Sierra-Cascade Intensive Forest Management Research Cooperative

Series Report No. 9

http://wric.ucdavis.edu.sierracascade/

ANNUAL REPORT 2008

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The year 2008 marked the ninth year as an organization for the Sierra Cascade Intensive Forest Management Research Cooperative.

Membership dropped slightly with one member withdrawing. The current membership consists of a mixture of landowners, forestry-related industries, State of California and federal agencies. There are currently sixteen member organizations in the Co-op.

Bob Rynearson presented an update on the Co-op at the Forest Vegetation Management Conference in January.

Working Group II held a meeting on February 19th (a summary of the meeting can be found in this Annual Report). Chair Jason Warshawer opened the meeting with a progress report on the new proposal that was accepted by the Co-op in 2007. This is the glyphosate efficacy study suggested by Mark Gray. Work will continue on this proposal during 2008. Bob Amesbury brought the group up to date on the study Stu Farber presented to the full membership in 2007. This study deals with effects of intensive forest management on plant species/communities. Jason then asked each attendee to list their choice of subject matter as to what the Co-op could fund in 2008 with available dollars. This exercise resulted in five possible studies. Two of these were chosen by the working group to present to the full membership at the annual business meeting – cedar/sugar pine stock trials and mixed species plantations. Jason and Mark will write the proposal for the stock trial and Bob Powers for the mixed conifer plantations. These are the proposals to be presented at the business meeting. As a final item of business, Jason quizzed the working group members as to their desires for a field trip. The group voted to suggest a field trip to the full membership. The trip would be based around Challenge Experimental Forest but could also include the Co-op's slow release study on Soper-Wheeler lands and possibly the Garden of Eden site at Feather Falls.

The annual business meeting was held March 11th in Redding (a summary of the meeting can be found in this Annual Report). Seventeen Co-op members and guests attended. The first item of business was a review of the 2007 Annual report. This led into a discussion on the status of the budget. The Co-op ended 2007 with a surplus of $5,708. After funding ongoing studies and taking the final measurements on two studies that are ending, there should be a budget surplus of about $12,000 at the end of 2008 (actual surplus as of December 31, 2008 was $11,541).

Jason Warshawer, Chair of Working Group II, led a discussion about the meeting his group held on February19th. At this time he proposed a spring field trip as discussed in the February meeting. The full membership voted to hold a field trip in June with the trip being held on the Challenge Experimental Forest (a summary of the field trip can be found in the write-up of the annual meeting found in this Annual Report).

Following the discussion on the field trip, updates on two recently funded Co-op studies were presented. Matt Busse reported on Proposal 03-01 Agenda 2020 and Mark Gray on Proposal 07-01 Glyphosate/Evergreen Shrubs.

Executive Summaries of these two studies can be found in this Annual Report.

Following the updates on funded studies, new proposals were presented to the membership. Stu Farber reported on the results from the subcommittee that was formed at the 2007 meeting to develop his idea concerning intensive management effects on plant species and structure. Stu then canvassed the members as to which companies would be interested in being involved in the study. There were several Co-op members who expressed interest in participating. With this show of interest, the membership voted to fund the proposal with preliminary work set to start in 2008 and plot sampling to begin in 2009 (during the summer of 2008 another cooperator on this project withdrew their funds resulting in Stu having to terminate the study with our Co-op). Following Stu's presentation, Jason presented the cedar/sugar pine stock type proposal that was developed by Working Group II. Sierra Pacific Industries, Roseburg Resources, and possibly Silver Butte Timber Co. will be the initial Co-op members involved in this study. This proposal was approved by the membership with work to start in 2009. The other new proposal developed at the working group meeting – mixed conifer plantations – will be presented to the membership at a later date.

Two of the proposals funded by the Co-op report updated results in this issue of the annual report. These are 00-04 Stock Type/Fertilization and 02-02 Slow Release Fertilization. Results are reported in the form of Executive Summaries. Full data sets and the analysis are available from the Co-op office in Redding. As originally planned, the measurements taken in 2008 on these two studies would be the final ones. The Co-op will need to make a decision as to the future of the two sites.

The year 2009 should be an active one for the Co-op. A decision will need to be made on the future of the Agenda 2020 study. The glyphosate study will continue with additional plot installation and treatment application. The cedar/sugar pine stock trials will start with the first plantings in the spring. Root harvesting operations on the final site of the 3-PG study (05-01) will be done in the spring. Two new proposals will be presented at the annual meeting with implementation, if approved, in 2009.

2008 MEMBERSHIP

Land Manager Membership
- California Department of Forestry
- Collins Pine Co.
- Fruit Growers Supply Co.
- Roseburg Resources Co.
- Sierra Pacific Industries, Inc.
- Soper-Wheeler Co.
- Timber Products Co.
- W.M. Beaty & Associates, Inc.

Associate Corporate Membership
- Cal Forest Nurseries & Mountain Gate Gardens

Affiliate Membership
- IFA Nurseries, Inc.
- Silver Butte Timber Co.
- Total Forestry, Inc.

Supporting Members
- California Forestry Association
- PSW Research Station
- University of California, Davis
- USDA Forest Service

Sierra Cascade Intensive Forest Management Research Cooperative
Annual Meeting March 11, 2008

The 2008 annual meeting was held at the Forest Service office in Redding, CA on March 11, 2008. Seventeen Co-op members and guests attended.

The 2007 Annual Report was the first item of business. Membership status was discussed. One member had dropped out of the Co-op in 2008; there were no new members. Possible new members were suggested including Plum Creek and Lone Rock.

The two executive summaries in the 2007 Annual Report were reviewed. These were Proposal 05-01 3-PG Study and Proposal 03-01 Agenda 2020. Both of these studies are on-going.

The next item of business was the status of the budget. In addition to the summary of the 2007 budget found in the Annual report, spread sheets of the proposed budget/workload for 2008-2011 and the co-op manager's time/contract costs through 2010 were presented to the membership. Also a list of in-kind contributions needed from Co-op members to facilitate measurements due on existing studies in 2008 was provided. The Co-op ended 2007 with a surplus of $5,708. Dues for 2008 received at the time of the annual meeting totaled $50,000 with $12,000 more promised. Since the projections on the budget spreadsheets of dues received were based on membership in 2007, prior to the time when the member dropped out in 2008, it was decided to rework the spreadsheets to more accurately reflect actual membership. Using these corrected figures, a budget surplus of about $12,000 was predicted for the end of 2008.

During the annual meeting for 2007, the question was raised concerning use of the Co-op website. A show of hands revealed little use of the site by the membership. Gary Nakamura volunteered to check with Joe DeTomaso about the feasibility of continuing/maintaining the website. Gary reported at the 2008 meeting that it would take little effort or expense to continue with the website. Research papers resulting from Co-op funded studies could be scanned and placed on the site. Bob Rynearson suggested having completed research papers in a members-only site along with the latest budgets and details of current and proposed studies. Summary information of proposed and current studies and general information about SCIFMRC could be put on a public site.

