Alberta Conservation Association
2008/09 Project Summary Report

Project name: *Elk Habitat Planning Tool*

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Primary ACA staff on this project:

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Partnerships:

Alberta Outfitters Association
Alberta Professional Outfitters Society
Alberta Sustainable Resource Development
Foothills Model Forest Grizzly Bear Project
National Science Foundation (USA)
National Science and Engineering Research Council (CANADA)
Rocky Mountain Elk Foundation Canada
Shell Canada Limited
Sundre Forest Products
Talisman Energy
University of Alberta (Central East Slopes Wolf and Elk Study)
Weyerhaeuser Company

Key findings

- The elk habitat planning tool is a useful resource in predicting the effects of landscape change and habitat restoration for elk in the Central East Slopes.
- We recommend that future restoration efforts target areas with some source habitats (e.g., WMU 426-432) to increase the likelihood that elk will benefit from them.

Abstract

In collaboration with the University of Alberta and Alberta Sustainable Resource Development (ASRD), the Alberta Conservation Association (ACA) facilitated the development of a GIS habitat-disturbance planning tool that incorporated information from a 5 year wolf and elk radio telemetry study in the foothills of Alberta. The specific objectives of this project were to: (1) Develop a user-friendly GIS-based Elk Tool that can be used to evaluate the influence of proposed landscape treatments on elk occupancy and survival; (2) Test the Elk Tool by predicting the effect of prescribed burn treatments on elk habitat in the R11 Forest Management Unit (FMU); (3) Evaluate whether the models made by the Elk Tool could be extrapolated to

geographic areas outside of the original test area, but still within the Foothills Natural Region; and (4) Evaluate the efficacy of using remote trail cameras for detecting elk occupancy based on the Elk Tool predictions. We discuss the development and use of the GIS tool in landscape planning applications in west-central Alberta.

Introduction

Land use development and fire suppression have shaped wildlife habitat in the foothills of Alberta. Areas of high quality habitat that were historically maintained through lightning- and native-lit fire may now be in a state that does not support historic biodiversity and ungulate population levels. At the same time, industrial activities such as forest harvesting and oil and gas exploration have influenced habitat both positively, through creation of young forest, as well as negatively, through impacts on wildlife mortality, primarily along roads and linear clearings for seismic exploration.

The ACA has been working with the Central East Slopes Wolf and Elk Study (CESWES) and ASRD to provide the necessary tools for wildlife and habitat managers to evaluate alternative land use scenarios by their potential impacts on elk. Elk are a particularly useful species for assessing habitat changes because they have a high social and economic value, their habitat use patterns overlap those of other large mammals, including bighorn sheep, mule deer, and grizzly bears, and they respond both positively and negatively to landscape changes. The CESWES has produced statistically rigorous resource selection function (RSF) models that jointly account for the positive and negative responses of wild ungulates to land use changes. The occurrence and survival patterns of wildlife are predicted as a function of forage abundance, terrain conditions, and predation risk in addition to the proximity or density of human infrastructure.

The primary objective for the final year of this project was to determine the feasibility of expanding the elk planning tool outside the original study area extent. The expansion of the tool to other areas of the Foothills was dependent on the availability of similar GIS layers used to build the models. In addition, we worked with the ASRD Area Biologist to assess elk habitat in the Clearwater forest and identified areas in need of restoration.

Methods

The Foothills Research Institute Grizzly Bear Project has developed extensive landcover and other GIS layers that overlap the proposed expanded area and we hoped to use this information source to apply the models throughout the Foothills Natural Region. First we compared landcover differences and elk tool predictions between FRI and CESWES layers in the original study area extent. We generated 1,000 random points in the original study area extent and intersected the point layer with the FMF and CESWES landcover to compare general differences. Then we compared the Elk Tool predictions made with the FRI versus CESWES landcover input in the models at multiple spatial scales: (1) Point, (2) 9 km^2, and (3) 100 km^2.

Each time the elk tool runs, 8 maps are created: elk occurrence, wolf occurrence, elk mortality risk, and habitat states, for summer and winter. The habitat state maps are particularly valuable because they combine elk occurrence and mortality risk models to determine areas where elk are likely to occur but die (risky sink habitats) or areas where elk occur and survive (safe source habitats). We used the tool to generate elk habitat quality predictions in Wildlife Management Units (WMU) in the Clearwater forest to determine areas in need of potential restoration.

Results

In general, there was poor agreement between the original CESWES and FRI landcover maps. We found that some layers (e.g., cutblock, closed conifer, burn, and wet herbaceous) had good agreement (> 60%), while most layers didn't have high enough agreement for our purposes when comparing landcover categories. We also determined that the elk tool habitat state predictions differed for winter and summer seasons. A kappa statistic computes the degree of agreement between categories and ranges between 0 - 1 (1 = perfect agreement); in summer the kappa = 0.66, SE = 0.02 and in winter the kappa = 0.67, SE = 0.02.

