SMC Quarterly News

Stand Management Cooperative
School of Forest Resources, University of Washington
3rd Quarter 2009

www.standmgt.org

Dave Briggs, SMC Director

From the Director

The SMC database update has been completed and if you have not received a copy and would like one or would like a tutorial on its use, contact Randy Collier (rcollier@u.washington.edu). At this time, the field crew is finishing various maintenance activities at some installations. This summer they will be working with PhD student Kim Littke to set up additional paired-tree fertilization installations. There will also be a student summer field crew, supported by the Corkery Family Chair and grant funds, that will be visiting installations for soil sampling, competing vegetation measurements on genetic gain/Type IV and other installations, monitoring growth with terrestrial lidar, and other activities.

Spring Meeting: We held the Spring Meeting on April 21 as a webinar in response to problems many were having with travel due to the economy. Several Policy Committee members attended on campus but most attended via the remote webinar system. Because of this format, we only conducted a business meeting, deferring the usual series of research presentations until the fall meeting. Much of the discussion focused on the effects of the economic situation on the budget. While no members have indicated that they will drop out of the SMC and all expressed a strong desire to ensure its survival, a number have indicated that they may be forced to reduce their dues. In addition, since member dues have been flat over the past decade, inflation has pushed up expenses, primarily travel expenses and salaries for the field crew and database staff such that a fully loaded budget has been in deficit for several years. We have been able to manage this because of successes in obtaining external research grants that have paid some of these expenses. However, the deficit continues to grow making it increasingly risky to rely on

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deficit continues to grow making it increasingly risky to rely on uncertain grants. Combining this with the expression by some members that they may not be able to pay full dues in 2010, it was obvious that action is needed to keep the budget balanced with as little impact on the core mission as possible. After discussing various preliminary options, a Finance Committee was formed from which the following actions are being taken as of July 1; we will lay off one of the database staff (John Haukaas), we will reduce salaries of all others by the equivalent of 2 weeks for the remainder of 2009, and we will reduce corresponding travel and other support expenses. We will continue this into 2010, meaning that all will have the equivalent of a one-month salary reduction over the entire year. It is hoped that the savings in the second half of 2009 and for the entirety of 2010 will be adequate to keep the budget balanced. This will be closely monitored to determine if these actions are sufficient or if more action is needed if the losses continue into 2011. These actions do have significant consequences; loss of John Haukaas will leave us with only Randy Collier to manage the database system – we will need to find other ways for accomplishing the fundamental programming and other database work that John had been doing. The cutback on the others will reduce our ability to accomplish many of the maintenance and other activities associated with installations that have traditionally been done by the field crew in the summer. This will create a backlog that will become serious if the cutbacks continue very long. Finally, the reduction seems to be coming at a time when more members would like the SMC staff to perform more database analyses to translate responses into meaningful forms and communicate it to members.

New SMC Member: Stimson Lumber Company in Gaston, OR, recently joined the SMC. On June 17 Dave Briggs, Rob Harrison, Kim Littke, and Eric Turnblom met with Margaret Banks, GIS/Inventory Manager; Scott Gray, Fee Manager; Roger VanDyke, Reforestation Manager; and Dave Sweeney, Central Unit Forester to discuss the SMC research program. Stimson is examining their lands for sites for inclusion in the paired-tree fertilization trials. Margaret Banks will be the Policy Committee representative.

Fall Meeting: At the Spring Meeting, we discussed the location and venue for the Fall Meeting. We had made tentative arrangements to hold the meet-

location as last Fall's meeting. This will follow a "Best Management Practices for Soil Productivity in the Douglas-fir Region"workshop sponsored by the Northwest Forest Soils Council and Western Forestry and Conservation Association on September 22. We felt that this would provide the opportunity for some to attend both while minimizing travel expenses. Some disappointment was expressed that no field trip was included and that we might consider a field trip and a different location and date, if necessary. A decision was made to poll the members for their input on this issue. Results of the poll indicate that an overwhelming majority wished to hold the meeting as currently planned on the 23rd so please reserve that date on your calendar. We will have a business meeting in the morning followed by research presentations and, for those who wish, we will have a field trip to visit the genetic gain/Type IV installation planted in 2005 at Donkey Creek. This installation is growing spectacularly and visiting it will afford a good opportunity to discuss growth changes that are being analyzed this summer, to review and discuss measurement procedures, and to consider possible changes.