Jason Warshawer, Chair of Working Group II, led a discussion about the meeting his group held on February 19, 2008 (a summary of this meeting is included in the 2008 Annual Report). One of the results of this meeting was the development of two new proposals to be presented to the full membership at the annual meeting in March. The Working Group also voted to suggest a field trip to the membership in March. The trip would be based around Challenge Experimental Forest and stops could include initial spacing studies and the Long Term Soil Productivity site. Other possibilities included the Garden of Eden site at Feather Falls and the Co-

op's slow release study on Soper-Wheeler.

Jason's discussion led to the full membership's consideration of the desirability of having a field trip in 2008. The membership decided to accept Working Group II's recommendation and a field trip was scheduled for June 23rd. It was decided to restrict the trip to sites on the Challenge Experimental Forest. Mixed conifer plantings would be the primary theme. Some of the studies to be visited included the national Long Term Soil Productivity site, Bill Oliver's initial spacing study, another Oliver study featuring mixed conifer plantings in a hexagonal pattern, and time permitting, an example of Nelder plots (Ponderosa pine only). Gary Nakamura asked if the field trip should be opened to the general public. Pros and cons were discussed by the membership with the final decision being that the field trip would be limited to Co-op members only.

Following the discussion on the field trip, updates on two recently funded Co-op studies were presented. Matt Busse reported on Proposal 03-01 Agenda 2020 and Mark Gray on Proposal 07-01 Glyphosate/Evergreen Shrubs. Matte asked for $3400 to do brush inventories/treatment on the two Agenda 2020 sites as well as analysis of nitrogen-fixation by the brush species during 2008. The full membership voted to honor this request.

Mark updated the membership on the status of the glyphosate study. Two sites have been chosen for installing the study – Ski Park Highway and Indian Springs Mountain. Full replications of the study design will be installed at each site. Layout will began in the spring of 2008. Brush species represented include snow brush, manzanita, and chinquapin. Herbicide application will be by directed spray.

Following the updates on funded studies, new proposals were presented to the membership. The first proposal was one that developed from an idea presented to the membership at the 2007 annual meeting by Stu Farber. The membership recommended at the 2007 meeting that a subgroup be formed to develop the idea into a proposal and this proposal be presented to the membership at a later date. The proposal, concerning intensive management effects on plant species and structure, resulting from work by this subgroup was the one presented by Stu at the 2008 annual meeting. Stu canvassed the membership as to which companies would be interested in being involved in the study and could possibly furnish a crew to take the measurements. Those members wanting to be included were Sierra Pacific Industries, Timber Products, Total Forestry, California Department of Forestry, W.M. Beaty and Associates, Roseburg Resources, U.S. Forest Service, and Silver Butte Timber Co. Several of these offered sites for installation of the study. The membership decided to fund the proposal. Some study design and preliminary inventory work would be done in 2008 with actual plot installations starting in 2009.

The next new proposal presented was the one for cedar and sugar pine stock trials as developed by Working Group II. Sugar pine will be dropped from the trial for the time being. Stock types to be tested: Styro 5, 8, 10, and 15; plug-1, 1-1, and 1-0. Measurements (caliper and

height) will be taken pre-plant and at the end of the fifth growing season. Survival will be monitored annually. Sierra Pacific Industries, Roseburg Resources and possibly Silver Butte Timber Co. will be the initial Co-op members involved in the study. This proposal was approved by the full membership. Work will start in 2009.

The other new proposal developed at the Working Group meeting - mixed conifer plantations - will be presented to the membership at a later date.

Mike Landram presented his thoughts on two items of possible interest to the Co-op. The first was concerning the life of stored seed. Are germination tests of stored seed in the seed bank adequate for proving viability? How long should seed be stored?

The second point concerned the need for considering genetic diversity in intensive forest research. Some thoughts: gene mapping on 2nd generation seed collections and finding preferred genotypes as they relate to seed zones, etc.

The meeting concluded at this time.

Working Group II Meeting February 7, 2007

Working Group II met at the PSW office in Redding on February 7, 2007. In attendance were Tom Young, Bill Morrison, Mark Gray, Lewis Howe, Jason Warshawer (Chair), Bob Rynearson, Bob Powers, Bob Amesberry, and Jianwei Zhang.

The meeting opened with a short discussion by Bob Rynearson about his recent trip to Germany concerning the FSC.

If all current members renew their membership, the 2007 budget should have a surplus of about $5000 to be applied to new research proposals. As much as $20,000 could be available for 2008.

One of the members led a discussion on the Co-op sponsoring a tour for Fish and Game and other agencies to show how intensively managed plantations do actually have brush/shrubs present especially in the early stages of establishment and then again following a thinning.

Lewis Howe brought up the subject of some pruning done on the McCloud flats in the 1906's and where might records of these operations be found. Stand record cards kept on the ranger district would be the best source for this information.

Jason then asked each attendee to state what aspect of regeneration they would like to see funded with the available funds:
Bob Rynearson: site preparation

Bill Morrison: site preparation intensity; and ripping and its effects on survival.

Chemical efficacy of glyphosate and Imazapyr

Bob Powers: curbing environmental concerns. Early seral species development throughout the life of a planted forest – use a video

Bob Amesberry: site prep and ripping related to past stand history. Brush life history (early seral)

Lewis Howe: long term, multiple-species growth comparisons across sites with stem mapping

Mark Gray: incense cedar – stock type and size and other early research

Tom Young: thinning densities, when and how much? Eucosma treatments, when to apply

All interests were listed and addressed. Considerations of funding, time, and interest level were used to narrow the list. Action items were developed to investigate or gather information already available on some of the items.

It was suggested that the Working Group take the responsibility of setting up a survey, distributing survey forms and compiling/reporting results of the survey to Co-op members on three of the items: chemical efficacy of glyphosate and imazapyr; incense cedar – finding out the basics; and thinning – when and how much.

Action items included resubmitting the proposal originally submitted to the membership in 2005 about chemical efficacy. The original proposal was

developed by Mark Gray and was one of the four proposals chosen in 2005 that the membership voted to fund as soon as the budget would allow. This resubmission will be done at the business meeting on March 27th.

The Working Group will suggest a field trip to Elliot Ranch to review the results of this thinning study as an opening move to help answer the thinning questions raised at the meeting.

Bob Amesbury will look into what Timber Products is doing as far as tracking early seral vegetation.

A field trip to Challenge was suggested as the opening attempt to study long-term, multiple species growth comparisons. This ties in with the action item concerning cedar in which the goal is to find out the basics such as stock type, stock size, early growth, etc.

Along with the resubmission of the chemical efficacy proposal, the Working Group will present to the membership at the March meeting a site preparation study looking at the effects of different slash loading on survival and early growth of white fir, Douglas-fir, and ponderosa pine.

Jason closed the meeting after this discussion of the two proposals to be presented in March.

