

Managing for the Ecological and Socioeconomic Effects of Climate Change on BC Rangelands



Ministry of
Forests and Range



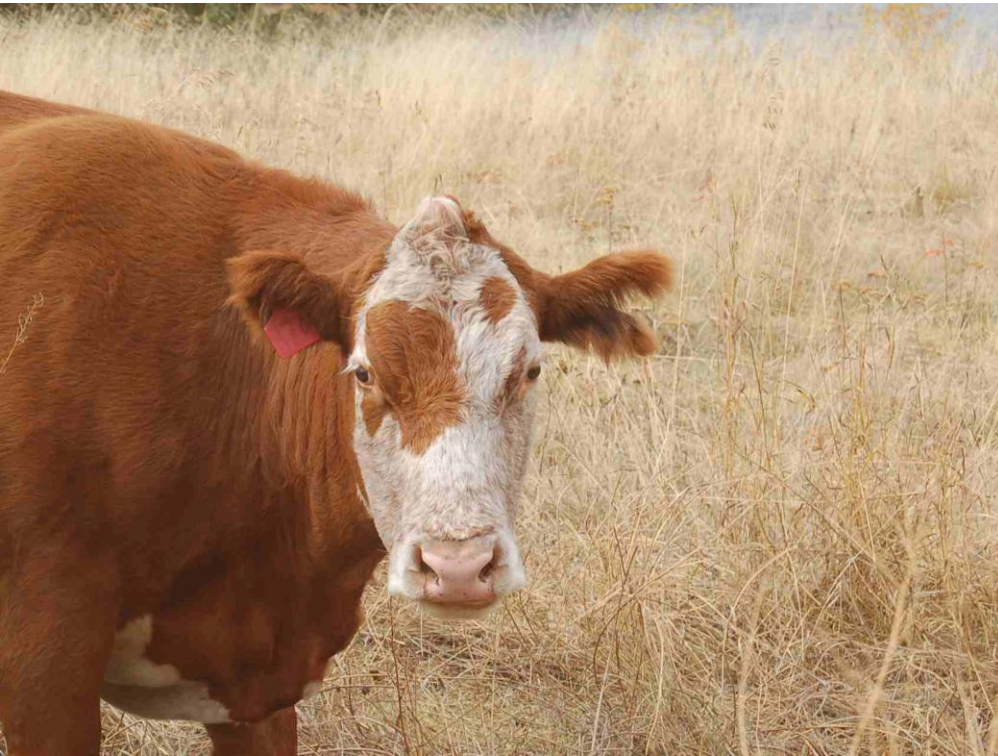
Lauch Fraser



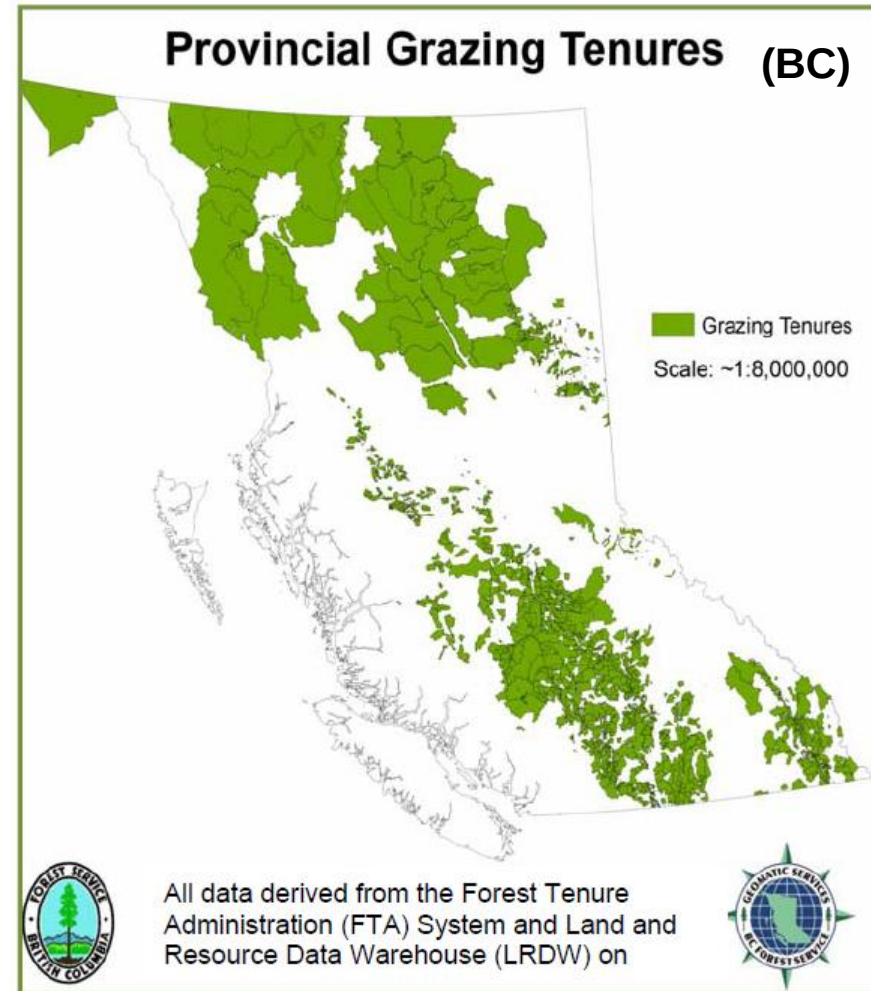
THOMPSON RIVERS
UNIVERSITY
KAMLOOPS, BC

Future Forest Ecosystems Scientific Council

Grazing



**Rangelands in BC
occupy about 58
million ha on a 95
million ha land base**

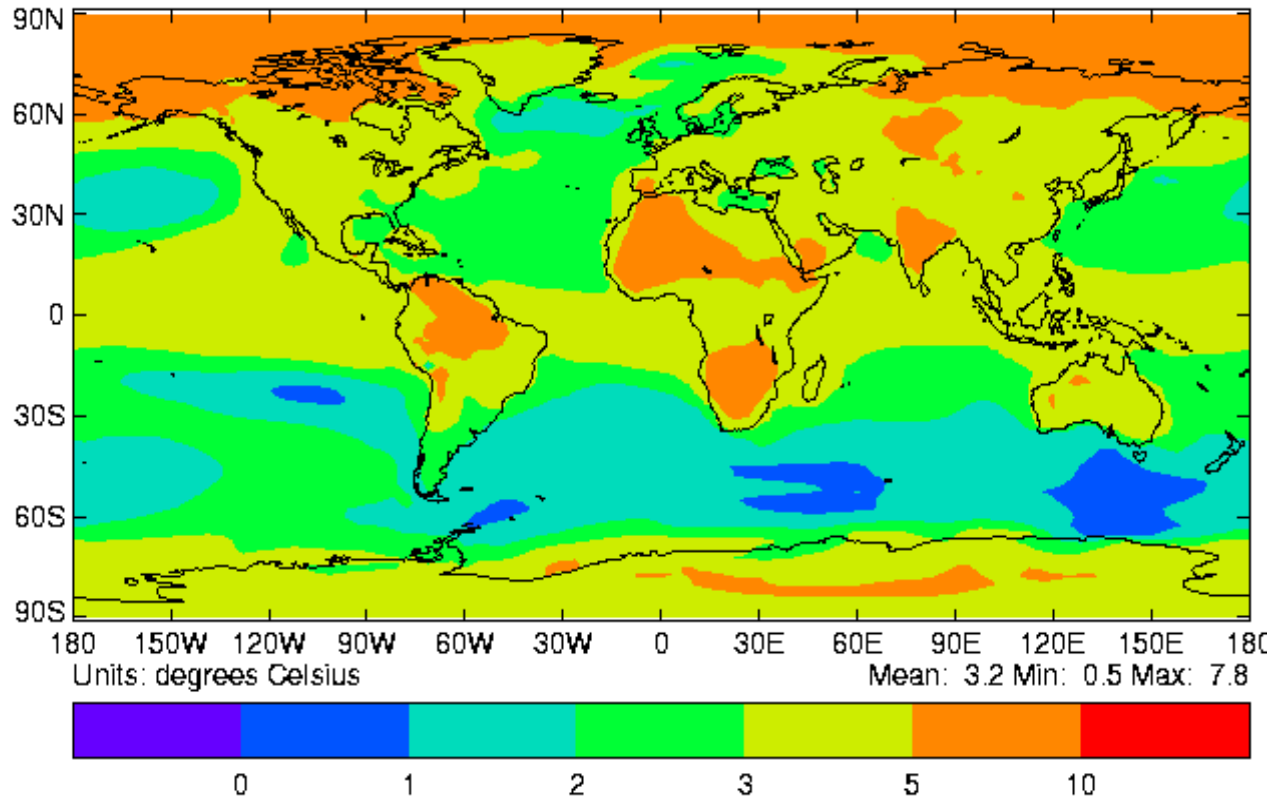


Threats to grasslands



Climate change

Change in annual average surface air temperature
from 1960–1990 to 2070–2100 from HadCM2 IS92a



Increased
Temperature

Increased
drought

Altered
precipitation

Primary Objectives:

- 1) Quantify grassland ecological goods and services.**
- 2) Identify existing or new financial tools based on economic modeling that may be viable to support sustainable agriculture and grasslands conservation in BC.**
- 3) Forge policy recommendations for government that will support a viable and ecologically sustainable ranching industry in BC.**

- 10 Teams**
- 39 Participants**

The background image is a landscape photograph showing rolling green hills. In the foreground, there is a wire fence with wooden posts. The hills are covered in green grass and some shrubs. In the distance, there are more hills and some trees, all under a hazy, light-colored sky. The text is overlaid on the upper right portion of the image.

Range Team
Survey Team
5 Ecology Teams
Natural Capital Team
Planning Team
Extension Team