In This Issue: We have a note from Dick Miller on the recent re-measurement and plans for an updated analysis of a thinning and fertilization trial established in 1963. This is followed by an analysis by Randy Collier on Elk Browsing Patterns at Installation 604 (Boxcar) on page 5 and an announcement on page 10 from the University of Washington that places the College of Forest Resources in the new College of The Environment.

Time Will Tell: Results after 25 Years vs. 8 Years, Dick Miller, retired, USFS.

Background: The 1929 Douglas-fir plantation near Planting Cr. on the former Wind River R.D. in SW Washington has grown slowly. The native soil is variable because of past large-scale soil-slumping, and is generally shallow and stony. Stand-replacement wildfires in 1926 and 1928 that were associated with the extensive Yacolt Burn undoubtedly volatilized most of the above-ground organic matter and nitrogen (N). Growth rates were improved moderately in portions of the plantation that were experimentally thinned, and improved greatly by experimental application of ammonium nitrate fertilizer in 1963. The most visual response to N; however, is readily apparent in the

1963. The most visual response to N; however, is readily apparent in the greater diameter and height of Douglas-fir associated with red alder that were inter-planted within an 80-ft wide strip straddling a N/S section line. Although the original purpose of the inter-planting was to provide a future firebreak, the inter-planting provides a remarkable, serendipitous demonstration of the stimulating effects of adding N to an N-limited site. In 1983, we installed a second fertilizer trial in this plantation. The design involved 240 single-tree subplots each centered on dominant and co-dominant Douglas-fir within and at systematic distances from the alder strip. Further details about the trial and the response 8-years after fertilization can be found in the following publication:

Dick Miller, retired USFS and Bert Hasselberg, SMC field crew member.

Miller, Richard E.; Reukema, Donald L.; Hazard, John W. 1996.

Ammonium nitrate, urea, and biuret fertilizers increase volume growth of 57-year-old Douglas-fir trees within a gradient of nitrogen deficiency. Res. Pap. PNW-RP-490. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

Abstract: In a nitrogen-deficient plantation in southwest Washington, we (1) compared effects of 224 kg N/ha as ammonium nitrate, urea, and biuret on volume growth of dominant and codominant Douglas-fir (*Pseudotsuga menziesii* var. *menziesii* (Mirb.) Franco); (2) determined how 8-year response of these trees to fertilization was related to their distance from a strip of the plantation inter-planted with nitrogen-fixing red alder (*Alnus rubra* Bong.); and (3) observed effects of biuret on understory vegetation. On both sides of the strip centerline, we grouped subject trees into 30 plots of 4 trees each, based on slope position and distance from alder. We randomly assigned three fertilizers and a control within each plot. We analyzed separately data from east and west of the mixed stand centerline. Initial volume differed greatly among the 120 trees on each side, so we used covariance analysis to adjust observed treatment means. Adjusted mean volume growth was increased ($p \leq 0.10$) by 22 to 28 percent on the east side and by 11 to 14 percent on the west side, with no significant difference in response to the three fertilizers. Only biuret stimulated growth within the mixed stand. Biuret had no visible toxic effect on competing vegetation during the 8 years after application.

Recent and Pending Developments: Recently, the SMC field crew (Bob Gonyea, Bert Hasselberg, and Bill Bizak) and I measured current d.b.h. and height of about 200 surviving and undamaged subject Douglas-fir…and had a great time reminiscing about past experiences. In the mixed stand, nearly all of the red-alder have died and the original 640 TPA of Douglas-fir now average about 150 TPA vs. about 300 TPA in the neighboring pure stands. Summarization and re-analysis of the updated data are pending, and so is my curiosity. Is biuret truly a slow-release fertilizer? Stay tuned for a future SMC newsletter.

Elk Browsing Patterns at Installation 604 (Boxcar)

By Randol Collier

Introduction

Browse damage is not usually a large concern when regenerating most north western tree species. In areas with high populations of deer or elk or where the intention of the manager is to establish preferred browse species such as western red cedar it is sometimes necessary to employ animal repellants, bud caps, or plastic mesh to protect the leaders of the seedlings. In some cases a plantation is deemed valuable enough to justify fencing the complete area.

