

(1) Comprehensive General Liability

(a) Automobile: Bodily injury - $2,000,000 each person - $2,000,000 each occurrence; Property Damage - $ 2,000,000 each occurrence.

(b) General Liability: No deductible. Bodily injury - $2,000,000 each person - $2,000,000 each occurrence; Property Damage - $2,000,000 each occurrence. (Including products, completed operations, and contractual.)

(c) Loggers Third Party Damage - $2,000,000 primary limit.

(2) Workers Compensation which will compensate up to the maximum benefits as stated in the Workers Compensation Laws of the State of California.

B. Contractor shall supply University with appropriate Certificates of Insurance naming the Regents of the University of California as an additional insured covering the policies required above prior to commencing his operations under this Agreement. University shall have the right to inspect the original policies of such insurance. University will be given at least thirty (30) days written notice prior to any change or cancellation of the insurance policy.

C. Contractor shall require all subcontractors to meet all provisions listed in IXA and IXB above.

X. Completion:
Contractor shall log and deliver all merchantable timber marked as such under the provisions of this Agreement on University's land, as described herein, by October 15,-2007, and Contractor's right hereunder will cease at that time.

XI. General:

A. This Agreement shall not be assigned by Contractor without the written consent of University.

B. Waiver by University of the breach of Contractor of any of the provisions hereof or of any of Contractor's promises herein shall not be deemed a waiver of any future breach of the same or any other provision or promise herein.

C. Contractor recognizes University's title in and to University's land and agrees never to assail or resist said title.

D. University reserves the right to use its land during the term hereof for any and all purposes not inconsistent with the exercise by Contractor of his rights hereunder.

E. Upon the completion date hereof, all of Contractor's rights and interest in the logs, cordwood and/or timber which are subject to this Agreement and which have not yet been removed from University's land shall terminate, unless this Agreement is extended by mutual agreement of the parties.

F. This Agreement constitutes the complete understanding of the parties. No modification of this Agreement shall be binding upon either party unless it is made in writing and subscribed to by the parties hereto.

IN WITNESS whereof the parties hereto have executed this contract on the day and year first above mentioned.

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

By_____

Business Contracts Administrator

Date_____.

By_____

?????
Contractor

Date_____.

Appendix A: Blodgett Forest map will be attached

Appendix B: 2011 Timber Harvest area map will be attached

Plants on Blodgett Forest

Sp-Code	Name	Common	Family
ACMA	Acer macrophyllum	Bigleaf Maple	Aceraceae
	Toxicodendron diversilobum	Poison Oak	Anacardiaceae
OSM	Osmorhiza spp.		Apiaceae (Umbelliferae)
SAGR-1	Sanicula graveolens		Apiaceae (Umbelliferae)
SATU	Sanicula tuberosa		Apiaceae (Umbelliferae)
APO	Apocynum spp.	Dogbane	Apocynaceae
ACSLEP	Asclepiadaceae	Milkweed Family	Asclepiadaceae
ASCO-1	Asclepias cordifolia		Asclepiadaceae
ASC-1	Asclepias spp.	Milkweed	Asclepiadaceae
ATFI	Athyrium Filix-femina var. cyclosorum Rupr.	Lady Fern	Aspidiaceae (fern)
	Chrysothamnus spp.	Rabbitbrush	Asteraceae
ACH-1	Achillea millefolium	Yarrow	Asteraceae (Compositae)
ADBI	Adenocaulon bicolor	Trail Plant, Trail marker, path finder	Asteraceae (Compositae)
AGRE-2	Agoseris retrorsa	Mountain dandelion	Asteraceae (Compositae)
ANT-4	Antennaria spp.		Asteraceae (Compositae)
ASOC	Aster occidentalis		Asteraceae (Compositae)
CESO-1	Centaurea solstitialis		Asteraceae (Compositae)
CIIN	Cichorium intybus		Asteraceae (Compositae)
CIR-1	Cirsium spp.	Thistle	Asteraceae (Compositae)
	Cirsium vulgare	Bull Thistle	Asteraceae (Compositae)
COCA-2	Conyza canadensis		Asteraceae (Compositae)
CON-7	Conyza spp.	Horseweed	Asteraceae (Compositae)
ERIN-2	Erigeron inornatus		Asteraceae (Compositae)
ERLA-6	Eriophyllum lanatum		Asteraceae (Compositae)
GNMI	Gnaphalium canescens (G. microcephalum)		Asteraceae (Compositae)
GNLU	Gnaphalium luteo-album		Asteraceae (Compositae)
GNPA	Gnaphalium palustre		Asteraceae (Compositae)
GNCH	Gnaphalium stramineum (G. chilense)		Asteraceae (Compositae)
GRI-1	Grindelia spp.		Asteraceae (Compositae)
HAAC-1	Haplopappus acaulis		Asteraceae (Compositae)
HAP-1	Haplopappus spp.		Asteraceae (Compositae)
HEBI	Helenium Bigelovi		Asteraceae (Compositae)
HIAL	Hieracium albiflorum		Asteraceae (Compositae)
HYRA-2	Hypochoeris radicata		Asteraceae (Compositae)
LASE-1	Lactuca serriola		Asteraceae (Compositae)
MAEL	Madia elegans	Tarweed	Asteraceae (Compositae)
PSI-2	Psilocarphus spp.		Asteraceae (Compositae)
RUHIP	Rudbeckia hirta var pulcherrima		Asteraceae (Compositae)
RUHIP	Rudbeckia hirta var pulcherrima		Asteraceae (Compositae)
SEIN-2	Senecio integerrimus		Asteraceae (Compositae)
SETR	Senecio triangularis		Asteraceae (Compositae)
SOCAE	Solidago canadensis		Asteraceae (Compositae)
SOL-4	Solidago spp.		Asteraceae (Compositae)
SOAS	Sonchus asper		Asteraceae (Compositae)
STE-7	Stephanomeria spp.		Asteraceae (Compositae)
TAOF	Taraxacum officinale	Dandelion	Asteraceae (Compositae)
TRDU-1	Tragopogon dubius		Asteraceae (Compositae)
WHDE	Whitneya dealbata		Asteraceae (Compositae)
	Berberis spp.	Oregon Grape	Berbidaceae
ALTE	Alnus incana (A. tenuifolia)	Mountain alder	Betulaceae
ALRH	Alnus rhombifolia	White alder	Betulaceae
	Corylus cornuta Marsh var.	Hazelnut, filbert	Betulaceae

	californica		
BLSP	Blechnum spicant	Deer Fern	Blechnaceae (fern)
WOFI	Woodwardia fimbriata	Giant Chain Fern	Blechnaceae (fern)
CRY-2	Cryptantha spp.		Boraginaceae
CYOC	Cynoglossum occidentale		Boraginaceae
ARA-2	Arabis spp.	Rock Cress	Brassicaceae (Cruciferae)
ATPU-1	Athysanus pusillus		Brassicaceae (Cruciferae)
BRGE	Brassica geniculata now called Hirschfeldia incan		Brassicaceae (Cruciferae)
BRA-5	Brassica spp.	Mustard	Brassicaceae (Cruciferae)
CRUCIF	Brassicaceae (Cruciferae)	Mustard Family	Brassicaceae (Cruciferae)
CABU-3	Capsella Bursa-pastoris		Brassicaceae (Cruciferae)
DEN-1	Dentaria spp. (genus merged with Cardamine)		Brassicaceae (Cruciferae)
ROCU	Rorippa curvisiliqua	Yellow-Cress	Brassicaceae (Cruciferae)
ROR-1	Rorippa spp.	Yellow-Cress	Brassicaceae (Cruciferae)
STTO	Streptanthus tortuosus		Brassicaceae (Cruciferae)
CAHE-5	Callitriche heterophylla		Callitrichaceae
CAPR	Campanula prenanthoides		Campanulaceae
CAM-3	Campanula spp.		Campanulaceae
HERA-2	Heterocodon rariflorum		Campanulaceae
LIBOL	Linnaea borealis spp. longiflora	Twinflower	Caprifoliaceae
LOIN-4	Lonicera involucrata	Twinberry	Caprifoliaceae
	Sambucus caerulea	Blue Elderberry	Caprifoliaceae
SYM-(3)	Symphoricarpos spp.		Caprifoliaceae
SYAC	Symphorocarpus mollis (S. acutus)	Spreading Snowberry, Creeping Snowberry, Trip vine	Caprifoliaceae
CEVU	Cerastium fontanum (C. vulgatum)		Caryophyllaceae
CEVI	Cerastium glomeratum (C. viscosum)		Caryophyllaceae
SAG-1	Sagina spp.		Caryophyllaceae
SCAN-1	Scleranthus annuus		Caryophyllaceae
SICA-2	Silene californica	California Indian Pink	Caryophyllaceae
SILE	Silene lemonii		Caryophyllaceae
SPRU	Spergularia rubra		Caryophyllaceae
STNI	Stellaria nitens		Caryophyllaceae
CHBO	Chenopodium botrys		Chenopodiaceae
CHMAF	Chenopodium macrospernum		Chenopodiaceae
CHPU-1	Chenopodium pumilio		Chenopodiaceae
COAR-2	Convolvulus arvensis	Morning glory	Convolvulaceae
CONU-2	Cornus nuttallii	Dogwood	Cornaceae
COSE-3	Cornus sessilis		Cornaceae
CUS	Cuscuta spp.	Dodder	Cuscutaceae
CUSCUT	Cuscutaceae	Dodder Family	Cuscutaceae
HEAC	Heleocharis acicularis		Cyperaceae
RHGLC	Rhynchospora capitella (R. glomerata v. capitella)		Cyperaceae
SCCO	Scirpus congdonii		Cyperaceae
	Polystichum munitum	Sword Fern	Dryopteridaceae (fern)
POSC-2	Polystichum scopulinum		Dryopteridaceae (fern)
EQAR	Equisetum arvense	Common Horsetail	Equisetaceae (with ferns)
ARME-3	Arbutus menziesii	Madrone	Ericaceae
ARPA-9	Arctostaphylos patula	Greenleaf Manzanita	Ericaceae
ARC-5	Arctostaphylos spp.	Manzanita	Ericaceae
ARVI	Arctostaphylos viscida	Whiteleaf Manzanita	Ericaceae
CHME-2	Chimaphila menziesii	Prince's Pine	Ericaceae
CHUMO	Chimaphila umbellata (formerly	Little Prince's Pine, Pipsissewa	Ericaceae

	var. Occidentalis)		
GAOV	Gaultheria ovatifolia	Salal	Ericaceae
LEDA	Leucothoe davisiae	Sierra-laurel	Ericaceae
PYSE	Orthilia secunda (Pyrola secunda in Pyrolaceae)	Side-bells Pyrola	Ericaceae
PTAN	Pterospora andromedia	Pine Drops	Ericaceae
PYPI	Pyrola picta	White-veined Wintergreen	Ericaceae
RHOC	Rhododendron occidentale	Western Azalea	Ericaceae
RHO-1	Rhododendron spp.	Azalea	Ericaceae
VAPA	Vaccinium parvifolium	Red Huckleberry	Ericaceae
VAC-2	Vaccinium spp.	Huckleberry	Ericaceae
EUSE-1	Chamaesyce serpyllifolia (Euphorbia s.)		Euphorbiaceae
	Lotus oblongifolius		Fabaceae
CYSC-2	Cytisus scoparius	Scotch Broom	Fabaceae (Leguminosae)
LEGUMI	Fabaceae (Leguminosae)	Pea Family	Fabaceae (Leguminosae)
LONE-2	Lotus incanus (L. neo-incanus)		Fabaceae (Leguminosae)
LOPU-2	Lotus purshianus		Fabaceae (Leguminosae)
LOT-1	Lotus spp.	Lotus	Fabaceae (Leguminosae)
LUP-1	Lupinus spp.	Lupine	Fabaceae (Leguminosae)
MELU	Medicago lupulina		Fabaceae (Leguminosae)
MED-	Medicago spp.	Medick	Fabaceae (Leguminosae)
MEAL	Melilotus albus	Sweet-Clover	Fabaceae (Leguminosae)
ROPS	Robinia pseudo-acacia		Fabaceae (Leguminosae)
TRDU-2	Trifolium dubium		Fabaceae (Leguminosae)
TRPR-2	Trifolium pratense		Fabaceae (Leguminosae)
TRI-9	Trifolium spp.	Clover	Fabaceae (Leguminosae)
VIC-1	Vicia spp.	Vetch	Fabaceae (Leguminosae)
CACHM	Chrysolepsis chrysophylla (Castanopsis c.)	Golden Chinquapin, Giant Chinquapin	Fagaceae
CASE-3	Chrysolepsis sempervirens (Castanopsis s.)	Bush Chinquapin	Fagaceae
LIDE(-2)	Lithocarpus densiflorus	Tan-oak	Fagaceae
QUCH-2	Quercus chrysolepsis	Canyon Live Oak	Fagaceae
	Quercus kelloggii Newb.	Black Oak	Fagaceae
	Garrya fremontii	Silk tassel bush	Garryaceae
ERCI-2	Erodium cicutarium	Filaree or Storksbill	Geraniaceae
GERANI	Geraniaceae	Geranium Family	Geraniaceae
RIRO	Ribes roezlii	Sierra Gooseberry	Grossulariaceae
RIB	Ribes spp.	Current or Gooseberry	Grossulariaceae
HYDROP	Hydrophyllaceae	Waterleaf Family	Hydrophyllaceae
	Phacelia spp.	Phacelia	Hydrophyllaceae
DRSY	Draperia systyla	Draperia	Hydrophyllaceae
HYPERI	Hypericaceae	St. John's Wort Family	Hypericaceae
HYAN	Hypericum anagalloides		Hypericaceae
HYPE	Hypericum perforatum	Klamath Weed	Hypericaceae
IRHA	Iris Hartwegii	Hartwegs Iris	Iridaceae
SIEL	Sisyrinchium elmeri	Elmers Blue-eyed Grass	Iridaceae
SIID	Sisyrinchium idahoense	Idaho Blue-eyed Grass	Iridaceae
JUNCAC	Juncaceae	Rush Family	Juncaceae
JUAC	Juncus acuminiatus		Juncaceae
JUAR	Juncus articulatus		Juncaceae
JUBA	Juncus balticus		Juncaceae
JUBU	Juncus bufonius (var. halophilus now J. ambiguus)		Juncaceae
JUEF	Juncus effusus		Juncaceae
JUEN	Juncus ensifolius		Juncaceae