Range Team

Doug Fraser, Rick Tucker, Harry Jennings, Ray Coupe

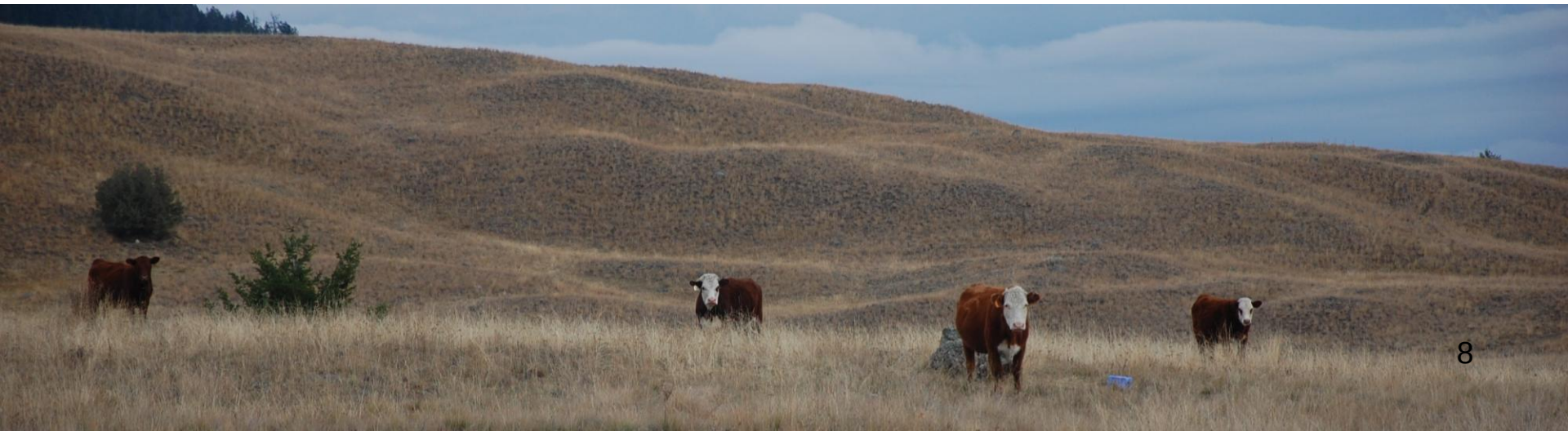
- **Range expertise**



Survey Team

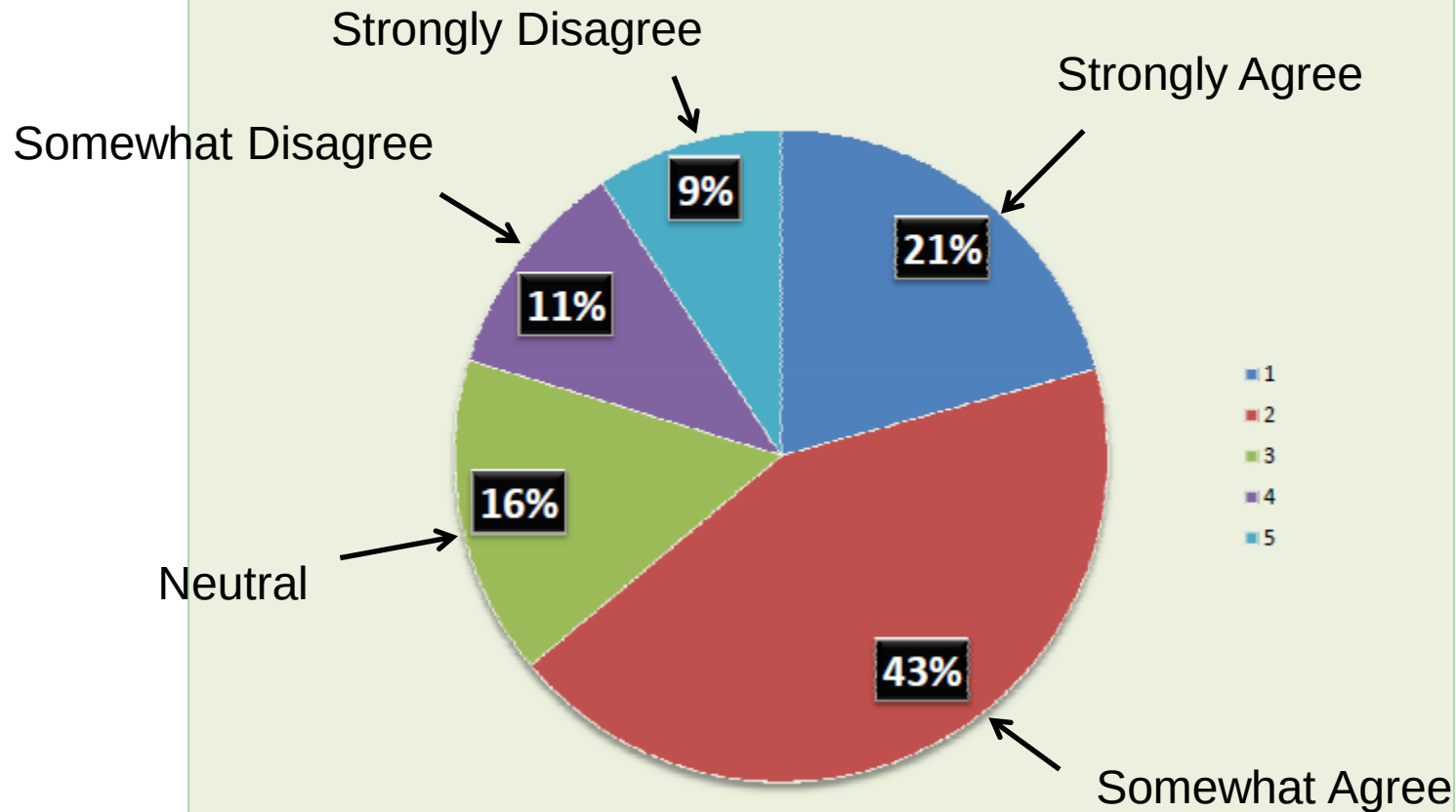
Lauch Fraser, Robert Androkovich, Sadie Cox

- **Stakeholder survey to assess BC cattle producers perception of climate change and its impact on the ranching industry**



Preliminary results

Please select the extent to which you agree with the following statement: Human activities are increasing the rate at which global climate changes occur. *With 1 being strongly agree and 5 strongly disagree.*
n = 227



Canadians more likely than Americans to believe in global warming: Survey

By Keith Bonnell, Postmedia News February 23, 2011

The dividing line in the climate-change debate could well be the 49th parallel, according to a new survey that suggests there are major differences in attitudes between Canadians and Americans when it comes to global warming.

The survey, released Wednesday, found that **80 PER CENT OF CANADIANS POLLED SAID THEY BELIEVE THERE IS SOLID EVIDENCE OF GLOBAL WARMING, COMPARED TO 58 PER CENT OF AMERICANS.**

Touted as the first survey to explicitly compare public opinions in Canada versus the United States, the results also contain some potentially significant results for political leaders, suggesting Canadians are willing to pay extra for renewable energy.

The survey suggests that **56 PER CENT OF CANADIANS ARE WILLING TO PAY \$50 A MONTH IN A CARBON TAX VERSUS 15 PER CENT OF AMERICANS.**