Six high value genetics/silviculture trials established by the Stand Management Cooperative and the Northwest Tree Improvement Cooperative were fenced to prevent browse damage. These installations contain woods run stock, 10 separate families of moderate gain stock and 10 separate families of high gain stock.

Unfortunately, the fence at one site was breached by wind thrown trees during the winter storms of 2006-2007 and then again during the winter of 2007-2008. During the summer of 2008 a site assessment was carried out and as part of the assessment, every living seedling was assessed for elk browse damage.

Field procedures

Before the seedlings were planted a flag was set out to mark every planting site and the type of seedling in terms of genetic gain to be located at the planting point. Every non woods run seedling was labeled with a tag that indicated its family number. Once the plantation was established every seedling was mapped as to column and row and the family code was recorded. Vegetation control was carried out each spring and needed repairs to the fence were made. After 2 growing seasons the first measurements of the seedlings were made during the winter of 2007-2008. Once the extent of the browse damage was known a detailed browse survey was incorporated into the summer site quantification exercise. Each seedling was assessed for browse damage and given a code based on the damage. Table one contains the codes.

Elk Browsing Patterns at Installation 604 cont.

Table 1: Browse Codes

Browse Code	Description
0	No Damage
1	Laterals only
2	Previous year leader only
3	Previous year leader and laterals
4	Current leader
5	Current leader and one or more laterals
6	Previous and current leader
7	Previous and current leader and laterals
20	Dead
30	No seedling found

As all spots to be planted were marked by pins with different colored flags, every seedling could be accounted for in some way. Seedlings that were dead or missing were counted but not included in the analysis.

Literature Review

The literature on browse damage is somewhat limited. Kimball and Nolte (2006) present results on developing repellents for deer. Saunders and Puettmann, (1999) presented site specific models for predicting deer browse damage to white pine. An evaluation of the effectiveness of different methods of reducing browse damage to white pine was presented by Ward and Mervosh (2008). Kruger and Peterson (2006) indicated that local conditions such as wind thrown trees tend to determine the type and extent of browse damage.

Analysis

This assessment can be viewed as a retrospective study rather than as an experiment, thus while some statistics can be calculated, the absence of randomization reduces the strength of any inferences that can be drawn. Another weakness is that this assessment is limited to living seedlings; it is possible that browsing may have contributed to seedling mortality but there was simply no way to identify such situations.

The first question to be addressed was whether or not there was any evidence of patterns of selection based upon observed genetic gain. A review of table 2 and figure 1 shows that there are no visible associations between the extent of damage and the level of genetic gain. The plot with the least amount of damage (plot 11) and the plot with the highest amount of damage (plot 4) were planted with high gain stock.

Elk Browsing Patterns at Installation 604 cont.

Table 2: Percentage of Live Trees Not Browsed and Gain Level

Plot	Percentage Not Browsed	Gain
1	42.1	Woods Run
2	40.4	Medium
3	27.8	High
4	**5.1**	**High**
5	18.6	Woods Run
6	8.7	Woods Run
7	21.3	Woods Run
8	34	Medium
9	35	High
10	59.9	Woods Run
11	**62.5**	**High**
12	16.7	Woods Run
13	12.1	Medium
14	48.8	High
15	53.9	High
16	57.3	Woods Run
17	59.7	High
18	38.8	Medium
19	18.4	Woods Run
20	36.7	Medium
21	21.9	High
22	18.1	Woods Run

As can be seen there are no apparent patterns to the browse damage at least with regard to genetic gain levels. The survey crew indicated that it seemed that the seedlings that were surrounded by deep slash were less likely to suffer browse damage.

No meaningful correlations were found between the intensity of browsing and the average depth of slash, the proportion of sample points with a slash depth greater than 30 cm, and size and density of the stumps on each plot. This is reasonable as logic dictates that it is the physical distribution of the slash rather than plot average measures that would impede the movement of wildlife through the site and thereby reduce the extent of any browse damage. This is in line with the findings of Krueger and Peterson (2006).

In order to look for family trends, the damage classes were compressed into 4 classes: No Damage; First Year Only; Second Year Only, and Both Years. In theory, the no damage class indicates that the seedling was physically protected by slash or was unattractive to the browsing animals. The first year browse damage class may indicate a protective reaction of some families against browsing. Seedlings in

Elk Browsing Patterns at Installation 604 cont.

the second year only class may have grown up enough to be within reach or that the slash has receded enough to allow the animals to reach the tree. Trees that were browsed both years indicate that while the browsing may have reduced growth the trees still appeared palatable to the elk.