JUOX	Juncus oxymeris		Juncaceae
JUN-1	Juncus spp.	Rush	Juncaceae
JUTE-1	Juncus tenuis		Juncaceae
LUCO-1	Luzula comosa	Wood Rush	Juncaceae
LUPA	Luzula parviflora		Juncaceae
LABIAT	Lamiaceae (Labiatae)	Mint Family	Lamiaceae (Labiatae)
MAVU	Marrubium vulgare		Lamiaceae (Labiatae)
PRVUL	Prunella vulgaris spp. Lanceolata	Selfheal	Lamiaceae (Labiatae)
	Stachys rigida	Hedge-nettle	Lamiaceae (Labiatae)
STA-1	Stachys spp.		Lamiaceae (Labiatae)
TRLA-1	Trichostema lanceolatum		Lamiaceae (Labiatae)
CAL-5	Calochortus spp.	Mariposa-lily	Liliaceae
CAM-1	Camassia spp.		Liliaceae
	Chlorogalum pomeridianum	Soap Plant	Liliaceae
CLUN-2	Clintonia uniflora	Queens Cup	Liliaceae
DIHO-2	Disporum hookeri	Fairy Bells	Liliaceae
LILIAC	Liliaceae	Lily Family	Liliaceae
	Lilium parvum	Alpine lily	Liliaceae
LIL-(2)	Lilium spp.	Lily	Liliaceae
	Lilium washingtonium	Washington lily	Liliaceae
SMRAA	Smilacina racemosa (formerly var. Amplexicaulis)	Racemose False Solomons-seal	Liliaceae
SMST	Smilacina stellata	Panicled False Solomons-seal	Liliaceae
BRLU	Triteleia ixiodes (Brodiaea lutea)	Brodiaea, Pretty Face	Liliaceae
VECA-1	Veratrum californicum		Liliaceae
	Allium spp.	Wild Onion	Liliaceae (Amaryllidaceae)
	Triteleia hyacinthina (Brodiaea hyacinthina)		Liliaceae (Amaryllidaceae)
	Triteleia lilacina (Brodiaea hyacinthina)		Liliaceae (Amaryllidaceae)
SID-4	Sidalcea spp.		Malvaceae
MYHA	Myrica hartwegii	Sierra Sweet-bay	Myricaceae
MYRICA	Myricaceae	Wax-myrtle Family	Myricaceae
CLA-	Clarkia spp.	Clarkia	Onagraceae
	Epilobium spp.	Willow Herb, Fireweed	Onagraceae
GAY	Gayophytum spp.	Willow Herb, Gayophytum	Onagraceae
ONAGRA	Onagraceae	Evening-Primrose Family	Onagraceae
BOMU	Botrychium multifidum	Leathery Grape Fern	Ophioglossaceae (fern)
EBAU	Cephalanthera austiniae (Ebuorophyton austinae)	Phantom Orchid	Orchidaceae
COMA-4	Corallorhiza maculata		Orchidaceae
GOOB	Goodyera oblongifolia	Rattlesnake Orchid	Orchidaceae
HALE	Habenaria leucostachys	Bog Orchid	Orchidaceae
HAB	Habenaria spp.	Rein Orchid	Orchidaceae
SPPO-2	Spiranthes porrifolia		Orchidaceae
	Dicentra formosa	Bleeding Heart	Papaveraceae (from Fumariaceae)
	Pinus attenuata	Knobcone pine	Pinaceae
	Pinus contorta	Lodgepole pine	Pinaceae
PLLA	Plantago lanceolata	Plantain	Plantaginaceae
PLMA-1	Plantago major	Plantain	Plantaginaceae
AGEX-1	Agrostis exarata		Poaceae (Gramineae)(Agrostideae)
AGSC-2	Agrostis scabra		Poaceae (Gramineae)(Agrostideae)
AGTH	Agrostis thurberiana		Poaceae (Gramineae)(Agrostideae)

PHPR-1	Phleum pratense		Poaceae (Gramineae)(Agrostideae)
SOHA	Sorghum halepense		Poaceae (Gramineae)(Androgonae)
AICA	Aira caryophyllea	Hairgrass	Poaceae (Gramineae)(Aveneae)
AVFA	Avena fatua		Poaceae (Gramineae)(Aveneae)
DACA-1	Danthonia californica		Poaceae (Gramineae)(Aveneae)
DEEL	Deschampsia elongata		Poaceae (Gramineae)(Aveneae)
DEHO	Deschampsia holciformis		Poaceae (Gramineae)(Aveneae)
HOLA-1	Holcus lanetus		Poaceae (Gramineae)(Aveneae)
GRAMIN	Poaceae (Gramineae)	Grass	Poaceae (Gramineae)(Aveneae)
ANOD	Anthoxanthum ordoratum		Poaceae (Gramineae)(Festuceae)
BROR-1	Bromus orcutianus		Poaceae (Gramineae)(Festuceae)
BRTE	Bromus tectorum	Cheatgrass	Poaceae (Gramineae)(Festuceae)
CYEC	Cynosurus echinatus		Poaceae (Gramineae)(Festuceae)
DAGL-1	Dactylis glomerata		Poaceae (Gramineae)(Festuceae)
ELY-1	Elymus spp. Many species now in genera Taeniather	Rye	Poaceae (Gramineae)(Festuceae)
FEAR-3	Festuca arundinacea		Poaceae (Gramineae)(Festuceae)
FEOC-1	Festuca occidentalis		Poaceae (Gramineae)(Festuceae)
GLEL	Glyceria elata		Poaceae (Gramineae)(Festuceae)
MEAR-1	Melica aristata		Poaceae (Gramineae)(Festuceae)
POPR-1	Poa pratensis		Poaceae (Gramineae)(Festuceae)
POSC-3	Poa secunda (Poa scabrella)		Poaceae (Gramineae)(Festuceae)
POTR-1	Poa trivialis		Poaceae (Gramineae)(Festuceae)
PUCA-2	Torreyochloa pallida (Puccinellia pauciflora)	Alkali Grass	Poaceae (Gramineae)(Festuceae)
MUFI	Muhlenbergia filiformis		Poaceae (Gramineae)(Paniceae)
PAN-1	Panicum spp.		Poaceae (Gramineae)(Paniceae)
STLE-1	Achnatherum lemmonii (Stipa l.)		Poaceae (Gramineae)(Stipeae)
STCA-1	Achnatherum occidentalis (Stipa californica)		Poaceae (Gramineae)(Stipeae)
COHE-2	Collomia heterophylla	Collomia	Polemoneaceae
ALDI-2	Allophyllum divaricatum		Polemoniaceae
LICI	Linanthus ciliatus	Whisker Linanthus	Polemoniaceae
NADI	Navarretia divaricata		Polemoniaceae

NAV	Navarretia spp.	Navarretia	Polemoniaceae
POCO-6	Polygala cornuta	Milkwort	Polygalaceae
POL15	Polygala spp.		Polygalaceae
POLYGA	Polygalaceae	Milkwort Family	Polygalaceae
ERNU-3	Eriogonum nudum	Wild buckwheat	Polygonaceae
POLYGO	Polygonaceae	Buckwheat Family	Polygonaceae
POAV	Polygonum arenastrum (Polygonum aviculara)		Polygonaceae
RUAC	Rumex acetosella		Polygonaceae
RUCO	Rumex conglomeratus		Polygonaceae
RUCR-2	Rumex crispus		Polygonaceae
RUM-1	Rumex spp.	Dock or Sorrel	Polygonaceae
CAUM	Calyptridium umbellatum	Pussy Paws	Portulacaceae
MOPE-2	Claytonia perfoliata (Montia perfoliata)	Miners-lettuce	Portulacaceae
DOD	Dodecatheon spp.		Primulaceae
PRIMUL	Primulaceae	Primrose Family	Primulaceae
TRLA-3	Trientalis latifolia	Star Flower	Primulaceae
PTAQP	Pteridium aquilinum var. pubescens	Bracken Fern	Pteridacea (fern)
CHGR-1	Cheilanthes gracillima		Pteridaceae (fern)
PITR	Pentagramma triangularis/pallida (Pityrogramma t.)		Pteridaceae (fern)
ANQU	Anemone quinquefolia some var now A. oregana	Windflower	Ranunculaceae
AQU-	Aquilegia spp.	Columbine	Ranunculaceae
DEL-2	Delphinium spp.	Larkspur	Ranunculaceae
RANUNC	Ranunculaceae	Buttercup (Crowfoot) Family	Ranunculaceae
RAN-1	Ranunculus spp.	Buttercup	Ranunculaceae
CECO-2	Ceanothus cordulatus	Mountain Whitethorn	Rhamnaceae
CEIN-3	Ceanothus integerrimus	Deerbrush or Sweet Birch	Rhamnaceae
CEPR	Ceanothus prostratus	Squaw Carpet, Mahala mat	Rhamnaceae
RHAMNA	Rhamnaceae	Buckthorn Family	Rhamnaceae
RHA-1	Rhamnus spp.	Cascara	Rhamnaceae
AMPA-2	Amelanchier pallida	Serviceberry	Rosaceae
AME	Amelanchier spp.	Serviceberry	Rosaceae
CHFO-2	Chamaebatia foliolosa	Bear Clover, Mountain Misery	Rosaceae
FRPL(1)	Fragaria virginiana (Fragaria platypetala)	Scarlet Strawberry	Rosaceae
GEMA	Geum macrophyllum		Rosaceae
HOTR-1	Horkelia tridentata		Rosaceae
POGL-2	Potentilla glandulosa	Cinquefoil	Rosaceae
POGR-4	Potentilla gracilis	Cinquefoil	Rosaceae
PORE	Potentilla recta	Cinquefoil	Rosaceae
POT-2	Potentilla spp.	Cinquefoil	Rosaceae
PREM	Prunus emarginata	Bitter Cherry	Rosaceae
	Prunus virginiana var. demissa	Western Choke Cherry	Rosaceae
	Rosa gymnocarpa	Wood Rose	Rosaceae
	Rosa pinetorum	Pine Rose	Rosaceae
ROS	Rosa spp.	Rose	Rosaceae
ROSACE	Rosaceae	Rose Family	Rosaceae
RUPR	Rubus discolor (R. procerus)	Himalaya Blackberry	Rosaceae
RUGL	Rubus glaucifolius	Glaucous-leaved Raspberry	Rosaceae
RULA	Rubus laciniatus	Cut-leaf Blackberry	Rosaceae
RUPA-2	Rubus parviflorus	Thimbleberry	Rosaceae
RUB-2	Rubus spp.		Rosaceae
	Rubus vitifolius	California Blackberry	Rosaceae

SOCA-3	Sorbus californica	Ash	Rosaceae
SOR-4	Sorbus spp.	Ash	Rosaceae
GAL-1	Galium	Bedstraw	Rubiaceae
GAAP	Galium aparine	Bedstraw or Cleaver	Rubiaceae
GABO	Galium bolanderi	Bolanders Bedstraw	Rubiaceae
GASP-1	Galium sparsiflorum	Bedstraw	Rubiaceae
GATR-4	Galium trifindum	Bedstraw	Rubiaceae
GATR-2	Galium triflorum	Sweet scented Bedstraw	Rubiaceae
KEGA	Kelloggia galiodes	Kelloggia	Rubiaceae
RUBIAC	Rubiaceae	Madder Family	Rubiaceae
POFR	Populus fremontii	Fremont's Cottonwood	Salicaceae
SALZ	Salicaceae	Willow Family	Salicaceae
SALA-4	Salix laevigata		Salicaceae
SALA-3	Salix lasiolepis		Salicaceae
SALA-5	Salix lucida ssp. lasiandra (S. lasiandra)		Salicaceae
SAME-3	Salix melanopsis		Salicaceae
SASC	Salix scouleriana		Salicaceae
SAEX	Salix sessilifolia (S. exigua)	Willow	Salicaceae
SAL11	Salix spp.	Willow	Salicaceae
BOMA-2	Boykinia major		Saxafragaceae
BOEL	Boykinia occidentalis (B. elata)		Saxafragaceae
LIAF	Lithophragma affine	Woodland Star	Saxafragaceae
SAXAFR	Saxafragaceae	Saxafrage Family	Saxafragaceae
DIPU	Digitalis purpurea	foxglove	Scrophulariaceae
MICA-3	Mimulus cardinalis		Scrophulariaceae
MIGU	Mimulus guttutus		Scrophulariaceae
MIMO-3	Mimulus moschatus	Monkey Flower	Scrophulariaceae
MIPR	Mimulus primuloides	Monkey Flower	Scrophulariaceae
MIM-1	Mimulus spp.	Monkey Flower	Scrophulariaceae
PESE-3	Pedicularis semibarbata	Pedicularis	Scrophulariaceae
PEN-2	Penstemon spp.	Penstemon	Scrophulariaceae
SCOPHU	Scrophulariaceae	Figwort Family	Scrophulariaceae
VETH	Verbascum thapsus	Common Mullein	Scrophulariaceae
VEAM	Veronica americana	Speedwell	Scrophulariaceae
VESC-2	Veronica scutellata		Scrophulariaceae
VESE	Veronica serpyllifolia	Speedwell	Scrophulariaceae
SOL-1	Solanum spp.		Solanaceae
TABR	Taxus brevifolia	Pacific Yew	Taxaceae
	Torreya californica	California nutmeg	Taxaceae
TYLA	Typha latifolia	Broad-leaved Cattail	Typhaceae
VIGL	Viola glabella		Violaceae
VILO	Viola lobata	Pine Violet	Violaceae
VIMA	Viola macloskeyi		Violaceae
VIPU	Viola purpurea (some subspecies = new species)		Violaceae
VIO-1	Viola spp.	Violet	Violaceae
VIOLAC	Violaceae	Violet Family	Violaceae

BIRDS OF BLODGETT FOREST

Acorn woodpecker	Great blue heron	Rock wren
American robin	Great-horned owl	Ruby-crowned kinglet
Anna's hummingbird	Hairy woodpecker	Rufous-sided towhee
Band-tailed pigeon	Hammond's flycatcher	Sandhill crane
Barn swallow	Hermit Thrush	Sharp-shinned hawk
Bewick's wren	Hermit warbler	Solitary vireo
Black swift	House wren	Spotted owl
Black-headed grosbeak	Hutton's vireo	Steller's Jay
Black-throated gray warbler	Lesser goldfinch	Swainson's Thrush
Blue grouse	Macgillivray's warbler	Townsend's solitaire
Brown Creeper	Mountain chickadee	Townsend's warbler
Brown-headed cowbird	Mountain quail	Turkey vulture
Bushtit	Mourning dove	Varied thrush
California quail	Nashville warbler	Violet-green swallow
Calliope hummingbird	Northern flicker	Warbling vireo
Cedar waxwing	Northern pygmy-owl	Western bluebird
Chestnut-backed chickadee	Northern saw-whet owl	Western Flycatcher
Chipping Sparrow	Olive-sided flycatcher	Western tanager
Common poorwill	Orange-crowned warbler	Western wood pewee
Common raven	Pileated woodpecker	White-breasted nuthatch
Cooper's hawk	Pine siskin	White-crowned sparrow
Dark-eyed junco	Plain titmouse	White-headed woodpecker
Downy woodpecker	Purple finch	Wilson's warbler
Dusky flycatcher	Pygmy nuthatch	Winter wren
Evening grosbeak	Red crossbill	Wrentit
Fox sparrow	Red-breasted nuthatch	Yellow warbler
Golden-crowned kinglet	Red-breasted sapsucker	Yellow-rumped warbler
Golden-crowned sparrow	Red-shouldered hawk	
Goshawk	Red-tailed hawk	

MAMMALS OF BLODGETT FOREST

Black bear	Northern flying squirrel
Black-tailed jackrabbit	Oppossum
Bobcat	Pinyon mouse
Broad-footed mole	Pocket gopher
Brush mouse	Porcupine
California ground squirrel	Raccoon
Coyote	Ringtail
Deer mouse	Snowshoe hare
Douglas squirrel (chickaree)	Striped skunk
Dusky-footed woodrat	Trowbridge's shrew
Gray fox	Vole
Long-eared chipmunk	Western gray squirrel
Long-tailed weasel	Western jumping mouse
Mountain lion	Western spotted skunk
Mule deer	

REPTILES OF BLODGETT FOREST

Gilbert's skink
Northern alligator lizard
Racer
Rubber boa
Sagebrush lizard
Sharp-tailed snake
Southern alligator lizard
Western aquatic garter snake
Western fence lizard
Western rattlesnake
Western skink
Western terrestrial garter snake

AMPHIBIANS OF BLODGETT FOREST

California newt
Ensatina
Pacific treefrog

Northern Goshawk (*Accipter gentilis*) Surveys
Blodgett Forest Research Station
July 2008

Report submitted on July 30, 2008

University of Minnesota Spotted Owl Research Team

Douglas Tempel, Project Leader
William Berigan, Asst. Project Leader
Sheila Whitmore, Asst. Project Leader

Methods

We surveyed Blodgett Forest compartment numbers 292, 295, 490, 590, 600, and 1140 for the presence of northern goshawks (*Accipiter gentilis*) during July 2008. We conducted broadcast surveys using a portable stereo system and recordings of four goshawk vocalization types—adult alarm call, adult two-note wail, adult male food delivery call, and juvenile begging call (Kennedy and Stahlecker 1993, Watson et al. 1999, U.S.D.A. Forest Service 2000, Woodbridge and Hargis 2006). Each survey lasted approximately ten minutes (*see Appendix A*).

