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<th>Project Title</th>
<th>Cariboo Silvopasture Demonstration Project</th>
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<td>Organization</td>
<td>Zimhelt Ranch</td>
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<tr>
<td>Mailing Address</td>
<td>PO Box 3, Big Lake Ranch, BC, V0L 1G0</td>
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<td><a href="http://www.zimheltranch.ca/index.html">http://www.zimheltranch.ca/index.html</a></td>
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Disclaimer
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Project Context

Zirnhelt Ranch is a family owned and operated ranch located in Beaver Valley BC. Our family believes in sustainable food production thus we use farming methods that minimize the ecological impact on our natural environment. As well, our family ranch is a place of local employment. Two of our sons operate Zirnhelt Timber Frames, a timber frame building company, located on the ranch.

We strive to minimize our ecological impact by, raising and finishing our beef on our pastures and local rangeland, not using chemical fertilizers, pesticides or hormones, not supplementing with grain or corn feed, and respecting the natural environment and wildlife. We believe that our 100% grass fed beef is healthier because it is leaner and has a better composition of vitamins and nutrients. In particular, grass fed beef is higher in omega 3 fatty-acids, which current research describes as a health promoting fatty acid or “the good fat”. We are currently working with the Thompson Rivers University and other local beef producers on enhancing the levels of the good fat (omega 3) in our grass-fed beef.

The demonstration site is located in the Beaver Valley roughly 1 hour from Williams Lake on a parcel of land approximately 60 ha in size on the western slopes above Opheim Lake. The site was harvested of most mature timber in 2004 ago, providing an opportunity to implement new practices. We are interested in integrating forestry practices with livestock grazing in order to diversify our operations and provide multiple commodities. This supports both the value-added sale of our beef, as well as the timber industry of which we rely on for raw products used in our timber frame enterprises. Furthermore, we believe a holistic approach to resource use and management is important for sustaining industries in the BC interior.

Over the past number of years, timber and livestock producers have faced depressed commodity prices and volatility due to fluctuating demand and exchange rates, pest outbreaks, and regulatory changes. Collectively, these are affecting the structure and profitability of these industries. Moreover, the MPB epidemic has created unprecedented regional social and economic challenges for forest resource dependent communities in the Interior. Other large-scale resource management and conservation issues, including climate change, watershed stewardship, and wildfire risk, also require innovative natural resource management solutions. As part of a toolkit, agroforestry systems such as silvopasture can help producers and managers respond to these socio-economic and resource management challenges.

Purpose

Silvopasture is an agroforestry system that intentionally blends management of trees, forages, and livestock such that the interactions are planned and managed, and the system is operated and evaluated as a single enterprise rather than as separate parts. Either pastures or treed areas can be adapted and managed for combined timber and forage production, providing practical options to help sustainably address economic diversification for agricultural and timber interests that can contribute positively to regional stability, while also generating other valuable ecological goods and services. As silvopasture is a production system based on the integrated nature of the design and management of the timber, forage and livestock resources, a variety of physical layouts and management intensities are possible, with application under a variety of land tenures.

The overall goal of the Cariboo silvopasture project is to demonstrate an operational producer-led silvopasture approach implemented on a recently cut site and managed under high-intensity-short-duration grazing. The long-term objectives are to: determine the integrated forage and timber production, soil moisture response and the economic cost-benefits of a silvopasture approach under these conditions.

The demonstration augments two existing collaborative silvopasture projects established under differing land tenures and management regimes, with differing physical designs. Each contributes to a larger sector development objective of testing approaches and building a database of establishment costs, forage and timber productivity and ability to generate co-benefits.
This demonstration project will address gaps in existing information and knowledge that limit the adoption of silvopasture practices in the region by providing an operational-scale system to derive development guidelines, management recommendations and cost-benefit information.

The project will deliver:
1. An operational demonstration site providing for long-term assessment of intensive silvopasture management. The information will be used to develop beneficial management practices and decision aids, and inform supportive policy.
2. A final report summarizing: silvopasture establishment and on-the-ground implementation steps; operational constraints or efficiencies encountered throughout the project; baseline productivity assessments; and, a cost:benefit analysis.

