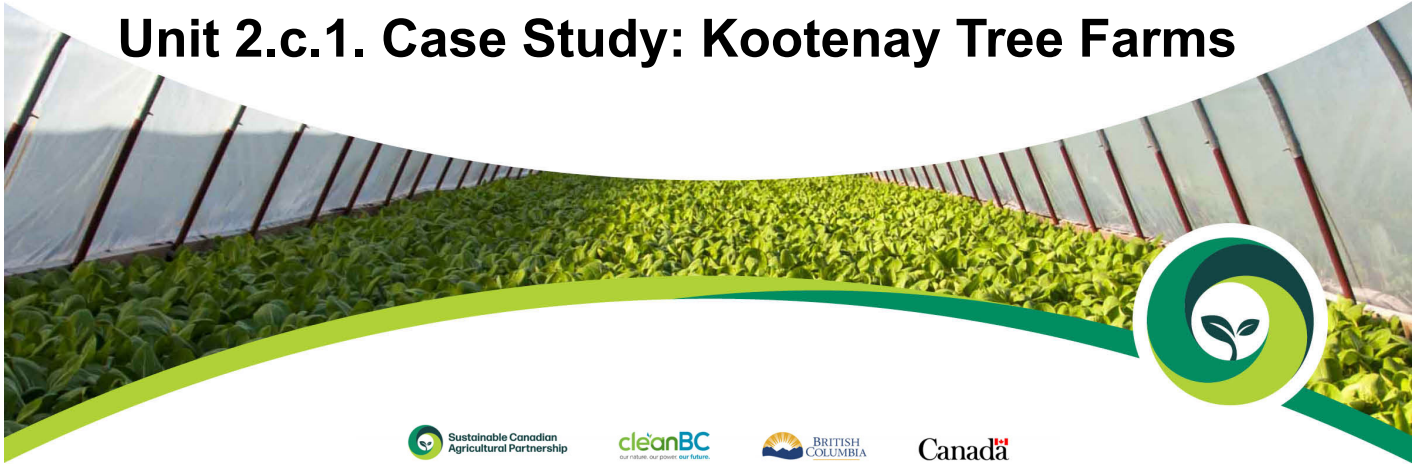


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Silvopasture In British Columbia Information Series

Unit 2.c.1. Case Study: Kootenay Tree Farms





Acknowledgment

This work has been funded by the Governments of Canada and British Columbia under the Sustainable Canadian Agricultural Partnership, a federal-provincial-territorial initiative.

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Insert local indigenous territorial acknowledgment.

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Silvopasture in BC Information Series Content Guide

Core Units	Case Studies	Supplemental Units
0. Series Overview		
1. Introduction		1.s. History of SP in BC
2. Science Behind SP	2.c.1 Production Synergies: Kootenay Tree Farms	2.s.1. Light & Microclimate
	2.c.2 Riparian Silvopasture: Silver Hills Ranch	2.s.2. Hydrology
3.1. SP BMPs - part 1	3.c.1 Small-lot SP: Just Another Weed Patch Farm	3.s. Managing Damage
3.2. SP BMPs - part 2	3.c.2 Mature Forest to SP: Indian Gardens Ranch	
4. SP Planning	4.c.1 Planning on Crown Land: SP Pilot Project	
	4.c.2 Adaptive Management at Aveley Ranch	

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This silvopasture case study is meant to reinforce information provided in the first two units of the Silvopasture in BC Information Series:

- An Introduction to silvopasture; and,
- The science behind designing and managing silvopastures.

Unit 2.c.1. Case Study: Kootenay Tree Farms

Goal

Gain a deeper understanding of silvopasture planning, implementation and management through British Columbia case studies.

Prerequisites

Units 1: Introduction and 2. Science Behind Silvopasture.

Content

Silvopasture for over-yielding: Kootenay Tree Farms.



In this unit we'll look at an example of silvopasture use in BC to gain a better understanding of the planning, implementation and management considerations.

Prior to commencing this module, you should have completed core units 1 and 2 in this information series.

This case study will cover silvopasture used to create production synergies and production diversification in an integrated livestock - Christmas tree operation at Kootenay Tree Farms.