The counts of the number of each family and the woods run stock were compiled into a 21 by 4 contingency table and a Chi-Square statistic was calculated. The Chi square statistic was 124.0029 with 30 degrees of freedom which has a p value of 0.999. Thus there are significant differences between the type of damage and the families. One high gain family (96048) had far more than the expected incidences of being browsed both years than chance would indicate while two other high gain families 96049 and 96052 appear to have been browsed the first year and avoided the second. This may indicate that some members of these families reacted to being browsed in such a way that the elk avoided them during the second year. The actual contingency table analysis is presented in the appendix.

Conclusions

Based on this analysis, browse damage appears to be a function of the seedlings being easily available to the elk. Those seedlings that had physical barriers of slash barring easy access were less likely to suffer browse damage. Unfortunately this is location specific at the seedling scale and difficult to determine at the plot level. There is some evidence that some families may respond to being browsed in such a way that they become less attractive to elk in subsequent years. However it would take a clipping and bioassay study to substantiate this.

Literature Cited

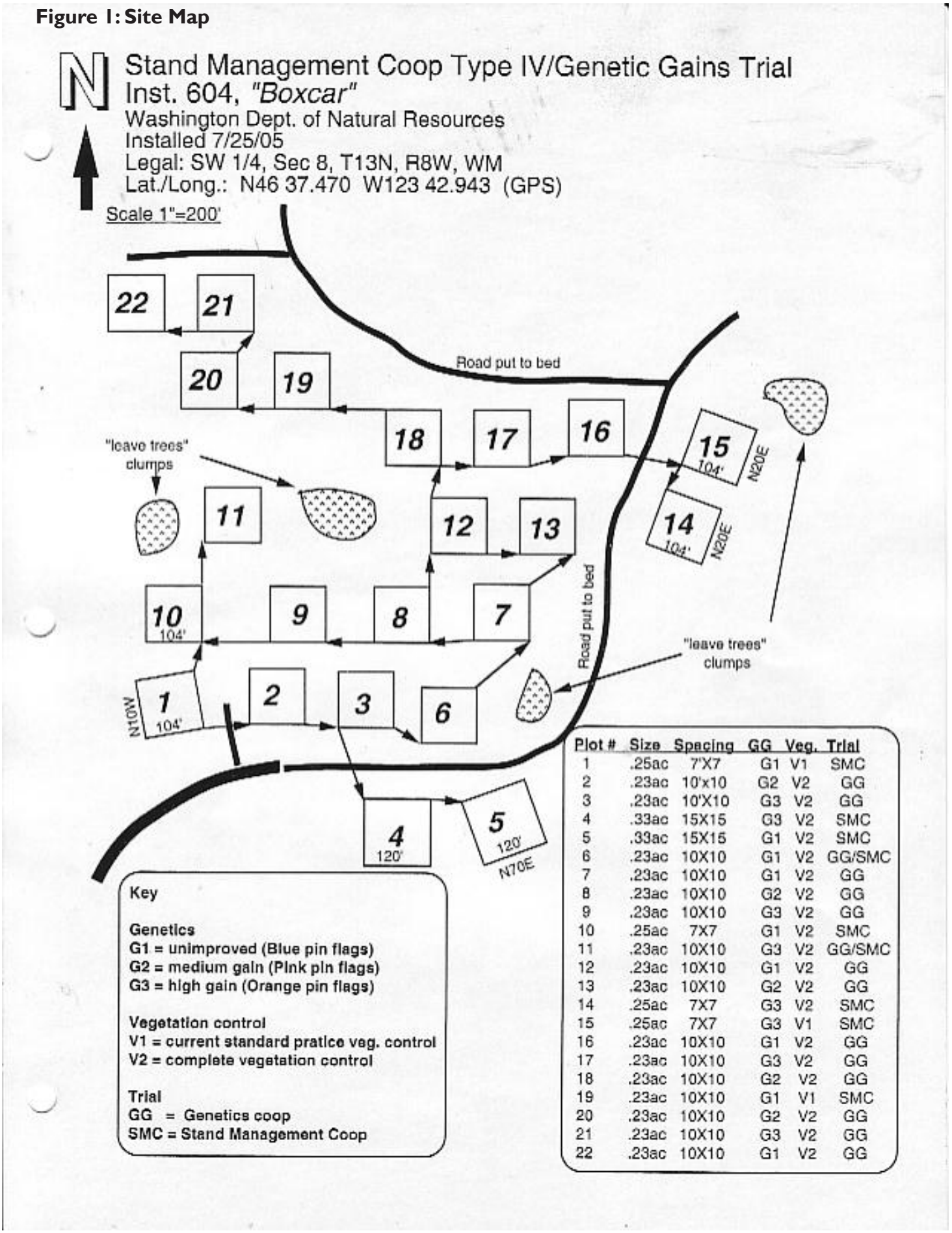
Kimball, B.A and D.L Nolte 2006. Development of a new Deer Repellent for the protection of Forest Resources. WEST j. Appl. For. 21(2) 108-111.

