



Coastal Silviculture Committee

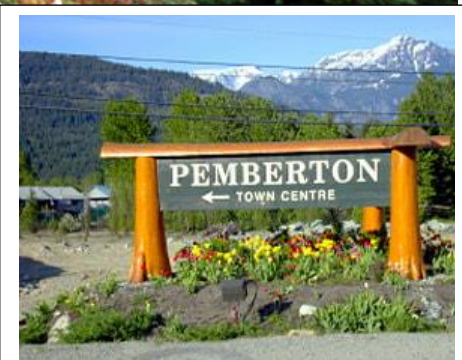
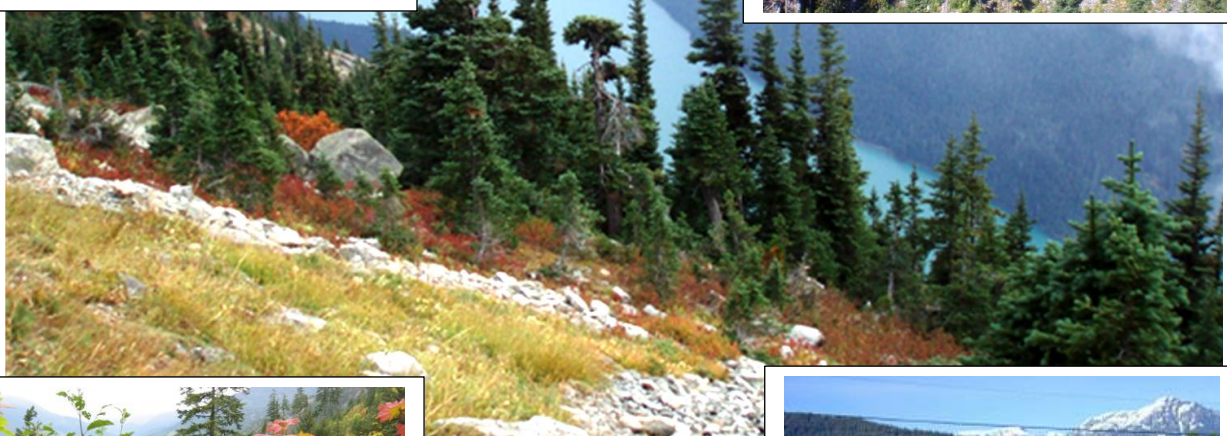
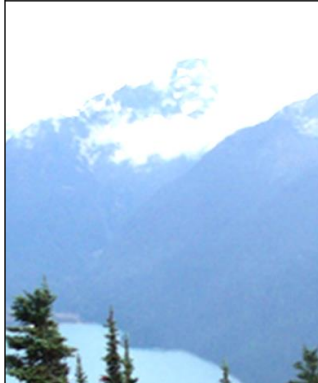
2019 Summer Workshop

Pemberton / Whistler

June 18 and 19th, 2019

"Will Tradition work in the Transition?"

***- Exploring challenges and new approaches in a rapidly changing coastal climate -
The Coastal Transition Zone (CTZ)***



photos by Don Pigott & Ralph Schroeder

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Acknowledgements

The Coastal Silviculture Committee (CSC) wishes to thank the following people for contributing their time and efforts in organizing the 2019 Summer Workshop:

<u>Co-chairs</u>	<u>Katherine Lawrence</u>	Day 1	<u>Norm Caldicot</u>	Day 2 c- 778-866-2132
	<u>Chelsey Toth</u>	Dinner		
	Jack Sweeten	c-604-819-7423	Lauchlan Glen	
	Dave Weaver	Booklet	Jocelin Teron	Reg/Webmaster
	Craig Wickland		Margaret Symon	First Aid Contact c-250-709-2626
	Don Piggot	c-250-668-4635	Neil Hughes	

On behalf of the CSC, the organizing committee would like to thank all the presenters for taking the time out of their very demanding schedules and lives to share their experience and knowledge with the rest of us – once again!

“Will Tradition work in the Transition?”
- Exploring challenges and new approaches in a rapidly
changing coastal climate -The Coastal Transition Zone (CTZ)
“The summer field review”

The CSC summer workshop co-chairs and CSC directors have designed this tour to take you to field stops narrated by local practitioners, that highlight projects and initiatives that demonstrate the serious challenges in this unforgiving silviculture zone and offer ideas and new successes for discussion. Topics presented over the 2 days in the field will attempt to address a range of issues from: plantation establishment; seedlots options; alternative species/provenances’ performance history; species planning using climate models; fertilization at planting; brushing approaches; forest health updates; managing for multiple values including visuals and wildfire protection ultimately using alternative retention systems to achieve these multiple values.

Day One: Will be all north of Pemberton, and all accessed off of the Lillooet River FSR. The first stop will be a “reality check” stop, of a not very successful plantation, due to all of the factors visited during the next 2 days. Stop 2 will be at the large 2015 Boulder Creek fire in the Upper Lillooet River/ Meager Creek area. This area is being reforested under the Forests for Tomorrow Program and approaches to site challenges will be discussed. Stop 3a will take you to a recent (2018) time of planting fertilization performance trial and a review of the early findings. Stop 4 will have an open discussion led by senior practitioners on the positives and negatives of time of planting fertilization.....get ready for a respectful debate! Stop 3b, will dig into the differences between Class A and B stock types in nursery production and the impacts to field performance in the CTZ. The last stop – 4, will allow all to walk through a 1996 provenance trial to see for your self the winners and losers and have a look at the data.

Day Two: Will all be south of Pemberton and will end up just south of Whistler The first stop of the day will be Suicide Hill – a 30-year-old multi - species and provenance trial. Details of the alternative species planted - the winners and losers - will be assessed while discussing forest health issues present and future. As well the Climate Change Informed Species Selection Tool (CCISS), will be presented and applied to the site as a working example. Stop 2 will be in the Cheakamus Community Forest and the manager will illustrate the integrated approach used to address silviculture issues and multiple values use adjacent to the major tourism municipality of Whistler. As well, an integrated wildfire protection silviculture treatment will be toured that embraces this interface zone. The last stop will highlight alternative silviculture systems as a possible option, while reviewing the results of a multiple-storey and species partial cut research trial 10-11 years old.

The day will end with the buses returning all to the parking lot in the Whistler area where your vehicles were parked that morning.

Observe.....Discuss.....Debate.....and.....Enjoy!!

2019 CSC Summer Workshop Program – June 18 & 19 – Pemberton

"Will Tradition work in the Transition?"