Our survey locations were coincident with selected Blodgett Forest plots established to monitor long-term vegetation trends within the compartments (*see Appendix B*). We typically surveyed at every other vegetation plot marker within a stand compartment. Vegetation plot markers are spaced 400 feet apart along parallel transects; adjacent transects are also spaced 400 feet apart (*see Appendix C for an example*). As a result, our goshawk survey points were 243.8 meters apart (i.e. 800 feet) along each transect, and each transect was separated by 121.9 meters (i.e. 400 feet).

We conducted two survey sessions, during which we completed one survey at each goshawk survey point. The first survey session occurred on July 1–2, and the second session occurred on July 15–16. Nesting goshawks in the central Sierra Nevada should have fledged young by the date of our initial survey (U.S.D.A. Forest Service 2000, Woodbridge and Hargis 2006). We conducted all surveys between 8:50 A.M. and 7:15 P.M. Pacific Daylight Savings Time.

Results

We detected no northern goshawks during our survey sessions. We detected one adult red-tailed hawk (*Buteo jamaicensis*) and two unidentified raptors flying high overhead.

References

Kennedy, P.L.; Stahlecker, D.W. 1993. Responsiveness of nesting Northern Goshawks to taped broadcasts of 3 conspecific calls. Journal of Wildlife Management 57: 249–257.

U.S.D.A. Forest Service. 2000. Survey methodology for northern goshawks in the Pacific Southwest Region, U.S. Forest Service. Internal memo obtained from Claudia Funari, Georgetown District Biologist, Eldorado National Forest. 18 p.

Watson, J.W.; Hays, D.W.; Pierce, D.J. 1999. Efficacy of Northern Goshawk broadcast surveys in Washington state. Journal of Wildlife Management 63: 98–106.

Woodbridge, B.; Hargis, C.D. 2006. Northern goshawk inventory and monitoring technical guide. Gen. Tech. Rep. WO-71. U.S.D.A. Forest Service, Washington, D.C. 80 p.

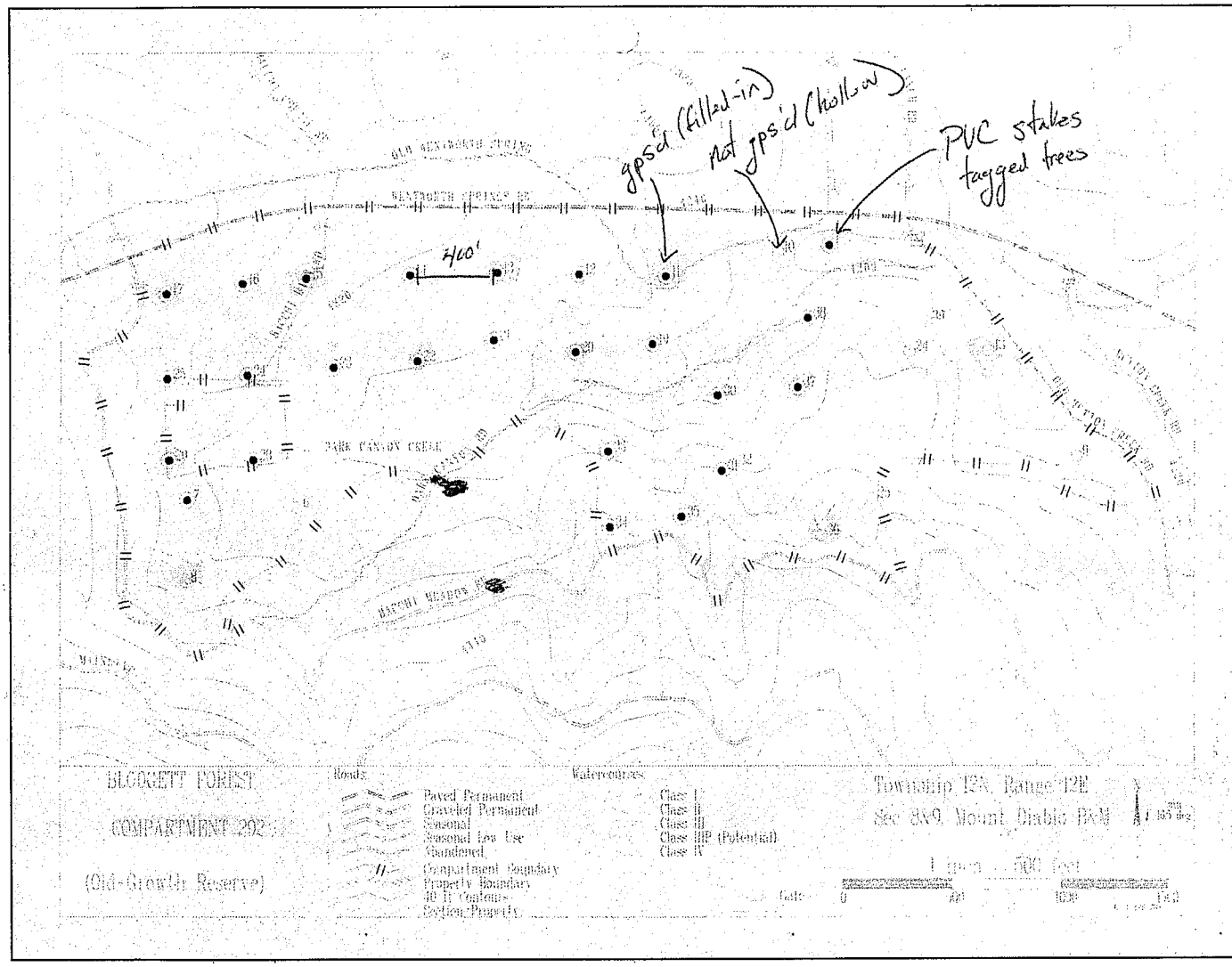
Appendix A: Goshawk Survey Protocol

1. At each survey station, broadcast tracks 1-4 on the "Goshawk Calls" CD while facing north. Wait 30 seconds, then broadcast Tracks 1-4 while facing east. Wait 30 seconds, then broadcast Tracks 1-4 while facing south. Wait 30 seconds, then broadcast Tracks 1-4 while facing west.
2. **At all times during the broadcast survey, listen and watch carefully for goshawks.**
3. Walk to the next survey location at an easy pace, listening and watching for goshawks.
4. Repeat step 2 at each survey location.
5. Record the location, age (adult or juvenile), and behavior of any detected goshawks (see data form).

Appendix B: Goshawk Survey Locations

compartment	plot marker	UTM east	UTM north
292	1	704146	4308743
292	8	703246	4308260
292	11	703917	4308696
292	13	703678	4308699
292	13	704382	4308534
292	15	703410	4308688
292	17	703214	4308664
292	20	703791	4308588
292	22	703568	4308573
292	24	703330	4308550
292	29	703221	4308429
292	33	703839	4308448
292	36	704056	4308365
292	37	704105	4308542
295	3	704033	4308822
295	5	703811	4308818
295	7	703579	4308807
295	9	703695	4308940
490	2	703369	4306171
490	6	703356	4306431
490	10	703445	4306938
490	12	703448	4306807
490	16	703456	4306576
490	20	703468	4306307
490	24	703350	4306646
490	32	703569	4306223
490	34	703563	4306420
490	36	703555	4306640
490	40	703654	4306528
490	42	703693	4306304
590	1	704515	4305005
590	5	704538	4304734
590	9	704559	4304526
590	16	704718	4304625
590	22	704393	4304842
590	23	704332	4304610
600	1	704093	4304727
600	3	704125	4304507
600	5	704245	4304397
600	7	704230	4304620
600	9	704482	4304431
600	12	704750	4304443
1140	1	702192	4312036
1140	3	702071	4312155
1140	5	702074	4311914
1140	7	701952	4312034
1140	9	701955	4311792
1140	10	701830	4312152
1140	12	702321	4311799
1140	13	702188	4311792

Appendix C: Goshawk Survey Locations within Compartment 292



Blodgett Forest Research Station
Road Report

Introduction:
Roads are a major source of erosion and sedimentation on most managed forest and ranch land (Weaver and Hagans, 1994). There are many factors which contribute to this potential road erosion, including: types and number of stream crossings, road gradient, road surface, road construction and design, precipitation amount and periodicity, water holding capacity of surrounding soil, and road usage. By carefully planning with these factors in mind, Blodgett Forest Research Station (BFRS) intends to economically minimize erosion and sediment transportation, thereby decreasing negative impacts on environmental quality. This Road Report (RR) provides guidelines for constructing, reconstructing, monitoring, maintaining, and closing of forest roads and log landings. The goal is to disconnect the forest road transportation system from the natural hydrological system, thereby minimizing sediment input and road water drainage to watercourses. The RR will meet or exceed the guidelines of the California Forestry Practice Act Rules and Regulations, and will provide low cost, low impact, permanent solutions. This RR includes the following components:

1. **History:** Description of design standards for the original road network and events leading up to the inception of the RR.
2. **Environmental Concerns:** List of aquatic and riparian issues to be addressed.
3. **Road/Culvert Identification and Inspection/ Maintenance/ Improvement Program**: Guidelines for monitoring forest roads & culverts and establishing a maintenance priority program.
4. **Road Design and Construction Standards**: Guidelines for road location, design, and construction.
5. **Road Use Restrictions**: Guidelines that identify restrictions on use of forest roads.
6. **Road Abandonment Plan**: A comprehensive plan to identify and prioritize roads to be properly abandoned on the forest.
7. **Air Quality:** Guidelines for reduction of particulate matter emissions.
8. **Archaeology:** Guidelines for protection of historic and prehistoric cultural resources at risk.

Limited new road construction is anticipated, and emphasis is placed on improving and abandoning poorly designed or misplaced roads.

This RR is intended to provide a systematic program to inventory the existing roads, log landings, watercourse crossings and drainage features; provide guidelines for new road construction and maintenance; improve current roads and stream crossings; and abandon high-risk & unnecessary roads to minimize adverse impacts of sediment transportation into local water courses.

1. History:
A substantial portion of the roads on BFRS have received surface improvement over the past decade. The road system was designed and primarily constructed in the 1960's. Contemporary standards led to a road system designed to minimize the combined cost of road construction, downhill log yarding, and road maintenance. Research prospects indicated that all roads would need to be permanent and located on university controlled property. These design standards indicated a system of roughly parallel main roads with an average spacing of 600 to 800 feet slope distance. Common practice at that time was to locate roads on top of existing railroad or mining ditch access. These were typically located on good grades and along watercourses thus facilitating total downhill yarding access. Main roads were constructed 16 feet wide on steady grades of 1 to 4 % with minimum 60 foot radius curves, inside ditches, outside berms and cross drain aluminum culverts of typically 12" to 18" diameter. Watercourse crossings were designed to accommodate 50-year return interval storm events. Steep, 12 foot wide (10% + grade) low standard roads "connected" main roads together for management and research access. Short spur roads reached "long corners" and property edges. The resulting road network was systematic, efficient to build and maintain, and provided excellent summer access. Unfortunately it also created 38 miles of road occupying about 3 % of 3000 acres, much of it hydrologically connected to the watershed.

By 1985 only 4% of the road system had rock surface, while the remainder was still compacted native soil. No significant road construction or reconstruction had occurred for over two decades. Routine maintenance consisted of fall grading of the most heavily utilized road segments. A system of gates limiting public access, particularly during wet weather, had been added in the 1970's. Management limited road use and attempted with modest success to restrict research access of the roads during winter. No significant road issues had occurred within the remembrance of forest managers or users.

During March 1986, a warm rainstorm delivered 3.5" of precipitation on what started as two feet of packed snow. Every Class I watercourse crossing overflowed as did most class II crossings. One crossing failure diverted an

entire stream down ¼ mile of main road. Many segments of native surface roads experienced modest to substantial rilling, particularly segments predisposed with even the slightest wheel ruts from winter use. Despite the proximity of many roads to watercourses, low road gradients and shallow crossing fills reduced total damage. The economic and environmental costs associated with this single event motivated efforts for developing the current Blodgett Forest Road Report.

2. Environmental Concerns:

Roads primarily affect aquatic and riparian ecosystems through five pathways:

Fine and coarse sediment can be eroded from the cut slope, road surface, and fill material. Sediment may be delivered directly into streams or wetlands, or may be carried to the stream or wetland via ditches or surface flow. Fine sediment (for purposes of fish habitat evaluation, sediment having a diameter less than 0.85 mm) in streams may accumulate in stream bed gravels, reducing reproduction capabilities of aquatic life. Fine and coarse sediment may also cause other adverse impacts to fish habitat, such as reducing incubation and over-wintering rearing habitat, increasing turbidity, and filling pools. In addition, sediment may fill wetlands, impairing their capacity to store and filter water and support sensitive plant and wildlife populations.

Culverts, bridges, and other channel modifications associated with stream crossings may create fish passage barriers, rendering upstream habitat inaccessible. Culverts and bridges associated with stream crossings, or flow diversions which fail to move water properly, can increase sediment yields by causing fill washouts and channel diversions. Culvert failure, improper culvert sizing, and delayed maintenance of drainage structures are key issues for Blodgett Forest managers because of their potential to cause sediment delivery to streams.