Sierra Cascade Intensive Forest Management Research Cooperative Proposal 00-04, Stock Type/Fertilization Study

Principal Investigator: Ed Fredrickson

Title: Improving the establishment and growth of Douglas-fir and white fir on dry sites through fertilization and stock type

Year Funded: 2000

Executive Summary:
A study was initiated in 2000 to determine the principal contributions of stock size and fertilization to Douglas-fir (*Pseudotsuga menziesii*) and white fir (*Abies concolor*) survival, growth and total above-ground biomass on dry sites in the interior Sierra Cascade region of northern California and southwest Oregon under vegetation-free conditions. A second objective was to determine the partial contributions of stock size and fertilization on initial root growth and total root volume (dry weights) after the first growing season in the field. The third objective was to determine differences attributable to site based on low and high precipitation zones.

Planting sites were provided by three Co-op members: Roseburg Resources, Sierra Pacific Industries, and Boise Cascade. All sites tested Douglas-fir; Boise Cascade also tested ponderosa pine (*Pinus ponderosa*). Seedling problems eliminated the white fir from the study after the initial planting. All three sites were planted in March, 2003. Wil-Gro briquettes (9-9-4) were used to fertilize the bare-root stock. All sites had adequate soil moisture at the time of planting and there was no snow on the ground. Each site received substantial moisture immediately following the planting and through the rest of the spring.

Root volume measurements will be made at time of lifting and at the end of the first growing season. Seedlings will be measured for caliper and height when planted and at years 1, 2, 3, 4, and 5. Seedling volume will be derived from these measurements. Survival will be noted at the time of remeasurement. Foliar nutrient samples and dry weights per 100 needles will be collected and analyzed at years 1, 3, and 5. Analysis of variance (ANOVAs) of treatment means will be used to test for treatment effects and significant differences among treatments.

2008: Caliper and height measurements were taken in the fall of 2008. Survival was also recorded at this time. This was the end of the sixth growing season for the study. Since this was possibly the final year for this current study, all plot corners were remonumented in case the Co-op chose to use the sites for another study sometime in the future.

Survival: There were no significant differences in survival among treatments on the Sierra Pacific site for **Douglas-fir** related to stock type or fertilization (Figure 1). Survival ranged from 38 percent to 62 percent at this site. The Boise Cascade Douglas-fir showed significant differences among treatments related to stock type but no differences

due to fertilization. Overall survival varied from 30 percent to 81 percent. On this site, seedlings in both 1+1 treatments had significantly higher survival than did seedlings in both the Styro 8 treatments. Douglas-fir on the Roseburg site had significant differences among many of the treatments. Survival ranged from 2 percent to 66 percent at this site. Seedlings in the 1+1 nonfertilized treatment had significantly higher survival than seedlings in all other treatments with the exception of the 1+1 fertilized treatment. The survival in the 1+1 fertilized treatment was significantly higher than seedling survival in the plug+1 fertilized, Styro 8 nonfertilized, and both Styro 20 treatments. Within stock types, there were no significant differences in survival related to fertilization.

There were no significant differences in survival in **ponderosa pine** related to stock type or fertilization on the Boise Cascade site. Survival was above 90 percent in all treatments.

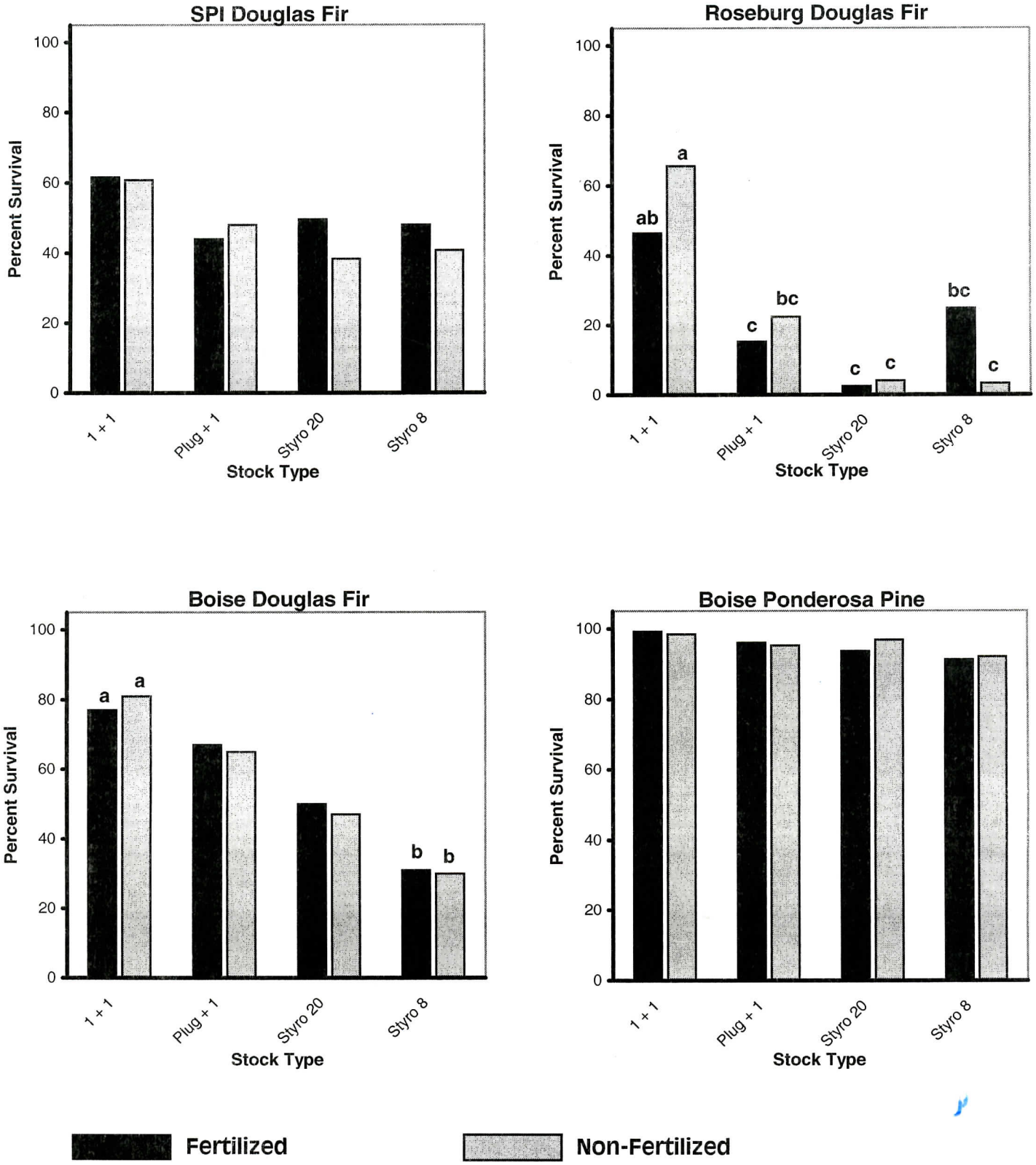
Growth: There were no significant differences among treatments for caliper, height, or volume for **Douglas-fir** on the Sierra Pacific site. This was also the case on the Roseburg site with one exception – the 1+1 fertilized seedlings were significantly larger in caliper than the Styro 8 nonfertilized seedlings. The Douglas-fir seedlings on the Boise Cascade site showed significant differences in caliper, height, and volume (Figure 2). **Caliper:** The 1+1 fertilized seedlings were significantly larger in caliper than seedlings in both Styro 8 treatments and the Styro 20 fertilized treatment. The plug+1 fertilized seedlings were larger that seedlings in the Styro 8 nonfertilized treatment. **Height:** the 1+1 fertilized seedlings were significantly taller than the seedlings in all of the Styro 8 and Styro 20 treatments. **Volume:** Plug+1 fertilized and 1+1 fertilized seedlings had significantly higher volume than seedlings in the Styro 8 nonfertilized treatment.