Krueger, L.M. and C.J. Peterson. 2006 Effects of white tailed deer on Tsuga canadensis regeneration:evidence of microsites as refugia from browsing. Am. Mid. Nat. 156.2 p253.

Saunders, M.R. and K. J. Puettmann 1999. Use of vegetational Characteristics and Browsing Patterns to Predict Deer Damage in Eastern White Pine (*Pinus strobus*) Plantations. North. JK. Appl. For. 16(2):96-102.

Ward, J.S and T. L. Mervosh. 2008. Strategies to reduce browse damage on eastern white pine (*Pinus strobus)* in southern New England, USA. For. Ecol. Man. 255(5-6) 1559-1567.

Figure 1: Site Map



Plot #	Size	Spacing	GG	Veg.	Trial
1	.25ac	7'X7	G1	V1	SMC
2	.23ac	10'x10	G2	V2	GG
3	.23ac	10'X10	G3	V2	GG
4	.33ac	15X15	G3	V2	SMC
5	.33ac	15X15	G1	V2	SMC
6	.23ac	10X10	G1	V2	GG/SMC
7	.23ac	10X10	G1	V2	GG
8	.23ac	10X10	G2	V2	GG
9	.23ac	10X10	G3	V2	GG
10	.25ac	7X7	G1	V2	SMC
11	.23ac	10X10	G3	V2	GG/SMC
12	.23ac	10X10	G1	V2	GG
13	.23ac	10X10	G2	V2	GG
14	.25ac	7X7	G3	V2	SMC
15	.25ac	7X7	G3	V1	SMC
16	.23ac	10X10	G1	V2	GG
17	.23ac	10X10	G3	V2	GG
18	.23ac	10X10	G2	V2	GG
19	.23ac	10X10	G1	V1	SMC
20	.23ac	10X10	G2	V2	GG
21	.23ac	10X10	G3	V2	GG
22	.23ac	10X10	G1	V2	GG

Key

Genetics
G1 = unimproved (Blue pin flags)
G2 = medium gain (Pink pin flags)
G3 = high gain (Orange pin flags)

Vegetation control
V1 = current standard pratice veg. control
V2 = complete vegetation control

Trial
GG = Genetics coop
SMC = Stand Management Coop

College of Forest Resources is now the School of of Forest Resources in the UW College of the Enviroment

A college, three schools and departments, several centers and programs, and an institute will be combined July 1 as the inaugural units of the UW's College of the Environment. President Mark Emmert authorized the consolidation to have the units in place for the start of the new fiscal year. The first courses through the new college will be offered fall quarter.

Moving into the College of the Environment will be the College of Forest Resources, School of Marine Affairs, Department of Atmospheric Sciences, Department of Earth and Space Sciences, Program on the Environment, Program on Climate Change, Quaternary Research Center and Joint Institute for the Study of the Atmosphere and Ocean. The college will be led by interim Dean Dennis Hartmann, a professor of atmospheric sciences.

The inaugural units bring to the new college 900 students, 128 faculty members and $33 million in outside grants and contracts. By comparison, in fiscal year 2008 the College of Arts and Sciences had 940 faculty members and nearly $91 million in outside grant and contracts. The College of Engineering had 240 faculty members and $90 million in awards. Those two were among the top grant and contract producers outside of Health Sciences.

New money comes from $10 million in private gifts that will be used for endowed professorships, student support and college programs.