Establishment and On-the-Ground Implementation

1. Planning (excerpted from Powell 2011) – assessment of location, site, biophysical resources, existing infrastructure

Location
The Beaver Valley site encompasses approximately 60 ha and is located entirely within District Lot (DL) 8240 in the Cariboo Land District, being private land owned by David Zirnhelt and family (site mid-point at approximately 52° 31’ 04” N, 121° 53’ 30” W). The site is located on the western slopes of the Beaver Creek valley above Opheim Lake near the unincorporated community of Big Lake Ranch.

Topography
The site has an eastern aspect and topographically is dominated by three north-south oriented benches intersected by a series of east-west ravines extending from lower to upper bench land (Fig. 1). Elevation ranges from approximately 680- to 700-m on the lower bench, 720- to 740-m on the middle bench, and 760- to more than 780-m on the upper bench. Slopes on the benches are generally very gentle (2 to 5%) to gentle (6 to 9%). Slopes between the benches range from moderate (10 to 15%) to strong (16 to 30%), with some very strong to steep sloping phases (31 to 70%), particularly on the northern portion of the site.

Soils
Soils on the site are typed as a Deserters-Dominion compound association (Lord 1984). A Brunisolic Grey Luvisol is the dominant soil type of this association with Podzolic Gray Luvisols and gleyed subgroups common. The soils are derived from gravelly, loamy moraine materials. Some large stone and cobbles are present at the soil surface. These soils exhibit variably permeability and range from imperfectly drained (Dominion) to well-drained (Deserters).

Ecology
The site is divided between two ecological associations. The lower bench and slopes (approximately 35 ha) are classified as within the moist, hot Sub-boreal Spruce (SBSmh) biogeoclimatic subzone. Commencing on the slopes above the middle bench (approximately 25 ha), at elevations of 740 to 750 m, the area transitions to the Horsefly variant of the dry, warm Sub-boreal Spruce (SBSdw1) biogeoclimatic subzone. Prominent indicators for separating the zones are the presence of lodgepole pine in the SBSdw1 and beaked hazel in the SBSmh. Detailed ecological surveys were not conducted, however based on aspect, slope position and vegetation observations in the reconnaissance survey, it is estimated that most of the SBSmh on this site is comprised of the modal site series, 01 SxwFd – Hazelnut with components of the more hygric site series 06 SxwFd - Collsfoot (Steen and Coupé 1998). The benches of the SBSdw1 with gentle to moderately steep slopes, from upper to lower slope positions, are estimated to be predominantly the zonal site series - 01 SxwFd - Pinegrass Site Series (Steen and Coupé 1998), with small portions along ridge crests with rock outcrops falling within the 02 FdPl - Cladonia Site Series and the steep east-facing slopes between the benches potentially in the 05 SxwFd - Ricegrass Site Series.
Timber and Forage

The site has been selectively logged on multiple occasions since the 1930s. The most recent timber harvesting occurred in 2004 and removed most of the mature trees. Residual mature trees and advanced regeneration are very patchy with respect to both size and species distributions. The lower bench (Fig. 1 map reference BV1) contains sporadic mature spruce and trembling aspen and open to dense patches of advanced spruce, Douglas-fir and trembling aspen regeneration. Forage species are mix of native and introduced forbs (e.g. dandelion) and domestic grasses including Kentucky bluegrass and timothy. The forage stand is interspersed with native shrubs (e.g. prickly rose) and patches of orange hawkweed and other non-native weedy species. The middle bench (Fig. 1 map references BV2 & BV3,) has a low-density cover of scattered spruce, paper birch and trembling aspen. The southern portion of this bench has very little spruce regeneration interspersed with infrequent lodgepole pine seedlings as one progresses upslope towards the ecological transition. Larger patches of large-sized, mature spruce, birch and trembling aspen occur in the center portion of this bench coincident with an area of broken, rolling terrain and steep slopes. Infrequent 3- to 4 year-old trembling aspen regeneration is present in patches. Native forbs and shrubs (alder, Oregon grape, and snowberry), are mixed with pinegrass and mixed domestic grasses (Kentucky bluegrass, timothy) primarily along trails and roadsides. Moderate amounts of coarse woody debris occur throughout, with a few large residual piles of logging slash adjacent to the main road. The northern portion of the upper bench (Fig. 1 map reference BV4) has scattered residual mature Douglas-fir and spruce. Very patchy spruce regeneration and trembling aspen suckers occur across this area. Forages are a mix of pinegrass, native forbs with timothy, orchardgrass and Kentucky bluegrass. The southern portion of this bench (Fig. 1 map reference BV5) hosts infrequent mature paper birch and Douglas-fir with patches of spruce seedlings and some 2 to 5 year-old lodgepole pine seedlings. The forage stand is less well developed in the southern portion with thicker patches of native shrubs (e.g. alder, prickly rose), and a sparse layer of native forbs and domestic grasses.

