Progress Report

December 31, 2004

Characterizing Vegetation Response to Variable Density Thinning Treatments in Young Douglas-fir Forests of Western Oregon

Submitted to:

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Project Overview

Overall the project is on schedule. We have successfully completed collection of vegetation data from seven sites, including unscheduled repeated measurement of vegetation data of BLM plots, originally measured in 2005. All data have been entered and cleaned up. Due to technical issues with the data loggers, quality assurance data checks were more time consuming than expected and are still underway. At the same time, we are continuing data analysis in preparation of a manuscript. In addition, we spent quite a bit of effort on development of an overall vegetation database and metadata. We are getting close to finalizing the database structure and making vegetation data accessible on the web. We presented the study and preliminary results at the IUFRO Balancing Ecosystems Values Workshop in August, as a poster and during a field trip, and at the CFER meeting in December.

Additionally, Bob Fahey completed the field sampling for his master's study this summer. Permanent transects were installed at four initial thinning sites and data were collected. Bob has entered and completed the clean-up of the vegetation data and hemispherical photo data. He will begin data analysis in the winter of 2005.

DMS and Vegetation Study Background

The BLM Density Management Study (DMS) was designed to investigate whether thinning at various densities can accelerate development of late-successional characteristics in managed young forests (40-70 yrs), while permitting timber production at the same time. Such an approach is critical in the PNW where a large portion of federal forest lands are young, even-aged conifer plantations. The DMS consists of two components: initial thinning treatments (7 sites) and re-thinning treatments (4 sites; note that Keel Flats was dropped from the study this year, 2004). These 11 DMS sites are located on four BLM districts in western Oregon: Salem, Eugene, Roseburg, and Coos Bay (see Table 1 for sites and measurement schedule).

The vegetation study has two main components at this time, both are long-term monitoring studies:

1. OSU is installing new vegetation monitoring plots at each of the initial thinning sites to evaluate overall treatment effects (for objectives, see Vegetation Measurements and Analysis of the Density Management Study Proposal, K. Puettmann 2003). These plots are randomly located within the treatments, including gaps and leave islands.
2. Permanent vegetation monitoring plots were initially established by the BLM at each site to monitor the relationships of overstory and understory vegetation to target thinning densities (at rethinning and initial thinning sites). These plots were only established in thinned forests, excluding gaps and leave islands.

As part of the vegetation study, Bob Fahey implemented a transect study in 2004 to evaluate the changes in vegetation along a gradient within gaps into the adjacent forest

matrix. This study assesses relationships of understory vegetation to available light (using hemispherical canopy photographs) and proximity to gap/forest edge or gap center.

Table 1. Density Management Study vegetation measurement schedule for initial thinning (A) and re-thinning (B) sites. The measurement schedule was constructed to standardize measurements in the same year of post-treatment development so that measurements are on a comparable basis across the study. The measurement scale is in five year increments (i.e., 1, 6, 11, etc.). Sites in bold are those that have been sampled for 6-year post harvest data, remaining sites will be sampled in 2005.

A. Initial Thinning Sites

Site name	Majority harvest completed	Initial measurement (date/growing seasons post harvest)	First remeasurement (year/growing seasons post harvest)	Second remeasurement (year/growing seasons post harvest)
Bottomline	11-97	9-98/1	2003/6	2008/11
OM Hubbard	11-97	9-00/3	2003/6	2008/11
Keel Mountain	12-97	9-99/2	2003/6	2008/11
North Soup	8-98	9-00/2	2004/6	2009/11
Green Peak	1-00	4-02/2	2005/6	2010/11
Ten High	1-00	4-02/2	2005/6	2010/11
Delph Creek	4-00	3-03/3	2005/6	2010/11

B. Re-thinning Sites

Site name	Majority harvest completed	Initial measurement (date/growing seasons post harvest)	First remeasurement (year/growing seasons post harvest)	Second remeasurement (year/growing seasons post harvest)
Sand Creek	11-97	9-98/1	2003/6	2008/11
Little Wolf	9-98	7-00/2	2004/6	2009/11
Blue Retro	3-99	8-99/1	2004/6	2009/11
Perkins Creek	3-00	10-00/1	2005/6	2010/11

Project accomplishments

Field season 2004

OSU hired a six person field crew to complete all vegetation measurements in 2004 (June – October field season). The crew collected vegetation data at new OSU plots and established BLM monitoring plots. In addition, the crew performed "field verifications"

for data flagged as anomalous or out-of-range during data quality assurance checks for data from previous years and they collected missing data (i.e., only for missing data that was not time sensitive). See Appendix A for documentation of the field methods and Appendix B for the sampling protocol (both documents have been revised since the June 2004 Progress Report).