Silvopasture For Diversification

Cattle with Christmas Trees

- Integrating livestock production and Christmas tree cultivation to diversify, enhance productivity and environmental services.
- Demonstration headed by Charlie Willis (Kootenay Tree Farms) and funded by the BC Agroforestry Industry Development Initiative (2003-2013).



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The Kootenay region has a long history of both livestock production and Christmas tree cultivation. Integrating these two practices into silvopastoral systems provide options to diversify, enhance productivity and provide incremental environmental services.

This case study is based on a demonstration project headed by Charlie Willis of Kootenay Tree Farms in Cranbrook.

It was funded by the BC Agroforestry Industry Development Initiative, which supported agroforestry-related trials and demonstrations across BC from 2003 to 2013.

Funding and support for the Agroforestry Initiative was provided by Agriculture and Agri-Food Canada and the British Columbia Ministry of Agriculture and Food. The Federation of British Columbia Woodlot Associations administered that Initiative.

Silvopasture For Diversification

Stump-Cultured Christmas Trees

Native-stands of interior Douglas-fir (*Pseudotsuga menziesii*)

- Practiced in BC for over 80 years.
- New main stem grown from a lower branch remaining after the harvest of a previous tree.
- Extends production from an existing root system, so speeds the regeneration cycle.



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In native-stand Christmas tree silvopasture systems, Interior Douglas-fir (*Pseudotsuga menziesii*) are grown by 'stump culturing'. It has been practiced for over 80 years in BC, with the main production areas concentrated in the Kootenays.

Using the stump culture method, a Christmas tree is grown from the existing root base after the harvest of the previous tree. Stump culture is a sustainable production system that involves leaving the bottom 2 or 3 branches, 50 - 75-cm above the ground, each time a Christmas tree is harvested. A new shoot can then grow from near the cut, or the uppermost of these remaining branches can turn upward to form a new tree top.

This creates the means to extend production from the same root system for multiple cycles.

Silvopasture For Diversification

Fertilizing and Shearing

Used to give the trees dense, dark green foliage

- Nutrients applied at all production stages.
- Fertilizer also increases forage growth.



Extra forage can pose problems:

- Increased competition;
- Tangling lower branches; and
- Cover for small mammals.

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In Christmas tree production, fertilizer is applied in combination with shearing and pruning of the lateral tree branches, to promote the growth of dense, dark green foliage.

Because stump-cultured trees have fully established root systems, they can take advantage of nutrients applied at all stages of production. And, the fertilizer benefits the crop trees and can also increase understory forage growth.

If left unmanaged however, the added forage growth can pose some production problems for Christmas tree growers. This comes in the form of increased competition for soil moisture, tangling of the lower branches (i.e. the future crop trees in the next cycle), and by creating cover for small mammals that, in turn, can feed on the tree bark and roots.

Silvopasture For Diversification

Benefits of Grazing with Christmas Trees

- Christmas tree stands provide large areas for forage production.
- Fertilization for the trees, can also double the understory production.
- Grazing benefits livestock production and also:
 - Controls competition on crop trees.
 - Benefits wildlife
 - Contributes to IPM strategy.



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The density and growth form of managed Christmas trees in these production systems provide large areas for concurrent forage production.

And with fertilization around the trees, the Kootenay Tree Farm demonstration showed that it can double the understory production relative to unmanaged stands.

Grazing of this additional forage benefits livestock production. It also controls the potential negative impacts of the added biomass around the trees by relieving competition and removing rodent habitat. Increased forage availability also benefits wild ungulate species. With forest ingrowth throughout BC in the past century, livestock use and wildlife have sometimes come into conflict, rooted in the diminishing open range available to both.

Keeping the vegetation grazed also aids in air flow, which combined with tree pruning, is an integrated pest management strategy to combat the two prominent fungal diseases of Douglas-fir Christmas trees.

Silvopasture For Diversification

Integrated Pest Management



Production challenges - disease outbreaks.

- Rhabdocline Blight (*Rhabdocline psuedotsugae*)
- Swiss Needle Cast (*Phaeocryptopus gaeumanni*)
- Need 3 to 4 years to recover a marketable tree.

IPM Strategies

- Fungicides effective, but cost-prohibitive.
- Pruning.
- Gap between the bottom branch and the ground
- Grazing to maintain a low-statured understory.