The amount of high quality "safe" habitat predicted in the Clearwater forest was low. Under current landscape conditions, 1/3 of potential elk habitat in the study area was predicted to be sink habitat (Frair et al. 2007). More sink than source habitat was identified in winter when resources are most limiting and elk are constrained by terrain factors (Frair et al. 2007). The proportion of predicted source habitat in the Clearwater Wildlife Management Units was low and ranged between 1-13% (winter) and 6-30% (summer) (Table 1). Conversely, the proportion of predicted non-critical elk habitat varied between 36-99% (winter) and 7-73% (summer) (Table 1).

Table 1. Proportion of predicted source and sink elk habitat in the Clearwater forest Wildlife Management Units. The remainder amount is considered non-critical habitat. Note that the Elk Tool extent does not overlap all Clearwater WMU's.

		Winter (proportion)		**Summer** (proportion)	
WMU	**Area**(km2)	**Source**	**Sink**	**Source**	**Sink**
316	254.67	0.13	0.51	0.25	0.69
318	1153.72	0.07	0.35	0.13	0.30
324	1027.91	0.03	0.14	0.06	0.22
326	971.48	0.05	0.41	0.11	0.54
328	2870.48	0.07	0.48	0.18	0.59
412	0.56	0.00	0.07	0.06	0.40
414	440.00	0.06	0.28	0.18	0.67

416	287.54	0.05	0.15	0.13	0.46
417	397.30	0.09	0.31	0.15	0.38
418	356.19	0.07	0.07	0.24	0.23
420	1102.91	0.06	0.10	0.20	0.48
422	590.46	0.03	0.01	0.30	0.44
426	669.88	0.04	0.05	0.18	0.12
428	460.71	0.06	0.07	0.17	0.67
429	1023.27	0.05	0.36	0.14	0.65
430	807.39	0.05	0.18	0.16	0.24
432	833.67	0.01	0.00	0.19	0.10
434	1458.48	0.06	0.20	0.13	0.54
436	610.50	0.07	0.17	0.25	0.40
736	425.61	0.01	0.00	0.17	0.10
738	445.76	0.01	0.00	0.26	0.12

Conclusion

Landcover layers used to build the habitat models in the Clearwater forest were classified differently from the available layers in the expanded Foothills Natural Region. After attempting to translate the FRI Grizzly Bear Program landcover classes into those required by the elk models, we compared tool predictions at different spatial scales using the original and expanded landcover layers. We concluded that the FRI and CESWES landcover layers and the predictions made from them were statistically and biologically different and do not recommend expanding use of the Elk Tool beyond the original study area extent at this time.

However, the Elk Tool is a valuable resource for evaluating habitat quality, particularly in the Clearwater forest where elk habitat could be improved. The approach for identifying areas for potential habitat restoration could focus on areas that have a high proportion of sink habitat (e.g., WMU 324, 326 or 412) or improve areas that have moderate amounts of safe source habitat (e.g., WMU 426-432). The advantage of targeting areas with some good habitat is that elk would be more likely to occur and colonize new areas. Whereas improving sink areas may not necessarily mean that elk may benefit from them if elk do not occur in the area.

Future application of the Elk Tool includes collaboration with the ASRD Area Biologist to identify areas that might improve elk translocation success and provide general land use planning assistance. In addition, the Elk Tool will continue to be used in the ACA's Ungulate Winter

Range Restoration program, specifically in evaluating the potential effects of prescribed burn scenarios on ungulate habitat quality.

Communications

- Paper – Frair et al. 2009. *Modeling the cumulative effects of wolves and industrial activities on habitat effectiveness for elk in the Rocky Mountains of Alberta, Canada*, Journal of Wildlife Management (submitted for review).
- Presentation – Webb, S. W. and R. B. Anderson. 2009. *Predicting the habitat value for elk in the central east* slopes. Alberta Chapter of the Wildlife Society Conference, Edmonton, AB.
- Paper- Webb, S. W. and R. B. Anderson. 2009. *Predicting the habitat value for elk in the central east* slopes. ACA Technical Report available at: http://www.ab-conservation.com/go/default/index.cfm/publications/report-series/.

Literature cited

Frair, J., E.H. Merrill, and M.S. Boyce. 2007. Modeling the cumulative effects of wolves and industrial activities on habitat effectiveness for elk in the Rocky Mountains of Alberta, Canada. Final report submitted to the Alberta Conservation Association. 29 pp.

Elk at Ya Ha Tinda Ranch (Photo Credit: Maria Didkowsky)

One of the objectives of the Upper North Saskatchewan Prescribed Burn is to improve wildlife habitat conditions for species such as elk. (Photo credit: Maria Sharpe)

A view from Highway 11of the preliminary burning for the Upper North Saskatchewan Unit 1 Prescribed Burn, just east of the North Saskatchewan Crossing in Banff National Park. (Photo Credit: Maria Sharpe)