New OSU plots

The OSU field crew permanently installed and sampled 77 new OSU plots at the North Soup initial thinning site. A total of 3,155 overstory trees were tagged and measured across all 77 plots. Understory vegetation, stumps, and small and large coarse woody debris were sampled at these plots. General plot information was taken at all plots, including GPS coordinates, slope, aspect, elevation, physiography, and detailed plot notes.

Re-measurements of BLM monitoring plots

Remeasurements of 3,251 overstory trees and understory vegetation were made for 93 BLM monitoring plots at the North Soup, Blue Retro and Little Wolf. In 2003, overstory and understory vegetation was measured on BLM monitoring plots at OM Hubbard, Keel Mountain, Bottomline, Delph Creek and Sand Creek sites; however, the standard sampling protocol was not followed. Therefore, we added these plots to our measurement schedule and revisited these sites in 2004 to collect understory vegetation data from 163 BLM monitoring plots. However, we did not revisit Delph Creek BLM monitoring plots in interest of time and because this site is schedule for remeasurement next year (2005).

General plot data was also collected for BLM monitoring plots (0.25 acre). This included GPS coordinates (within maximum 30 ft accuracy), slope, aspect, elevation, physiography and other detailed plot notes. New subplot center stakes (PVC pipe) were installed at the North Soup BLM plots.

Table 2. Sites and plots sampled in 2004 field season. New OSU plots were installed and measured at the North Soup initial thinning site. BLM monitoring plots were sampled for understory vegetation at Bottomline, Keel Mountain, OM Hubbard, and Sand Creek. North Soup, Blue Retro, and Little Wolf sites were remeasured for overstory and understory vegetation at the BLM monitoring plots.

Sites	**# new plots**	**# BLM monitoring plots**
DMS Initial Thinning Sites		

Bottomline	---	46
Keel Mountain	---	48
OM Hubbard	---	51
North Soup	77	52
DMS Re-thinning Sites		
Sand Creek	---	18
Blue Retro	---	18
Little Wolf	---	23
Total	**77**	**256**

Gradient transects

Bob Fahey is investigating changes in vegetation and light regime along gradients from gap center into the adjacent forest and evaluating how gap size influences these changes. The crew installed permanent transects on four of the seven DMS Initial Thinning sites: OM Hubbard, North Soup, Bottomline and Keel Mountain. Within each site, transects were constrained to the moderate density and variable density treatments areas (Table 3). Thirty transects were permanently installed in ¼ and 1 acre gap openings. Vegetation plots were installed along each transect (length of transect and number of vegetation plots varies with gap opening size, see Appendix C for methods). A total of 900 vegetation plots (4 m^2 in size) were sampled for understory vegetation as part of the gradient transect study. In addition, 900 hemispherical photographs of the overstory canopy were taken at each plot. Vegetation data have been entered and cleaned up. Photo data have been processed and used to calculate light availability along the gradients. For more detail on the procedures and progress, see Appendix C.

Table 3. Site summary of transects and vegetation plots (50% of transects at each site are in 1 acre gaps and the other 50% are in ¼ acre gaps).

Site	Bottomline	OM Hubbard	North Soup	Keel Mountain	Total
# Transects	6	8	8	8	30
# Veg Sampling Plots	180	240	240	240	900
# Species encountered	114	135	136	101	182

Data Documentation

The efforts to develop a data clean-up, data management and documentation took most of the year. We spent quite a bit of effort on this portion, since proper documentation of methods and data management is essential to a long-term study such as this. At this time, all sampling methods and protocols are thoroughly documented (see Appendices A and B; these documents have been revised since June 2004). In addition, the data clean-up

protocol and quality assurance and control procedures are documented in detail. These established data management procedures will maximize data quality and increase efficiency in data management with incoming data from future field seasons.

