Bighorn and Domestic Sheep Interface Program in Southeastern British Columbia

DAVE ZEHNDER,[1] East Kootenay Bighorn and Domestic Sheep Interface Program, 3300 Johnston Road, Invermere, BC V0A 1K4, Canada

Abstract: Some bighorn sheep die-offs are linked with diseases contracted from domestic sheep. This study explores means of mitigating this issue while engaging domestic sheep producers in the solutions. We assessed bighorn habitat quality and quantity, carrying capacity, health and morphology, location and movement, population dynamics, and exposure risks to domestic sheep and goats. Field study reports were obtained from many sources including our previous work, a Parks Canada telemetry program, and input from producers. Here we review the interface potential as well as mitigation options of buy-out, alternative livestock and relief pastures, domestic sheep exclusion covenants, profit á prendre, legal restrictions, fences, and guardian dogs. For each method we considered practicality, cost, and property tax ramifications for the producer. Successful implementation of any measure requires careful review on a case-by-case basis but overall, buy-out coupled with profit á prendre provides the best "blanket" solution.

BIENN. SYMP. NORTH. WILD SHEEP AND GOAT COUNC. 15:122-129

Key Words: Bighorn sheep, British Columbia, disease transmission, domestic sheep, East Kootenay

[1]*E-mail address: dzehnder@rockies.net*

Earlier phases of the Bighorn and Domestic Sheep Interface Program (BDSIP) in southeastern British Columbia focused on collecting data from stakeholders, including domestic sheep producers, scientists, resource people, and governmental departments (Adams and Zehnder 2002). This allowed us to see the scope of the problem in East Kootenay and to open lines of communication among various interested or affected groups. More recently, gap analysis identified successful strategies undertaken in other jurisdictions. Although education and communications continue through a regional committee and regular landowner contact, from 2001 to 2006 we focused on alternatives to separate domestic and bighorn sheep and implement the best options. Our goal is to find solutions which enhance the sustainability of regional agriculture while resolving the disease risks. Herein we report on the East Kootenay component of the BDSIP, implemented in conjunction with Helen Schwantje from the British Columbia Ministry of the Environment and Daryl Stepaniuk of South Okanagan California Bighorn Sheep Recovery Project.

Methods

We constructed maps to show the proximity of high risk domestic producers to

bighorn sheep winter range along the

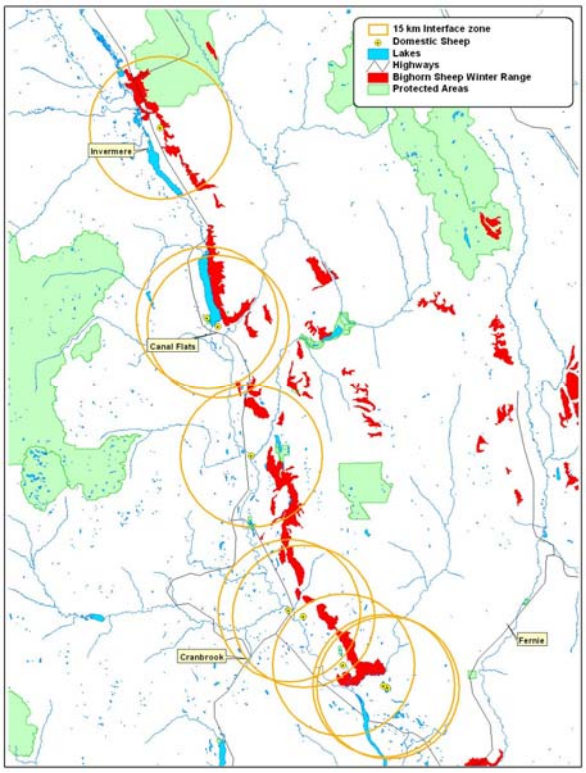

Figure 1. Location of domestic sheep in proximity to bighorn sheep winter range in southeastern British Columbia.