DAY ONE –Pemberton North - June 18th 2019 – Lead Katherine Lawrence

Time	Location	Activity - Topic	Presenter(s)
8:15 – 8:30 am	Registration in parking lot – Pemberton Valley Lodge		
8:30 am	Boarding on the buses		
8:35 – 9:20 am	Travel to Railroad Ck (Hurley FSR)		
9:20 am	Stop #1 Block 242 - WFP TL T0752	<u>Historically what hasn't worked in the Coastal Transition Zone (CTZ)</u> – Introduction to major silviculture failures/learnings	Wes Staven RPF Hedberg Associates Consultants
10:00am	Coffee Break - 15 min break		
10:20-11:05	Travel to 38km Lillooet FSR - Upper Lillooet Fire Area		
11:05 – 11:50 am	Stop #2 Boulder Ck- old FSR bridge crossing	<u>Introduction to Boulder Creek post wildfire treatments in the CTZ</u> FFT and FCI projects with site challenges	Katherine Lawrence RPF FLNRORD Integrated Investment Specialist South Coast Region
11:50 - 12:30 pm	LUNCH (bag lunch by Tsipun Lil'wat FN) at Stop # 3		
12:30-12:40 pm	Travel to Stop 3 – 10 min		
12:40-1:40 pm	Stop #3a and #3b Rehabbed industrial site at 39km	<u>3a - Time of Planting Fert trial</u> <u>3b - A seed vs B seed and stock types for challenging sites</u>	1) Wes Staven RPF, Hedberg Associates Consultants and Darius Bucher RPF, Integral Forest Management 2) Siriol Paquet Sylvan Vale Nursery, Black Creek
1:40-1:50 pm	Travel to Stop 4 – 10 min		
1:50-2:50 pm	Stop #4 FFT planting at 40km	<u>DISCUSSION - Time of planting fertilizer- site-specific considerations</u>	Darius Bucher RPF, Integral Forest Management and Norm Caldicott RPF retired
2:50-3:10	Coffee Break		
3:10 – 3:25 pm	Travel to 29 km		
3:25 – 4:25 pm	Stop #5 29km	<u>Provenance Trial</u> "There is no Tradition in Climate Change"	Michael Stoehr MoFLNRO Forest Genetics, Victoria
4:30 – 5:30 pm	Return to Pemberton		
5:30 – 6:00	Big Sky Golf Club – Fescues Restaurant – 1690 Airport Road Pemberton		
6:00 – 10:00	DINNER – 1) KEYNOTE SPEAKER – Klay Tindall to speak to Lil'wat forestry - successes/problems 2) LOGISTICS DAY 2 - Norm		

**DAY TWO – Pemberton South to Whistler - June 19th 2019 –
Lead Norm Caldicott**

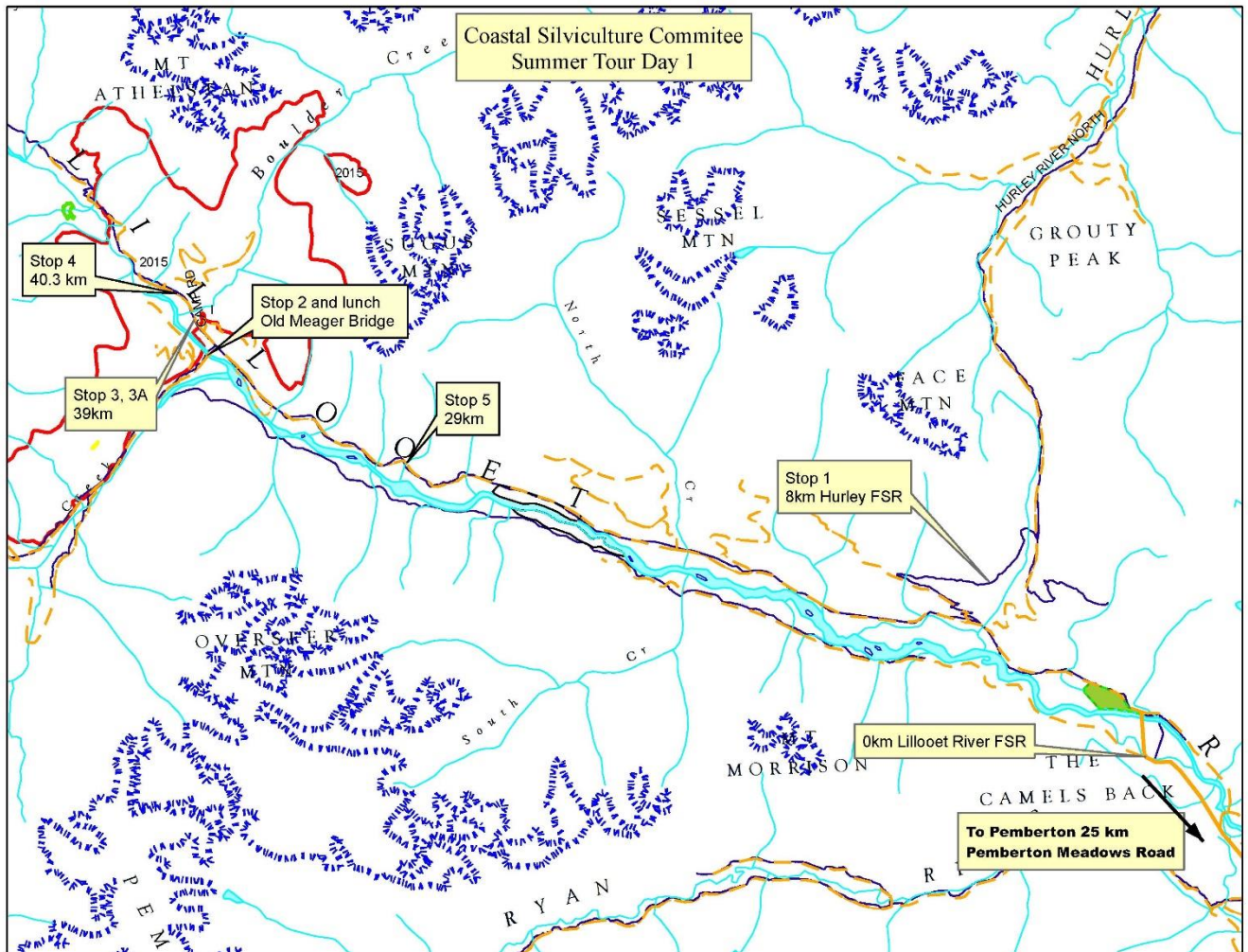
Time	Location	Activity - Topic	Presenter(s)
8:00 - 8:20 am	All travel from Pemberton to Nairn Falls in private vehicles, park most vehicles there and carpool to Suicide Hill (20 vehicles).		
8:20 – 9:45am	Stop #1a & 1b & 1c Suicide Hill	<p>1a- How are Alternative Species Working in the CTZ? 30-year-old multi - species & Provenance trial</p> <p>1b - Climate Change Informed Species Selection Tool (CCISS) – Reviewing a multi-species Plantation</p> <p>1c- Forest Health Drought, root disease? etc.</p>	<p>1)Michael Stoehr RPF MoFLNRO Forest Genetics, Victoria</p> <p>2)Heather Klassen FLNRORD Regional Research Vegetation Ecologist</p> <p>3)Stefan Zeglen RPF FLNRORD Coast Region Forest Pathologist</p>
9:45 – 10:30 am	Pick up vehicles at Nairn Falls and Travel to Function Junction (Whistler Interpretive Forest Parking area) to board buses. Travel by bus to Callaghan FSR.		
10:30–10:50 am	Coffee Break – Sponsored by Khowutzun Forest		
10:50–11:20 am	Stop #2a Cheakamus Community Forest Callaghan FSR	<p><u>Silviculture challenges with retention systems</u> Harvesting near the Whistler</p> <p><u>FESBC Introduction</u></p>	<p>1)Tom Cole RPF Forestry Manager Cheakamus Community Forest</p> <p>2)Katherine Lawrence RPF FLNRORD Integrated Investment Specialist South Coast Region</p>
11:30–12:00pm	Stop #2b Cheakamus Community Forest	<u>Managing for Multiple Objectives</u> – Fuel management, Timber, Wildlife, Visuals	Bruce Blackwell RPF BA Blackwell & Associates
12:00–1:15pm	Travel and Lunch stop at Brandywine Falls		
1:15 - 1:25pm	Travel to Stop 3		
1:30 to 2:15pm	Stop #3 Brew Creek	<u>Alternative silvicultural systems</u> Multiple-storey & species partial cut research trial 10-11 years old	Ralph Schroeder RPF Practices Forester BCTS Chilliwack
2:15 – 2:30 pm	Closing	Quick Summary CSC Next Summer - where?	
2:45 pm	Bus returns to Function Junction parking area		