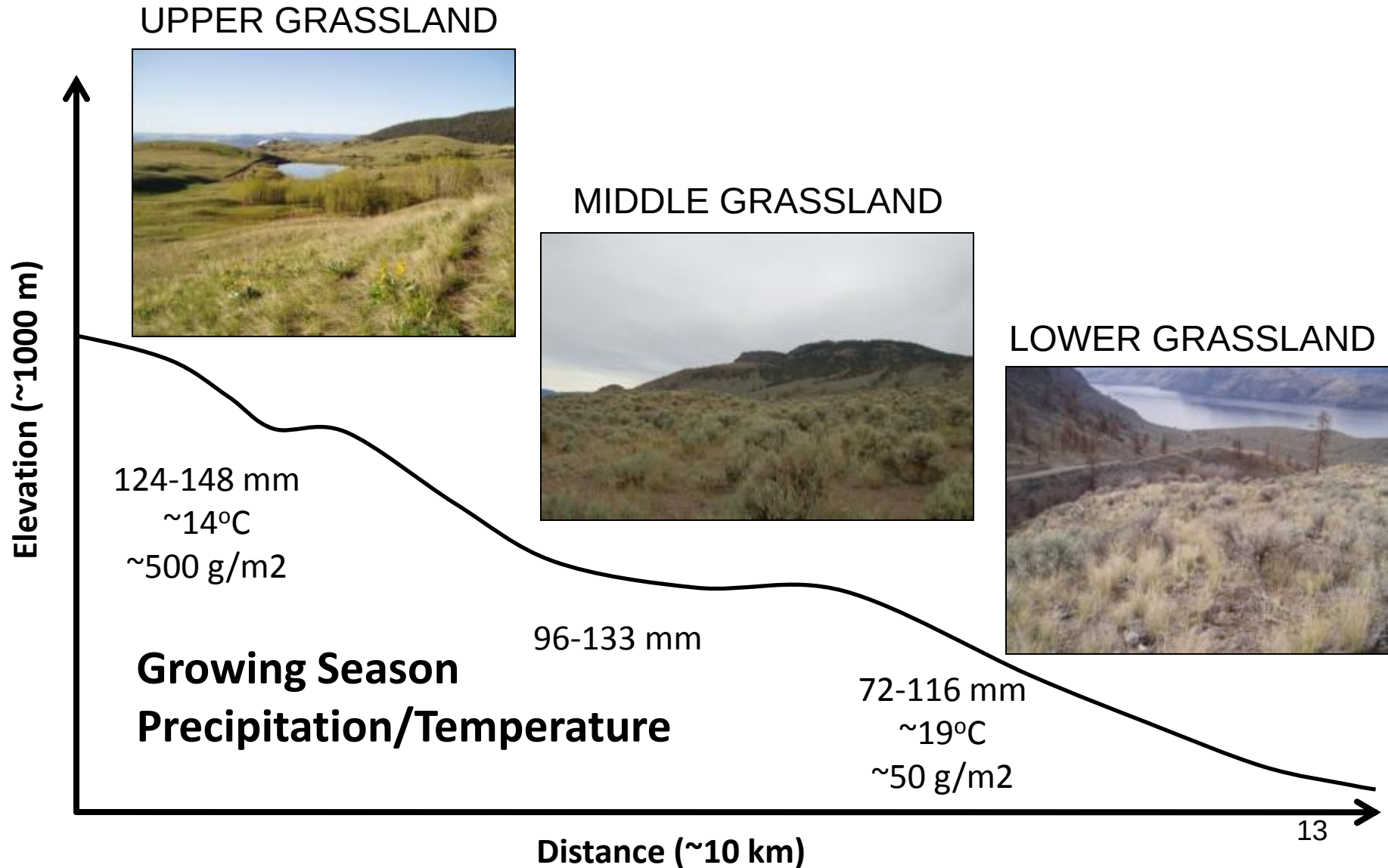
Please identify what types of incentives you would consider in exchange for sustainably managing private rangelands you use. *Rank the options listed below in the order of most important to least important with 1 being least important.*

	1 (least)	2	3	4	5 (most)
Carbon offsets for grazing management	37%	19%	15%	13%	16%
Water management	12%	15%	26%	14%	32%
Grants	15%	19%	23%	19%	25%
Tax incentive program	9%	11%	15%	21%	39%
Rangeland health monitoring program	35%	22%	20%	14%	10%

5 Ecology Teams



Lac du Bois Grasslands (Environmental Gradient)



Ecology Team One

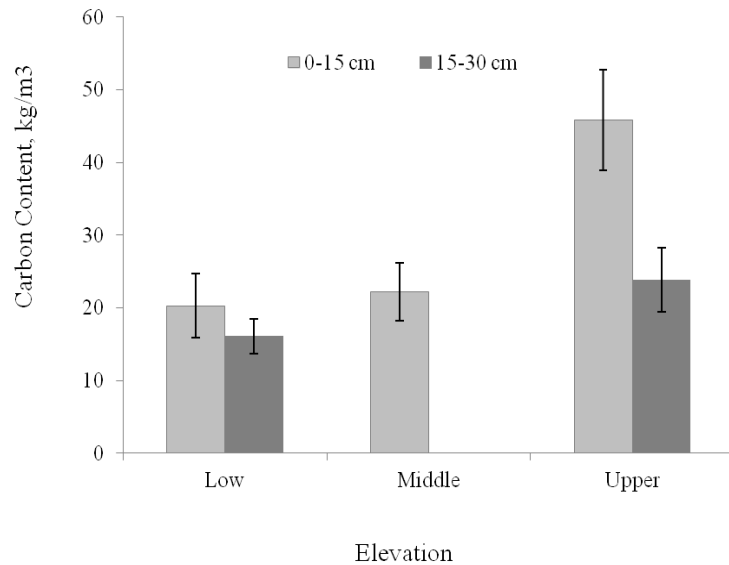
Lauch Fraser/Justine McCulloch/Anna Sapozhnikova/Don Thompson