"We are very encouraged by the support we have received so far from donors who want to help advance our efforts to establish a broadly integrated program of teaching, research and public engagement in understanding the environment and how human activities can transform it," Hartmann says.

Inaugural units are:

* The College of Forest Resources, which celebrated its 100th anniversary last year, will become the School of Forest Resources. Professor Thomas Hinckley was named interim director, effective July 1, pending approval by the UW Board of Regents. Bruce Bare, College of Forest Resources dean, will return to the faculty and serve as special adviser to Hartmann in the new college. All existing units including environmental and resource management, the UW Botanic Gardens and units concerned with the engineering of biomass for biofuels, pulp and paper will move into the College of the Environment.

* The School of Marine Affairs is moving from the College of Ocean and Fishery Sciences. The school integrates natural and social science with policy discussions concerning the nation's 3.4 million square miles of ocean as well as marine resources elsewhere around the world.
* The Department of Atmospheric Sciences is moving from the College of Arts and Sciences. The department is involved in research and teaching on such subjects as weather, climate and air quality.
* The Department of Earth and Space Sciences also is moving from the College of Arts and Sciences. The department is so named because its scope extends from the center of Earth to the rim of the solar system, with its research cutting across traditional disciplines of physics, chemistry, biology, geology and mathematics.
* The Program on the Environment has for 12 years helped students combine courses from various UW schools and departments to earn a bachelor of arts degree or a minor in environmental studies. Two graduate-certificate and one undergraduate-certificate program are also offered. Never having had any faculty of its own, the program helped promote and integrate environmental-related degree programs and events across the three UW campuses.
* The Program on Climate Change coordinates and fosters collaboration in climate research and teaching among UW schools and departments and other research units.
* The Quaternary Research Center fosters interdisciplinary research focused on the last 2 million years of the global environment.
* The Joint Institute for the Study of the Atmosphere and Ocean fosters collaborative, cutting-edge research between the UW and the National Oceanic and Atmospheric Administration in climate, ocean and fishery sciences.

Emmert and Provost Phyllis Wise decided that the Applied Physics Laboratory -- which is sponsored by the federal government and concentrates on acoustics, marine and polar science and engineering, medical and industrial ultrasound, and environmental information and electronic systems -- will leave the College of Ocean and Fishery Sciences and report to the provost.

Communications are under way with the leadership of the College of Ocean and Fishery Sciences about the possible inclusion of the School of Oceanography, School of Aquatic and Fishery Sciences and Washington Sea Grant in the College of the Environment.

When fully implemented the College of the Environment is expected to have more than 1,200 students, 200 faculty members and approximately $80 million in outside grants and contracts.

The college's Web site is http://coenv.washington.edu/.

Abstracts and Publications

Long-term effects of site preparation and postplanting vegetation control on Picea glauca survival, growth and predicted yield in boreal British Columbia. Jacob O Boateng, Heineman, Jean L., Bedford, Lorne, Harper, George J. and Linnell Nemec, Amanda. Scandinavian Journal of Forest Research, 24:2,111-129.

Abstract

The 19-20-year effects of mechanical site preparation, windrow burning, chemical site preparation, and postplanting vegetation control on survival and growth of planted white spruce are reported from two boreal sites in British Columbia, Canada. Survival differed between treatments at both sites, but was relatively good ($\geq$77%) even in untreated plots. Current data regarding the proportion of spruce that were physically overtopped by vegetation and previous results from related soils and vegetation studies suggest that lasting reductions in tall shrub and aspen abundance were more important to spruce growth than early microenvironmental effects associated with manipulating the rooting environment. At Inga Lake, postplanting vegetation control produced a 13-fold increase in spruce volume over the control after 19 years, which was statistically equivalent to increases resulting from fine mixing, plow-inverting and windrow burning site preparation treatments. At Iron Creek, chemical site preparation and plow-inverting quadrupled spruce volume, whereas mounding, patch scarification and disc trenching were ineffective. Growth and yield simulations using treatment-specific site index curves for Inga Lake suggested that rotation length could be shortened by 12-16 years through the use of site preparation or postplanting vegetation control. However, untreated areas, due to the relatively good survival of white spruce at age 19, were predicted to produce equivalent volume if left to grow to mean annual increment culmination age.

Abstracts and Publications cont.

