Managing Water in the Haines Creek Range Unit

The Haines Creek project demonstrates planning for climate change on Crown Range in the Chilcotin. Two water developments are used to encourage livestock distribution through the Range Unit

Project Overview

The Haines Creek Project is 20 km west of Alexis Creek. This is a gravity fed system to access high quality spring fed water. The Upper Creek Pasture was unused since the 2017 wildfire. There is significant forage associated with the open forests, open range, and recently burned area, however there is little surface water available for livestock.

Project Design

Vertical culverts were sunk into groundwater seepage areas (springs) at two different locations. Protecting the springs is an important aspect of these projects, as the compaction and damage to riparian vegetation associated with livestock use in the riparian area can reduce the water storage capacity of these seepages. A trough located in the dry upland improves the resiliency and longevity of the water source. The systems are not at risk to evaporation and are intended to reduce the uncertainty of the water resource from year to year.

The Top Three Learnings from the Haines Creek Pilot Project

> Water resources that are less prone to evaporation are more resilient in future climate scenarios.

> Providing the option of connecting additional troughs to the gravity fed system allows for managers to improve the distribution on a range unit.

> Protecting the seepages from trampling by livestock and the associated compaction is essential to ensuring water storage within the riparian zones.

Key Design Features of the Water Development

> Protect the intake and discourage livestock from using the riparian zone.

> Troughs have outlets and are positioned in the landscape to allow for a series of troughs.

> Gravity fed system is low maintenance.

> Perforated culverts form the intake.

> Intakes are locked and accessible for draining lines in the fall prior to freeze up.

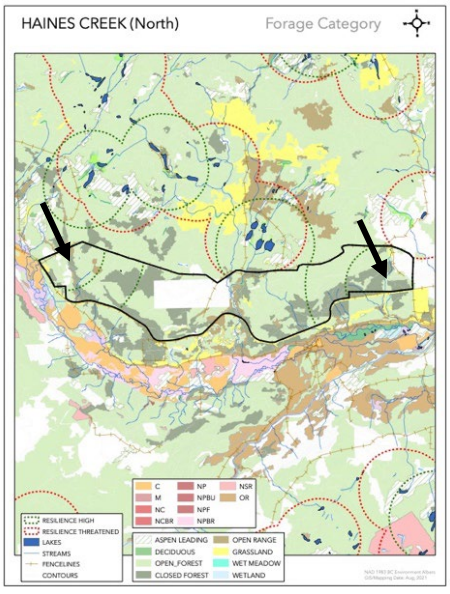
Figure 1. Troughs are supplied water by gravity from a seepage source collected inside a vertical culvert. Shut off valve and air lock are protected inside the culvert with a locking lid.

Forage Production and Climate Change

The forage resource within three kms of the water developments covers 760 ha providing 247 AUMs of forage. The open grasslands, recent burn, and open Douglas fir forests are the primary sources of forage. The open forests are dominated by pine grass and Richardson's needlegrass, whereas the open range is mostly bluebunch wheatgrass. The areas burned in 2017 have a variety of forbs, as well as vigorous stands of pinegrass. The greatest limiting factor for livestock access is woody debris. The rangeland health is excellent throughout this portion of the range unit.

Table 1. The forage calculation, limiting factors, stocking rate, and water requirements are for the area within three kms of the water developments. The water developments are located by the arrows in the map and provide access to forage identified by the hashed green circles (760 ha).