Field Program – Day 1

North of Pemberton

Stop #1	Page 8 - 9	<u>Historically what hasn't worked in the Coastal Transition Zone (CTZ)</u> – Introduction to major silviculture failures/learnings	Wes Staven RPF Hedberg Associates Consultants
Stop #2	Page 10 - 11	<u>Introduction to Boulder Creek post wildfire treatments in the CTZ</u> FFT and FCI projects with site challenges	Katherine Lawrence RPF FLNRORD Integrated Investment Specialist South Coast Region
Stop #3a	Page 12 - 13	<u>Time of Planting Fert trial</u>	Wes Staven RPF, Hedberg Associates Consultants and Darius Bucher RPF, Integral Forest Management
Stop #3b	Page 14 - 15	<u>A seed vs B seed and stock types for challenging sites</u>	Siriol Paquet Sylvan Vale Nursery, Black Creek
Stop #4	Page 16 -17	<u>DISCUSSION - Time of planting fertilizer- site-specific considerations</u>	Darius Bucher RPF, Integral Forest Management and Norm Caldicott RPF retired
Stop #5	Page 18 - 19	<u>Provenance Trial</u> “There is no Tradition in Climate Change”	Michael Stoehr RPF MoFLNRO Forest Genetics, Victoria
Dinner Keynote Speaker	6:00 to 10:00 pm	Big Sky Golf Club – Fescues Restaurant – 1690 Airport Road Pemberton Klay Tindall to speak to Lil'wat forestry	

Maps - Day 1 -



Stop #1

Historically what hasn't worked in the Coastal Transition Zone

Name: Wes Staven RPF

Affiliation: Hedberg Associates Consulting Ltd.

Position: Project Forester

Responsibilities: Timber development / operational forestry, silviculture, vegetation management, hydroelectric and natural resource management projects.

Academic training: BCIT's Renewable Resources Forestry Diploma Program, and has a B.Sc. from UBC's Forest Science Program. accredited Silviculture Surveyor and certified Wildlife Danger Tree Assessor.

Previous employment: N&R Forest Management (Squamish), Tembec (Fernie), Slocan Forest Products (Radium Hot Springs).



Presentation Abstract:

This site is a prime example of the difficulties facing silviculture in the Coastal Transition Zone.

Block 242 along the Hurley River FSR is a severely drought-affected steep southeast-facing moderately high elevation site with coarse textured and rapidly drained soils. Brush competition and deer browse is also very high. Numerous failed plantations despite several brushing treatments, time of planting fertilization, and deer repellent applications. Currently partially FG, partially SR, and partially NSR with a S. 97.1 application pending for relief of obligations.

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Upper Lillooet Fire Area

Stop #2

Introduction to post wildfire treatments in the CTZ

FFT and FCI projects with site challenges

Name: Katherine Lawrence, RPF

Affiliation: FLNRO, south coast

Position: Integrated Investment Specialist

Responsibilities: Land-based investment planning and co-ordination, Forests for Tomorrow implementation

Academic training: BSF, UBC

Previous employment: FLNRO authorizations and stewardship positions on the coast and southern interior, consulting (silviculture mainly).




Presentation Abstract:

The 2015 Boulder Creek fire burned 6900 ha in the Upper Lillooet River/ Meager Creek area, which was previously impacted by the Capricorn Slide in 2010. Non-obligation areas impacted by the fire are being reforested under the Forests for Tomorrow Program. This presentation will introduce the challenges faced in reforesting these hot, dry, severely burned transition zone sites, located in a geologically unstable area with difficult access. Spring and summer droughts, lack of organic matter, stock quality, vegetation competition and browse are all factors that are impacting reforestation success.

[illegible]

Stop #3a

Time of Planting Fertilization trial

<p>Name: Wes Staven RPF</p> <p>Affiliation: Hedberg Associates Consulting Ltd.</p> <p>Position: Project Forester</p> <p>Responsibilities: Timber development / operational forestry, silviculture, vegetation management, hydroelectric and natural resource management projects.</p>	 <p style="text-align: right;"><i>Yes, Me Again</i></p>
<p>Name: Darius Bucher RPF</p> <p>Affiliation: Integral Forest Management</p> <p>Position: Consultant</p> <p>Responsibilities: For the past 14 years Darius has had the privilege of representing Reforestation Technologies International (RTI) - the makers of teabag fertilizer.</p> <p>Academic training: BSF from the UBC faculty of forestry</p> <p>Previous employment: After being the silviculture forester for Gilbert Smith Forest Products for 9 yrs, he got the itch and went out on his own and established his own forestry consulting company, Integral Forest Management Ltd. He is much too busy to hold a real job and when not promoting fertilizer you'll find him either in the garden amending his soil to create nutritionally dense food or in the woods training with 6 of his kids for cross country ski races during the winter months.</p>	

Presentation Abstract:

Year 1 of a time of planting fertilization trial with three different t-bag blends on a 13ha reclaimed industrial work site in the Upper Lillooet River valley. Planted in the Fall of 2018 with five tree species (Fdc, Cw, Ba, Pl and Sx). Soils were extremely coarse-textured and well-drained, and devoid of organic material. This flat valley bottom site was snow-covered from November 1 – May 1, but early indications show good survival and acceptable growth (relative to site conditions) throughout all three treatment types. Re-measurements and data analysis pending.

[illegible]

Stop #3b

A seed vs B seed and stock types for challenging sites

Name: Siriol Paquet

Affiliation: Sylvan Vale Nursery Ltd

Position: Assistant Manager

Responsibilities: All aspects of nursery production

Academic training: Horticulture Diploma – Olds College, Alberta



Presentation Abstract:

The sub-maritime region can be challenging to seedling performance.

This session will look at:

- The differences between growing regimes for A seedlots and B seedlots.
- Why we treat them differently in the nursery
- How this should affect stock type selection.
- Performance differences in the field

[illegible]

Stop #4

DISCUSSION

Time of planting fertilizer- site-specific considerations

Name: Darius Bucher RPF

Affiliation: Integral Forest Management

Position: Consultant

Responsibilities: For the past 14 years Darius has had the privilege of representing Reforestation Technologies International (RTI) - the makers of teabag fertilizer.

Academic training: BSF from the UBC faculty of forestry



Name: Norman Caldicott RPF

Affiliation: Independent; sometimes employed by: Infinity-Pacific Stewardship Group Ltd;
Green Admiral Nature Restoration Ltd.

Responsibilities: His passion, and the focus of most of his work, is applied silviculture in coastal BC.

Academic training: B.Sc. Zoology, B.S.F., Diploma in Advanced Silviculture – SIBC.

Previous employment: Norm has worked in applied natural resource management, mainly in southern BC, since 1966.

Recently Norm retired from BCIT in the spring of 2018, after teaching at BCIT since fall 2000. Subject matter included plant identification, soil assessment, ecosystem classification, plant propagation, practicums, projects and all things silviculture in their Renewable Resources Programs.