Modeling natural regeneration following mountain pine beetle attacks in the southern and central interior of British Columbia. 2007. LeMay, V.M.; Lee, T.; Sattler, D.; Marshall, P.; Robinson, D.; Zumrawi, A.A. Natural Resources Canada, Canadian Forest Service, Pacific and Yukon Region, Victoria, BC. Mountain Pine Beetle Initiative Working Paper 2007-16. 51 p.

Abstract

Under the federal Mountain Pine Beetle Program, research is being implemented to study the economic and ecological characteristics of mountain pine beetle-damaged stands in British Columbia and Alberta. Stand development projections following beetle attack will depend upon the ability to accurately project natural regeneration following attack. In this study, stand structure measured on affected stands shortly after attack was used to estimate the abundance and composition of natural regeneration a number of years following attack. Based on plot data previously gathered by the Canadian Forestry Service and additional data gathered under separate BC Forest Science Program funding, the average amount of regeneration per hectare was quite high, and included predominantly pine and deciduous species, with few other conifers. Only three of the 326 plots had no regeneration. Fourteen overstorey variables were selected for estimating regeneration by species and size classes using multivariate nearest-neighbour imputation: elevation; stems and basal area per hectare for all live trees by three species groups; crown competition factor and quadratic mean diameter (QMD) for all live trees; stems per hectare, basal area per hectare, and QMD for pine snags; years since disturbance; and site series. There was wide variability in estimated versus observed regeneration at the plot level. However, the average estimated regeneration by species and size class was very similar to the average measured regeneration, except within the smallest size class. A prototype to incorporate this estimation procedure into PrognosisBC was developed to project stands following beetle attack, using overstorey measures shortly after attack.

Abstracts and Publications cont.

Considering the effectiveness of mountain pine beetle mitigation strategies. 2008. Coops, N.C.; Timko, J.A.; Wulder, M.A.; White, J.C.; Ortlepp, S.M. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. Mountain Pine Beetle Working Paper 2008-21. 44 p.

Abstract

In this communication, we review a broad range of mitigation strategies associated with the management of mountain pine beetle (Dendroctonus ponderosae Hopkins). We consider methods that are currently utilized or proposed for controlling beetle populations, the manner in which the effectiveness of these approaches is monitored and assessed and, finally, the role that remotely sensed data may play in a large-area monitoring system. To this end, we first review the goals of effectiveness monitoring and introduce a general classification system to clarify the purpose and practice of efficacy monitoring. Based on these principles, the review is then structured around effectiveness evaluations for managing forest pests, primarily mountain, southern, and western pine beetles throughout North America. These evaluations are grouped by management strategy: silvicultural treatments; prescribed burns; and the use of attractants, repellants, and insecticides. Finally, we propose the use of remotely sensed data as a complementary tool for monitoring changes in the extent and severity of mountain pine beetle damage across large areas. Use of such data enables assessment of the efficacy of landscape level management practices, direction of the application of new mitigation activities, and reduction of the risk of future infestations.

Upcoming Meetings and Events

July 10-17, 2009, IUFRO Working Party 7.03.04: Diseases and Insects in Forest Nurseries. Hilo Hawaiian Hotel - Hilo Hawaii.
http://www.westernforestry.org.

July 14-16, 2009, Celebrating 100 Years of Seedling Production at the University of IdahoJoint Meeting of: Western Forest and Conservation Nursery Association The Intertribal Nursery Council Intermountain Container Seedling Growers' Association. Best Western University Inn, Moscow Idaho.
http://www.westernforestry.org.

August 26-28, 2009., Northwest Forest Soils Council Summer Field Tour. Northwestern Olympic Peninsula, Washington.
http://www.westernforestry.org.

September 22, 2009, Best Management Practices for Maintaining Soil Productivity in the Douglas-fir Region Sponsored by: Northwest Forest Soils Council and Western Forestry and Conservation Association. Little Creek Casino Resort, Kamilche, WA.
http://www.westernforestry.org/forestsoils/forestsoils.htm.

September 23, 2009, SMC Annual Fall Meeting. Little Creek Casino Resort, Kamilche, WA. http://www.little-creek-casino.com.

Stand Management Cooperative
SILVICULTURE ▪ NUTRITION
WOOD QUALITY ▪ MODELING

Stand Management Cooperative, School of Forest Resources
University of Washington, Box 352100 Seattle, WA 98195