Forest Health Factors

No major forest health factors were present. Mountain pine beetle infested pine were previously on site, but all affected trees were removed with the most recent timber harvest. Douglas-fir beetle is known to occur in the Beaver Creek valley, but none was observed on this site.

Range Improvement Developments

The site's south, west and north boundaries are enclosed with 2-strand electric fencing; no cross fencing is in place. Temporary electric fencing is installed seasonally along the eastern boundary when livestock are on site. The existing water development (Fig. 1) consists of a trough connected by gravity-fed surface pipe flowing from a shallow weir dam impounding surface flow. Potential water developments include a wetland area on the upper bench that could feed a dugout, and a hillside spring between the upper and middle benches that could feed water troughs.

Figure 1. Beaver Valley site. Site reconnaissance map.
**Capability Classifications**

Agriculture and forestry capability classifications have not been directly determined for this site, however, interpretations can be made on the basis of other regional classifications with similar soils, climate and topography. Land and soil capability analyses (Canada Land Inventory 1975) conducted on adjacent areas of the Beaver Valley with similar topographic and soil characteristics list the Canada Land Inventory (CLI) capability for agriculture ranging from 5 (severe limitations that restrict capability to producing perennial forage crops, but with improvement practices feasible) to 6 (severe limitations that restrict capability to producing perennial forage crops, and improvement practices not feasible), with adverse topography and stoniness as principle subclass limitations. The dominant soil association on this site is also classified for their agricultural and forestry capability by Lord and Mackintosh (1982). Their analysis classifies the climatic capability for agriculture as 3 (moderately severe limitations that restrict the range of crops), and the soil capability as 7 (no capability for arable culture) due to adverse topography and excess stoniness. The forestry capability (Lord and Mackintosh 1982) is rated as 3 (capable of 5.0 to 6.3 m³/ha/year timber growth) with physical restrictions to tree rooting caused by dense or consolidated soil layers and excess soil moisture. Based on the predominant site series, hybrid spruce and Douglas fir have mean site indices (SI) of 18.0 and 21.0, respectively in the SBSmh. Hybrid spruce has a SI of 18.4, Douglas-fir a SI of 18.0 and lodgepole pine a SI of 21.5 in the SBSdw1. Detailed SI by site series are provided in Table 1.

![Table 1. Site index by site series at the Beaver Valley site.](image)

Based on the biogeoclimatic classification, the site is expected to receive an average 585 mm of precipitation annually, with 286 - 328 mm during the growing season. The frost-free period varies with elevation and ecological zone: the lower (< 750-m elevation) slopes and bench are expected to have an average frost-free period of 179 days, whereas the upper slopes and benches in the SBSdw1 are expected to have an average frost-free period of 152 days.

2. **Implementation**

The site was divided into: 1) an existing vegetated control representing post-timber-harvest grazing opportunities with no further site treatment; 2) a silvopasture treatment which included brushing of deciduous trees and shrubs, removal of slash where required and spacing of the remaining crop trees to a 5 x 5 m spacing; and 3) a potential pasture area which would have included brushing of all trees and shrubs to create a non-timbered pasture-like opening. The latter treatment was proposed by separate application to the Cariboo Chilcotin Beetle Action Coalition (CCBAC) and did not form part of the AIDI project proposal. The CCBAC project proposal was not supported, thus the demonstration report will primarily refer to the existing vegetation control and the silvopasture treatment as supported under the AIDI.