Vegetation data from the 2004 field season has all been entered and cross-checked against the data cards. The 2004 vegetation data is still being cleaned and checked for quality control. All other vegetation data is in digital form and is stored in the vegetation database (Access database). The database structure was finalized this fall and we are fine-tuning the efficiency and functionality of the database with the help of Kate Norman (see Appendix D for a Guide to the Vegetation Database). In addition, Kate has developed a user's guide Access for those working specifically with the vegetation database.

In addition, we have been working with the Northwest Alliance for Computational Science and Engineering (NACSE), associated with USGS National Biological Information Infrastructure (NBII), to make the database more "user-friendly" and to ultimately allow us to make data available on the web. As part of this effort, we are also working with Cheryll Solomon, a metadata specialist with NBII, to develop standardized metadata. This is quite a large effort, but will facilitate the data-sharing process and will prove useful over the long term.

The initial summary of 2004 data and previous year's data is still underway. We have been delayed due to unexpected sampling needs (see BLM 2003 data) and unexpected problems and inconsistencies with past data, inconsistencies in data documentation, datalogger download problems, and the large effort of database development. We expect to finish this summary fairly soon, but do not feel comfortable providing data that has not been checked to our quality assurance standards.

Future Timeline

<u>January – March 2005</u>

- Continue data analysis and preparation of a manuscript for publication of understory vegetation response to initial thinning treatments 6-years post harvest; results from the OSU vegetation data. A draft manuscript is targeted for the end of March.
- Present initial results from the DMS transect study by Bob Fahey and results from the DMS OSU vegetation data at the Northwest Scientific Association meeting in Corvallis, Oregon (March 23-26 at Oregon State University); poster presentation.
- Melissa Hamar has been hired on the study to assist with data management, database development and data documentation. She will assist with various tasks through March. Tasks include:
    - Complete data entry for all data collected during the 2004 field season. She will perform data quality control checks for all data collected in 2004: cross-check digital data with field data cards; query datasets for inconsistencies and/or missing data.

    - Continue QA/QC checks on all of the vegetation data in the new database. She is developing a list of data that need to be verified in the 2005 field season.
    - Update metadata and the database with information and data from 2004 field season.
    - Continue to improve and stream-line the vegetation database (using ACESS) and working with Northwest Alliance for Computational Science and Engineering (NACSE), associated with USGS National Biological Information Infrastructure. Work with NACSE to improve database efficiency and to publish the data on the web.
- Continue to build the project metadata working with Cheryl Solomon, a metadata specialist working for the USGS National Biological Information Infrastructure.

April – June 2005

- Continue data analyses and summaries for the BLM and OSU vegetation data (1 and 6 years following harvest).
- Hire a crew leader for the 2005 field season and hire 5 crew members. Plan for the involvement of two German interns visiting during the field season.
- Organize and plan 2005 field season logistics:
    - Organize the field training and brief the crew leader.
    - Convert the sampling protocol into a bound field manual that is user friendly and can be easily referenced by crew members in the field.
    - Outline sampling schedule.
    - Arrange crew accommodations and transportation.
    - Purchase necessary field equipment; repair broken equipment.
    - Develop a more effective approach to data recording in the field: either improve palm pilots or change the polycorder program. Develop datasheets.
    - Organize field check lists and data cards.
- Prepare progress report for June 2005 that includes: summaries of the vegetation response at 1 and 6 years post-harvest in relation to overstory density using BLM plot data and summaries of the 6 treatment-level vegetation response using OSU plot data (see Proposal for modification to the Density Management Study CESU agreement (HAA003D00, Task Order HAF033F05, K. Puettmann and S. Berryman 2004 for details).

Outreach efforts in 2004 (June-December)

- IUFRO Balancing Ecosystems Values Workshop: Innovative Experiments for Sustainable Forestry in Portland, Oregon (August 15-20th); presented a poster of preliminary results on understory vegetation response 6 years post harvest at initial thinning sites. Also, led field trip to the Delph Creek site, presented various aspects of Density Management Study
- CFER—Klaus gave an overview talk on the DMS vegetation study at the CFER monthly meeting. Goal of the presentation was to inform the CFER group about

opportunities for cooperation within the DMS. Follow up discussion have been initiated with S. Perakis.