- **Experimental Precipitation Effects on Grasslands**

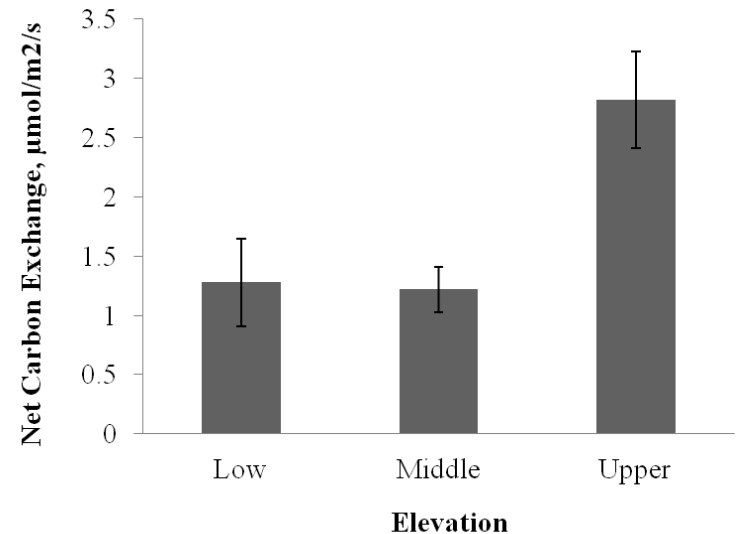


Preliminary Results

Soil Carbon Content by Grassland Type and at two different soil depths



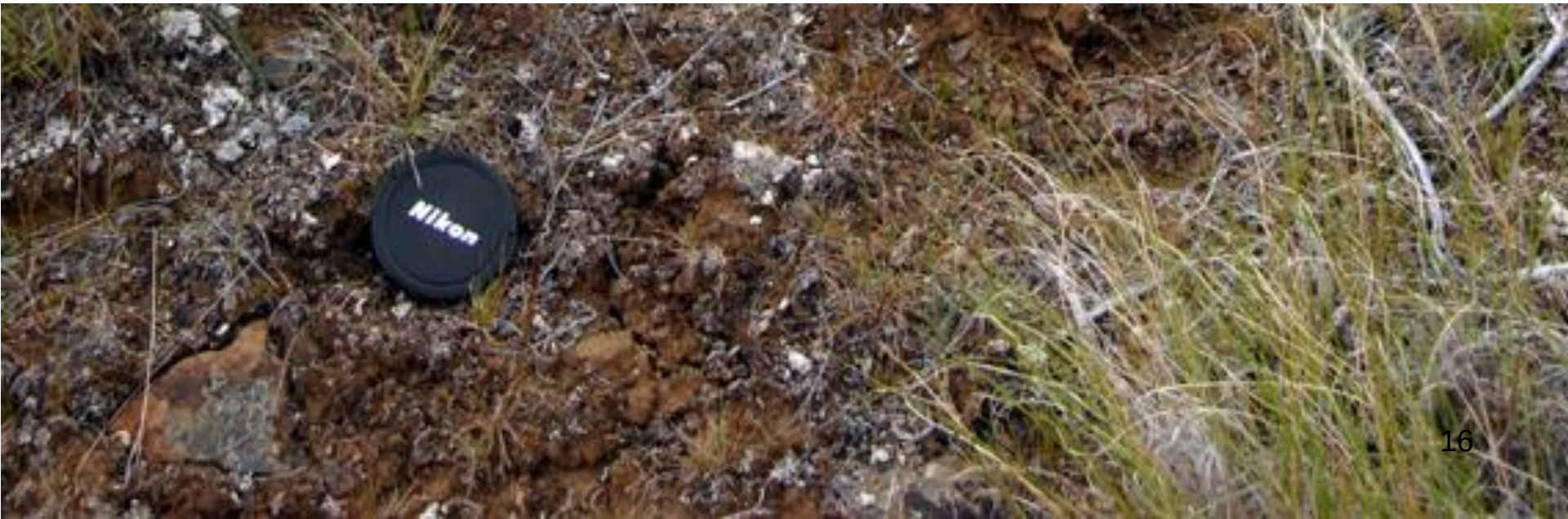
Net Carbon Exchange by Grassland Type

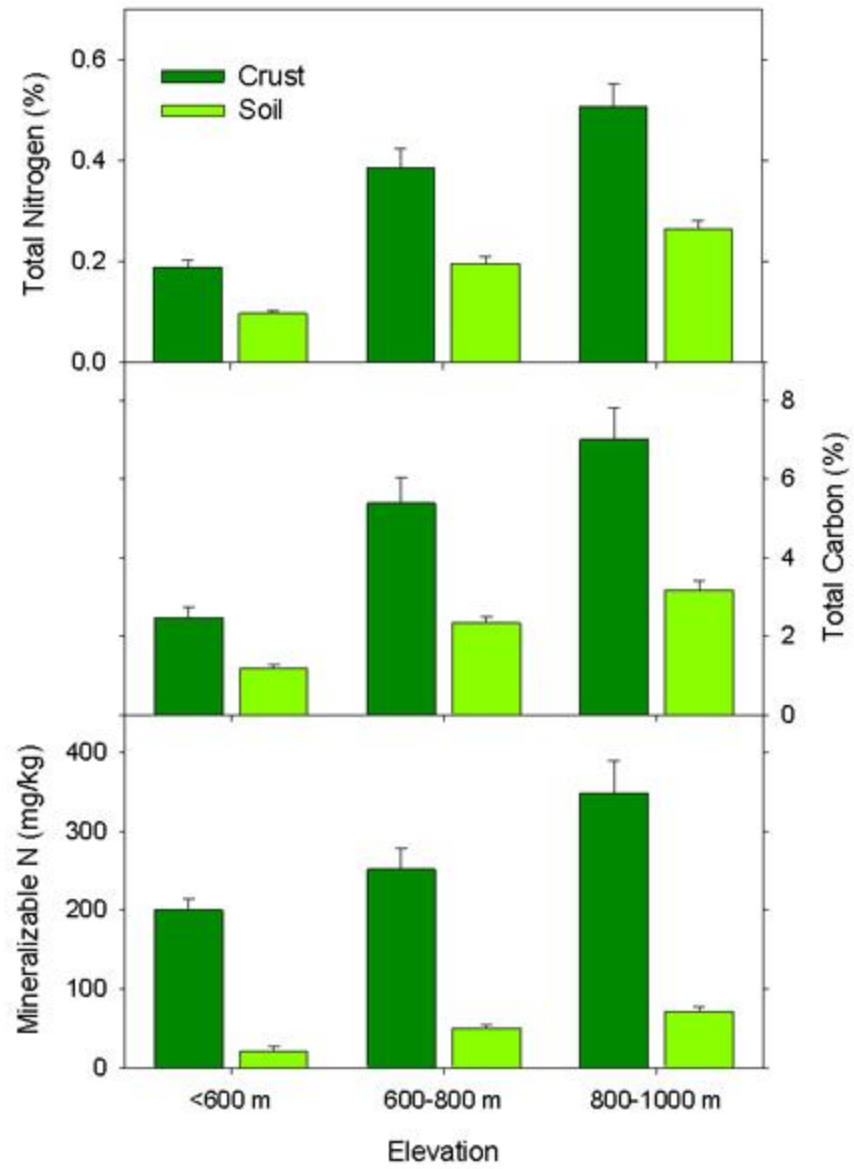


Ecology Team Two

Darwyn Coxson, Paul Sandborn, Kasia Caputa

- **Biological Soil Crusts & Nutrient Cycling in Grassland Soils**





Highlights

- The biological soil crust layer had consistently higher levels of carbon and nitrogen than the immediately underlying soil, particularly mineralizable nitrogen, which is the form most readily available to plants.
- The amount of nitrogen and carbon in the soil crust increased with elevation, possibly due to increased moisture availability.