Presentation Abstract:

Norm will report some results of time of planting fertilization (TOP) trials done at Harrison Lake and then state my opinion about where time of planting fertilization is worthwhile. The Harrison Lake trials were commissioned by Jack Sweeten and Paul Braumberger and were designed, installed and assessed by BCIT, the BCIT Forest Society, Green Admiral Nature Restoration and Infinity-Pacific Stewardship Group, with involvement by myself throughout. Trials were deliberately established on areas intensely burned in the Wood Lake fire of August 2015. The fire had almost completely consumed the forest floor and there was very little vegetation competition.

Six types of slow release fertilizers, manufactured by Reforestation Technology International (RTI), are involved in the trials as well as a no-fertilizer control

Refer to the attached Appendix Handout for more details.

[illegible]

Stop #5

Provenance Trial

“There is no tradition in Climate Change”

Name: Michael Stoehr RPF

Affiliation: Forest Improvement and Research Mgt. Br.

Position: Coastal Team Lead

Responsibilities: Coastal Douglas-fir Breeding

Academic training: BScF, MScF, PhD, RPF

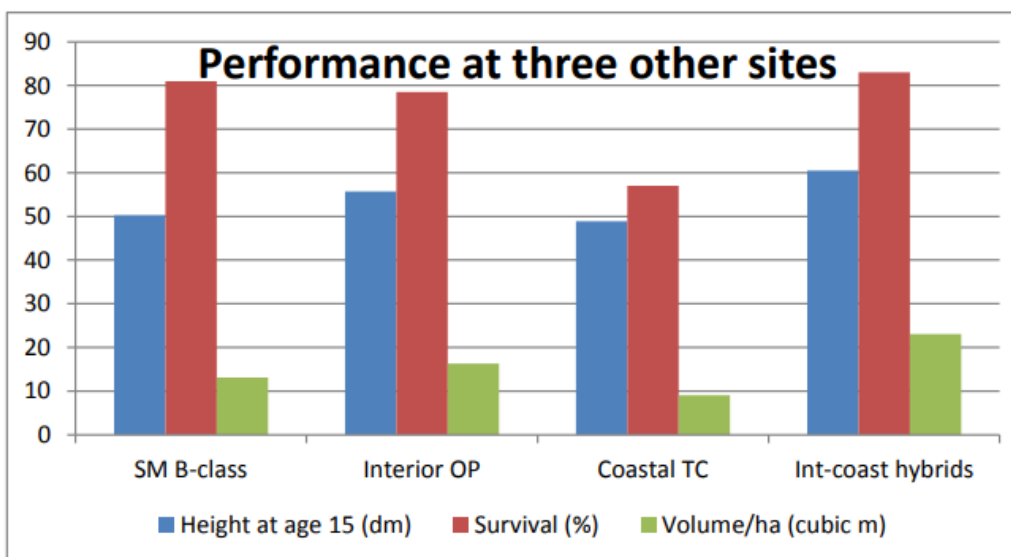
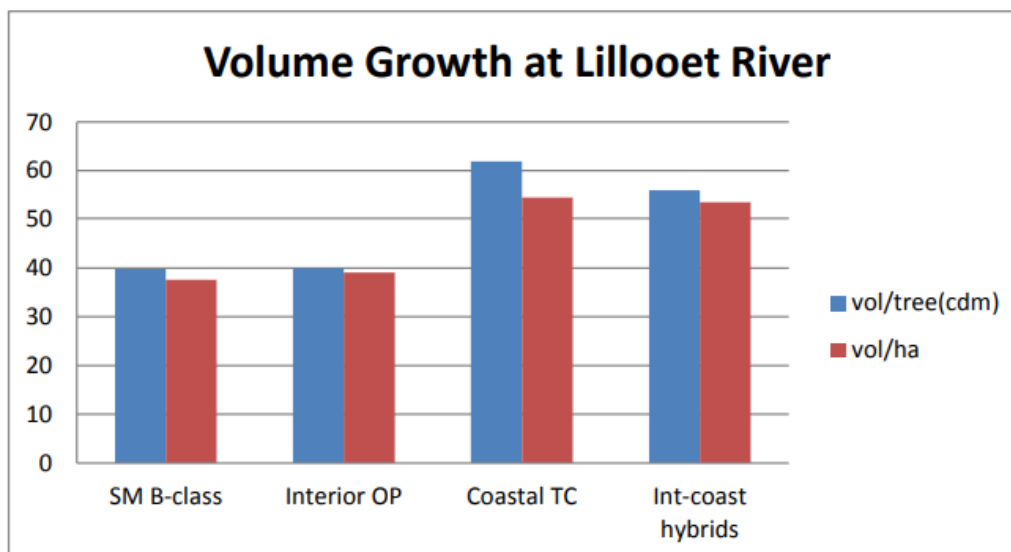
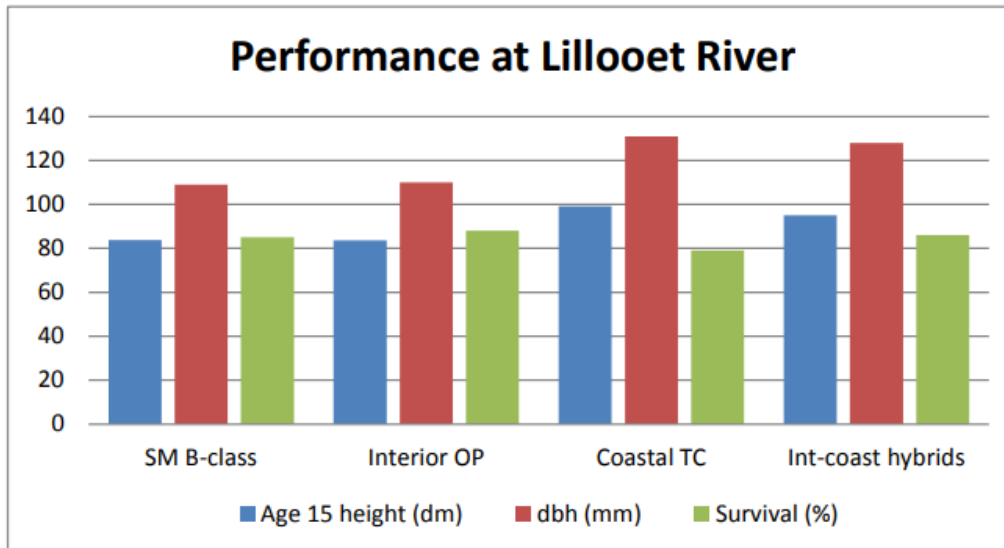
Previous employment: Post Doc at UVic



Presentation Abstract:

Successful reforestation in the transition zone is traditionally very difficult to achieve and only the most-well adapted seedlings enhance survival. For these reasons, we established tests to select parents that will produce progeny with higher survival rates and better growth. This approach is even more important in the face of greater uncertainty due to climate change. Five provenance test sites were established in the transition zone in 1996 (one site failed due to soil conditions that caused high mortality and was subsequently abandoned). The informative test sites remaining are Lillooet River (this stop), Railroad (up the Hurley), Talchako and Salloompt, (near Bella Coola). On the Lillooet River site, the coastal top cross (TC) material had the greatest growth, but the lowest survival (79% vs. 85% for the local seed source). However, expressed as volume per ha (that incorporates given survival rates), coastal TC material produced the highest standing volume after 15 years. Congruent with this evidence, the new climate-based seed transfer (CBST) rules require that seed from coastal seed orchards are used for reforestation in transition zone CWHds1 and CWHms2 sites. In contrast, performance of coastal TC seed was poor on Railroad and Talchako due to the harsher environment in these locations. The coast-interior hybrids showed a slightly better performance than local sub-maritime sources and open-pollinated interior (Shuswap-Adams) sources. As a result, low-elevation coastal seed is not eligible to be planted in the CWHms1 or CWHds2. The preferred seed for the CWHms1 is transition zone comes from seed orchard 181.