Roads may impair water quality by runoff of extremely fine sediment that creates high levels of turbidity in surface waters. Heavily used roads may produce runoff of chemicals such as oil, fine metal fragments, and pulverized rubber. Roads may sometimes affect water quality indirectly by altering watershed hydrologic response via increased runoff rates, or by causing temperature and chemistry changes due to loss of shade, alteration of the stream channel, etc.

Road construction and operations may destroy or disturb sensitive ecosystems such as wetlands, riparian zones, ponds, and stream channels. These impacts may occur in conjunction with road construction and relocation; therefore, all new road locations are thoroughly investigated during the planning process – often linked with the THP process and accompanied by a California Department of Fish and Game 1603 Permit application.

Landslides caused by roads, rather than by timber harvest, are the primary source of sediment from forest practices in the western U.S. (Mills 1997). Roads on steep slopes can trigger landslides by cutting off the tow of a dormant slide, over-steepening a slope with fill material, delivering water to a slope via drainage ditches, or reducing soil stabilization by removing tree roots (i.e. by killing the trees). Road-caused landslides may deliver large amounts of sediment into stream channels, killing fish and severely degrading fish habitat. No road-related landslides exist on BFRS.

Figure 1. Culvert at Peak of 100 Year Return Interval Storm Flow, 90 CFS

3. Current Road / Culvert Identification and Inspection / Maintenance / Improvement Program:
On Blodgett's main 3,000 acre tract there were 34 miles of roads in 2003. In section 29, (a non-contiguous portion of BFRS) there were 6 miles of roads in 2003. 75 acres of road area cover 2.2 % of the total property. Currently, all watercourse crossings on BFRS roads are culvert installations. In total, there are 162 culverts in the BFRS road system. The value of the roads exceeds the total investment in housing and service facilities at BFRS. Management has taken an active role in maintaining the roads at a standard that provides reasonable access to all areas and reduces sediment production.

BFRS managers have a keen interest in achieving future road conditions that protect the beneficial uses of water and restore natural watercourse processes while disconnecting the transportation network form the hydrologic network.

In keeping with the desired future road conditions, road inspections will identify sections of road to be abandoned, outsloped or resurfaced. Potential sediment source areas will be evaluated to determine the downstream depositional reaches. Analysis of the hydrologic connection between source and possible deposition area will allow management to prioritize identified problem areas for upgrade with future road work. Areas with high sediment movement are prioritized using the Road Erosion Status Report. See Appendix E for the Road Surface Erosion Survey of 1999. Roads with high sediment yield can be rocked, reshaped with drainage features, or abandoned depending on their relation with the entire road network. A threshold sediment level does not exist; however, known problem areas with the highest volume of transported sediment will be addressed first. Road segments where forest managers are currently planning on doing work are outlined in Appendix G. Road work in these areas will be completed incrementally as resources become available.

In the past decade 6 miles of road were abandoned at BFRS. All roads which paralleled Class I or II watercourses within flood zones were removed. Slightly more than 2 miles of new road located >200' from the nearest watercourse were built to replace the abandoned sections, resulting in a net decrease of 10%.

During this period four Class I and sixteen Class II watercourse crossings were abandoned. One Class I and four Class II crossings were constructed on replacement roads. The seven remaining Class I watercourse crossings were replaced with new culverts designed to pass the water and debris resulting from a predicted 100-year return interval storm event. Each crossing was built to facilitate fish passage at both high and low stream flow levels, is rock armored, and has a designed failure point which minimizes potential loss of fill in watercourses should the culvert fill or become blocked. Eight Class II watercourse crossings were similarly rebuilt. All rebuilt crossings except one

have survived a 100 year flow (rain on snow) on January 1, 1997. One Class II plugged with debris. However, the resulting overflow followed the designated failure path with minimal fill loss.

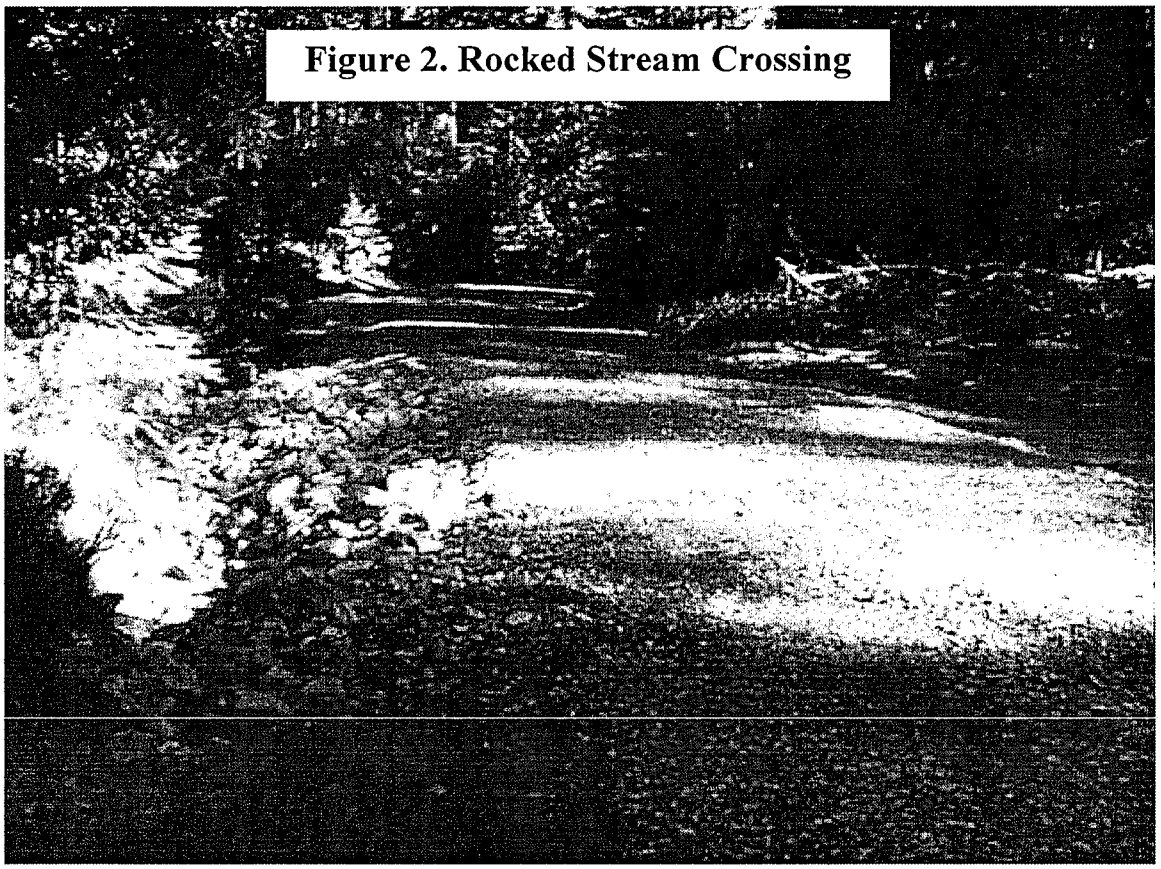


Figure 2. Rocked Stream Crossing

Over ten miles (30%) of roads have been rock surfaced in the past decade. Approximately ½ mile was paved. An additional 3 miles of road have been reshaped as outsloped to remove inside ditches and cross drains.

Additional miles of road to be rocked or outsloped are selected in much the same way. Roads are prioritized by potential for sediment input and level of use. Those roads are repaired by either reshaping to remove an inside ditch or resurfacing with a less erodible material. Roads that are heavily rilled or have an inside ditch are good candidates for improvement by outsloping and installing rolling dips. Examples of potential locations for future road work are identified in Appendix H

The continual inventory of roads and stream crossings provides the basis for upgrading the current road system and maintaining it into the future. Road inspection/ inventory/ improvement currently includes the following components (a description of each follows):

- Road and culvert GPS location and integration into the GIS database
- Sign identification at road junctions, watercourse crossings and road drainage culverts
- Annual culvert inspections identify maintenance needs and prioritize improvements
- Annual road inspections address safety concerns and identify areas for maintenance and improvements
- Road inventory every five years measures sediment transport on a sub-set of BFRS roads and prioritizes drainage problems for future road work
- Stream Inventories identify sources of sedimentation in watercourses for incorporation into road work priority analysis
- As pressure for wet season use increases, road segments are rocked with 1.5" crushed limestone road base or paved.
- Roads are gradually converted from crowned surfaces with inside ditches, cross drain culverts and outside berms to totally out-sloped with self maintaining drainage.
- Road maintenance and construction has been part of the continuous planning process of forest management

3.1 Road and culvert GPS location and integration into the GIS database

Road and culvert locations are recorded using global positioning system (GPS) technology and integrated into the BFRS geographical information system (GIS) database. Current information detailing road layout such as width, length, and surface type as well as culvert location, size, and material is incorporated into the GIS database. The database also includes comments that enable the forest managers to prioritize road maintenance and estimate costs to fix problem areas. As new road features are installed or abandoned the forest managers will continue to add the new information into the GPS/GIS database. GIS maps of the Blodgett Forest road network and culvert locations are attached in Appendix A.

3.2 Sign Identification at Road Junctions and Watercourse

Road junctions on Blodgett Forest have signs identifying the converging road names. Every culvert location is systematically marked and identified with a plastic PVC pipe that is labeled with a two-letter code followed by a number on reflective tape. This code identifies the name of the road and the culvert's sequential number on that road (South to North or East to West). Conditions of the culvert ID posts are checked during the annual culvert inspection and repaired/replaced as necessary. A driver's log with mileage between road junctions and culverts is available from the forest managers.

Figure 3. Intersection Sign

3.3 Culvert Inspection and Maintenance/Improvement Program

Blodgett Forest's current road inventory includes an annual inspection of culverts before significant rainfall or the start of the winter maintenance period on October 15. During inspection, every culvert on Blodgett Forest is visited and culvert condition is noted with appropriate maintenance requirements.

Immediately following or concurrent with inspection, culverts are cleaned and any minor damage is repaired. Prompt removal of any material that restricts water flow is the most important type of maintenance for culverts. Culvert inlets, outlets and catch basins are cleaned during annual culvert inspection and during heavy runoff periods (>3 inches in a 24 hour period) especially below recently harvested or burned units or known problem areas. Catch basins are routinely cleared of floatable debris (leaves, needles, and slash).

Culverts requiring more extensive repair or which have substantial sediment deposited at the inflow or outflow are revisited by staff with a backhoe. Material which constricts flow is removed in such a way as to prevent sediment delivery to downstream watercourse protection zones. Clean 6-8" rock can be used in the inlet catch basin to prevent scouring of soil and subsequent blockage of the culvert. Rock or other energy dissipation devices may also be placed below the outlet of road drainage culverts as needed to help reduce erosion potential and prevent rilling.

During inspection, recommendations are made for culvert replacement or removal. Since 1995, culverts that corrode, are damaged or otherwise need to be replaced, are replaced with culverts large enough to accommodate the

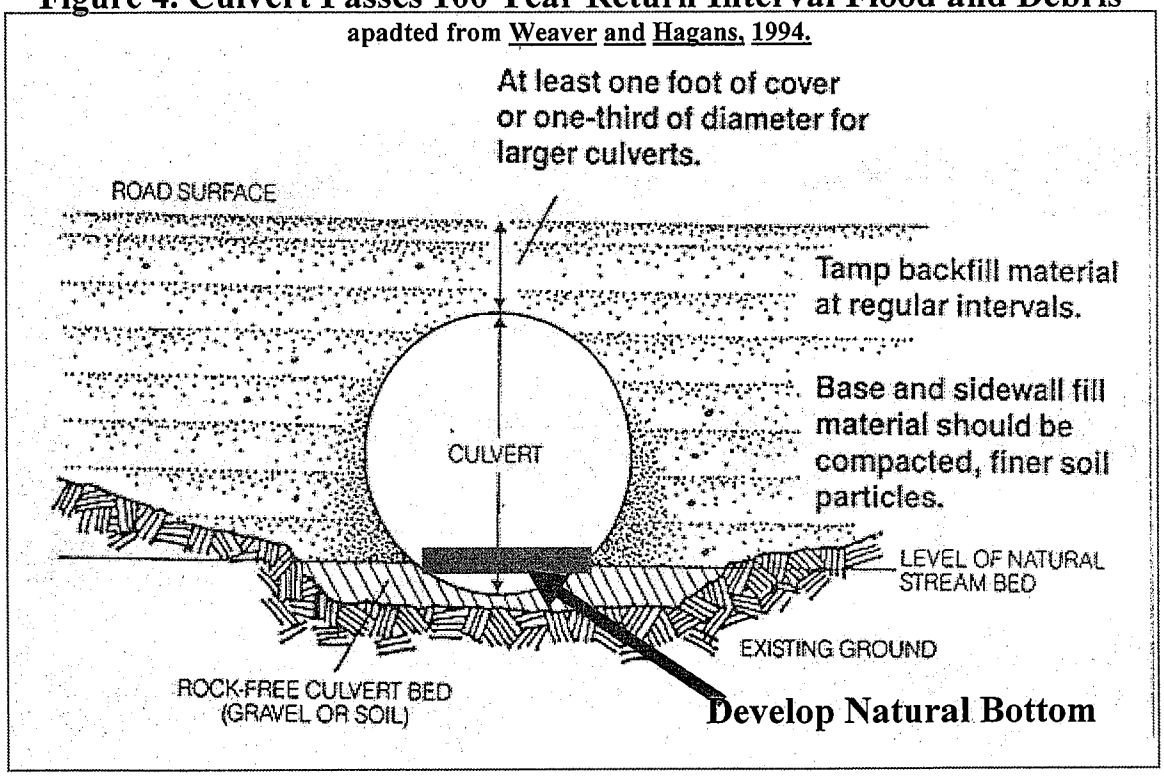
flow from 100-year storm events. Appropriate sizing techniques include USGS regional regression equations, rational method, flow frequency analysis, and flow transference (i.e., scaling discharge by watershed area from gauging station records, using a regional regression coefficient for watershed area – see Waananen and Crippen 1977). The preferred method is to use more than one office-based technique to determine discharge, and then check this result against field observations (Cafferata et al. 2000).

Past culvert inspection reports have identified each crossing as a wet/dry crossing or road drain. This information does not appear on the most recent culvert reports; however, in future this information will be incorporated back into the report. All inspected crossings will also be evaluated and classified into one of the following categories: Class I, Class II, Class III, Class IIIP, Class IV, or ditch relief. This information is crucial to the forest managers when determining the appropriate priority of maintenance work in relation to these structures.

The next step toward incorporating information regarding the hydrologic network with that of the current road network is to link these associations during inventory. The next culvert inventory will look specifically at whether road sediment appears to be entering the hydrologic system where it crosses the road. This information coupled with the watercourse classification will increase awareness about whether road-related sediment is impacting sensitive reaches of watercourse. For more information on what is being done to minimize the impact of roads on watercourses, see the section on Road Inspections.