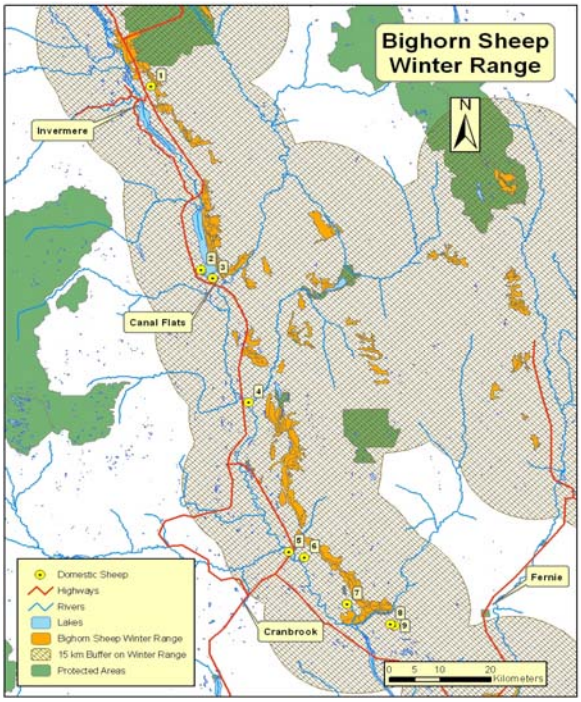

Figure 2. Bighorn winter range relative to high risk domestic sheep producers in southeastern British Columbia. Numbers indicate specific producers.

Rocky Mountain trench in southeastern British Columbia. We based the maps on universal transverse mercator (UTM) locations of high risk producers and data on bighorn winter range, as determined from a telemetry study of bighorn sheep headed by Alan Dibb with Parks Canada. We applied a GIS layer showing an interface buffer radius of 15 km, generally accepted as the minimum distance to mitigate the risk of bighorn contact with domestic sheep (Bureau of Land Management 1992).

We investigated a number of direct mitigating options to determine what combination would create the most desirable result. These included buy-out, alternative livestock and relief pastures, domestic sheep exclusion covenant, profit á prendre, legal restrictions, fences, and guardian dogs. The cost and property tax implications associated with each approach were considered. We also interviewed sheep producers to determine which solutions they perceived to be workable.

Results and Discussion

Interface overlap

We mapped the potential risk of overlap of domestic sheep producers and bighorn sheep from two perspectives: the location of high risk sheep producers relative to bighorn sheep winter range (Figure 1) and the location of bighorn sheep winter range relative to high risk sheep producers (Figure 2). We also established the proximity of domestic producers to the specific locations of GPS-collared bighorns from the Radium band of sheep (A. Dibb, unpublished data). We displayed the data points on a Landsat map in relation to the problem areas and buffer zones (Figure 3). Many domestic producers were located in areas with little or

no separation from bighorn populations. Separation distances ranged from 242 m to 3362 m (2174 m on average). The data reinforced a previous concern (Adams and Zehnder 2002) that the danger of a massive die-off of bighorn sheep in the East Kootenay is very high. Regular updating of this map is a useful tool to monitor the ongoing risk.

Mitigation Options

Buy-out. This involves negotiated purchase of domestic flocks, coupled with a restriction against sheep being reintroduced to the parcels of land under question. This option would be dependent on funding and the willingness of the producers, not all of whom find this acceptable.

Alternative livestock and relief pastures. All producers zoned as agriculture by the Regional District are concerned with loosing their preferential tax status. The introduction of alternative livestock allows the landowner to retain the preferential tax status of legitimate farmers who surpass a gross agricultural income requirement. Assignment of land currently used in domestic sheep production as "relief pastures" for the cattle industry could produce a similar result. Cattle ranchers can apply to have the preferred tax status remain on these properties if used as part of the cattle operation. The forest service also expressed interest in this approach as an alternative to ranges scheduled for restoration burns.

Domestic sheep exclusion covenant. This is a legally binding agreement attached to the title of a lot. In our case, it restricts the owner from raising sheep on property under covenant. Landowner agreement can be purchased at a typical cost per farm of approximately $21,000 to negotiate and monitor the covenant in perpetuity (Table 1). Estimated cost of applying this option to the highest risk producers in the East Kootenay is ~$250,000. Although this option could provide an acceptable solution, the Agricultural Land Commission (ALC) found this approach to be an unacceptable restriction on land zoned for agriculture and exercised its power of veto. A similar situation occurred in the Southern Okanagan California Bighorn Sheep Recovery Project (Dave Stepaniuk, personal communication), although efforts continue to have the ALC decision overturned. The Commission may reconsider amendments to the wording in the covenant. Further evaluation of the merit of this approach is contingent upon the ALC.