The Boise Cascade site was the only site that included **ponderosa pine** in the study design. There were significant differences among treatments in caliper, height, and volume (Figure 3). **Caliper:** Seedlings in the Plug+1 fertilized and plug+1 nonfertilized treatments were significantly larger in caliper than the seedlings in all the Styro 8 and Styro 20 treatments. The seedlings in the 1+1 fertilized treatment were significantly larger than seedlings in both Styro 8 treatments. And the seedlings in the 1+1 nonfertilized treatment were larger than seedlings in the Styro 8 nonfertilized treatment. **Height:** Seedlings in the plug+1 fertilized treatment were taller than the seedlings in all the Styro 8 and Styro 20 treatments. Seedlings in the plug+1 nonfertilized and 1+1 fertilized treatments were taller than the seedlings in both Styro 8 treatments. **Volume:** Seedlings in both plug+1 treatments had significantly higher volume than did seedlings in all the Styro 8 and Styro 20 treatments. Seedlings in the 1+1 fertilized treatment had significantly more volume than did seedlings in both Styro 8 treatments.

After six growing seasons the seedlings in the two stock types that were the largest at time of lifting (1+1 and plug+1) in February 2003 were still the largest in fall of 2008. There were no significant differences in size between these two stock types. But there were

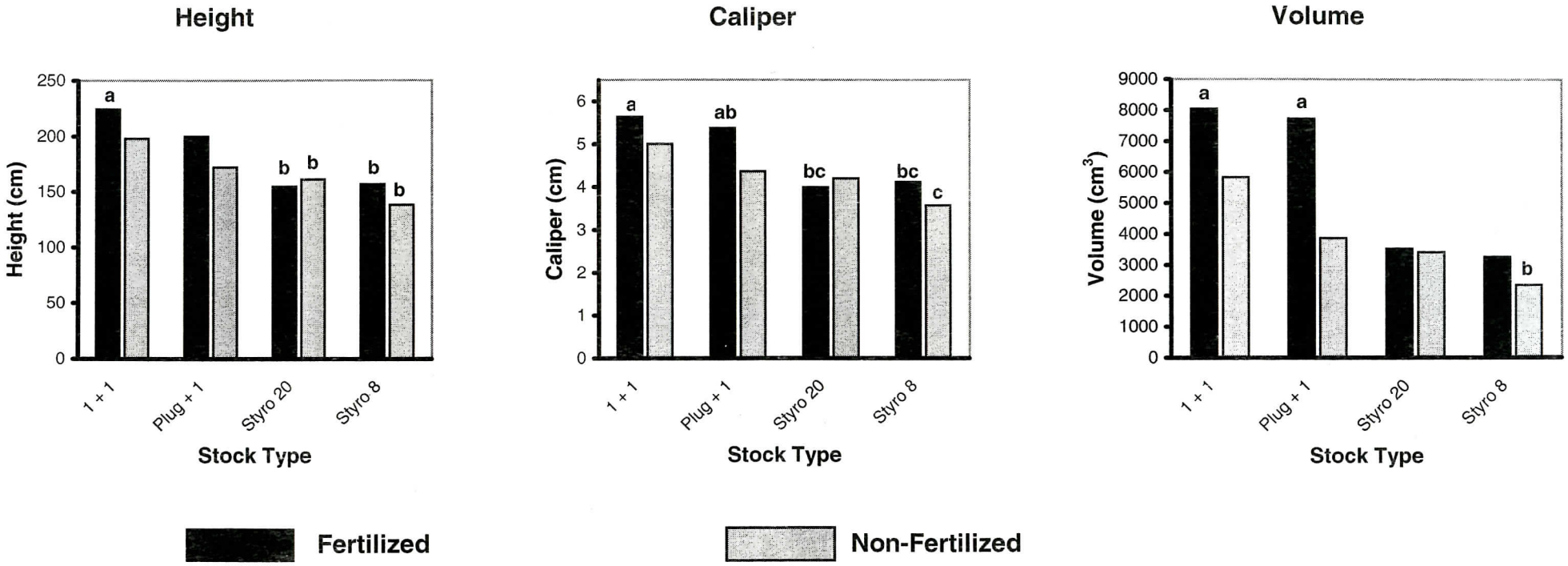
significant differences between these two larger stock types and the Styro 8 and Styro 20 stock types. In turn there were no significant differences in size between the two Styro stock types. Within a stock type, fertilized seedlings are almost always larger than their counterparts in the nonfertilized treatment, but not significantly so.

Figure 1: Percent Survival for Stock Type/Fertilization Study, Fall 2008



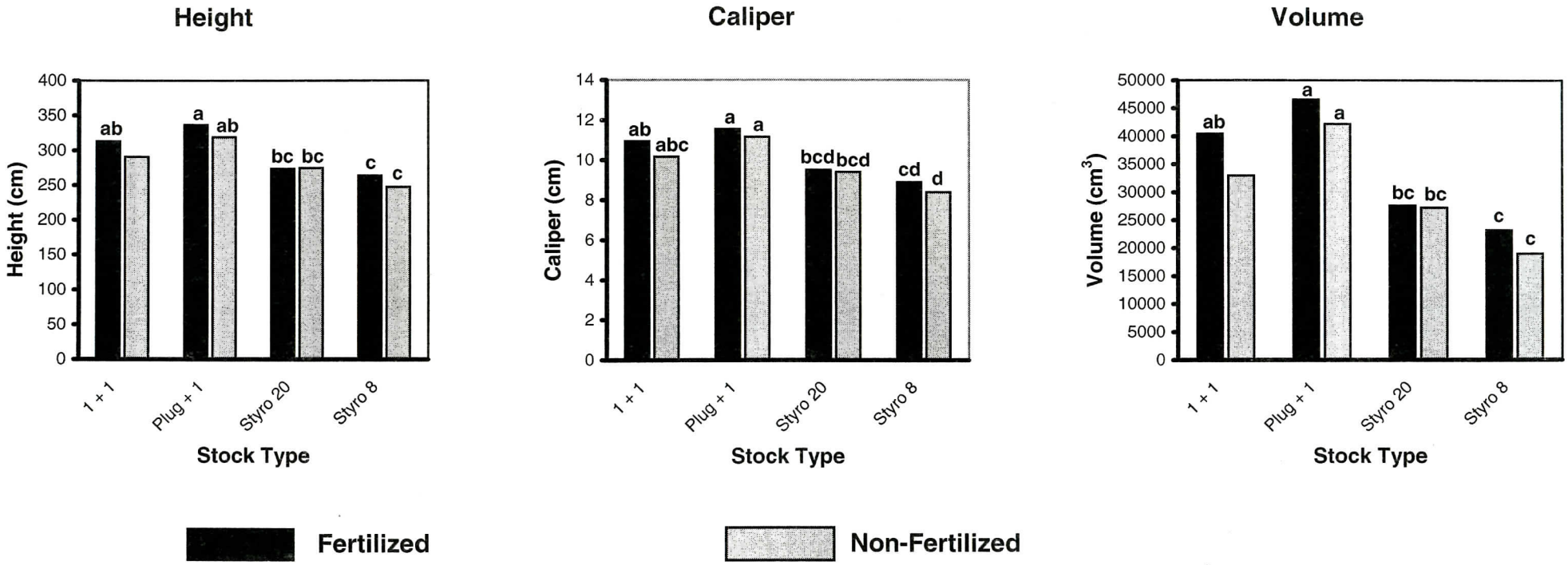
For each fertilizer rate, site and stock type, treatment means with the same letter do not differ statistically at the 0.05 level. Means with no letters do not differ.