Ecology Team Three

Gary Bradfield, Maja Krzic, Robbie Lee

- **Grassland Plant Communities Defined by Abiotic Relationships**



Highlights

- The relationship of plant communities and soil properties is highly dependent on slope and aspect.
- The invasive plant species observed in this study with the highest potential to persist under conditions of future change are Kentucky bluegrass, yellow salsify, and cheatgrass.

Ecology Team Four

Karl Larsen, John Surgenor, Jessica Gosling

- **Thermal Habitat use by Northern Pacific Rattlesnakes: a GIS Mapping Approach**

21



Highlights

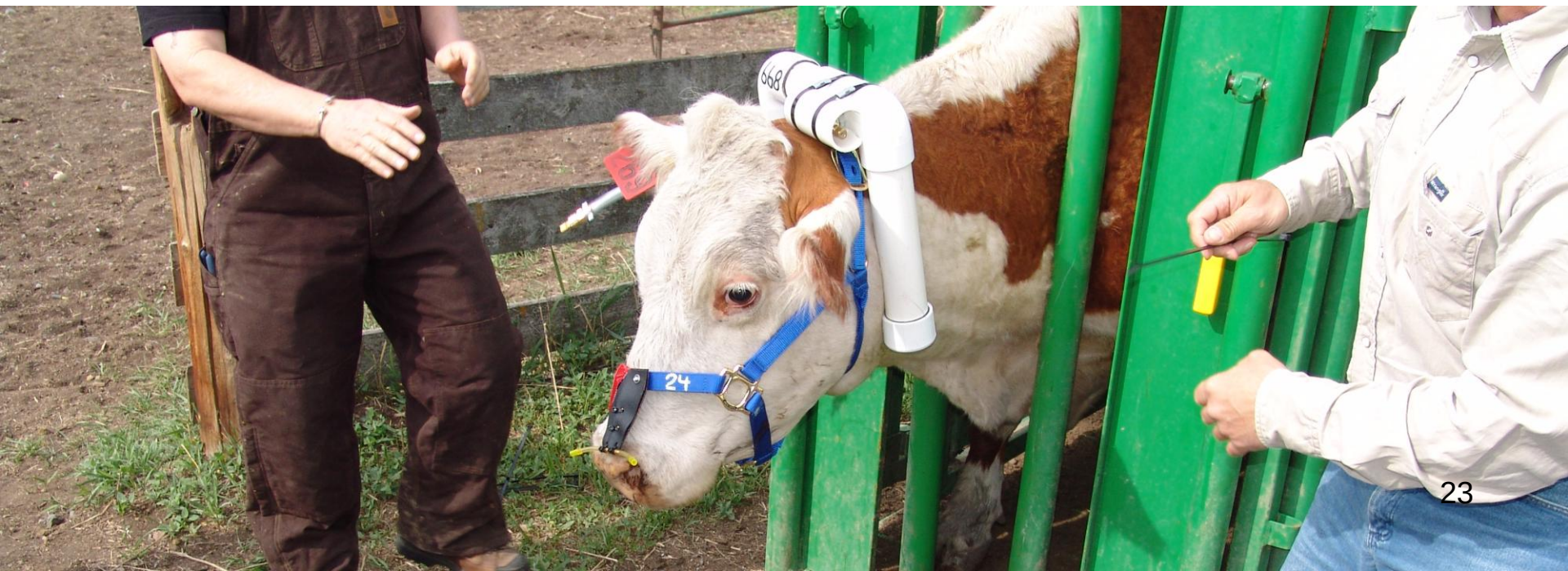
- Movements for most individual animals are directional.
- The majority of snakes are using habitats that provide a thermal advantage (as predicted by the solar radiation model).
- Behavioural patterns of habitat use and thermoregulation differ between the major regions of the rattlesnakes' range in BC.