NOTES

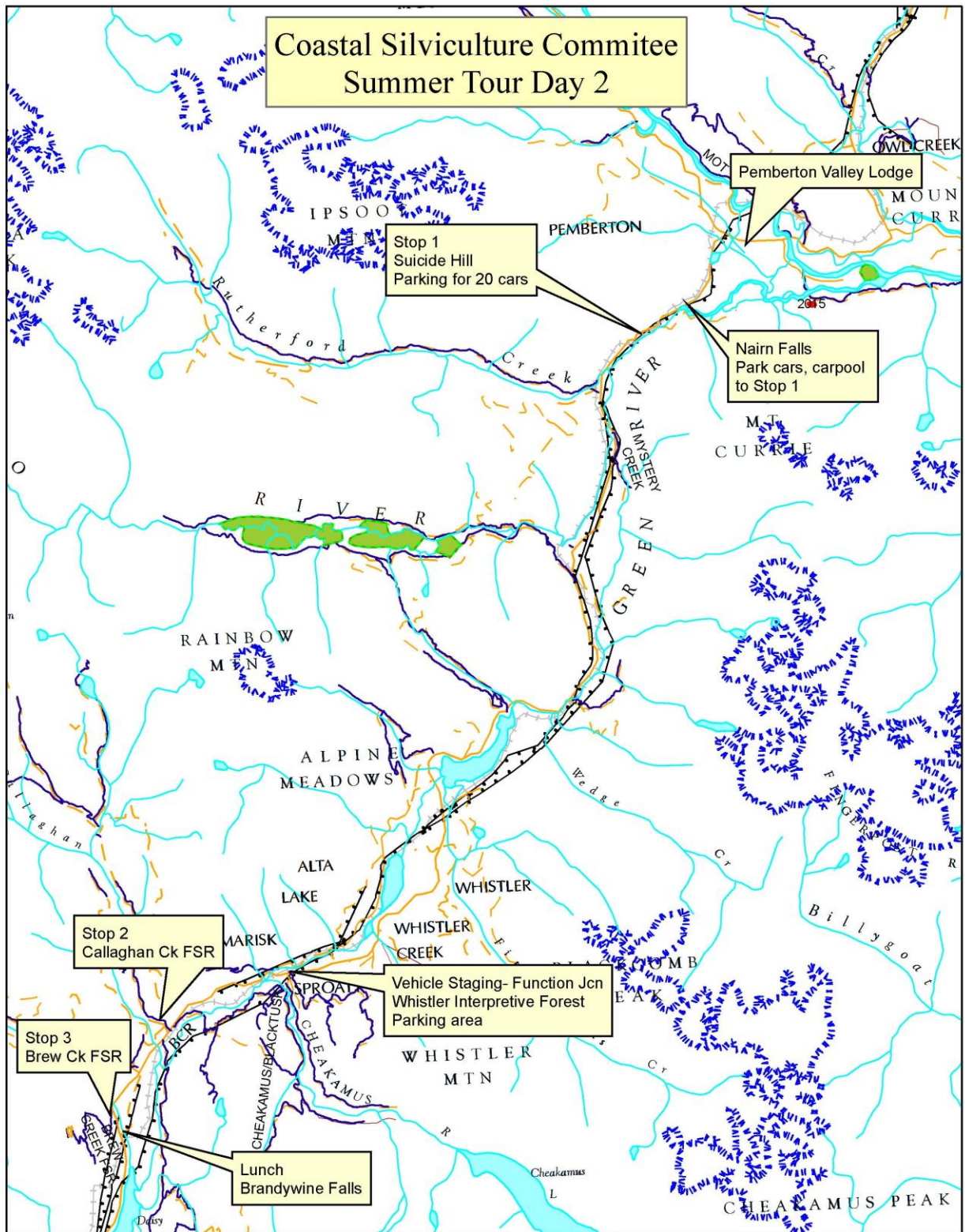


Field Program – Day 2

Pemberton to Whistler

Stop #1a	Page 22 -23	<u>How are Alternative Species Working in the CTZ?</u> 30-year-old multi - species & Provenance trial	Michael Stoehr RPF MoFLNRO Forest Genetics, Victoria
Stop #1b	Page 24 - 25	<u>Climate Change Informed Species Selection Tool (CCISS) –</u> Reviewing a multi-species Plantation	Heather Klassen FLNRORD Regional Research Vegetation Ecologist
Stop #1c	Page 26 - 27	<u>Forest Health</u> Drought, root disease? etc.	Stefan Zeglen RPF FLNRORD Coast Region' Forest Pathologist
Stop #2a	Page 28 - 29	<u>Silviculture challenges with retention systems</u> Harvesting near the Whistler <u>FESBC Introduction</u>	1)Tom Cole RPF Forestry Manager Cheakamus Community Forest 2)Katherine Lawrence RPF FLNRORD Integrated Investment Specialist South Coast Region
Stop #2b	Page 30 - 31	<u>Managing for Multiple Objectives</u> – Fuel management, Timber, Wildlife, Visuals	Bruce Blackwell RPF BA Blackwell & Associates
Stop #3	Page 32 - 33	<u>Alternative silvicultural systems</u> Multiple-storey & species partial cut research trial 10-11 years old	Ralph Schroeder RPF Practices Forester BCTS Chilliwack

Map – Day 2 –



Stop #1a

30-year-old multi - species & Provenance trial

Affiliation: Forest Improvement and Research Mgt. Br.

Responsibilities: Coastal Douglas-fir Breeding

Academic training: BScF, MScF, PhD, RPF

Previous employment: Post Doc at UVic



NOTES

[illegible]

[illegible]

Stop #1b

Climate Change Informed Species Selection Tool (CCISS)

Reviewing a multi-species Plantation

Name: Heather Klassen

Affiliation: Coast Area Research, FLNRORD

Position: Research Vegetation Ecologist

Responsibilities: Biogeoclimatic Ecosystem Classification for coastal BC; applied research and research consultation on current and emergent operational topics, e.g., climate change, forest and landscape structure and dynamics, disturbance ecology, and ecosystem-based management.



Presentation Abstract:

This Climate Change Informed Species Selection (CCISS) tool uses BEC, site series-specific tree species suitability rankings presented in the 2017 Chief Foresters Reference Guide to Stocking Standards, and Climate BC to output future species suitability. This stop will include a brief overview of how the Climate Change Informed Species Selection (CCISS) tool, including updates on data inputs and release dates. We will compare CCISS tool outputs for species suitability, based on weighted probability of future sites series, with observed species performance on site.

[illegible]

Stop #1c

Forest Health Drought, root disease? etc.

Name: Stefan Zeglen RPF

Affiliation: BC MFLNRORD Coast Region

Position: Forest Pathologist

Responsibilities: Dead trees

Academic training: BScF, MScF

Previous employment:

1994 to present – Regional Forest Pathologist, Nanaimo

1989 to 1994 - Regional Forest Pathologist, Smithers



Presentation Abstract:

After a couple of consecutive long, hot summers this year seems to be heading for more of the same. Is this the “new normal” or is it actually abnormal? Does it matter in terms of risk managing your stands in the transition zone?