Figure 4. Culvert Passes 100 Year Return Interval Flood and Debris

apadted from Weaver and Hagans, 1994.



Newly installed culverts must also be positioned in such a way as to allow for the passage of fish and other aquatic organisms in all stages of their life cycle. For this reason, multi-level culverts are installed where necessary with a sunken culvert for fish passage during low water (Figure 5). Where possible on Class I stream crossings, bridges or pipe arches are used to facilitate fish passage. Watercourse crossings are designed to minimize diversion potential. Fill volume is minimized over crossings, while providing sufficient depth of fill to protect a culvert from crushing under vehicle traffic. Where necessary to avoid substantial loss of fill material watercourse crossings using culverts with diameters of 60 inches or more will have armored entrances and outflows.

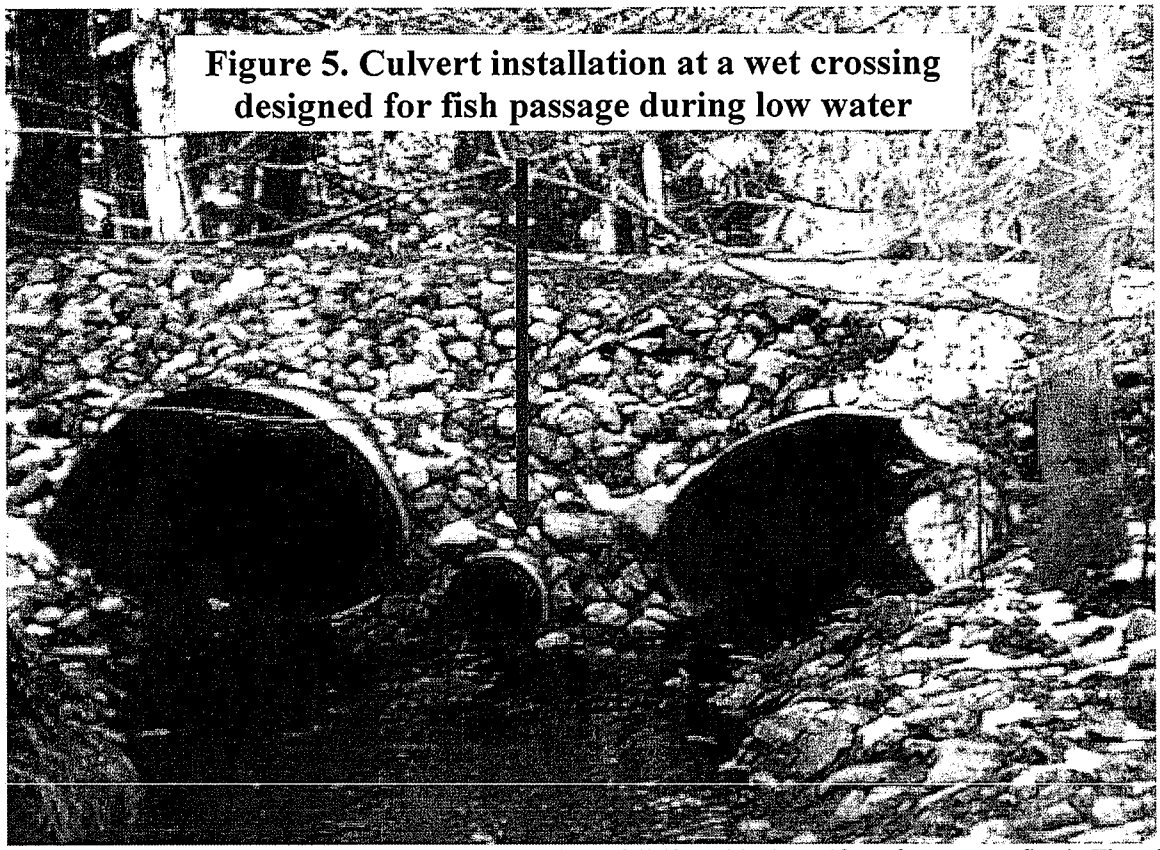
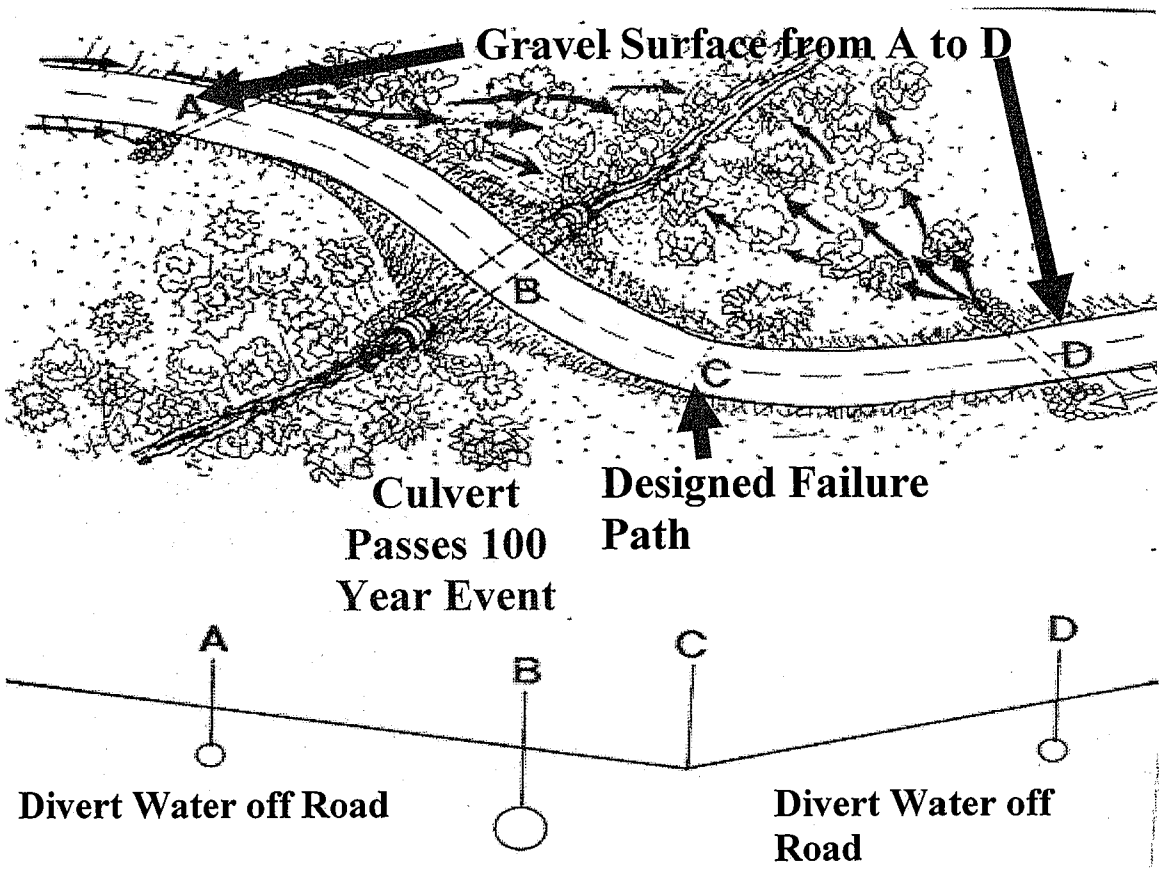


Figure 5. Culvert installation at a wet crossing designed for fish passage during low water

Management assumes all culverts have some potential to fail (from blockage if not from water flow). Therefore since 1990 all new and replaced watercourse crossing culverts on BFRS have fill failure protection ("rip-rap") and a designed failure path to mitigate this potential event. The forest experienced a 100-year flood event in the winter of 96/97 without any fill failures. One class II culvert did plug. However, the designed failure path functioned as planned, preventing fill erosion.

Figure 6. Overhead and profile view of ideal stream crossing – apadted from Weaver and Hagans, 1994.



All watercourse crossings that do not meet the standard are planned to be gradually upgraded to pass 100-year return interval storm events including debris. A prioritized list will be developed during 2003.

Culvert Inspection Reports are available from 1995 to present from the forest managers. The 2002 Culvert Inspection Report is included in Appendix B.

3.4 Road Inspections

A visual inspection of all roads is done in the spring while re-opening roads closed to wet-season access. This is a simple inspection to ensure safe passage for the following field season and to clear debris from the road surface. In addition to the spring inspection, a more detailed inspection is carried out annually in late summer/early fall. This inspection is conducted with sufficient time before the wet season in order to treat areas requiring roadwork before the winter period. Apart from the official inspections by designated staff, all staff who travel regularly on Blodgett Forest Roads are educated about road operations and encouraged to report any road maintenance problems they encounter,

Road inspection reports are recorded (see Appendix C) and kept on file by the forest manager for at least five years. Any major problems should be documented by photographs – a digital camera works well for this. Post-inspection work should also be documented in writing on the original inspection form, or on a follow-up sheet.

Road features including ditches, lead-outs, rolling dips, waterbars, and surface drainage patterns are evaluated for possible maintenance needs. Debris in ditches that may cause clogging is removed. Unless necessary to prevent blockage, road ditches are not "pulled" so as to reduce potential movement of loose soil. While cleaning and grading ditches to remove impediments to water flow, care is taken not to undercut slopes which may cause them to slough or slide. Obstacles are removed that could cause ponding, which can saturate the road subgrade and contribute to surface rutting on soft spots. Recently used haul roads (especially native soil surfaced) are checked for surface drainage capability and re-graded if necessary.

During future road inspections, road deficiencies in terms of hydrologic function will be addressed. Areas that exhibit signs of sediment movement will be closely observed to determine the destination of the transported sediment. For example, a rill traveling on the road surface will be followed to the point where sediment is deposited, be that on the forest floor in a layer of duff and litter, in a roadside ditch, or to a culvert crossing. Using the crossing classification from the annual culvert inspection, this information will help forest managers prioritize road work to correct identified sediment movement problems.

Road sections where sediment is recognized as transported to culvert crossings other than ditch relief will be given precedence. Class I and Class II culvert crossings receiving road generated sediment will be improved to remedy the immediate problem before the inspection and associated maintenance is complete. More in-depth road work may be mandated for a more permanent fix as soon as resources are available. The comprehensive road inspection done in 1998 is given in Appendix C

3.5 Road Inventory

Road inventory is a more thorough survey of the entire road network on BFRS to identify and prioritize road work that will enhance road functions and move us toward achieving our desired future conditions.

The road inventory will help the Forest staff:

- Identify problems that can be corrected through routine annual maintenance activities;
- Assign maintenance and mitigation priorities to planning watersheds, road segments, and crossings;
- Identify the most effective designs for roads, landings and culvert problem sites; and
- Identify roads to be properly abandoned.

Road inventory will be completed in late summer/early fall every five years (see the RR Implementation Schedule in Appendix H.) All roads are evaluated for erosion potential and possible sediment delivery to sensitive riparian areas Special attention is given to those roads with high traffic volume, close proximity to recently harvested or burned units or known problem areas.

. The Road Surface Erosion Assay re-measured in 1999 is covered in Appendix E. Future road inspections will incorporate elements from the protocol of each of these surveys.

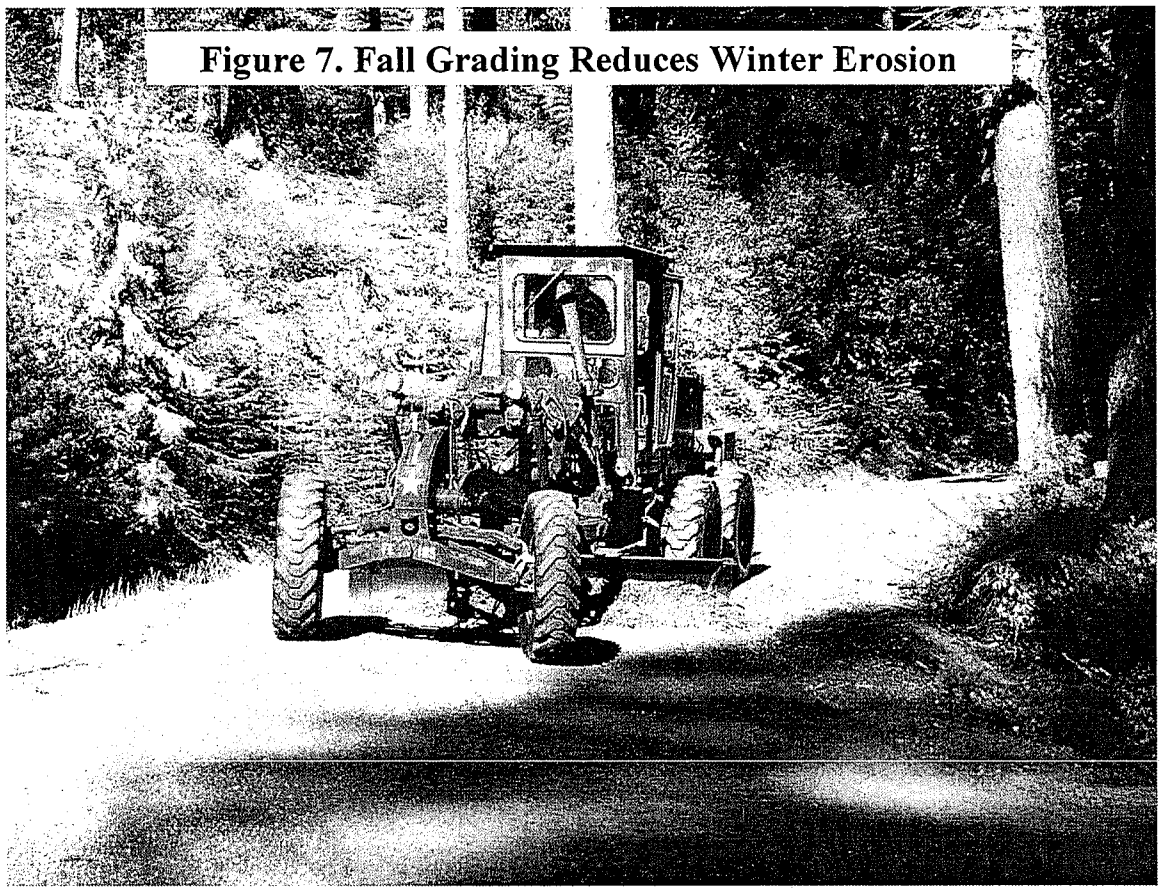


Figure 7. Fall Grading Reduces Winter Erosion

3.6 Road Maintenance

Proper maintenance is a key to reducing the long-term contribution of road related sediment. The full length of all permanent and seasonal roads are inspected at least once annually to ensure that drainage properties and structures are functioning properly. Two types of inspections are used: 1) formal inspections, and 2) rapid ad hoc inspections. During formal inspections, all roads will be carefully observed every five years and problem sites will be recorded on road inventory forms. To cover the period between detailed inspections, a rapid ad hoc inspection will be made by BFRS Forest Managers and other staff during normal activities. "Storm patrol inspections" of known or anticipated problem facilities will be triggered by large winter storm events.