9 9

The fungi, Rhabdocline Blight, causes browning of Douglas-fir foliage and ultimately needle loss. Similarly, Swiss Needle Cast causes needles to drop, leaving unsightly gaps in these ornamental trees.

It can take 3 to 4 years of new growth with fertilization and reshaping to recover a marketable tree.

Options within an Integrated Pest Management (IPM) approach all work well in a silvopasture scheme. Fungicides can be effective but may be uneconomical to apply. Using tree row orientation, pruning to leave a gap between the bottom-most branch and the ground, and maintaining a low-statured understory through grazing, all can improve air-flow and thereby reduce excess humidity in the stand. This, in turn, can slow the spread of these fungal diseases.

Silvopasture For Diversification



Managing Interactions

- Some livestock damage to trees expected.
- Success depends on understanding livestock behaviour.
- Wildlife damage only eliminated with suitable fencing.

Controlling Livestock Use

- Moderate stocking levels (<1 AUM/ha).
- Use salt placement, watering locations and active herding.
- Time grazing to minimize risk and maximize tree growth benefits.

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Kootenay Tree Farms demonstrated that management of trees, forage and livestock can benefit each other in well-designed silvopastures.

Livestock benefit from, and can create benefits for the Christmas trees, but it takes good management to ensure they enhance tree growth, without damaging young trees. Success depends on understanding livestock behaviour, although some level of incidental damage is unavoidable. Extensive damage is generally preventable and indicative of a need for management change.

In general, livestock can damage trees through browsing, trampling and rubbing. In the stump-cultured Douglas-fir stands, cattle browsing is minimal. When it occurs, it is generally incidental, such as when lower tree branches are intermixed with forages. With other livestock species or wild ungulates, the tree foliage may be more palatable, and their use needs to be managed accordingly.

In stump-cultured stands, new trees are growing from a large established base; stem trampling is, therefore, not a major damage factor. Some rubbing damage is to be expected though, but it is generally manageable, by maintaining moderate animal stocking (<1 AUM/ha) and with techniques to ensure good livestock distribution (e.g. dispersing salt placement and watering locations or with active herding).

Timing of grazing is also important. Although cattle usually choose forages over conifers, new tree foliage can be attractive in the spring. But this is also a period when vegetation control can be very effective, so it is important to closely monitor spring grazing. Delaying grazing access until after the current year's tree buds have set, greatly decreases the risk of livestock impacts on tree growth, especially in the first one to two years of a new Christmas tree production cycle.

Silvopasture For Diversification

Improved Economics



- 6 to 8 years needed to produce a marketable Christmas tree.
- Silvopasture generates annual returns from livestock.
- Boughs for wreaths, swags and garlands for additional income.



As with other silvopasture applications, these Christmas tree systems offer improved economics by using cattle to generate annual cash flow. It takes between 6 to 8 years to produce a marketable Douglas-fir Christmas tree by stump culturing.

Using a silvopasture for production diversification generates annual returns from livestock production while waiting for a Christmas tree crop to harvest.

Additional non-timber forest production is also possible in these systems. Boughs pruned from the trees can be used to create wreaths, swags and garlands. Collecting pruned branches for value-added production generates additional income and also clears the understory for incremental forage growth, to the benefit of the livestock use.

Silvopasture For Diversification

Production - Overyielding

A 'virtuous circle' is created:

- Managing Christmas trees improves the production and quality of forages;
- The added forage improves grazing opportunities; and,
- Managing livestock improves the production and quality of Christmas trees.



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Although the demonstration on which this case study was based was established to highlight silvopasture as a means to diversify production through integrated use, it also highlights how production synergies can dramatically increase the total productivity of a site.

In this silvopasture, a 'virtuous circle' of production is created with each element of management reinforcing or strengthening the others:

1. Managing the Christmas trees improves the production and quality of forages;
2. Managing the forages improves the grazing opportunities; and,
3. Managing the grazing improves the production and quality of the Christmas trees.

When production synergies occur, the results are a better overall capture and use of the natural growth potential and over-yielding is achieved: the total production per unit area of Christmas trees and forage exceeds what is possible than when they are separated.

Thank You!



Questions and discussion on the case study.