This talk will discuss how forest health risk factors change depending on the long-term forecast for a rotation. How the dynamic between pest, host and environment shifts depending on your view of the future and your desired outcomes. Also, how now, more than ever, it is important that you know your sites and are able to catalog their strengths and weaknesses in terms of assessing risk and achieving your management objectives.

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Stop #2a

Silviculture challenges with retention systems

Harvesting near Whistler and FESBC Introduction

<p>Name: Tom Cole RPF</p> <p>Affiliation: Cheakamus Community Forest</p> <p>Position: Forestry Manager</p> <p>Responsibilities: Implementing an innovative community forest tenure with a scenic objective and recreation focus.</p> <p>Academic training: Diploma BCIT –Forest Resource Technologist 1984, Registration ABCFP 1992 RPF</p> <p>Previous employment: Coast-Interior transition career, 25 years Operations Forester with Richmond Plywood Corporation. Since 2015 assisted FLNRORD in establishing area-based Community and First Nation Tenures in the South Coast Region.</p>	
<p>Name: Katherine Lawrence RPF</p> <p>Affiliation: FLNRORD</p> <p>Position: Integrated Investment Specialist South Coast Region</p>	
<p>Stand History: Logged 1966, slash burned and planted with Fdc in 1973/74; Spaced and fertilised in 1992, pruned in 1996; Fertilised again in 2007</p> <p>Pre-treatment stand characteristics:</p> <p>L1: Fd90Hw5Ba5Cw5, 536 SPH, BA 36, DBH 30, Height 21m, CC 40%</p> <p>L2: Cw100 SPH L3 HwFd 150 SPH L4 Hw 25 SPH</p> <p>Fuel Reduction Performance Criteria: Retained Trees: L1 350 sph; Forest Floor Fine Fuels (<2.5cm) 1kg/m²; Pruning 75% >3m; Basal Scarring <5%</p> <p>Project Background: TU “C3 North”</p> <p>Prior to the establishment of the Forest Enhancement Society, the Resort Municipality of Whistler (RMOW) financially supported the Cheakamus Community Forest (CCF) in implementing a lower cost treatment in the creation of landscape linear shaded fuel break. Historically, costs within the RMOW on interface work ranged between \$35-45,000/ha and were primarily manual thinning in direct proximity of residential development. Callaghan Creek FSR was selected to test and develop operational expertise in applying whole tree removal using ground based mechanical equipment. Thinning was initiated in the late fall of 2014 and through a progression of projects a 40.4 ha roadside treatment is complete along its 5km. Callaghan is one of 4 primary landscape level fuel breaks underway in the CCF.</p>	

The tour will include details of project costs and outputs. The group is asked to consider:

- Ground disturbance and basal scarring;
- Winter vs spring mechanical thinning issues;
- Floristic and regeneration growth response;

Participants' should keep in mind the level of past intensive silviculture investments, the implications of changing objectives from timber production to wildfire prevention and more importantly ***“now what”?***

Terminology: *“hot loading”, “Landscape”, “Interface”, “Infrastructure”*

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Terminology: *“hot loading”, “Landscape”, “Interface”, “Infrastructure”*

[illegible]

Stop #2b

Managing for Multiple Objectives

Fuel management, Timber, Wildlife, Visuals

Name: Bruce Blackwell RPF

Affiliation: B.A. Blackwell & Associates Ltd.

Position: Principal

Responsibilities: Over 30 years of experience in forestry and environmental planning focused on fire and forest ecology, silviculture, vegetation management, wildland/urban interface planning, forest policy and practice audits and reviews.

Academic training:

MSc, 1989, UBC, Faculty of Forestry, Program: Ecological effects of prescribed fire related to soils, vegetation, fuels and the implications to operational forestry practices.

BSc Forestry, 1984, UBC

Previous employment:

Principal of B.A. Blackwell & Associates Ltd., 1988-present
BC Wildfire Service, Rapattack Wildfire Fighter, 1979-1981



Presentation Abstract:

A comprehensive fire behaviour analysis was conducted for Resort Municipality of Whistler (RMOW) and within the context of this analysis, 16 strategic fuel breaks were identified as suppression anchors for protection of the community. This field stop will review the first of these fuel breaks implemented within the community and outlines the strategic fuel management objectives and fire control strategies that can be utilized.

[illegible]

Stop #3

Alternative silvicultural systems

Multiple-storey and species partial cut research trial 10-11 years old

Name: Ralph Schroeder, RPF
Affiliation: British Columbia Timber Sales
Position: Practices Forester
Responsibilities: Timber Harvest Planning
Academic training: Bachelor of Science in Forestry
Previous employment:
 -1988 to 2005: Timber Cruiser, Assistant Silviculturist, Silviculturist, and Silviculture Forester, International Forest Products Ltd.
 -2005 to 2006: Forester, N&R Forest Management, Squamish, B.C.
 -2006 to 2018: Compliance and Enforcement Forester, Natural Resource Officer, Ministry of Forests, Lands, Natural Resource Operations and Rural Development
 -2018 to Present: Practices Forester, British Columbia Timber Sales



Alternative Silviculture Systems

Reasons for Alternative Silviculture Systems

- Successful Reforestation
- Mandated by District Manager (i.e. 10% of harvest)
- Achieve Visual Quality Objectives
- Research
- Wildlife Considerations

Reforestation Considerations

- Shade tolerant species
- Shade intolerant species
- Light Availability for Tree Regeneration
- Residual Tree Retention
- Future Timber Production
- Realistic Impact on Timber Supply Review
- Tree species growth versus "Normal Curves"
- Opportunities for analysis

Operational Considerations

- Terrain, Slope
- Available Machinery
- Cable Harvesting System (Carriage, Tower, Grapple)
- Ground Based Harvesting
- Basal Area Retention

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, typical of notebook paper. There are no margins, text, or other markings on the page.

Appendixes Handouts

Day 1 – Stop #4

DISCUSSION - Time of planting fertilizer- site-specific considerations

Norman Caldicott, BSc, BSF, AdvDiplSilv, RPF

I will report some results of time of planting fertilization (TOP) trials done at Harrison Lake and then state my opinion about where time of planting fertilization is worthwhile.

The Harrison Lake trials were commissioned by Jack Sweeten and Paul Braumberger and were designed, installed and assessed by BCIT, the BCIT Forest Society, Green Admiral Nature Restoration and Infinity-Pacific Stewardship Group, with involvement by myself throughout.

The trial sites are: low elevation, north to south-east aspect, flat to 70% slope, CWHdm 01, 03, 04 with deep but very rocky soil (40% to 95% CF), SiL, L, SL, LS fine fraction.

Trials were deliberately established on areas intensely burned in the Wood Lake fire of August 2015. The fire had almost completely consumed the forest floor and there was very little vegetation competition.

The Fdc trial was established in spring 2016 with 1+0 PSB 412B Sp SL60591 and assessed in fall 2016 and 2017.

The Pw and Cw trials were established in spring 2017 with 1+0 PSB 412A Sp SL60360 and 1+0 PSB 412A Sp SL63487 respectively, and assessed in fall 2017 and 2018. Although established a full growing season after the fire, the Pw and Cw sites were still quite vegetation free due to the intensity of the original burn and ground-access salvage harvesting in summer 2016.

2016, 2017 and 2018 were dry summers with 2017 the most extreme in the last 50 years.

Six types of slow release fertilizers, manufactured by Reforestation Technology International (RTI), are involved in the trials as well as a no-fertilizer control (Table 3).

