

# *Ecological Resilience and Bighorn Sheep Workshop*

## *Demography*

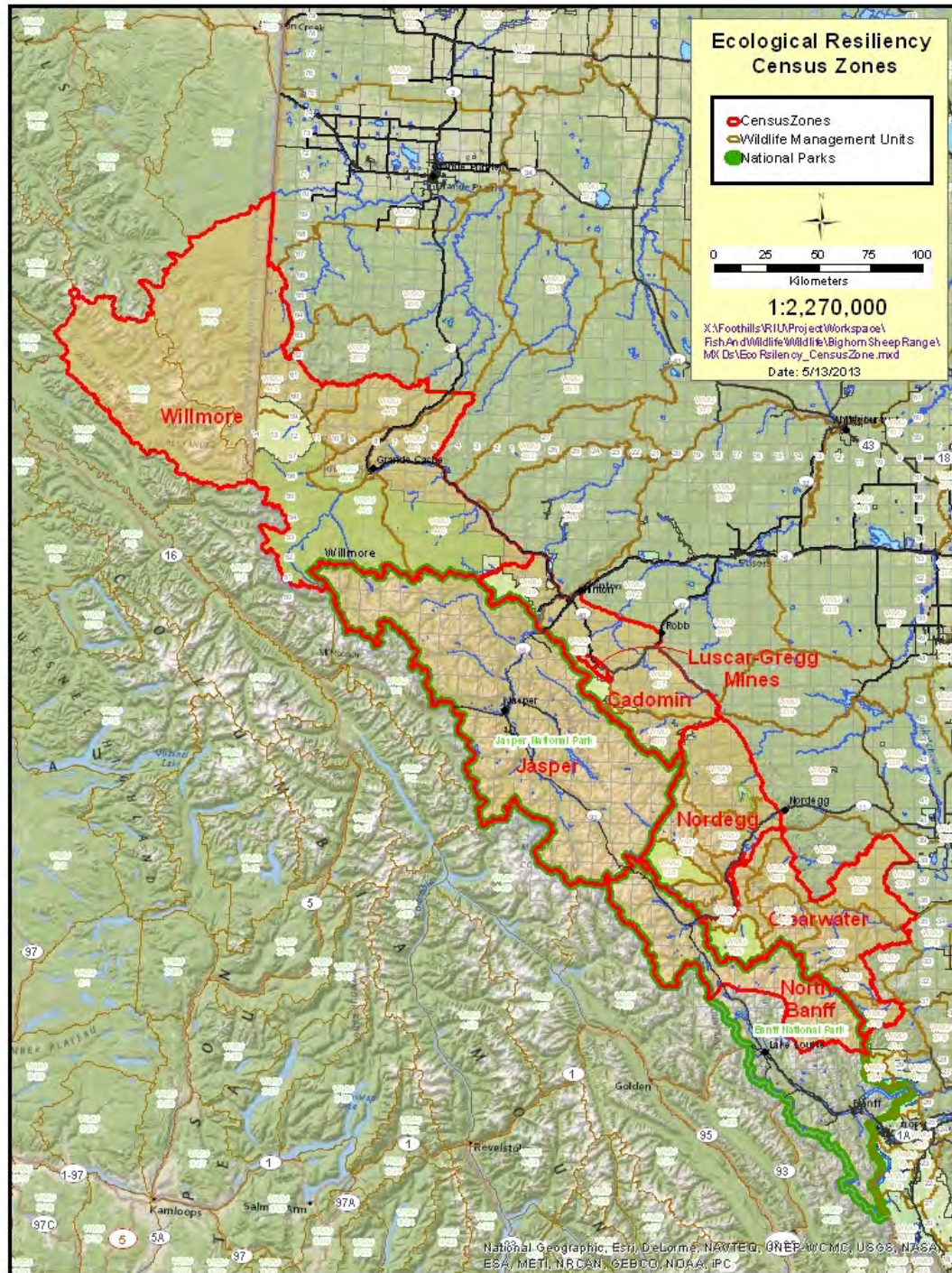


Jeff Kneteman and David Hik, Biological Sciences,  
University of Alberta, January 12, 2015





# Study Area



## Census Zones

Willmore

Cadomin

Luscar-Gregg River Mines (L&GR)