Figure 2: Mean Height, Caliper and Volume of Douglas Fir seedlings for Stock Type/Fertilization Study, Fall 2008
Boise Site



For each fertilizer rate and stock type combination, treatment means with the same letter do not differ statiscally at the 0.05 level. Means with no letters do not differ.

Figure 3: Mean Height, Caliper and Volume of Ponderosa Pine seedlings for Stock Type/Fertilization Study, Fall 2008
Boise Site



For each fertilizer rate and stock type combination, treatment means with the same letter do not differ statiscally at the 0.05 level. Means with no letters do not differ.

Sierra Cascade Intensive Forest Management Research Cooperative Proposal 03-01
Agenda 2020

Principal Investigator: Bob Powers

Title: An Experiment to Evaluate the Competitive and Ecological Effects of Understory Vegetation on the Productive Potential of Young Douglas-fir Plantations

Executive Summary:

As a follow-up to the January 13, 2003 Co-op meeting at which the Agenda 2002 proposal was accepted as a Co-op project, the membership was contacted in order to get suggestions on possible sites for the study (originally the first site was going to be located on Boise Cascade lands but the site nominated was not selected). In response to this request, two companies, Roseburg Resources (Ed Fredrickson) and Sierra Pacific Industries (Mark Gray) offered possible sites.

The Roseburg site consisted of two clearcut blocks located east of Redding near Big Bend. The stands had been harvested in the summer of 2003 and the additional site preparation required for implementation could be done in the fall. The stands harvested were high-site mixed conifer and the topography was almost flat. There were no restrictions on either of the blocks that would hinder the installation of the study. After two confirmation visits the Roseburg blocks were selected as the first Agenda 2020 site.

The SPI site was located northeast of Burney near the intersection of Highway 89 and the Dana Cutoff road. This site consisted of a single block that was scheduled for harvest in the fall of 2003. The stand was mixed confier growing on a good site. Topography was flat. As with the Roseburg site, there were no restrictions on this stand that would hinder installation of the Agenda 2020 study. This block was chosen as the second site for the study

As of December, the Roseburg site has been harvested and site preparation has been completed. The SPI site has been harvested with site preparation to follow in 2004. The goal is to install the Agenda 2020 study on both sites during the same time period. Plot layout is scheduled for summer of 2004 with planting to be done in the spring of 2005.

Tom Jopson (Cal Forest Nurseries) has started the collection of manzanita cuttings in order to raise the seedlings (root cuttings) of this species that will be needed for the study. The ceanothus seedlings will be raised from seed that Tom has ordered from the Lawyer Nursery. Both shrubs will be raised by Cal Forest at their Etna, CA. location.

2004: Site preparation was completed on the Sierra Pacific Industries site during the summer of 2004. Plot loayout on both sites was completed by September. Some changes were made to the original proposal prior to plot installation. Conifer spacing was changed from 12x12 to 8x8 feet resulting in 168 trees per plot. Of these

168 trees, 80 are measure trees. There will be a total of 8736 seedlings (4368 pine and 4368 Doug-fir) planted per site. There are thirteen treatments replicated four times per site. This makes a total of 52 plots per site. Contracts for marking the planting spots at both sites were let during November. The conifer seedlings for this study are being raised at Cal Forest Nursery. Ceanothus seedlings are growing at Cal Forest Nursery, also. Nursery crews collected plant material in November from the sites in order to start raising the manzanita plants required by the study. The treatments will be installed in the spring of 2005 as originally planned.

2005: The Dana site was planted on March 31. Weather was clear with a slight breeze. Planting started at 6:30 and was completed by 10:00. All planting was done using hoedads. Fourteen planters and one foreman along with two Sierra Pacific Industries inspectors accomplished the planting. The Douglas-fir were Styro 8 stock from Cal Forest Nurseries, 4500 foot elevation, seed zone 521. The ponderosa pine were Styro 6 stock from K & C Silviculture, Oliver, BC.

The two Roseburg sites were planted on the morning of April 1st. It was partially cloudy with no wind. All planting was done with hoedads. Thirteen planters and one foreman along with two Roseburg Resources inspectors accomplished the planting. The Douglas-fir seedlings were Styro 8 stock from Cal Forest Nurseries, 3000 foot elevation, seed zone 521. The ponderosa pine were also Styro 8 stock from Cal Forest Nurseries, 3200 foot elevation, seed zone 521.

In July, the plots receiving complete vegetation control were treated with a directed spray application using Roundup. Both the SPI and Roseburg sites received this treatment. The ceanothus species being raised at Cal Forest Nurseries for outplanting at the two sites are doing fine.

All attempts to raise manzanita have failed. Another atempt will be made in the spring at the height of the flowering season.

2006: Because of poor survival on the Dana Site, the half of the plot originally planted with Douglas-fir was replanted in the spring of 2006. At this time each planting spot was double planted with a white fir. This replanting was applied to all plots on the site.

In April, the plots receiving complete vegetation control, the fertilization treatment and those plots having some level of either manzanita or ceanothus stocking were treated with 4#/a atrazine applied with a pressurized broom. Both sites were treated at this time. In June these same plots received a directed spray application of 5% Buccaneer mixed with 5% Hasten.

On the Dana site, stocking of manzanita is still a problem. As we are still having no success raising this species, attempts will be made in the spring of 2007 to transplant wild seedlings, taken from the buffer around the plots, into the plots requiring manzanita. Other sources may have to be used to supplement the supply of seedlings if there are not enough seedlings in the buffer.

During 2006, two tours were conducted at the Dana site. A stop on the Weed

Tour of the California Pest Council took place in July; and a tour for faculty from Oregon State University was conducted in the fall.

2007: All release treatments were applied on schedule during the spring on both sites. This consisted of manual release on the Dana site and herbicide release on the Big Bend site. Survival of the fir component is still unsatisfactory despite two replants on the Dana site. The pine component is acceptable. The fir component on the Big Bend site suffered major mortality during 2006 and fir stocking is now marginal. As with the Dana site, the pine component at Big Bend is acceptable.