Abandoned roads and crossings will be inspected at least twice (the first summer and third summer) following the completion of the decommissioning process. A report describing the type and proposed timing of additional work will be developed.

In 1994 BFRS started a road-surveying project to help management prioritize road maintenance. This survey measured road surface rills to estimate the total loss of sediment from road surfaces and suggested erosion control treatments for each problem area. The result was a rating of roads based on total sediment movement. Erosion control efforts were then focused on those roads with the most sediment movement. A summary of the 1994 results is given in Appendix E.

A re-measurement in 1999 was done to further monitor road conditions and to assess the value of road maintenance efforts that were done following the 1994 survey. The 1994 road survey report suggested fixes for every problem regardless of severity. Rather than suggest a method for fixing every rill, broader suggestions that focus on

problem areas or whole sections of road should be considered. Also, the 1994 survey did not trace sediment transport corridors (STC – the pathway of sediment movement from the source to the watercourse). Survey methods similar to those done in 1994 that include STC measurements and broader drainage recommendations in the future will assist management in prioritizing the road maintenance program.

The 1999 survey was used in conjunction with stream inventory data to determine a hierarchy for treatments. Those watersheds and roads with the most erosion and sedimentation were treated first. The roads within the watershed that are contributing the most sediment can then be treated as a unit. An example of a road survey data sheet template for 1999 is included in Appendix E. BFRS will continue to do this extensive road survey every five years and do visual inspections (road inventories) every year. The results of 1994 and 1999 road erosion surveys are attached.

3.7 Stream Inventory as Part of Road Management

Prioritizing roads to study and treat should be done on a watershed scale. Blodgett currently has a full report of stream conditions for 1997 and 1998 for each of the class I watercourses that drain 2nd order watersheds. V* measurements of in-stream sediment have shown significant variation from year to year and may eventually reveal long-term trends in sediment change as a response to management activities. As watershed monitoring continues, V* measurements of in-stream sediment will provide an index value of each watershed's normal sediment load. Those watersheds that indicate a continuing high sediment supply will have a higher maintenance priority. Blodgett will be including Sediment Transport Corridor (STC) measurements as a part of the stream inventory procedure in the future. A STC seen delivering sediment to a watercourse can be measured and followed to its source. This will help develop a background sediment load and attribute specific changes in sediment load to certain management practices, including road construction and maintenance. Implementation of the Road Report will likely reduce the amount of erosion and sediment delivery to watercourses. Maps of the state planning watersheds and subwatersheds that are on Blodgett Forest are shown in Appendix A.

3.8 Vegetation Clearance

Clearing woody vegetation along roads increases visibility, allows sunlight to dry out road surfaces more quickly, reduces potential maintenance costs, and reduces organic debris falling on the road and in ditches. Manual and mechanical removal methods will be utilized before vegetation encroaches on the road running surface. Ditches will be kept clear of shrubs so equipment operators can see the drainage structures. However, herbaceous and low shrub vegetation will be encouraged on cutslopes and fillslopes to reduce failures and provide erosion control.

3.9 Road Surfacing

Main roads are gradually being resurfaced based on wet season access needs and erosion potential. Surfacing agents include but are not limited to: rock, chip seal, and asphalt paving. The most heavily used road in winter (Blodgett Forest Road) is 35% paved and 65% rocked. Rocked access is now available to both the North and South ends of the original 3000 acre Blodgett tract. 30% of the BFRS road system is paved or rocked to sufficient depth to allow light duty winter access. BFRS currently prohibits log skidding and hauling during the wet season.

BFRS typically uses angular cut limestone to fortify the existing road surface. The road base is a granular aggregate of inert, clean, tough, durable particles of crushed rock, gravel, and fine particles capable of withstanding the deleterious effects of exposure to water, freeze-thaw, handling, spreading and compacting.

1.9 Road Planning

The existing road network on Blodgett Forest provides access to all compartments that make up the Township 12 North tract (see Appendix A). New road construction is infrequent and limited to short spurs or re-alignment of existing roads to better protect natural features. However, non-contiguous tracts of Blodgett Forest such as section 29 and newly acquired lands may not have roads in the desired locations or conditions. In the instance of relocating a road because of environmental concerns or establishing a new road to provide accessibility, the forest managers formulate a plan in advance. As suggested in *The Handbook for Forest and Ranch Roads* (1994), the following considerations are addressed:

- What will the road be used for? Will it be for residential access, access for research, grazing, timber hauling, fire control, or recreation? What kind and size of vehicles or log yarding equipment will be used?
- Is the road necessary? If there is an existing road in the vicinity, could it be used or rebuilt? If the road is being built for timber removal, can an alternate harvesting or yarding method be selected that would either shorten the length of new road or eliminate the need for a new road altogether?
- How often and when will the road be used? Is it a one-time use (e.g. for timber removal) or daily use (e.g. for residential access)? How fast will it be traveled? Will it only be used during the summer or will it be used during winter months (i.e. does it need to be an all-weather road)?
- An additional consideration important for BFRS is the degree to which access is controlled or shared with other landowners.

2. Road Design and Construction Standards

Road construction guidelines provide principles for construction with the objective of enhancing stream channel conditions for fish, amphibians, and other sediment-sensitive aquatic organisms and to have minimum impact to upslope resources.

Road design is often a combined result of economic and local environmental factors that influence construction, operating, and maintenance costs (Weaver & Hagans, 1994). With proper road design BFRS will minimize the cost of designing, building and maintaining new roads while also minimizing damage to forest resources. The goal for building new roads is to accommodate our needs economically while having a low risk of sediment transportation in the watersheds. We plan to do so by following the guidelines described below.

BFRS managers feel that the current road system is adequate for research purposes, fire management/safety, and daily forest management practices with the exception of realignment for environmental protection. Therefore no construction of new roads is needed in the Township 12 North tract. If for some reason (most likely for research) new access is required, design and construction standards will be followed as listed below.

- All new roads will be seasonal roads, closed in winter and barricaded with a sign labeled "Road Closed".
- Single lane roads with gradient & curvature suitable for the largest vehicle/equipment used by Blodgett Forest and corresponding fire agencies.
- Inter-visible turnouts will be appropriately placed for road safety and accessibility.
- All roads will be out sloped where feasible.
- Cut and fill will be minimized. Special planning is required across stretches where there are frequent gradient changes.
- The number of watercourse crossings will be kept to a minimum
- Crossings will be installed to accommodate 100-year return interval storm events with armored surface and fill as well as a designed failure path.
- Road approaches which drain toward crossings will be surfaced with greater than three inches of 1.5 inch limestone road rock.
- Rolling dips will be installed on grades greater than 3% on access roads.
- Driveable water bars will be installed on low use connector roads.

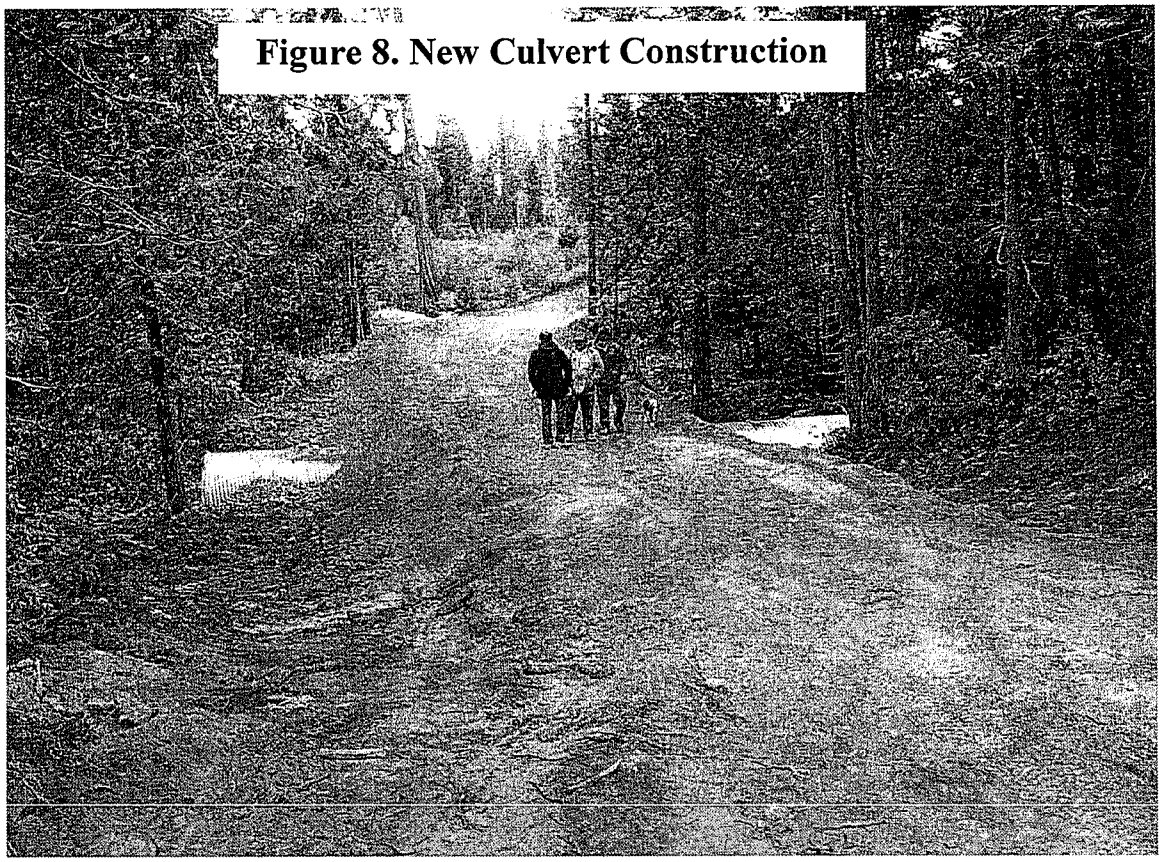


Figure 8. New Culvert Construction

3. Road Use Restrictions

Wet weather operations on Blodgett Forest will be minimized. Winter Operating Period is defined as from October 16th through May 14th. Road construction, reconstruction, upgrading and decommissioning, shall not occur during the winter period except:

- Road improvements may take place from May 1st to May15th when early spring drying has occurred or from October 16th to November 15th during unseasonably dry fall periods.
- Road decommissioning may take place from October 16th to November 15th during unseasonably dry fall periods.
- Operations will cease in the fall if the cumulative seasonal rainfall reaches 5 inches or anytime National Weather Service forecast is for a "chance" (30% or more) of measurable precipitation within 24 hours.
- All necessary surface erosion control measures will be installed on roads where work is being done prior to the end of the day if the National Weather Service forecast is for a "chance" of rain before the next day, and prior to weekend and other shutdown periods.

Specific measures are taken before the wet season to prevent vehicle traffic on soil-surfaced roads. All soil surface roads as well as some gravel surface roads are closed for the winter period. A small barricade and "Road Closed" sign is positioned at each affected road entrance. Notification of current road conditions is also posted on a central signboard in the headquarters area alerting all BFRS staff and visitors (Figure 9).

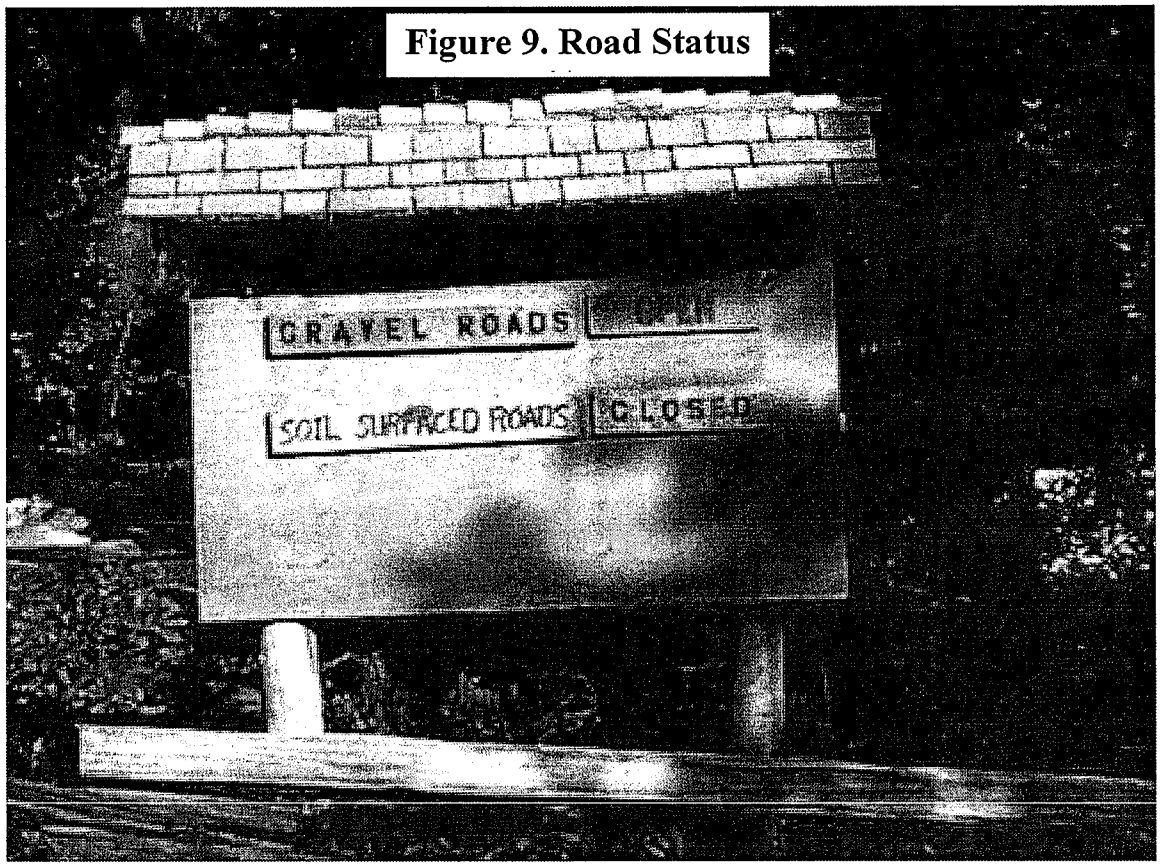


Figure 9. Road Status

Snow management is used primarily on approximately .5 mile of Entrance Road to allow access to the Headquarters area. Equipment used to plow snow not disturb the running surface of unpaved roads. Plowing should not create a snow berm that could channel snow melt along the road. Berms that develop incidentally should be breached every 100-200 ft. depending on road gradient to allow melt-water to flow off the road. These drainage gaps must be at least 100 feet from a watercourse crossing. Sand should be applied only sparingly to reduce slippery surfaces in the parking lot or on footpaths.

After the wet season or in prolonged dry periods during the wet season, roads are checked and once deemed safe may be re-opened. Roads that show visual signs of damage upon inspection should remain closed until they have sufficiently dried out.