Establishment of the silvopasture structure occurred in August/September 2013 (Figure 2), encompassing 10 ha. Once grazing commences in 2014, the silvopasture treatment will form a grazing unit within the larger managed grazing subdivision. The silvopasture structure was created by brushing and thinning natural forest regeneration into a widely spaced, open forest system with forage production zones between the trees (Figure 3). Scarification for mineral soil exposure was achieved with an excavator and brush rake attachment. Areas of exposed mineral soil will be seeded with a regionally adapted forage seed blend in the spring of 2014.
Permanent cross-fencing delineating the major pasture subdivisions (treatment units) was installed (Figure 2) enabling utilization of temporary electric fencing for frequent (daily to weekly) moves of livestock following the slope contours. Developed water sources included a dugout and a trough supplied by a spring.

Figure 2. Silvopasture treatment zones outlined in orange. Permanent cross fencing installed perpendicular to the slope outlined in yellow.

Figure 3. Thinned and brushed silvopasture treatment area.
Baseline Productivity Estimates

Overstory: Implementation of the silvopasture treatment was delayed to the fall of 2013 due to budget limitations related to original budget estimates, lack of contractor availability and the small scale of the area to be treated. As such, baseline overstory productivity estimates were not measured in 2013. Sampling of the control and silvopasture treatment areas will be conducted in 2014 in partnership with the Ministry of Agriculture. Similarly, baseline soil sampling was also delayed to 2014.

Forages: Range cages (Figure 4 and 5) were placed on site in August of 2012, prior to treatment to assess natural vegetation productivity and capture an estimate of variability. Forages were clipped in the late fall of 2012 and 2013 and dry weights measured (Table 2). Productivity estimates from 2012 represent the potential productivity from the last grazing pass, through to clipping. Productivity estimates from 2013 represent full-season potential productivity.

Variability is very high, ranging up to seven-fold in 2013 and providing an indication of the inherent site variability. Sampling intensity in 2014 will be adjusted to reflect the variability and will concentrate on comparison between treatments.

Table 2. Dry weight of vegetation clipped in each of 12 range cages placed on the Cariboo silvopasture demonstration site prior to treatments being established.
Figure 4. Example of range cage for measuring forage biomass. August, 2012. Location: old landing in the SBSdw1 silvopasture treatment area.

Figure 5. Range cage placement locations.

Operational Constraints and Efficiencies - Lessons Learned  
Notes for Beaver Valley Silvopasture Demonstration – December 2013  
David Zirnhelt owner/manager
**Implementation of Silvopasture Treatments**

The original budget to implement the prescription for the silvopasture treatment of 10 ha was found inadequate. Over the summer and fall of 2012, five contractors were approached to bid on the work. No one had done this kind of work before: spacing crop trees at 5 m, brushing between the crop trees, removing or piling and burning coarse woody debris and slashed brush. Some contractors cited the budget of $650/ha was very low considering that if machinery was to be used, such as an excavator, that low-bedding the machine two ways for only 10 ha of work was not worthwhile. At the time there was a funding submission before the Cariboo Chilcotin Beetle Action Coalition (CCBAC) to treat 20 ha of the ‘Pasture’ management unit as phase two of this project. Unfortunately CCBAC has not responded positively at this time. Treating a total of 30 ha at one time (the combined area encompassing the two treatments) would have made it more cost effective and attractive to potential contractors, however insufficiently so. As a result, the Zirnhelt Ranch approached project advisors and designers with the dilemma. Zirnhelt Ranch proposed to approach the most likely contractor to hand brush and space the 10 ha Since it was 9 years since logging and a lot of deciduous trees and brush had grown up, and given that a small trial on the property of having cattle winter fed over the top of the brush had successfully reduced brush and created conditions for grass and forbs, it was decided to contract the spacing and brushing. The brushing would open up corridors between the crop trees so cattle movement would be facilitated. The cattle then would do the brush control (Figure a through d) and stimulate the establishment of grass by the spring and fall grazing. Much of the brush and small aspen, alder, and hazelbrush have high protein and nutritional value, making it palatable for cattle when the grass and forbs are less nutritious. It is a common practice by those graziers who follow the Holistic Resource Management system (c.f. Allan Savory) to use the herd impact to “landscape” and create the conditions for their own nutritional needs (See Fred Provenza et al 2013. Complex Creative Systems Principles, processes, and practices of transformation. Rangelands 35(5):6–13 doi: 10.2111/RANGELANDS-D-13-00013.1).
Observation of areas where in previous years, yearling cattle were left to severely graze parts of the Control treatment unit, has shown that cattle can reduce the brush by grazing. However, yearlings which are being backgrounded (ie grown out to being ready to finish for slaughter) are not ideal for landscaping treatment as animals will not put on as much weight gain under a brush control regime. Dry cows (without calves) are a better choice, as putting on fat and growing are not the primary objective.