Another attempt was made in the spring to increase the population of manzanita in the plots at the Dana site. This attempt involved transplanting of freshly lifted wild seedlings harvested within a couple of miles of the study site. Planting weather was ideal with rain occurring before and after the planting. Despite careful lifting, storage, and planting, only about 10% of the seedlings survived the summer. Previous attempts have involved trying to raise seedlings at Cal Forest Nursery from seed purchased from dealers and from cuttings (harvested in the spring and in the fall from areas adjacent to the study site). To date, there has been little success with the attempts to raise manzanita seedlings.

In November a crew from PSW inventoried the amounts of brush on the plots at the Dana site. The Big Bend site will be inventoried in 2008. Plans for 2008 include measuring the amounts of nitrogen being taken up by the two species – manzanita and ceanothus – to determine any differences in nitrogen fixation between the two species.

2008: Funding support was given to Matt Busse (PSW Redding) to measure shrub cover and N fixation rates on all plots on both the Dana and the Big Bend sites. The shrub covering was measured on both sites in summer 2008, the third growing season after tree planting.

Shrub cover measurements from Dana (Figure 1) confirm the poor performance of shrubs across all treatments. Because of the scarcity of ceanothus at Dana, the decision was made not to measure N fixation rates.

Ceanothus cover at the Big Bend site (primarily whitethorn) ranged from 30 to 50 % on plots designed to retain N-fixing shrubs (Figure 2). However, Manzanita cover was conspicuously low, which precludes the ability at present to assess the competitive difference between scrub species.

Concerns and recommendations: (1) the validity of the original study objectives is in jeopardy given the poor performance of the shrubs, particularly Manzanita, at both sites; (2) shrub cover should be re-assessed in 2010 to determine if fifth year targets are met. However, this may be an appropriate time for the Co-op to critically evaluate the fate of the Agenda 2020 study. Should time be given to allow greater shrub occupancy, should an alternative study objective be identified based on existing site conditions, or should the study be abandoned?

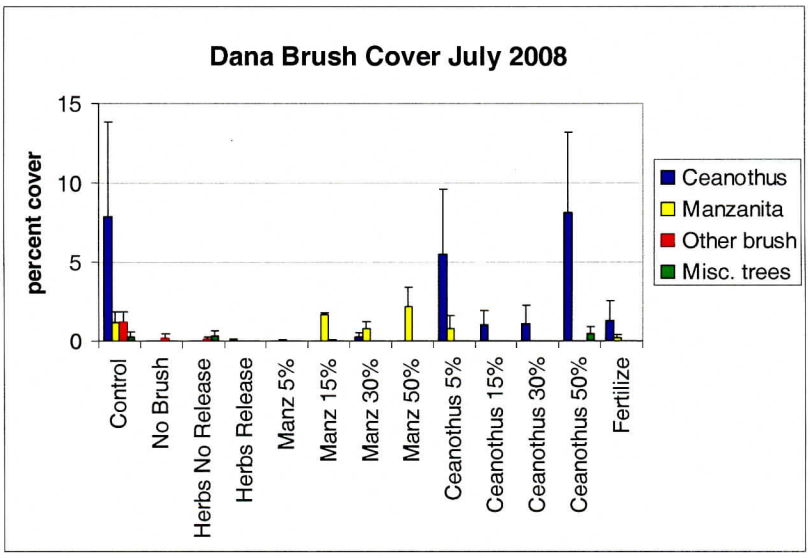


Figure 1.

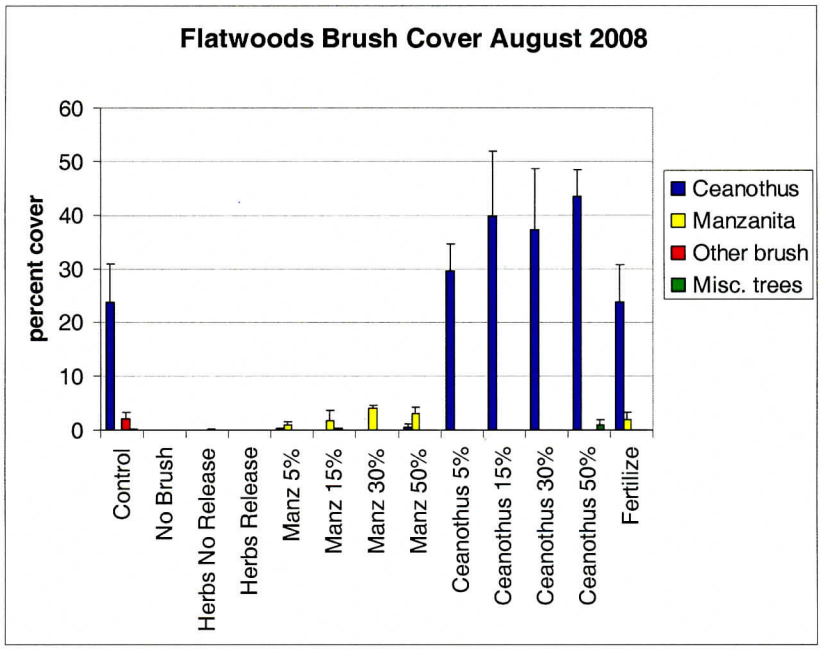


Figure 2.

Sierra Cascade Intensive Forest Management Research Cooperative Proposal 02-02, Slow Release Fertilization Study

Principal Investigator: Ed Fredrickson

Title: Evaluating the effect of slow release fertilizers incorporated into containerized seedlings in Mediterranean climates

Year Funded: 2002

Executive Summary:
A study was initiated in 2002 to evaluate the partial contributions of fertilizer type and rate to seedling survival and growth in the field for Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*). The influence of site quality and precipitation on seedling response to incorporated slow release fertilization was also to be investigated. The stated purpose of the study was to determine appropriate fertilizer ratios and rates for typical conifer species grown in Mediterranean climates and to evaluate survival and growth responses over a range of site qualities and moisture regimes.

Three sites on Co-op members' lands were chosen for the study: Soper-Wheeler Co., Silver Butte Timber Co., and W.M. Beaty & Associates. All three sites tested Douglas-fir and ponderosa seedlings; the Soper-Wheeler site also tested sugar pine (*Pinus lambertiana*). Continuous-recording weather stations capable of recording soil and air temperature, precipitation, and soil moisture were installed at each site. All seedlings were grown in Styro-10 containers. The fertilizer used was Nutra-Cote 16-10-10 at 0, 1, 2, and 3 grams per cell.

The fall planting was done in October and November, 2003. Conditions were cool and the ground was moist at the Silver Butte site; the soil was dry on the other two sites and it was hot and windy at the time of planting. The spring planting was done in March and early April, 2004. Planting conditions were ideal on all three sites at the time of planting. At the time of each planting, sample seedlings representing all species by landowner were taken to Redding where measurements of caliper and length were taken on 100 trees per species per landowner.

Caliper and height will be measured for all seedlings at the end of each growing season starting in fall 2004. Seedling volume will be derived from these measurements. Survival will be noted at the time of measurement. Analysis of variance (ANOVAs) of treatment means will be used to test for treatment effects and significant differences among treatments.