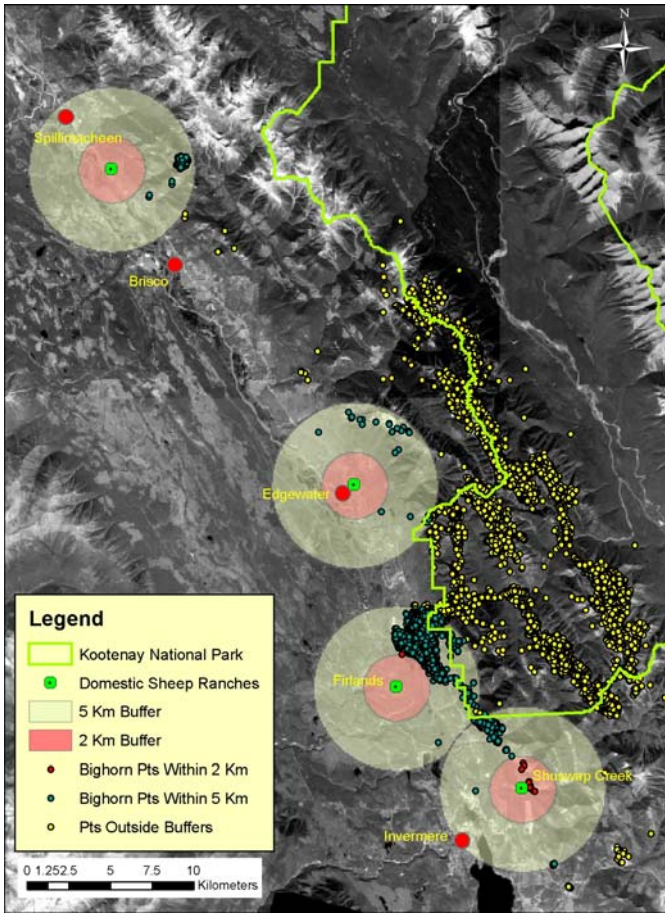

Figure 3. Location of collared bighorns from the Radium band relative to domestic producers in southeastern B.C.

Table 1. Cost estimates of a domestic sheep exclusion covenant (costs per typical farm).

	Description	Time/ Distance (hr or km)	Rate ($/hr or km)	Cost
Stage 1: Negotiation of Conservation Covenant				
Land Trust Time	Site visits to property & discussions with landowner	24	50	1,200
	Draft and review covenant	16	50	800
	Follow-up	8	50	400
	Baseline	8	50	400
Legal Time	Lawyer for land trust	8	150	1,200
Travel	Mileage (average distance 200km x 3 visits)	200	0.42	252
Fees	Registration fees			200
	Total Negotiation Costs			**4,452**
Stage 2: Purchase of Conservation Covenant				
	Value (1% assessed property value on the land only). Typically 50 acres x $3500/acre x 3%			**5,250**
Stage 3: Monitoring and Defense of Covenant				
	Endowment fund of $10,000 to cover perpetual costs over the life of each covenant			10,000
Land Trust Time	1 visit per year	8	50	400
Travel	Mileage to property (average distance 200km)	200	0.42	84
Legal Defense	One time cost to defense fund			1,000
	Total Monitoring Costs			**11,000**
Total Cost/Typical Farm (Stage 1+2+3)				**~20,600**

Profit á Prendre. A profit á prendre is a remnant of old English common law, although it retains modern precedence. It allows one landowner to purchase certain rights to another landowner's property, such as the right to fish, to graze, to cut trees. Conservation organizations use it to help secure the wishes of the property owner. In our case, the right to farm sheep on a lot could be sold to a conservation organization, which would not exercise this right and effectively accomplish the same result as a covenant. This approach removes domestic sheep from the lot, and is registered against title and legally binding. Also, it does not require approval of the ALC. Rough cost to establish this option with high risk producers (Table 2) is estimated as slightly less than that to pursue the covenant option (Table 1). However, costs are difficult to determine, in particular the value of grazing pastures and net income over 25 yr.

Legal Restriction. Directors of the Regional District of the East Kootenay (RDEK) area requested a legal solution to the problem. This approach must be work-

Table 2. Profit á prendre costs per typical farm.