A silviculture contractor agreed to undertake the brushing work, but the first two days of work with the brush saws would be on a $625/day per-diem basis. He was able to complete approximately 1.5 ha per day. Because there was no regeneration of fir, pine or spruce (the most desirable crop trees) over parts of the treatment area, it was agreed to leave alder, aspen or birch at the desired spacing where there was no other crop tree. This would satisfy the objective to leave tree cover which will shade the cattle in the summer heat and preserve moisture by reducing ground heating, without the need for fill-planting of trees.

Since there was considerable slash a one-day trial of hand-piling slash was undertaken. Three people piled spacing slash from a 9 ha area, at a cost of $1,000/ha.

The contractors were known to the Zirnhelt Ranch as extremely hard working and productive. The lead on the project was an RPF with broad experience in the region and is the consulting forester to the Zirnhelt Woodlot so is intimately familiar with adjoining land.

**Cattle Management**

In 2013, the cattle consumed approximately 25 lbs/head/day (1000 pound average) which for the spring grazing amounts to 123 pounds per acre on average. In the fall they consume an average of 454 pounds per acre for a yearly total of 567 pounds per acre. This is very close to 2012 totals, but with much more residual plant material left on site in 2013, which can be utilized in the early spring or just be left to feed and protect the regrowth. This information has led to the calculations of pasture benefits as reflected in the costs and returns analysis report (Appendix 1). Cattle movement records allow for the grazing plan to change the season (timing) of grazing in subsequent years.

Since brush control (landscaping) with cattle is one of the objectives here, this pasture has limits at least in early years of development, for backgrounding or finishing cattle. Cows and calves or dry cows are a better choice of livestock classes for landscaping as they can utilize a wider variety of plants and not suffer, whereas optimum grass and forb quality is necessary for yearlings and two year olds being backgrounded for finishing. One strategy that could be employed is to use the “leader/follower” method of grazing management. In this strategy, the class of livestock with the greatest nutritional requirement on this operation (yearlings and two year olds) would be put into a pasture first to do a light graze, then follow them with the cows and calves which can consume the less desirable left over material. However this requires two sources of water, one for each of the two pastures.

**Consequences of late start due to inadequate budget for treatment**

The delay in finding contractors willing to bid on the original prescription within the project budget meant that soils analysis and land equivalency ratio (LER) analysis were not completed in 2013. Both required installation of the treatments in 2012, and unfortunately they were not completed on the silvopasture unit until fall of 2013. They will be a work in progress. However, successful completion of the watering sites and the perimeter and permanent cross fencing, and the trials on hand piling, machine piling and scarification with a rake attachment on a 200 series excavator have provided valuable establishment and cost:benefit information. Additionally, further management information has been gained through successful utilization of cattle for silvicultural/pasture development treatments (browsing, trampling, seeding, fertilizing), and the ability to intensively manage the system to promote plant recovery after grazing. The use of smaller temporary pastures
allows more recovery time after grazing. We try to have 90-120 days of recovery time. It is much easier to create these smaller units with the existence of the permanent cross fencing. Animal impact by concentrating many cattle in small areas results in better forage and browse utilization/control, trampling (exposing mineral soil) seeding and fertilization by manure and urine.

**Initial Recommendations: silvopasture management unit**

This property was already logged when the Zirnhelt Ranch bought it. Although the perimeter was fenced the next year, it was only partially managed under an Intensive Grazing Management system, which is to say with some subdivision of pasture using temporary electric fencing to confine the cattle for short periods of one to seven days. As a result, the ingrowth of deciduous trees and shrubs got a head start on the grass except where the landings and roads had been seeded.