Survival: At the end of the fifth growing season (fall 2008), survival for all tree species was greater with the spring planting than with the fall planting on all three sites. Most differences were significant. The survival of the fall planted **Douglas-fir** on the Beaty site was so low that results could not be analysed. The fall planting treatment with the highest level of

fertilization (3 g/cell) had no survivors in any of the five replications. Two other treatments (1 and 2 g/cell) had only one survivor in the five replications. The treatment with no fertilization resulted in the best survival for the spring planted Douglas-fir seedlings on the Beaty site but the differences were not significant. There were no significant differences in fall or spring survival due to fertilization for any species on the Soper-Wheeler and Silver Butte sites. At the end of 2008, spring planted seedlings on Soper-Wheeler had a survival rate of 92 percent compared to fall planted seedlings with a rate of 34 percent. The spring planted seedlings on the Silver Butte site had a survival rate of 76 percent, the fall planted seedlings had a rate of 44 percent. The spring planted seedlings on the Beaty site had a survival rate of 65 percent.

For **sugar pine** on the Soper-Wheeler site spring planting had a survival rate of 97 per cent at the end of 2008. Fall planted seedlings had a survival rate of 90 percent.

For **ponderosa pine**, at the Beaty site, survival was 98 percent on the spring planted treatments compared with 80 percent on the fall planted ones. Silver Butte spring planted seedlings averaged a survival rate of 82 percent, the fall planted ones 74 percent. Soper-Wheeler spring planted seedlings had a survival rate of 97 percent compared to fall planted seedlings with a survival rate of 82 percent.

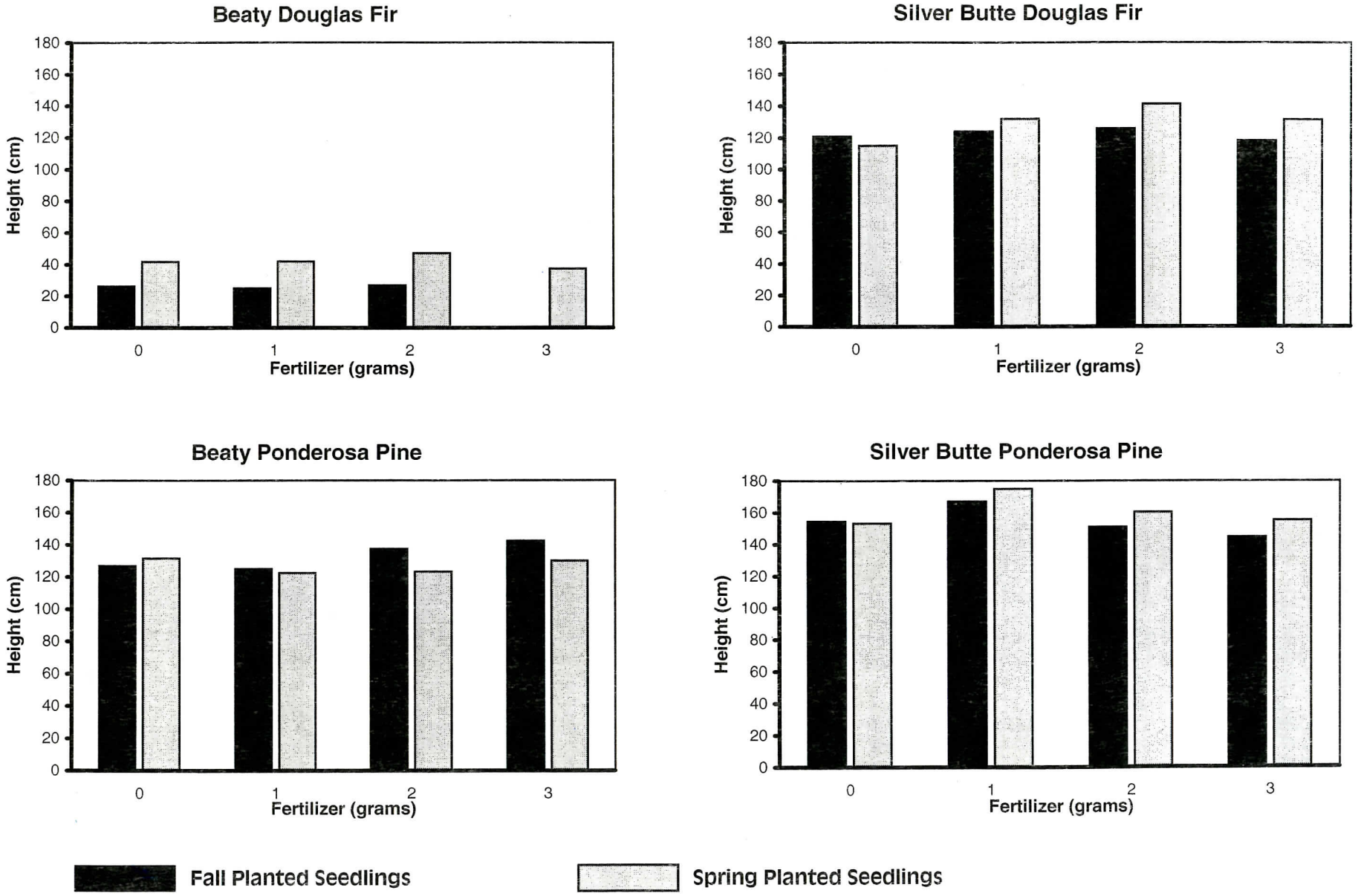
Growth: There were no significant differences in height, caliper, or volume of any species for any of the treatments on the Beaty and Silver Butte sites (Figure 1). For **Douglas-fir** at the Soper-Wheeler site, spring-planted seedlings with the highest fertilization rate (3 g/cell) were significantly taller than seedlings planted in the fall with the lowest fertilization rate (Figure 2). This same spring planted treatment also resulted in significantly larger values in caliper and volume as compared to the two fall treatments with the two lowest rates of fertilization (0 and 1 g/cell).

For **ponderosa pine**, there were no significant differences in height between any of the treatments on the Soper-Wheeler site. But the spring treatment with the highest fertilization rate (3 g/cell) resulted in seedlings with significantly higher values for caliper and volume when compared to seedlings planted in the fall with the second lowest fertilization rate (1g/cell).

For sugar pine, on the Soper-Wheeler site the second lowest fertilization rate (1 g/cell) in the spring planted treatment resulted in seedlings with significantly higher values in height, caliper, and volume than seedlings planted in the fall with the second lowest fertilization rate (1 g/cell).