Table [3]. Reforestation Technology International (RTI) fertilization products by research trial (from Ewen & Marcoux, 2018)

RTI Fertilization Products	Coastal Douglas-fir	Western red cedar & western white pine
Planting/Application Date	March 17/18 2016	March 25/26 2017
Silva Pak PHP 25-10-5 10 g	X	X
Gilbert Smith PHP 18-10-10 10 g	X	
Continuem PHP 18-9-9+6(S) 10 g	X	X
Chilcotin PHP 17-5-7 10 g	X	X
Chilcotin Worm Blend 20 g (10 g 15-4-4 + 10 g worm castings)	X	X
Hydration Pak 16-8-5 + water storing polymers 10 g		X

GROWTH

Increased growth occurred in the first two growing seasons after planting due to ToP fertilization with almost all combinations of the three species and fertilizer formulations.

Volume and height data at the end of the second growing season since out-planting is attached.

Significant observations

The 2 year increase in seedling height due to fertilization is of modest magnitude:

Species	control mean 2 year height (cm)	largest fertilizer treatment mean 2 year height (cm)
Fdc	37	48
Pw	32	35
Cw	51	59

The 2 year increase in seedling volume due to fertilization is substantial, around 2 x:

Species	control mean 2 year volume (cm3)	largest fertilizer treatment mean 2 year volume (cm3)
Fdc	3.4	7.6
Pw	8.8	15.0
Cw	12.3	19.4

Will the increased growth rate be sustained? Normally expected to diminish; more greatly so when there's increasing vegetation competition, drought, or damage such as browsing. These seedlings are being substantially overtopped by competing vegetation and its effect on diameter and vegetation press is obvious.

Could this rate of growth be achieved with larger stocktypes and or better vegetation control? Much greater growth rates are realized from larger and better stocktypes, better vegetation control, control of damage agents and microsite selection. Variation in growth was significant between blocks (site) in all cases.

Would this growth response occur where there's significant vegetation competition? Vegetation competition (threshold > 20% surface coverage) and drought and the interaction between the two greatly limit the magnitude of seedling growth response to ToP.

Where is ToP a wise financial investment? Is there a place? The OSU Vegetation Management Research Cooperative indicates this may only be where:

- Low vegetation competition is maintained until trees dominate the site
- Adequate soil moisture
- High seedling survival
- Short rotations
- Obviates need for one or more brushing treatments

SURVIVAL

Mortality and “good” seedling condition rating at the end of the second growing season since out-planting is presented below. Note that condition %’s are calculated using the number planted as the denominator.

Treatment	Fdc condition fall 2017		Pw condition fall 2018		Cw condition fall 2018	
	mortality %	good %	mortality %	good %	mortality %	good %
Control	8	31	24	73	39	38
Hydration			37	59	30	52
Chilcotin 20 g	8	29	33	62	45	40
Chilcotin 10 g	25	33	33	55	32	53
Continuem	19	30	31	62	29	53
Gilbert-Smith	25	41				
Silva	23	48	20	75	19	59

Significant observations

There was no consistent (or statistically significant) trend in survival in any of the three species and fertilizer formulations. Fertilization was associated with both greater and less mortality than control, but not significantly so at $p < 0.1$

Mortality rates at the end of the second growing season are generally quite high.

Mortality varied greatly by Block, to a lesser extent by Species and to a much lesser extent by Treatment. Microsite and mesosite (what the seedling was planted in and where on the landscape it was planted) greatly influenced mortality.

The much greater first growing season mortality of Cw and Pw than Fdc is likely due to the greater drought experienced by the Pw and Cw in the first growing season following planting in 2017 than that experienced by the Fdc planted in spring 2016. The very low vegetation competition experienced by the Fdc in its first growing season following planting probably also contributed to its greater 1st growing season survival.

Note that additional mortality occurred in the second growing season only in the Fdc. Additional mortality and worsening condition in the second growing may be attributed to the more pronounced drought in 2017 exacerbated by increasing vegetation competition .

Fdc condition rating declined from 74% good in fall 2016 to 43% in fall 2017.

Does ToP fertilization increase seedling survival and improve condition?

Not here, nor usually elsewhere. Focus on seedling condition at planting, site preparation, reduction of seedling damage, and brushing and weeding. In the drier transition zone, expect plantation failure about 30% of the time due to normal variation in weather; about 80% of the time if sites have greater than 20% vegetation coverage.

Fdc

Height

Table 17 (adapted from Ewen & Marcoux, 2018, Table 4) shows Fdc mean seedling height in fall 2017 by treatment.

Table 17. Fdc mean seedling height (cm) in fall 2017 (2 growing seasons in the field) by treatment						
	Control	Chilcotin 20 g	Chilcotin 10 g	Continuem	Gilbert-Smith	Silva
2017	36.95	42.92	43.08	44.67	45.78	48.20

There was a significant fertilizer effect on height (ANOVA, $p = 0.04$). Heights of seedlings treated with Silva (Tukey HSD, $p = 0.02$) and Gilbert Smith (Tukey HSD, $p = 0.09$) were significantly greater than the control (Ewen & Marcoux, 2018).

There was a significant Block effect on height (ANOVA, $p < 0.001$) (Ewen & Marcoux, 2018).

Volume

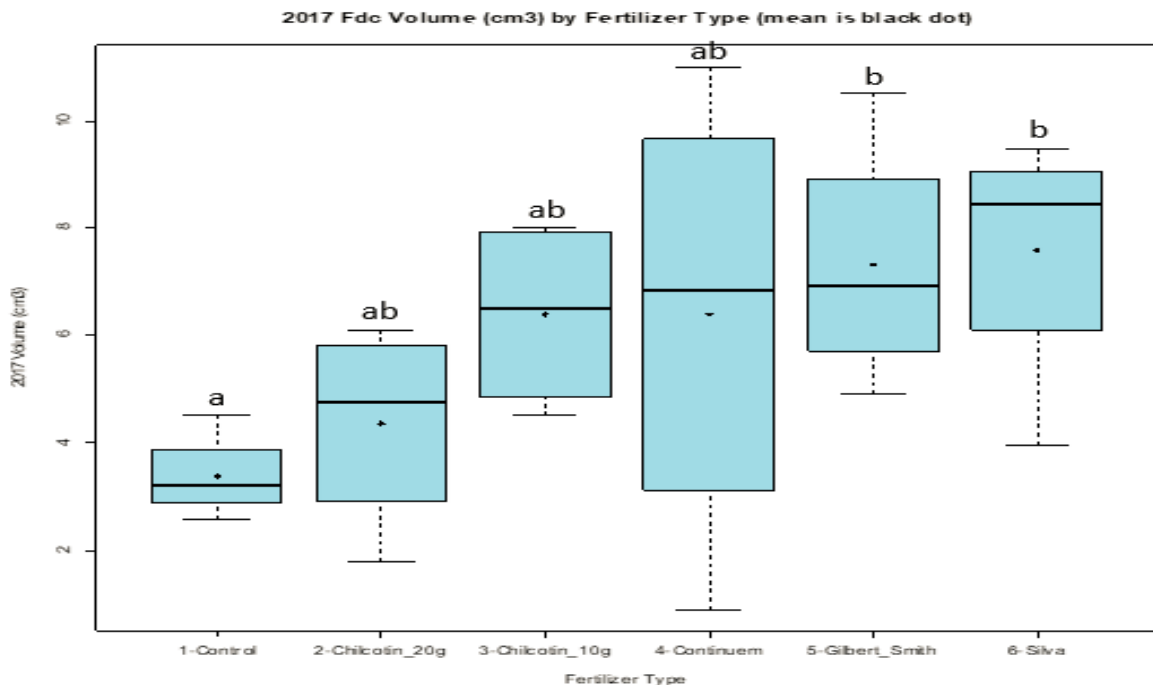


Figure [18]. Coastal Douglas-fir mean volume (cm³) per fertilizer treatment in 2017. Black dots represent the means and horizontal lines in the boxplots represent the medians. Lower case letters denote significant differences following pairwise comparisons using Tukey HSD ($p < 0.05$). (Ewen & Marcoux, 2018)

Pw

Height

Differences in height vary significantly between Blocks but not by treatment.