For silvopastures created through logging and brushing, a consideration would be for cattle to be introduced early after logging and in sufficient numbers to have a desired landscaping effect of trampling and stirring up the soil surface (to facilitate seeded grass catch), and eating the available non-grass and grass feed. With this approach, consideration might be given to a logging plan which takes advantage of existing regeneration, advanced regeneration or pre-commercial trees to achieve the desired stocking level of 350 stems per acre as prescribed in this demonstration. However, if silvopastures are established with planted seedlings rather than taking advantage of existing immature trees, this approach could result in very high levels of seedling damage, highlighting the need to match both agricultural and silvicultural management activities to the combined outputs of forages and timber.

**Fences/electric**

Some of what we learned about fencing on this project may well assist others who may build silvopasture and pasture systems. It is a good idea to work with temporary fencing—reels of good multi-strand electric wire and step-in posts until some experience is gained. In the case of this demonstration, two years working with temporary internal fencing resulted in a decision to work with the major subdivision of pastures by running the permanent cross fences from the top of the hills to the bottom, thereby allowing temporary additional fencing for frequent (daily to weekly) moves of livestock to follow the contours of the land: In other words, walking across the hills instead of up and down very steep slopes is easier. Also permanent corridors to facilitate walking or using an All Terrain Vehicle (ATV) to carry the wire and posts can be "constructed" by removing debris and brush. One hour with a small dozer can create about 300 meters of temporary fence corridor and save time. The blading will scarify and allow grass seeding as well as facilitating the movement of cattle from one pasture to the next. Steve Kenyon from Greener Pastures, an experienced custom grazer says if you have to move a temporary fence for access to water twice then one should consider the time and cost to put in a permanent single wire fence. Labour daily would be more expensive than the capital cost of the single wire fence. It is important to be sure you know where the permanent fences should go before they are built.

The construction method of the permanent cross fencing which subdivided the silvopasture property into the three management units involved both treated wooden posts and plastic composite posts. Treated 4-5 inch wooden fence posts were used for end braces, gate posts and braces and corners. Wooden posts were not utilized on the top of rises and in the bottoms of draws in the fence line, although that may be a practice recommended for the future. The posts in between braces and corners were a plastic composite material made by Pasture Pro. They are one and one eighth inches in diameter and 54 inches long, driven about one foot into the ground using a pilot driver/slide hammer. Once the hole is made, one knows there are no rocks to obstruct driving of the post with a sledge hammer. The advantage of the plastic post is that it does not shatter and peel off fibres as the fiberglass posts do after exposure to sunshine for some years. These posts which support a single strand of high tensile 12-gauge wire (held in place by drilling the post at the desired height and holding it with a long cotter key) will bend over and flex back if wildlife or domestic stock run into them, thereby reducing breakages. One additional advantage to the hand driven posts is that they can be placed easily on steep and rocky slopes where it is
impossible to get a machine mounted post driver. The advantage of plastic over metal post is that they require no insulators. They are the insulator.

### Water developments

One of the water developments was a dugout 40 feet by 60 feet and four feet deep, which filled in the spring, was dried up by the end of August, and slightly refilled with September rains, thus enabling usage of that area of the silvopasture in the fall. Access to the water was by fencing the stock off the water except for a small alley of electric fence giving 200 square feet of access at the end of the dugout. This causes excess muddying of the water by trampling. For a short term this might be all right. For continuous use it would not work because the banks would be too severely damaged and cause filling in of the dug out. Piping gravity-fed water to a slightly lower part of the slope 300 ft below the dugout would allow watering from a trough which could then be moved up to 1000 feet in several directions. Taking the water to the cattle via movable pipe would make it unnecessary to put in corridors to a stationary water trough, minimizing the compaction of trails. The dugout could be permanently fenced off from cattle. This solution would cost more initially, but may be justified on a return on investment basis. A further alternative is to bring in a portable water pump (solar powered) and pump from the dugout. If there was a portable system utilized on other properties on the ranch (which is being planned) and if it were moveable by ATV then for the six to eight weeks of grazing the pump could be used on the silvopasture.