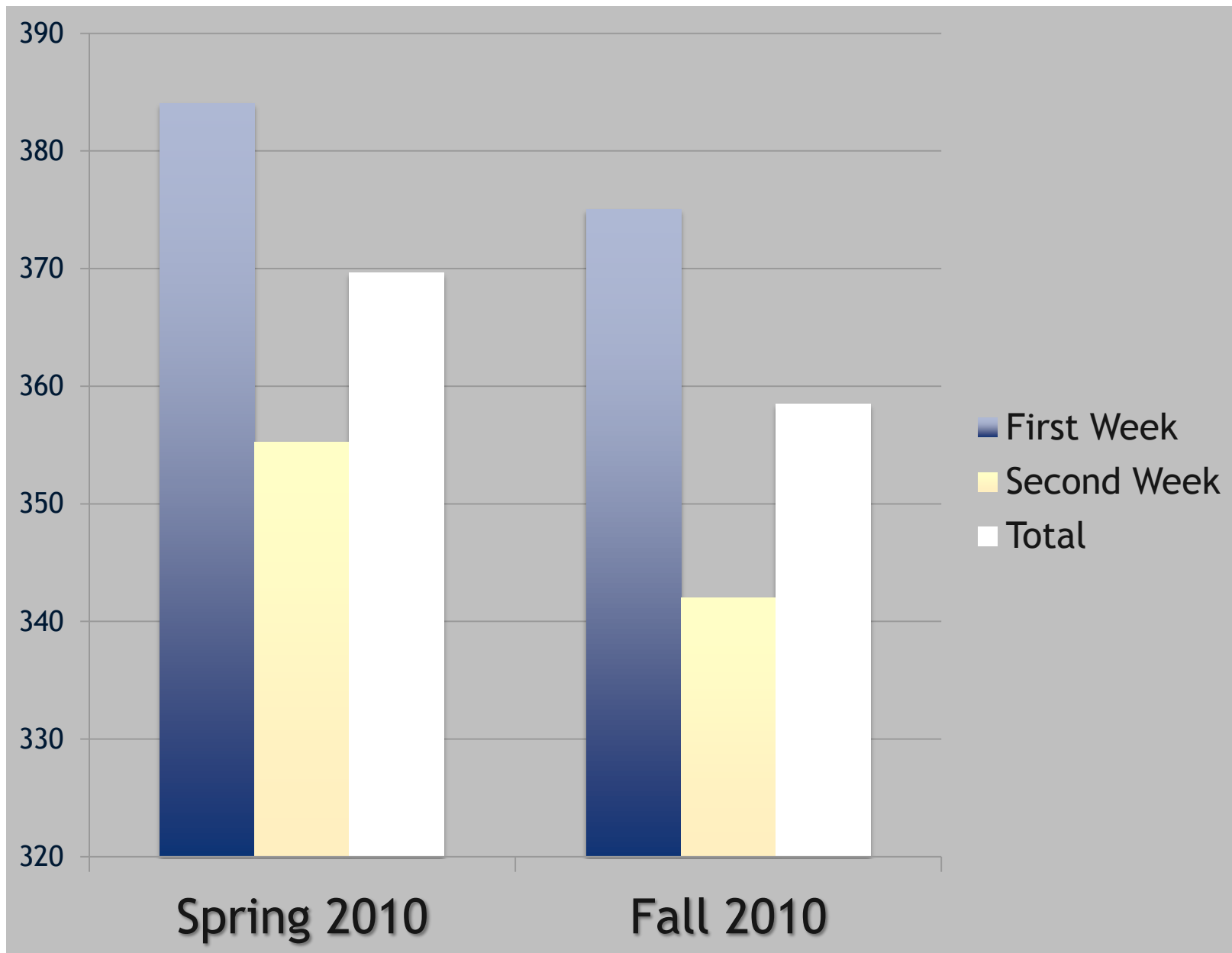
Ecology Team Five

John Church, Doug Veira, Peter Tsigaris, George Penfold, Jon van Hamme, Alan Iwaasa, Allan Raymond

- **Methane collection and life cycle analysis of grassland reared cattle in the Interior of British Columbia**



Average enteric methane produced per cow



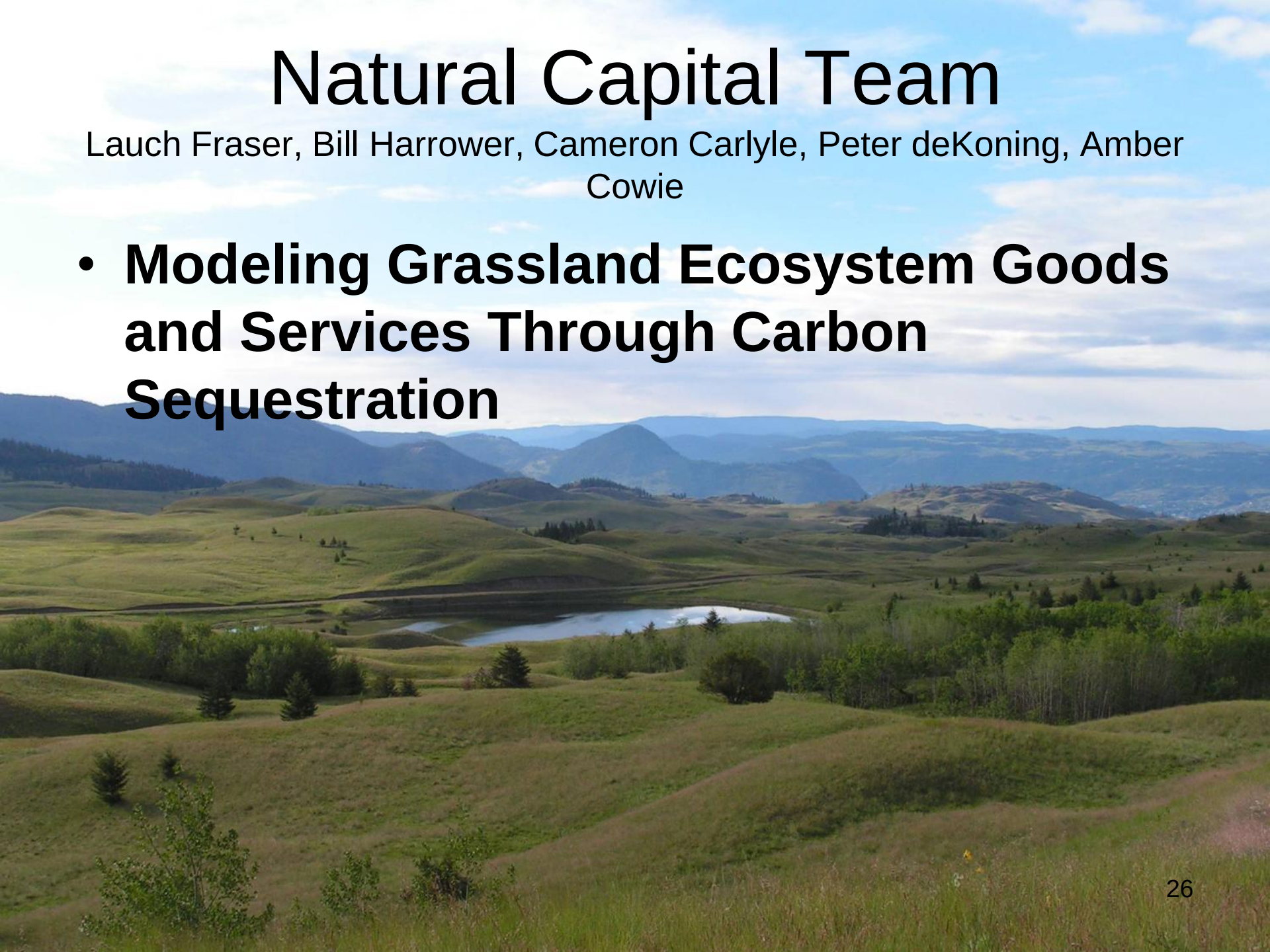
Highlights:

- The key outcome from this research was to provide the ranching community with insight with respect to their carbon footprint; to pinpoint the sources of greenhouse gas emissions from their operations, and to provide the information enabling them to effectively add value to their products by marketing and branding them as healthy, environmentally-friendly alternatives.
- Beef cattle produce greenhouse gas emissions, especially from the enteric methane produced by the mature beef cows as measured empirically in this study; however, modelling work has demonstrated that the grasslands of the central interior have potential to offset those emissions through carbon sequestration.