Jasper

Nordegg

Clearwater

*North Banff not classified to sex/age*

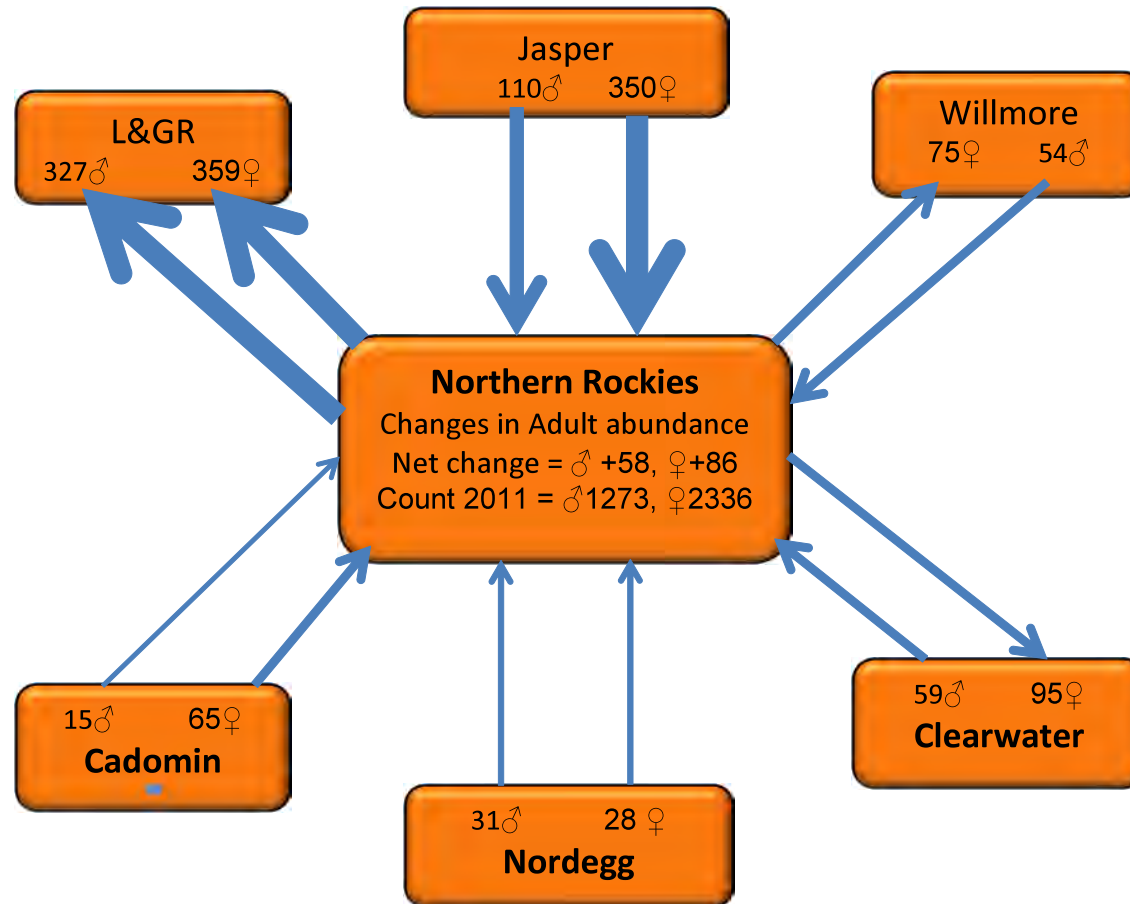
## WMUs

438 – in Cadomin

437 – in Cadomin

## Change in Abundance of Bighorn Sheep among Six Census Zones in the Northern Rockies From 1980 Census to 2011 Census

Arrow direction: inward flowing and outward flowing arrows respectively indicate net increase and decrease in abundance for that sex in that census zone and contribution to the net abundance change for that sex in the Northern Rockies