Table 9. Pw mean seedling height (cm) in fall 2018 and mean height growth from fall 2017 to fall 2018 by treatment						
	Control	Chilcotin 20 g	Continuem	Chilcotin 10 g	Hydration	Silva
2018	31.6	29.9	31.2	30.3	33.0	35.4
growth 2017 to 2018	12.6	13.6	12.4	10.7	13.4	14.4

Volume

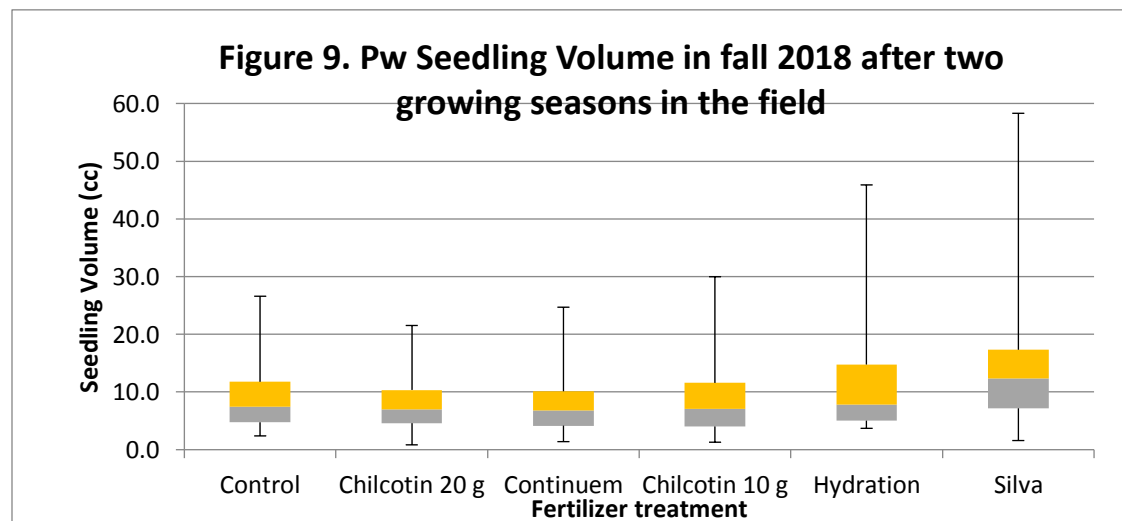
Seedling volume varied significantly among treatments in fall 2018 (ANOVA, $p = 0.04$).

Silva fertilized seedlings were significantly larger than Continuem, Chilcotin 20 g and Control:

- Silva and Continuem (Tukey HSD, $p = 0.05$);
- Silva and Chilcotin 20 g (Tukey HSD, $p = 0.06$); and
- Silva and Control (Tukey HSD, $p = 0.07$)

Seedling volume varied significantly between Blocks, much more so than between treatments (ANOVA, $p = 0.007$).

Table 8. Pw mean seedling volume (cc) in fall 2018 and volume growth from fall 2017 to fall 2018 by treatment						
	Control	Chilcotin 20 g	Continuem	Chilcotin 10 g	Hydration	Silva
2018	8.8	7.7	8.0	9.0	10.7	15.0
growth 2017 to 2018	6.5	5.9	6.1	6.5	8.5	11.3



Cw

Height

Differences in height vary significantly between Blocks but not by treatment.

Table 13. Cw mean seedling height (cm) in fall 2018 and mean seedling height growth from fall 2017 to fall 2018 by treatment						
	Control	Chilcotin 10 g	Silva	Continuem	Chilcotin 20 g	Hydration
2018	51.4	53.7	54.4	57.0	58.8	56.1
growth 2017 to 2018	8.2	4.7	8.8	11.6	12.5	6.1

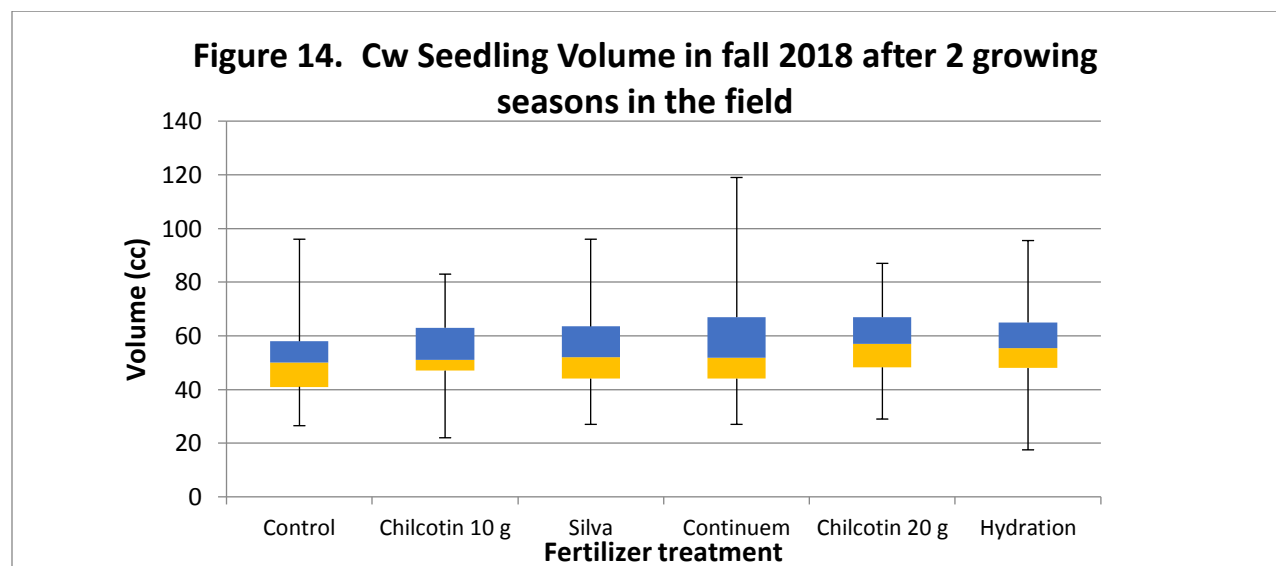
Volume

Seedling volume did not vary significantly among treatments in fall 2018 (ANOVA, $p = 0.53$).

The significant response associated with Hydration in 2017 was not apparent in fall 2018.

Seedling volume did vary significantly between Blocks (ANOVA, $p = 0.003$).

Table 12. Cw mean seedling volume (cc) in fall 2018 and mean seedling volume growth from fall 2017 to fall 2018 by treatment						
	Control	Chilcotin 10 g	Silva	Continuem	Chilcotin 20 g	Hydration
2018	12.3	13.6	15.7	16.4	17.3	19.4
growth 2017 to 2018	9.4	9.1	12.1	14.8	12.8	14.3



Day 2 – Stop #2

Day 2 – Stop #3