Natural Capital Team

Lauch Fraser, Bill Harrower, Cameron Carlyle, Peter deKoning, Amber Cowie

- **Modeling Grassland Ecosystem Goods and Services Through Carbon Sequestration**



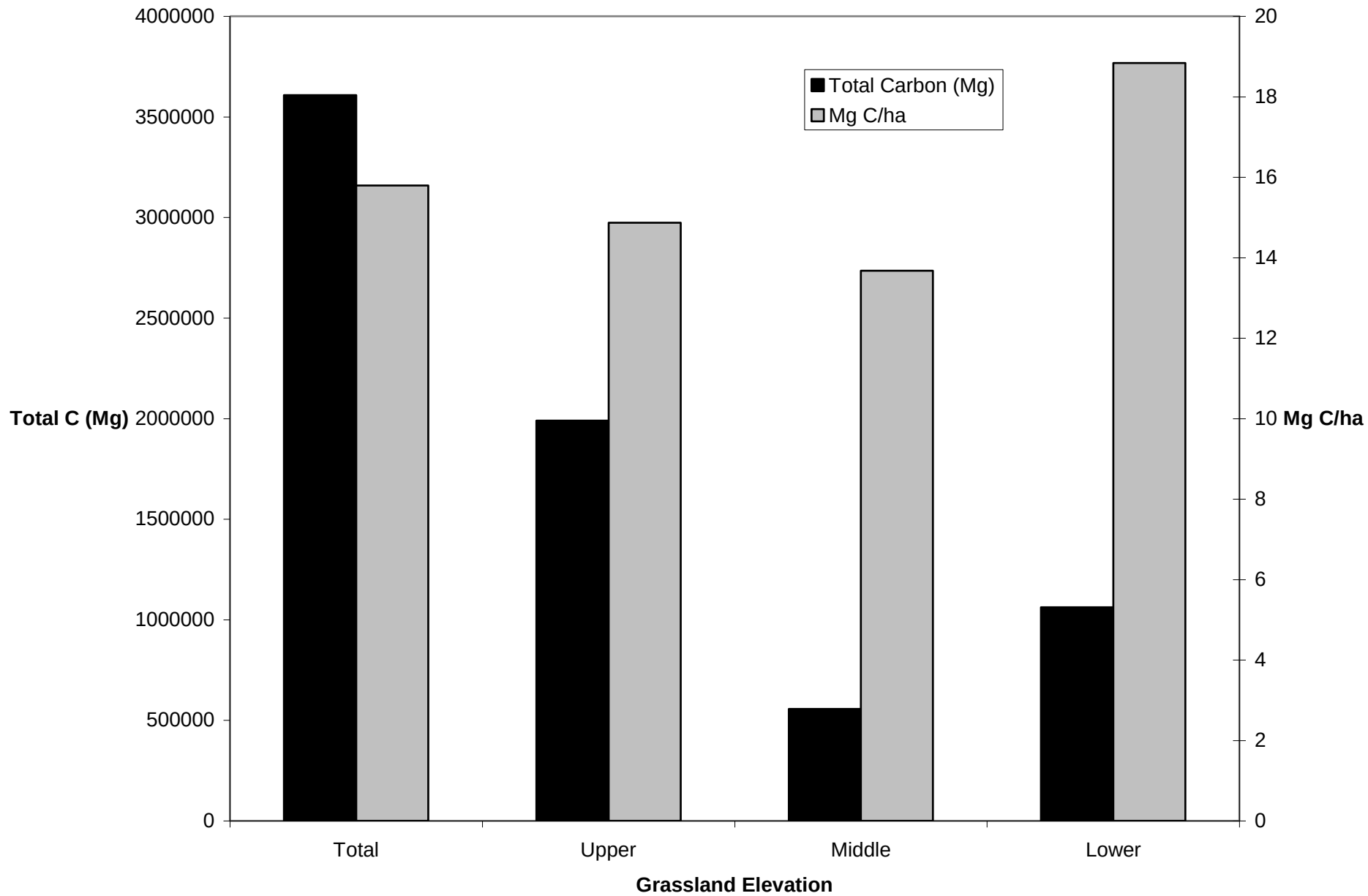


Table 1. Monetary value of Thompson-Nicola carbon stores if a 5% increase in sequestration occurred with a change in grazing management.

Grassland Type	Total Carbon (million \$)	Carbon/ha (\$)
Upper Grasslands	1.1 - 8.3	7.64 – 60.12
Middle Grasslands	0.4 - 3.2	9.65 – 75.92
Lower Grassland	0.6 - 4.5	10.22 – 80.35
Total Value	2.0 - 16.1	9.17 – 72.13

<p>Key Research Needs</p>	<p>We cannot manage grassland for carbon without data, the following data are required in order of decreasing importance:</p> <ol style="list-style-type: none"> 1) What is the size of different carbon pools in different grassland types across the province? 2) How do different grassland types sequester carbon under different grazing intensities, and less importantly different seasonal grazing regimes? 3) What is the extent of nitrous oxide emissions from cattle on pasture and winter feed operations, and how much methane do cows produce on different types and conditions of pasture? 4) How do different timing and intensity of rain and differing moisture regimes from changes in snowmelt impact site productivity and carbon sequestration grazed pasture. <p>Points 1-3 above will likely be required in the development of offset verification and validation protocols.</p>
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Planning Team

Reg Newman, Rick Tucker, Russ Walton, Brian Wallace

- **Planning for Climate Change in Range Management**



Key strategies developed:

- Maintain an aggressive weed control program against high priority weeds especially in areas projected to have significant losses of perennial herbaceous plant species.
- Start the process of reducing AUM allocation for pastures where declines in forage supply due to climate change can be verified.
- Start the process of increasing AUM allocation for pastures where increases in forage supply due to climate change can be verified.
- Develop a monitoring program with the objective of detecting forage supply changes resulting from climate change.
- Adopt livestock management regulations and practices that can deal with low or highly variable forage supply.

Extension Team

Lavona Liggins, Lisa Zabek, Wendy Gardner, Sadie Cox, Lauch Fraser

- **Extension and Outreach**
- **<http://climatechangeandbcrange.net/>**



A landscape photograph showing a grassy hillside under a cloudy sky. Four cows are visible in the field. The word "QUESTIONS?" is overlaid in large, bold, black capital letters in the lower center of the image.

QUESTIONS?