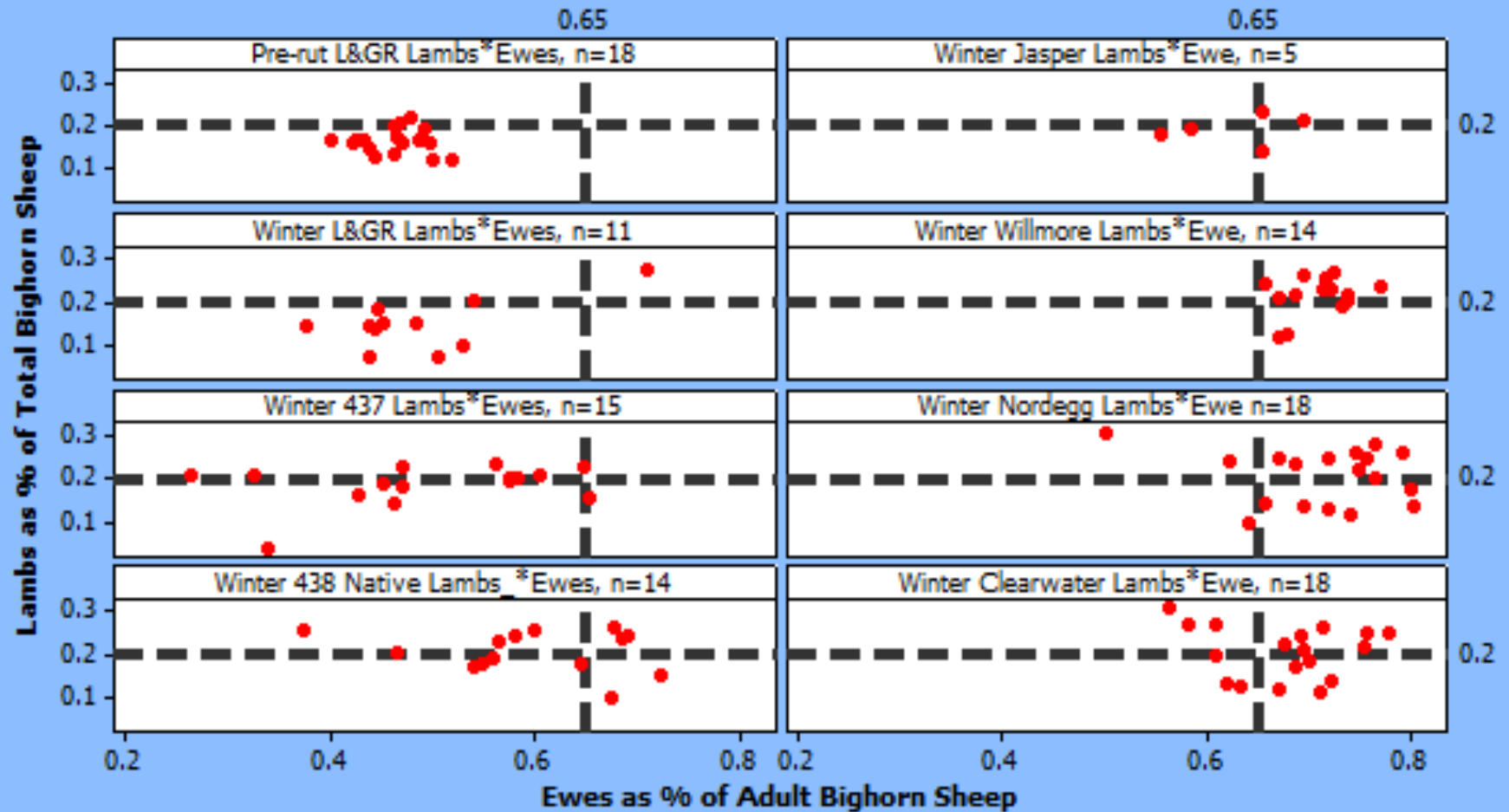


# Potential and Realized Productivity of Bighorn Sheep in the Northern Rockies

7 census zones by geographic, social, and administrative attributes 1972-2012, ( Jasper 1967-2012)

Ewes as % of adult bighorn sheep one-way ANOVA:  $F_{7,105} = 28.1$ ,  $R.sq. = 65.2\%$ ,  $p < 0.01$

Lambs as % of total bighorn sheep one-way ANOVA:  $F_{7,105} = 2.73$ ,  $R.sq. = 15.4\%$ ,  $p = 0.012$