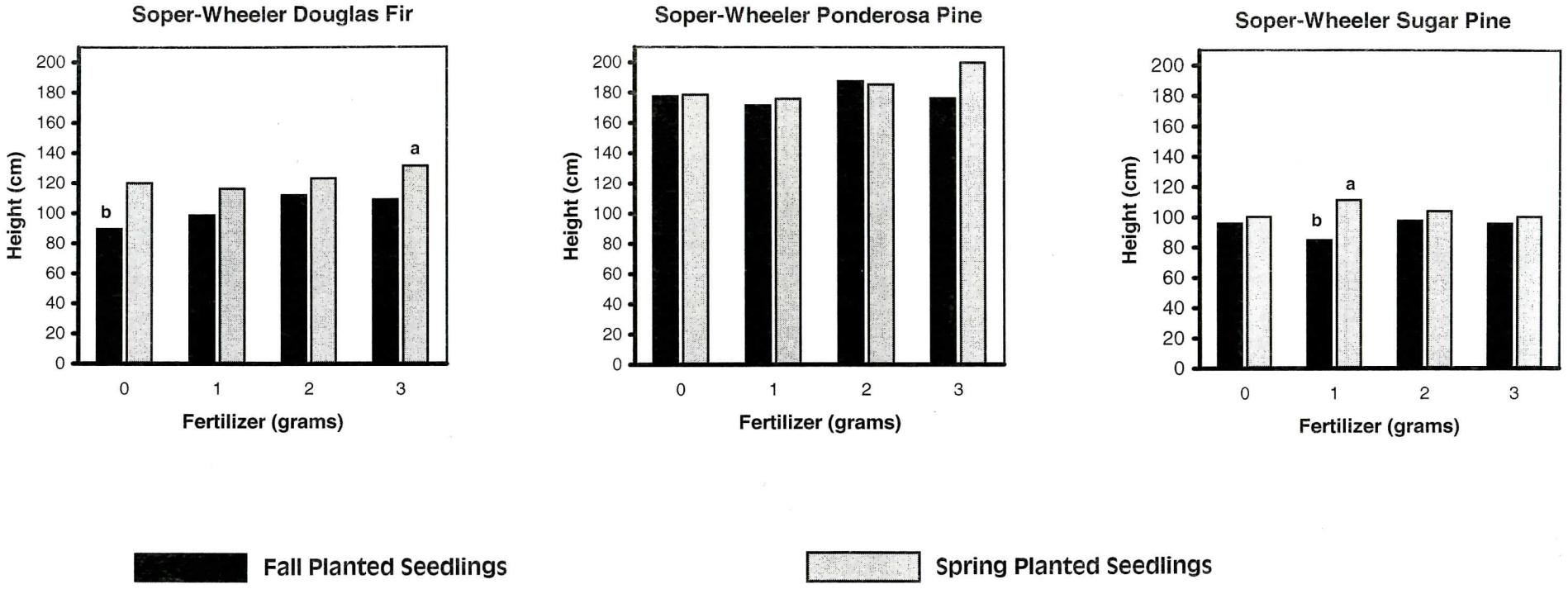
Weather stations were established at all three sites at the time of the first planting in 2003. Continuous readings of soil temperature, air temperature, soil moisture, and total precipitation were recorded through the fall 2008 season. The weather stations were removed following the completion of the conifer measurements in the fall of 2008.

Figure 1 : Height of seedlings for Slow Release Study by fertilizer rate and time of planting, Fall 2008
Beaty and Silver Butte sites



For each fertilizer rate, site, and planting time combination, treatment means with the same letter do not differ statiscally at the 0.05 level. Means with no letters do not differ.

Figure 2 : Height of seedlings for Slow Release Study by fertilizer rate and time of planting, Fall 2008
Soper-Wheeler Site



For each fertilizer rate, site, and planting time combination, treatment means with the same letter do not differ statiscally at the 0.05 level. Means with no letters do not differ.

Sierra Cascade Intensive Forest Management Research Cooperative Proposal 07-01, Glyphosate Control of Evergreen Brush

Principal Investigator: Mark Gray

Title: Investigating the Efficacy of Glyphosate for Control of Evergreen Brush Species

Year Funded: 2007

Executive Summary:
Glyphosate has been used effectively for control of many common weed species that infest conifer plantations. Treatments of evergreen species have historically had mixed results. Recent price reductions, due to the Roundup patent expiration, have renewed interest in developing effective treatment regimes for these harder to control species. Operational experimentation indicates control of manzanita, snowbrush, chinquapin, and tanoak is possible with various glyphosate/ surfactant combinations and, conversely some attempts result in poor control. Is the variability in control a function of timing, material applied or a combination of factors? A more controlled investigation of the treatment parameters would provide better guidelines for this promising application.

The stated purpose of this study is to determine the optimal rate of application of various glyphosate formulations for control of manzanita, chinquapin, snowbrush and brush-form tanoak. Additional purposes include determining surfactant superiority and the best application timing for each target pest.

Several sites on industrial timberlands that contain adequate populations of the target species will be selected. Treatments to be studied will include: 5% glyphosate, 5% oil; 10% glyphosate, 5% oil; 5% glyphosate, 5% syltac; 10% glyphosate, 5% syltac; and an untreated control. All vegetation will be treated with a directed foliar spray. Operational-size test plots will be 1 acre in size. Each study site will require 21 one acre plots. Treatment timing will be once a month starting in May and concluding in September (5 treatment dates). Base line data will be taken in the control plots prior to applying the other treatments. Crown reduction of the target species will be determined at the end of the second growing season after treating.

The first site chosen for the study was located on Sierra Pacific Industries land near McCloud, California. The site was a conifer plantation about ten years old that contained a good compliment of the target brush species. The planted conifers were taller than the adjacent brush. Brush species present included manzanita, rabbit brush, snowbrush, current, bitter cherry, and chinquapin. Plots were laid out in August and base line data from the control plot was collected in September. Shrub data was collected using the line intercept method. The control is very representative of the plantation as far as amount of competing shrubs. This plot had shrub foliar cover of 53%. The August set of treatments were applied August 15th; the September set on September 25th. Weather conditions prevented installation of the May, June, and July treatment sets. These treatments will be applied in 2009.

In addition to the Ski Park site, plans are to install another replication of the study on a second site on Sierra Pacific Industries lands – Indian Springs – in 2009. Other replications will be installed as sites become available.

Sierra Cascade Intensive Forest Management Research Cooperative
Income/Expense Statement
Calendar Year Report for the Period Jan. 1 to Dec. 31, 2008

Beginning Balance on January 1, 2008		$5,708.46
Total Income (Membership Dues)		$62,000.00
Expenses:		
Weather Station Maintenance/Removal	$1100.00	
Agenda 2020	$3400.00	
Measurements - Stock Type/Fertilization Study	$812.80	
Measurements – Slow Release Study	$854.04	
Co-op Manager Expenses	$50,000.00	
Total Expenses		$56,166.84
Year End Balance as of December 31, 20078		$11,541.62

WORKING GROUP MEMBERSHIP

Working Group I
Seed to Establishment

Tom Jopson, Chair
Steve Akehurst
Bob Amesbury
Ed Fredrickson
Jerry Gallagher
Mark Gray
Lewis Howe
Bill Morrison
Duane Nelson
Bob Rynearson
Tom Young

Working Group II
Out-planting through Precommercial Thinning

Jason Warshawer, Chair
Steve Akehurst
Bob Amesbury
Ed Fredrickson
Mark Gray
Lewis Howe
Bill Morrison
Duane Nelson
Bob Powers
Bob Rynearson
Tom Young