We believe that during rainy periods the cattle are getting their water from depressions containing run off rain water or are finding springs unknown at this time, as they did not follow temporary electric fenced corridors which would take them to a permanent water supply (in the Control management unit). The second water supply developed was a spring which runs year-round, but which is only a trickle in the summer drought. However, when there is a fenced area to protect the source and it is piped to a trough, there is sufficient supply—a one hundred gallon tub for an average of 50 head to fill adequately. However, if more livestock are to be placed on the pasture, there would need to be a larger holding tank which can trickle fill and hold extra to refill the drinking water trough on demand, which is to say when and if the whole herd drinks down the drinking trough, it can be refilled very quickly by the float valve opening the flow from the reservoir tank/trough and refilling the drinking trough. There would be an additional cost for the reservoir tank of approximately three hundred dollars. This is recommended in this case and any other circumstance where there is only a very small flow at the source and requires the capture on a 24 hour basis to supply the needs of the livestock.

For any water supply it is a good idea to have a permanent electric mainline close to it so it can be surrounded and protected from trampling with a fence which can be always charged (hot). Locating permanent subdivision fences and corridors close to the water supply is important in keeping costs down. We have chosen to progressively develop water sources and accesses to maximize effectiveness through the trial and then adapt to a more permanent infrastructure.

### Costs and Returns

An analysis of the financial considerations of the project was completed as outlined in a report and spreadsheet comprising Appendix 1. This analysis was specific to Zirnhelt Ranch and the project. Assumptions included the farm’s main income being the sale of beef meat products, which are forage finished and direct marketed. It limited the analysis to the value of the addition of forage supply to the enterprise. In other words the analysis looked at the existing vegetation control, the silvopasture and pasture treatments from the forage perspective only. The analysis did not take into account potential long-term timber production on the control or silvopasture treatment areas. The ‘pasture’ treatment did not consider land clearing expenses, approaching it as an established pasture. The intent was to compare the investment into the three areas and their capacity to meet the enterprise’s need to increase their forage base.

Based on the above, the cash flow analysis showed that spreading investment costs over 66 head as compared with 33 head is a better fit to the investment. Of the three treatments the ‘pasture’ approach showed the highest annual residual cash flow for the first 10 years. Specific to this enterprise, the analysis did not take into account the cost of land clearing to
develop a pasture area equivalent to the control or silvopasture areas. Analysis is based on the assumption of no further site development being needed. Since the control also required no further development costs it ranked second in terms of residual cash flow. This analysis did not attempt to include a future value of the trees or to separate the investment in tree growth from pasture (forage) development, suggesting that further data was required. This demonstration will help address identified data gaps such as tree growth and forage productivity in combined systems, in conjunction with other silvopasture work being conducted in the province.

**Extension/ Information sharing**

A workshop and field tour were held at the demonstration site in September of 2013 (Figure 6).

![Figure 6. Silvopasture workshop and field tour agenda.](image)

The workshop and tour brought together twenty-four local producers, association members and agency representatives. Discussions covered agroforestry principles, silvopasture systems and applications and the potential for expanding the system approach to other land within and beyond the region. Individual presentations can be found in Appendix 2.

**Next Steps**

Development of regional field pilots and demonstration projects, in partnership with producers, commodity organizations, agencies and others is a fundamental approach to developing management information and tools, fostering adoption and increasing industry capacity.

The project site has been established and will continue to act as a demonstration to provide livestock producers, foresters and woodlot managers with a regional on-the-ground silvopasture example. As noted elsewhere in this report, the Cariboo demonstration project augments two existing collaborative silvopasture projects established under differing land tenures and management regimes, with differing physical designs and partners. Each contributes to developing and evaluating BMPs; enhancing industry competitiveness and sustainability; developing and calibrating decision aids; developing peer-to-peer technical assistance capacity; and, informing policy. Data collection and monitoring including operational/management
practices, comparative productivity estimates and economic data will be garnered through the short- mid- and long-term life of the project. Data and information will be used to calibrate both regional and provincial approaches.

**Literature Cited**

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