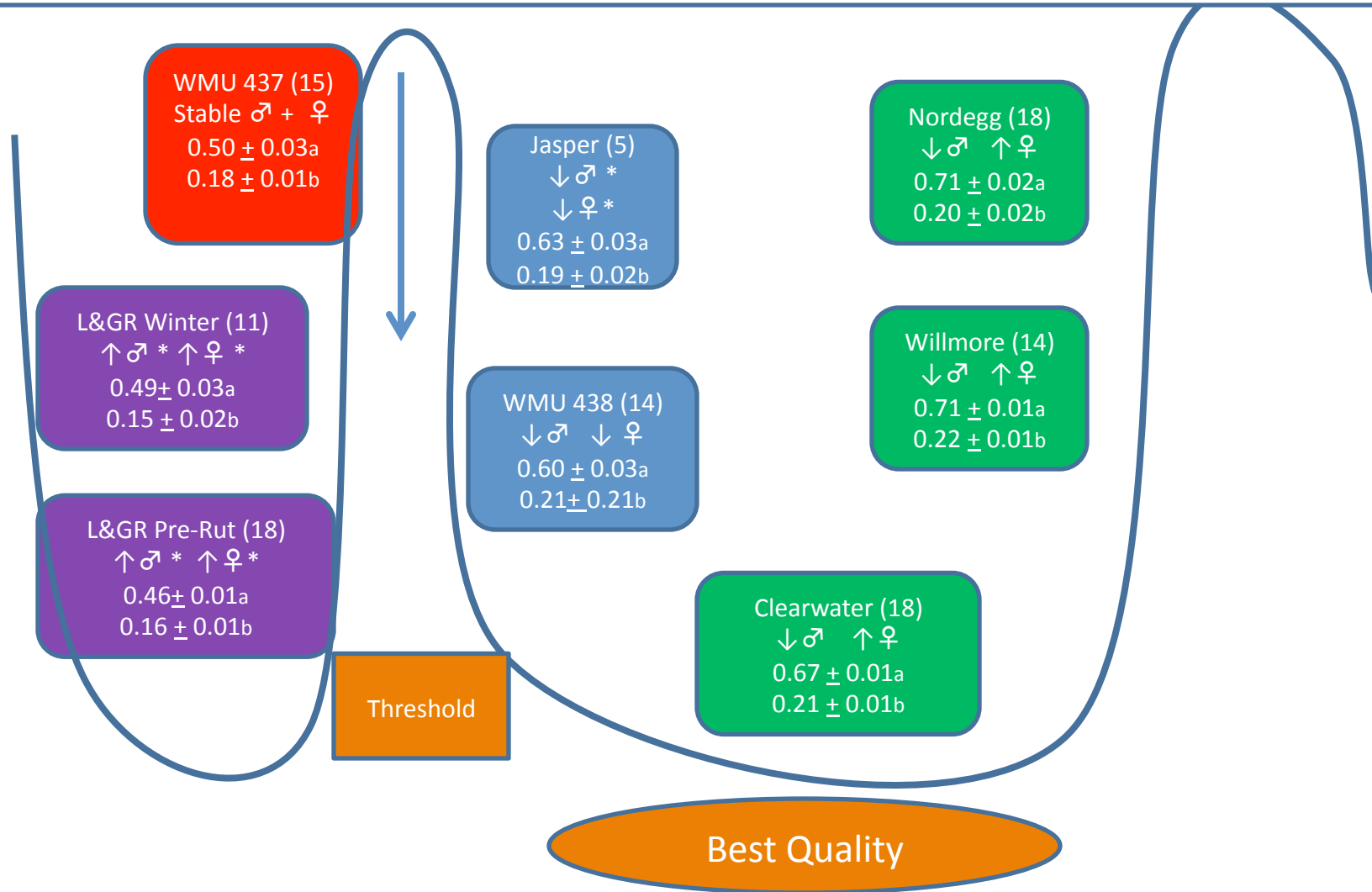
# Hypothesis for Population States and Potential Resilience of Bighorn Sheep

## Census Zones in the Northern Rockies 1972-2012 (mean $\pm$ SE)

a = females as % of adults: ANOVA – F=28.1, R sq. = 65.2%, p=0.00

b = lambs as % of total sheep: ANOVA – F=2.73, R sq. 15.4%, p =0.00

- = significant change in abundance; (n) = # of surveys years; Total ♂ = 1273, Total ♀ = 2336 in 2011; stable abundance 1980-2011; stable 0.35 ♂ 0.65 ♀ 1980- 2011







## *Summary*

As a whole, the Northern Rockies population abundance and composition appears to be stable.

At the census zone scale, population abundance and composition are variable.

Jasper and Banff need to be included as population units to understand sheep population dynamics and ecology.

The biological population units are not defined ( $\neq$  census).

The distribution from native range to novel (disturbed, synthetic) range appears to be disruptive and influence resilience.

This disturbance appears to represent a 'shock' to the larger study area that is reflected in movements away from native range.