Line Number	Master Table of Range Forage Types	Range Unit: Haines Creek Polygon ID (Pond ID): Water Developments 1 and 2					
1	Forage Category	Open Forest	Recent Burns	Open Range	Closed Forest	Roads and Landings	Totals
2	Productivity (Kg/ha)	540	1400	1320	400	2000	N/A
3	Accessible Area	400	100	150	100	10	760
4	Range Health (Poor, Fair, Good, Excellent)	PFC	PFC	Fair	PFC	PFC	
5	Seral Stage (Early, Mid, Late, PNC)	Late	Late	Mid	Late	Late	N/A
6	Limitations (%) (excluding slope)	75%	75%	20%	90%	10%	N/A
7	Available Forage (kg)	54000	35000	158400	4000	18000	269400
8	Safe Use Factor	40%	50%	25%	50%	50%	N/A
9	Forage for Livestock (kg)	21,600	17,500	39,600	2,000	9,000	89,700
10	Animal Unit Months (AUMs)	60	48	109	6	25	247
11	Stocking Rate (AUM/ha)	0.1	0.5	0.7	0.1	2.5	N/A
12	Grazing period (months)	1	1	1	1	1	1
13	Number of Animal Units Supported	60	48	109	6	25	247
14	Water Requirements (L) - Water estimate is 1800L/AU	107,107	86,777	196,364	9,917	44,628	444,793



Monitoring Plan

The current ecological health is in properly functioning condition. Improving the water resource will lead to livestock use and a potential risk to rangeland condition. Future monitoring should focus on the forage within 1.5 kms of the water developments, with special attention to the open range forage category as these highly productive plant communities will be used by livestock.

Producer Experience

There is very little water, and the water developments provide the opportunity to use the forage associated with the open forests and recently burned areas. It improves the resiliency of the range unit by supplementing the range area to the south which is also limited by water and ingrowth of forests. The existing plan is to use approximately 60 AUMs, thereby leaving about 190 AUMs as an emergency forage resource in years of drought.

Figure 2. The forage resource is associated with open range (left), recently burned areas (middle), and open forest meadows (right).

Economic Analysis (Prepared by Allen Dobb Consulting)

The cost/benefit (CB) analysis is used to determine if the project will produce a positive return on the investment. In this case, the Net Present Value (NPV) is positive, $12,802, indicating the project is worthwhile. In this case, the labour, equipment, materials, and planning make up the capital cost of the project. The life of the development is estimated at 25 years with the annual maintenance costs discounted to present value and added to the project cost. Additionally, with one to two years of droughts predicted during the project life span, climate change has been incorporating into the analysis.

The direct economic benefits of water developments can be quantified by the amount of forage made available. In this example, the benefits associated with the added forage are estimated using the fees paid for grazing on private land. In the drought scenario additional AUMs are used, adding considerable benefit. All else equal, at least 110 AUMs are needed annually to break even on this investment. In addition, there are benefits to animal health and promoting healthy ecosystems. The project provides knowledge for maintaining sustainable ranching operations in rural areas of British Columbia and improving the planning process for government land-based investment strategies.

Table 2. The cost/benefit analysis assumes a 25 year lifespan for the water development. It includes a set of assumptions to determine the overall net benefit, or present value of the investment.

Conditions	***Normal Rainfall***	***Drought***	***Total***
Frequency	"Two or three consecutive normal or wet years"	"Two or three consecutive years of drought"	
Probability (over 25 years)	0.5	0.5	1
Annual Benefits			
AUMs	60	250	
AUM Value	$22.50	$22.50	
Total Annual Value (AUMs x $/AUM)	$1,350	$5,625	
Annual value based on probabilities (over 25 yrs)	$675	$2,813	$3,488

Annual Costs (All Years)		
2 people x 4hrs (@$20/person/hr), plus UTV (@$25/4 hrs), spring and fall		$520
Present Value of Benefits		
Value ($3,488) over 25 years, @ 6% discount rate		$44,582
Present Value of Costs		
Annual Maintenance ($520) for 25 years @ 6% discount rate		$6,647
Cost of Water Development (total investment)		$27,050
	Total	$33,697
Net Present Value (NPV) = PVB-PVC		$10,885

Figure 3. The intake for the water development is protected with fence rails and rocks.

Economic Assumptions

> **No forage is available for use in this area without the development.**

> **If the forage is not available, the rancher would seek a private land grazing, at $22.50/ AUM, as the next best alternative.**

> **The AUMs are used as predicted with 60 AUMs in a normal year, and 250 AUMs used in a drought or emergency wildfire year.**

> **The discount rate represents the real rate of interest, or the opportunity cost on the investment.**

> **Planning, administration, and contract management costs are not included in this analysis.**

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