	Description	Time/ Distance (hr or km)	Rate ($/hr or km)	Cost
Stage 1: Negotiation of Profit á Prendre				
Land Trust Time	Site visits to property & discussions with landowner	24	50	1,200
	Draft and review	16	50	800
	Follow-up	8	50	400
	Baseline	8	50	400
Legal Time	Lawyer for land trust	8	150	1,200
Travel	Mileage (average distance 200km x 3 visits)	200	0.42	252
Fees	Registration fees			200
	Total Negotiation Costs			**4,452**
Stage 2: Purchase of Profit á Prendre				
Option A	Value of grazing pasture over 25 yrs			
Option B	Net income from sheep over 25 yrs			
	Estimated Purchase Costs			**~4,500**
Stage 3: Monitoring and Defense of Profit á Prendre				
	Endowment fund of $5,000 to cover perpetual costs over the life of each agreement			5,000
Land Trust Time	1 visit per year	4	50	200
Travel	Mileage to property (average distance 200km)	200	0.42	84
Legal Defense	One time cost to defense fund			1,000
	Total Monitoring Costs			**6,284**
Total Cost/Typical Farm (Stage 1+2+3)				**~20,236**

able and not unnecessarily restrictive to agricultural activities. This situation presently is not a high priority with RDEK but actions on this approach will continue to be monitored by the program.

Fences --A double exclusion fence is an acceptable mitigation strategy. Two fences, with a 1 m "sneeze zone" between, are required to accommodate the viability of disease pathogens in airborne mucous. We considered various fence designs, including a triangular suspended fence demonstrated in the Okanagan (Figure 4). A perpendicular perimeter fence protects private property from intrusion, and a second structure attached to the base and suspended at an angle along the inside keeps domestic herds at least 1 m from the perimeter.

An exterior perimeter 2.6m high fence consisting of high-tensile game wire and a 1 m minimum separation from an interior domestic sheep fence is preferred. Approximately 15 km of fence is required to encompass areas of highest concern in the East Kootenay, This is based on an estimate of the the property owners most likely to choose this option. Estimated cost of 15 km of 'elk fence' plus 15 km of page wire fence was $310,000 [in 2005]. Some producers want to retain their flocks and this type of fencing presents a reasonable option to them. However, the need for ongoing maintenance and continual risk of breeches in the fence make a buy-out with profit á prendre more attractive than fencing.

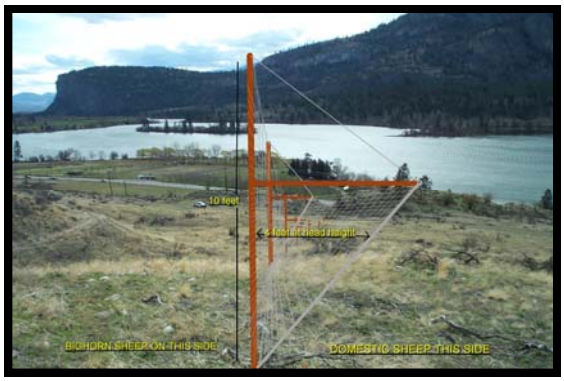

Figure 4. A triangular fence design demonstrated in the Okanagan.

Figure 5. Guardian dog with domestic sheep.

Dogs. Use of guardian dogs by domestic sheep producers is increasing (Figure 5). Various breeds, including maremma, komandore, and great pyrenees, are successful as deterrents to predators. Because of their instinct to protect the flock to which they are bonded, a well-trained dog will not allow any unfamiliar animal near the flock. These dogs could enforce the separation between a domestic flock and bighorn sheep, but only in combination with other mitigating strategies (like fencing), maintenance of necessary training, and dogs from proven working parentage. Suitable dogs cost $400 to $800 to purchase.

High risk procedures

One high risk producer in the Radium area moved sheep into a hay field to graze in order to take advantage of residual grass from the summer season. This was not normal practice. Usually sheep were grazed in rotation on paddocks with domestic sheep fencing which, coupled with location, provided a reasonable level of security. Use of the hay field drastically increased the possibility of contact with bighorns because of its location and lack of a sheep-proof fence. As a temporary solution, the sheep were penned in a more secure location and fed hay. The producer remained interested in other options but was reluctant to remove the sheep for fear of losing the advantageous tax status. Negotiation efforts turned to finding a long term solution. Any mitigation program must include a component of case-by-case flexibility.

Education and Communications

We communicated openly with stakeholders throughout the program. All domestic sheep owners in the study area were concerned over the potential for disease transmission between domestic and bighorn sheep. They were interested in finding a mutually beneficial solution to this issue. Producers who depend on income from sheep to retain a preferred tax status need a solution that mitigates any increase in land taxes.