Every road on BFRS is gated and locked; those gates easily accessible to the public are checked on at least a weekly basis to ensure security. Every gate on Blodgett Forest is posted with ownership and use limitation signs.

4. Road Decommissioning

Information for identifying and prioritizing road segments requiring abandonment comes from the semi-annual and five year road inventories. Some of the criteria used to identify candidate roads to proactively abandon include: 1) unstable areas, 2) roads in close proximity (within 200 feet except at designed crossings) to a watercourse (particularly Class I watercourse), 3) roads not needed for management purposes, and 4) roads with excessive amounts of perched fill on steep slopes. The priority for road abandonment will take into account the availability of alternative access for management, recreation, research, and fire control.

Since 1995, Blodgett Forest has taken an active role in abandoning such roads. All substantial road segments formerly located within 200 feet of class I and II watercourses have been abandoned. Some were replaced with alternate routes upslope. Since 1995, 6 miles (15 %) in the lower portion of Blodgett Forest have been abandoned.

Abandoned roads are barricaded to exclude vehicle traffic and treated to reduce future erosion. Treatments include: Pulling all culverts and stream crossings, ripping the road surface, partial removal of berms and fill sections, seed

and mulching (grass and weed free straw), installation of sediment traps to prevent sediment transport corridors and often tree planting.

Removing all culverts and stream crossings must allow for permanent, maintenance-free water flow. A backhoe or tracked excavator must work from outside the channel and excavate fill to restore the natural stream channel in both orientation and slope. The sides of the channel are pulled back and sloped to conform with the natural banks upstream and downstream, only slightly wider. The stream gradient is re-established to evenly flow across the abandoned road segment. Adequate drainage is installed in the crossing to allow the stream to assume its natural course. Runoff discharges onto vegetative cover, duff, slash or rocks. Where necessary the outlet is armored with 8-12" rip-rap. To enhance development of meandering watercourses, several logs can be placed in the stream channel at the removed crossing locations and keyed in the bank at opposing angles. At the completion of machine operations, all bare soil surfaces are planted with native grass seed and stabilized with slash and straw mulch to prevent slumping and minimize erosion.

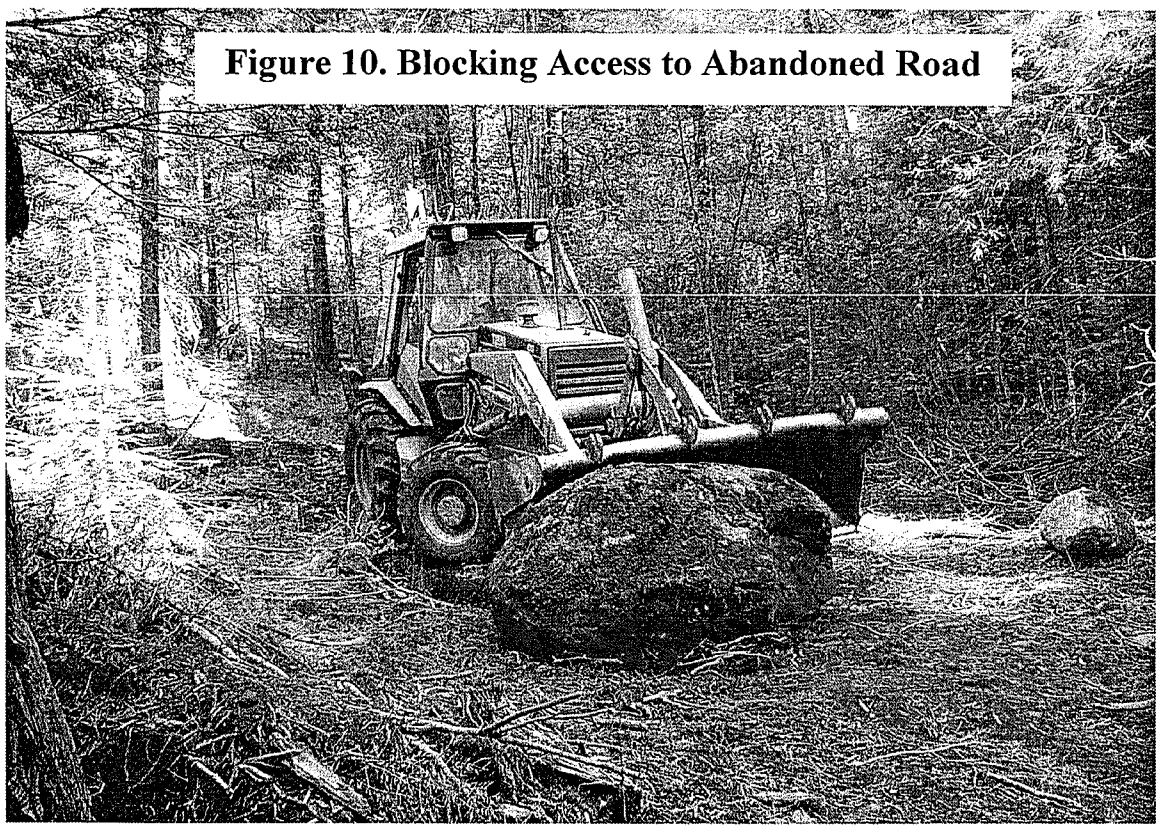


Figure 10. Blocking Access to Abandoned Road

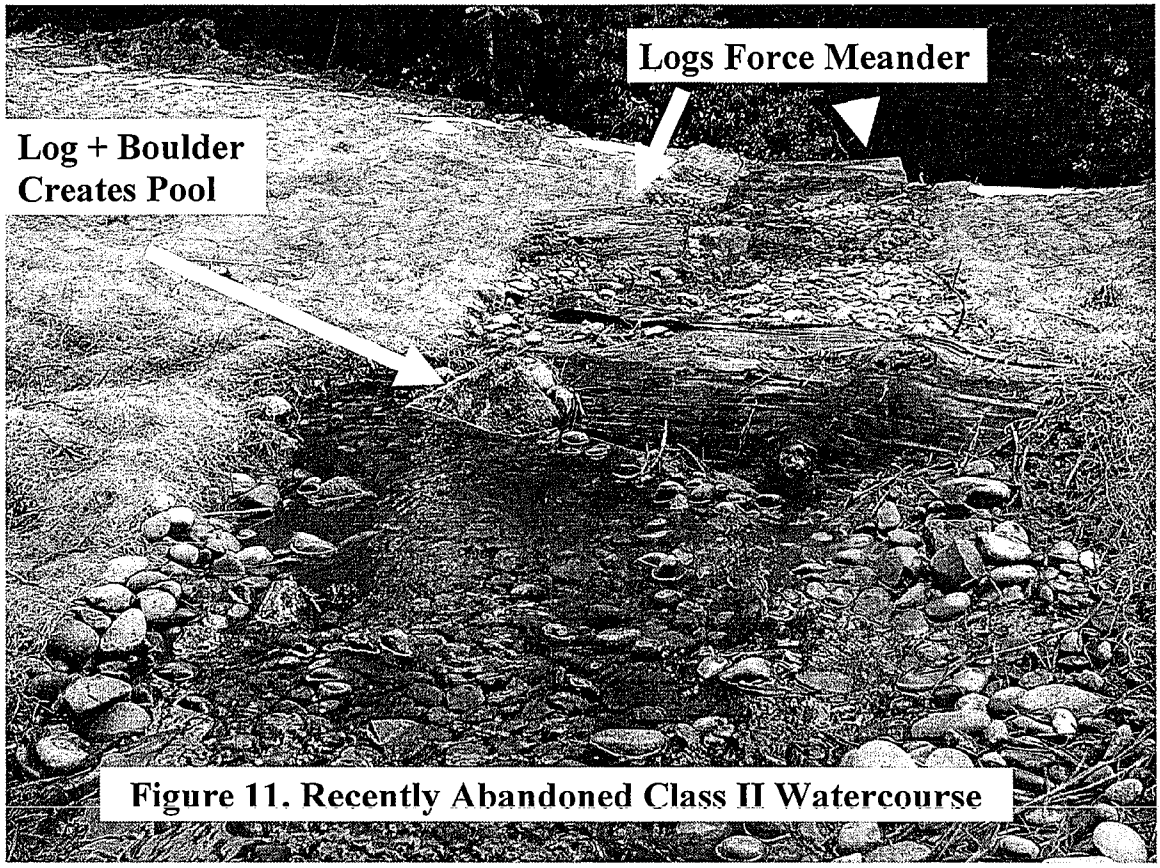


Figure 11. Recently Abandoned Class II Watercourse

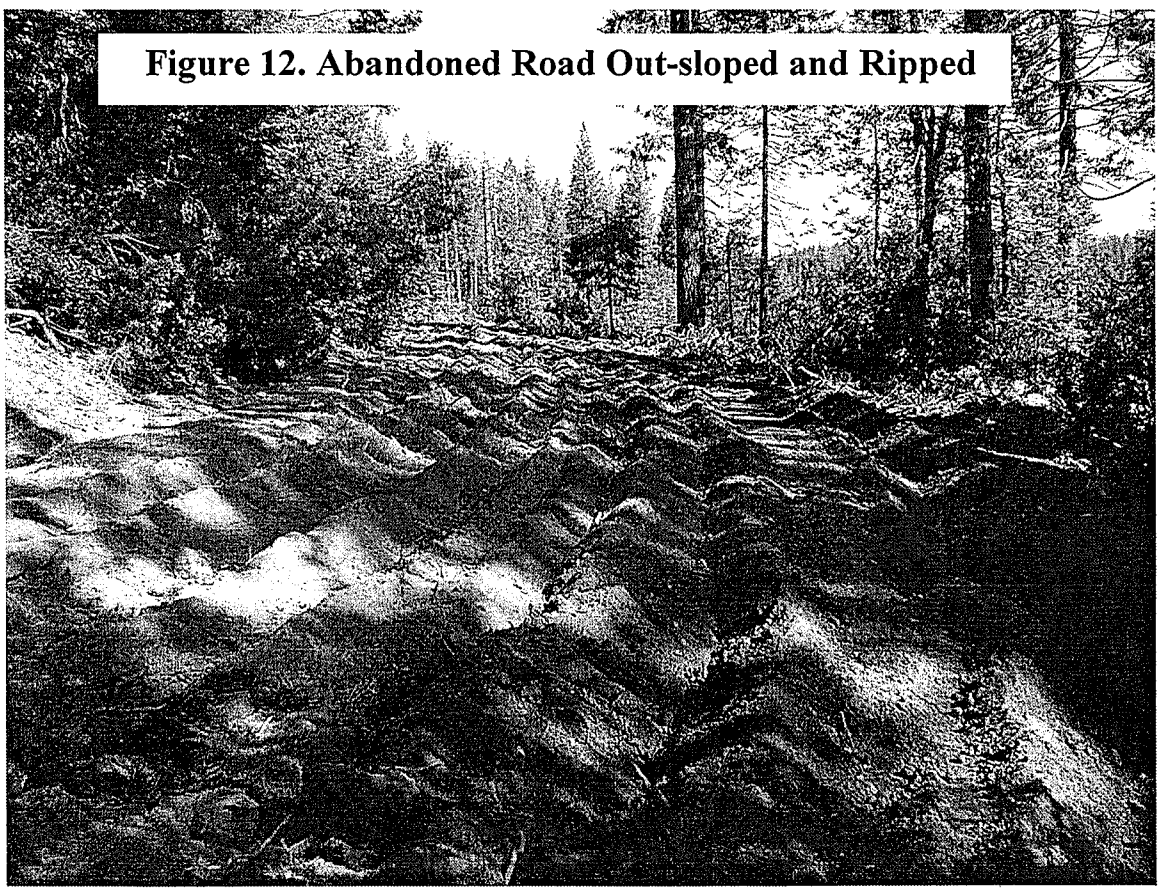


Figure 12. Abandoned Road Out-sloped and Ripped

To monitor the effectiveness of the treatments, abandoned roads will be inspected to find any new problems, and to assess the value of erosion control features that were put in previously. The inspection will follow the format of the 1998 Abandoned Road Report included in this plan (Appendix D). Erosion control work will be done before the beginning of the wet season (typically before October 15th). Straw bales, rice waddles, logging slash, sediment pit traps, and riprap have all been used in various situations to mitigate erosion. How well they "work" is difficult to quantify, but certain treatments may be more effective than others.

A prioritized list of road segments planned for abandonment is attached.

5. Air Quality

Implementation of this plan will improve air quality by reducing PM 5-10 emissions from vehicle traffic on unpaved roads The potential for generating airborne particulate matter from travel on unpaved roads can be minimized by several means. The following summarizes the principals stated in this Road Report that will have an effect on the air quality of BFRS and surrounding properties.

- The total mileage of roads will be minimized as roads that lie within 200 feet of a Class I watercourse or show a high degree of sediment movement are abandoned.
- Substandard roads with drainage and sediment production problems will be reconstructed, re-graded, resurfaced with less erodible materials (gravel or asphalt), or otherwise treated to prevent sediment delivery to watercourses.
- Existing roads will be used wherever appropriate, in preference to building new roads.
- New roads will be designed to the minimum width necessary to safely accommodate required traffic.
- All roads will be classified according to expected use (high, medium, or light) and maintained accordingly.
- Appropriate vehicle travel speeds will be posted at various locations throughout the road network.
- Roads that are actively used for log hauling or other concentrated activity will be treated to reduce the generation of road dust. Dust abatement most often includes watering the road surface but may also involve application of chemical stabilizers.

6. Archaeology

Past road construction and on-going maintenance have had significant impacts on BFRS cultural resources. Many of the known prehistoric and historic archaeological sites are located along roads. Much of the existing road network reflects a history of various transportation technologies and forest practices. A majority of the roads were constructed between the 1950s and 1970s, before historic preservation laws were in force and without consideration of impacts on significant cultural resources.

Many roads constructed on BFRS during that early period utilize or follow historic logging railroad grades established between 1910 and 1920 by the El Dorado Lumber Company. Remnants such as trestle abutments, retaining walls, and cable logging artifacts can be found along disturbed portions of the grade. Some modern truck roads also follow the grade of a historic hand dug canal known as the Georgetown Divide Ditch. Segments of the ditch have been effectively obliterated by these roads. Intact portions still exist with impressive dry-laid cobbles, cobble revetments and flumes or "boxes" at watercourse crossings.

Figure 14. 1912 Railroad Grade Supported by Hand Laid Rock Wall

The Township 12 North tract of BFRS has been surveyed extensively in an attempt to inventory all archaeological resources present and determine their significance (Draft: Blodgett Forest Research Station Archeological Survey, Dillon, 1993). Based on these findings, present and future forest activities incorporate methods that minimize or eliminate adverse impacts to known cultural resources. The BFRS archaeological records will be checked to determine the location of known archaeological sites before construction and maintenance work is started. Significant sites will be protected and left undamaged.