From 2001 to 2006, high and medium risk producers were contacted to establish the status of their flocks. Most retained their sheep, although some discontinued their breeding programs. We visited high risk producers and recorded the specific locations of their flocks. The resultant potential interface map (Figure 1) was included in various presentations to raise awareness of the issue among domestic and bighorn sheep managers. Media interviews and educational sessions with land conservation organizations highlighted the issues and focused on broad involvement in potential solutions. The Wild Sheep

Stewardship Committee (WSSC), representatives from BC Ministry of Environment, BC Ministry of Agriculture, East Kootenay Wildlife Association, Southern Guides & Outfitters Association and sheep producers, was formed with the goal to maintain consultative lines of communication in order to brainstorm on a means of multiple-land-use with acceptable levels of risk for the indigenous wildlife. This resulted in a protocol to deal with wild sheep in direct contact with domestics. Local conservation officers were advised of the bighorn and domestic sheep issue, and asked for input on the protocol. A reporting procedure is now in place and presentations at various wildlife conferences communicate the process to other jurisdictions. Educating groups and individuals is ongoing and integral to the success of the project.

Management implications

- GIS maps and bighorn sheep telemetry data should be updated regularly as they are valuable tools to monitor fluctuating borders of the high-risk interface areas between domestic and bighorn sheep.
- The most preferred mitigation option is a combination of buy-out and profit á prendre.
- Appropriate fences provide an immediate solution for those producers who wish to keep their flocks. But fences require maintenance and regular monitoring to ensure perimeters remain intact. A double fence combination of high-tensile "elk fence" perimeter with an inner domestic sheep page-wire fence is preferred.
- Legal zoning needs further investigation. Legislated restrictions must be sensitive to the needs of agriculture as well as the protection of bighorns.
- The Wild Sheep Stewardship Committee is a great forum for continued brain-storming, problem-solving, and stakeholder liaison. It also provides for ongoing education and outreach with stakeholders and the public.

Acknowledgements

Thanks are extended to Alan Dibb and Dave Gilbride for their input and for sharing the data from their research. The GIS maps were prepared in consultation with Pere Wallenius.

Literature cited

Adams, I., and D. Zehnder. 2002. Bighorn and domestic sheep in the East Kootenay: Minimizing the risks. Report for British Columbia Ministry of Water, Land, and Air Protection. Corvus Communications, Cranbrook, British Columbia, Canada.

Bureau of Land Management. 1992. Guidelines for managing domestic sheep in bighorn sheep habitats. Information Bulletin 92-212, Bureau of Land Management, Washington, DC.

General References

Davidson, P. W. 1994. East Kootenay bighorn sheep enhancement project: Completion report. Wildlife Branch report. British Columbia Ministry of Environment, Lands, and Parks, Victoria, British Columbia, Canada.

Demarchi, M. W., and D. A. Demarchi. 1994. Rocky Mountain bighorn sheep in the Kootenay Region: A habitat and population enhancement plan to 2004. Wildlife Branch report. British Columbia Ministry of Environment, Lands, and Parks, Victoria, British Columbia, Canada.

Foreyt, W. J., K. P. Snipes, and R. W. Kasten. 1994. Fatal pneumonia following inoculation of healthy bighorn sheep with *Pasteurella haemolytica* from healthy domestic sheep. Journal of Wildlife Diseases 30: 137-145.

Goodson, N. J. 1982. Effects of domestic sheep grazing on bighorn sheep populations: A review. Proceedings of the Biennial Symposium of the Northern Wild Sheep and Goat Council 3: 287-313.

Schommer, T., and M. Woolever. 2001. A process for finding management solutions to the incompatibility between domestic and bighorn sheep. USDA Forest Service.

Schwantje, H. M. 1988. Causes of bighorn sheep mortality and die offs: Literature review. Wildlife Branch Working Report No. WR-35. British Columbia Ministry of Environment, Lands, and Parks, Victoria, British Columbia, Canada.

Teske, I., and B. Forbes. 2002. East Kootenay Rocky Mountain bighorn sheep inventory: Winter 2001 and 2002. British Columbia Ministry of Water, Land, and Air Protection, Cranbrook, British Columbia, Canada.

Tremblay, M. 2001. Wildlife use and movement corridors in the Radium Hot Springs area, British Columbia. Prepared for Parks Canada for submission to British Columbia Agricultural Reserve Commission, Burnaby, British Columbia, Canada.