Archaeological surveys in the more recently acquired Township 11 North tract of BFRS have not yet been completed. An archaeological survey will be conducted by either a professional archaeologist or an RPF with current archaeological training prior to any substantial roadwork undertaken in this area. Any cultural resources will be recorded and potential significance evaluated. Specific mitigation measures to protect the site(s) will be developed in consultation with a CDF Archaeologist and documented in the project file.

For new road construction, substantial improvement to existing roads and appurtenances, or when planning for road abandonment, standards are applied as described in CDF's Archaeological Review Procedures to avoid potential impacts to significant cultural resources. The planning stage includes consultation with interested Native American Tribes to determine if significant traditional cultural resources known to them are present and may be affected. When known site boundaries are not systematically defined or may be in question, reasonable buffer zones for cultural resources are established where within which ground disturbing maintenance activities will be avoided. Results of this planning process shall be documented on the CDF Archaeological Report form. Routine annual maintenance has the potential to impact undiscovered cultural sites; however, deferring this upkeep in un-surveyed areas may result in greater potential impacts to cultural resources. Known cultural resources along roads are protected and left undamaged.

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APPENDICES AVAILABLE UPON REQUEST

A-11-004/ELD-2

ATTENTION

THE FOLLOWING ADDENDUM(S), AND INFORMATION IS REQUIRED BY LAW TO BE KEPT CONFIDENTIAL AND IS NOT FOR PUBLIC VIEWING:

ARCHEOLOGY:
(GOV. CODE 6254.10) & 14 CCR 969.1(a) (2))

PAGE 264 THROUGH PAGE 442

OPTION "A" TRADE SECRETS:
(GOV. CODE 6254.7(a))

PAGE_____ THROUGH PAGE _____

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(GOV. CODE 6254.7(a))

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II. THE FOLLOWING NON-CONFIDENTIAL PAGES HAVE BEEN REMOVED FROM THIS THP/NTMP. THESE PAGES ARE AVAILABLE UPON REQUEST FROM THE DEPARTMENT OF FORESTRY & FIRE PROTECTION, 1234 Shaw Ave., Fresno, CA 93710, OR CALL 559-243-4100.

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PAGE_____ THROUGH PAGE _____

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5/05/2011

William D. Solinsky, RPF #2297
Forester II, Review Team Chair
CAL FIRE
California Department of Forestry and Fire Protection
1234 East Shaw Avenue, Fresno, CA 93710

THP # 4-11-004/ELD-2 2011 Blodgett Forest
Response to Review Team Questions

1. Item #14(d) requests a waiver of marking within the commercial thinning areas, and detailed marking guidelines are provided in Section III with specific instructions within the Commercial Thin Compartments on page 55. Please provide simplified guidelines to the LTO in Section II so the operator will easily recognize the harvest trees.

A1. Page 6, Item# 14(d) second paragraph has the following added:
(SEE ITEM 38. (9) PAGE 28 FOR "SIMPLIFIED HARVEST TREE SELECTION GUIDELINES")

Page 28 Item #38 the following has been added:
38 (9) Item #14 (d) **SIMPLIFIED HARVEST TREE SELECTION GUIDELINES**

For commercial thinning of plantations only (compartments 151, 280, 360, 370, 371, 431, 553, 560, 561, 563 and 640) areas outside WLPZ and sample mark are as follows:

1. **The largest healthiest trees (e.g. free of damage, disease, genetic defects ...) are to be retained as the leave stand.**
2. **Where the preharvest dominant and codominant crown canopy is occupied by trees less than 14 in. DBH, 100 trees per acre over 4 in. DBH shall be retained (approximately 20 ft. x 20 ft. spacing).**
3. **Where the preharvest dominant and codominant crown canopy is occupied by trees greater than 14 in. DBH, 125 sq. ft. of basal area shall be left (if greater than 50% of the basal area is pine, at least 100 sq. ft. of basal area shall be left). Spacing will be approximately 20 ft. to 26 ft. between leave trees.**
4. **Under represented tree species (usually Douglas-fir, white fir and incense-cedar) if vigorous and of similar age, may be retained instead of a larger pine to help balance stand species composition.**

(Remove old pages 6 & 28, insert new pages 6 & 28)

2. The previous silviculture prescriptions for the proposed evenaged units utilized commercial thinning for the clearcutting Units 90 and 530 under THP 4-05-020/ELD, and shelterwood seed step for Unit 150 under THP 4-07-011/ELD. Please provide a short description of the current stand conditions of these evenaged units and state the enforceable stocking levels following the proposed harvest.

A2. As describe during a phone call with the review team chair; there are no exceptions proposed to the standard FPRs. This information is not required in the THP.

3. Item #24 on page 10 indicates that roads will be constructed. Please show all proposed roads on THP Map(s) as per 14 1034(x)(4).

A3. There is no planned road construction. Item # 24 has been changed as follows:

ROADS AND LANDINGS

24. Will any roads be constructed? [ ] Yes [X] No, or reconstructed? [ ] Yes [X] No. If yes, check items "a." through "g." Will any landings be constructed? [X] Yes [ ] No, or reconstructed? [X] Yes [ ] No. If yes, check items "h." through "k."

a.	[ ] Yes [ ] No	Will new or reconstructed roads be wider than single lane with turnouts?
b.	[ ] Yes [ ] No	Are logging roads proposed in areas of unstable soils or known slide-prone areas?
c.	[ ] Yes [ ] No	Will new roads exceed a grade of 15% or have pitches of up to 20% for distances greater than 500 feet? Map must identify any new or reconstructed road segments that exceed an average 15% grade for over 200 feet.
d.	[ ] Yes [ ] No	Are roads to be constructed or reconstructed, other than crossings, within the WLPZ of a watercourse? If yes, completion of THP Item 27 a. will satisfy required documentation.
e.	[ ] Yes [ ] No	Will roads be located across more than 100 feet of lineal distance on slopes over 65%, or on slopes over 50% which are within 100 feet of the boundary of a WLPZ?
f.	[ ] Yes [ ] No	Will any roads or watercourse crossings be abandoned?
g.	[ ] Yes [ ] No	Are exceptions proposed for flagging or otherwise identifying the location or roads to be constructed?
h.	[ ] Yes [X] No	Will any landings exceed one half acre in size? If any landing exceeds one quarter acre in size or requires substantial excavation the location must be shown on the map.
i.	[ ] Yes [X] No	Are any landings proposed in areas of unstable soils or known slide prone areas?
j.	[ ] Yes [X] No	Will any landings be located on slopes over 65% or on slopes over 50% which are within 100 feet of the boundary of a WLPZ?
k.	[ ] Yes [X] No	Will any landings be abandoned?

No landing construction or reconstruction (or road use for log hauling from October 15 to May 1) shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III, or IV waters or that violate Water Quality Requirements.

(Remove old page 10, insert new page 10)

4. Item #24 on page 10 indicates that roads will be reconstructed. Please provide LTO instructions in Section II, and show the locations on THP Map(s), where existing roads will be restored or improved to make them useable for hauling as defined by 14 CCR § 895.1.

A4. There is no planned road construction. (See Item # 24 above)

5. Item #24 indicates that roads will be constructed. Please include as per 14 CCR § 963.2(r) that "No road construction shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III or IV waters or that violate Water Quality Requirements, except that construction may occur on isolated wet spots arising from localized ground water such as springs, provided measures are taken to prevent material from significantly damaging water quality."

A5. There is no planned road construction. (See Item # 24 above)

6. Item #24 indicates that landings will be constructed. Please include under Item #24 as per 14 CCR § 963.5(e) that "No landing construction shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III or IV waters or that violate Water Quality Requirements."

A6. The following has been added to Item #24 as shown at A3 and new page 10:
No landing construction or reconstruction (or road use for log hauling from October 15 to May 1) shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III, or IV waters or that violate Water Quality Requirements.

7. Item #26 provides increased watercourse protection greater than the standard rules as shown in the table on page 10. There appears to be a contradiction between the THP Measures and Protection Zone Type since 14 CCR § 956.5(e)"B" requires a WLPZ and the zone type listed is an ELZ. Please clarify if the Class III watercourses will be protected with a WLPZ or an ELZ by either changing the "B" to "C", or ELZ to WLPZ.

A7. The "THP Measures" have been changed as shown on the new table as follows:

Slope Class (%)	*Standard Class*	*Comments*	*Standard width*	*THP width*	*FP Rules Standard*	*THP Measures*	*Protection Zone Type*
<30	IIIp		NONE	25 ft	NONE	CEH	ELZ
30-50	iiip		NONE	25 -50 ft	NONE	CEH	ELZ
<30	III	*956.4(c)(1)	*25 ft	25 ft	CFH	CEH	ELZ
30-50	III	Moderate EHR	*50 ft	50 ft	CFH	CEH	ELZ
<30	II		50 ft	50 - 75 ft	BEI	BEG	WLPZ
30-50	II		75 ft	75 -100 ft	BEI	BEG	WLPZ
<30	I	and domestic water for	75 ft	75 -100 ft	BDG	BDG	WLPZ
30-50	I	Blodgett Forest	100 ft	100-150 ft	BDG	BDG	WLPZ

This modified table is on the new page10.

8. Item #30 on page 13 describes the treatment of slash in certain areas for hazard reduction. Please clearly under Item #30 to state that there shall be no exceptions to 14 CCR § 957.2(a) for public safety adjacent to public roads and structures.

A8. The following has been added to Item # 30a.on page 13 and Item # 30a. page 79:
There are no exceptions to 14CCR 957.2(a) for public roads and structures maintained for human habitation.
(Remove old pages 13 & 79, insert new pages 13 & 79)

9. Item #32(a) on page 14 indicates "Yes" that listed or board sensitive species, including their habitat are associated with the THP area, although the entire discussion is under #32(b), Please move the opening dialog before the individual species to be under Item #32(a) as well as the discussions of the listed species Northern goshawk, California red-legged frog, and Sierra Nevada yellow-legged frog, and paragraph titled "Rare, Threatened and Endangered Plants". The other discussions regarding non-listed species may remain under Item #32(b).

A9. The contents of Item # 32 (a) and Item # 32 (b) have been reorganized as described in question 9.

(Remove old pages 14, 15, 16, 17 & 18 and insert new pages 14, 15, 16, 17 & 18)

10. Please include a statement under Item #38 as per 14 CCR § 963.1(j), or as appropriate, that "If logging roads will be used from the period of October 15 to May 1, hauling shall not occur when saturated soil conditions exist on the road that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III or IV waters or that violate Water Quality Requirements."

A10. This has been added to Item # 24 Roads and Landings on the new page 10 as shown at A3.
No landing construction or reconstruction (or road use for log hauling from October 15 to May 1) shall occur under saturated soil conditions that may produce sediment in quantities sufficient to cause a visible increase in turbidity of downstream waters in receiving Class I, II, III, or IV waters or that violate Water Quality Requirements.

11. The Shelterwood Removal Step area is shown on the Unit Map on page 34, although this unit was not included on the THP Silviculture Map on page 29. Please include Unit 150, including the proper legend symbol on the 2011 Harvest Plan Map on page 29.

A11. A new map has been supplied.

(Remove old map page 29, insert new map page 29)

12. The THP Map for Unit 150 on page 34 has the heading of "Blodgett Forrest THP Map". Please revise to eliminate the reference of "2007 Map".

A12. A new map has been supplied.

(Remove old map page 34, insert new map page 34)

13. Item #30 discloses that there are permanent structures within Unit 250. Please show the locations of these structures on the THP Map on page 38.

A13. A new map has been supplied.

(Remove old map page 38, insert new map page 38)

14. The Biological Assessment in Section IV refers to a Wildlife Habitat discussion in Section III in regards to Late Seral (Mature) Forest Characteristics. Please provide a general summary in Section IV regarding the amount of Late Seral (Mature) Forest Characteristics within the assessment area as well as the plan including the amount of remnant patches less than 80 acres in size.

A14. Additional information has been added to C.(4)(f.) Late Seral (Mature) Forest Characteristics.

(Remove old page 114, insert new pages 114 and 114.1)

15. The plan provides a discussion on pages 115 through 132 regarding the general sequestration of carbon, but does not clearly address the potential emissions including the harvesting emissions and wood processing emissions specifically to the proposed project. Pursuant to PRC § 15064.4, CAL FIRE must make a "good faith effort" to "describe, calculate, or estimate, the amount of greenhouse gas (GHG) emissions resulting from a project." The PRC provides CAL FIRE with the discretion to determine the context for this analysis and the methods for providing the estimate of site-specific emissions. Please provide an evaluation of the potential cumulative impacts associated with climate change and increased Green House Gas emissions which may result from the proposed harvest operations when compared to the impacts of past, present and reasonably foreseeable future projects.

A15. Estimating the carbon sequestration impacts of a timber harvest plan in California has been rewritten with additional information.

The RPF will also email a new Excel file GHG calculator for THPs – Blodgett variant III to the Review Team Chair. Please pay special attention to the Project Summary and Instruction sheets.

(Remove old pages 116 -129, insert new pages 116 – 129.2)

16. A discussion of past and potential herbicide use is included in Section IV on page 133, and states that "Herbicides to be used may include glyphosate, imazapyr and triclopyr." Please provide a discussion regarding each herbicide of the type of reactions it has to the targeted vegetation, the reaction in the soil, is it toxic to aquatic and wildlife species as will as to humans, and how fast the chemical breaks down.

A16. Additional information has been supplied.

(Remove old page 133, insert new pages 133 – 133.6)

17. The Erosion Hazard Rating (EHR) for Area "M" on page 195 is not shown. Please revise page 195 to indicate the EHR is "M" for Moderate.

A17. The missing "M" is no longer missing.

(Remove old page 195, insert new page 195)

18. THP Item #24 identifies that new roads will be constructed. I could not find any additional information on the new road construction in THP Item #25 or Section III. Prior to the PHI, please provide a description and locations of new road construction proposed for this plan. (WQ #1)

A18. There is no planned road construction. See A3. Item # 24 has been changed.

19. To facilitate the review process, please provide information regarding the segments of new road construction such as type, construction methods, length, and grade of each segment and please indicate the location of the new road construction segments on the THP maps. (CGS #1)

A19. There is no planned road construction. See A3. Item # 24 has been changed.

MAY 5 2011

PART OF PLAN

20. and 21. The Archeological responses are attached separately.

Please feel free to call or email me if you have any questions.

Sincerely,

Ken Somers, RPF #2381

Errata

(Remove old pages 6 & 28, insert new pages 6 & 28)

(Remove old page 10, insert new page 10)

(Remove old pages 13 & 79, insert new pages 13 & 79)

(Remove old pages 14, 15, 16, 17 & 18 and insert new pages 14, 15, 16, 17 & 18)

(Remove old map page 29, insert new map page 29)

(Remove old map page 34, insert new map page 34)

(Remove old map page 38, insert new map page 38)

(Remove old page 114, insert new pages 114 and 114.1)

(Remove old pages 116 -129, insert new pages 116 – 129.2)

(Remove old page 133, insert new pages 133 – 133.6)

(Remove old page 195, insert new page 195)

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