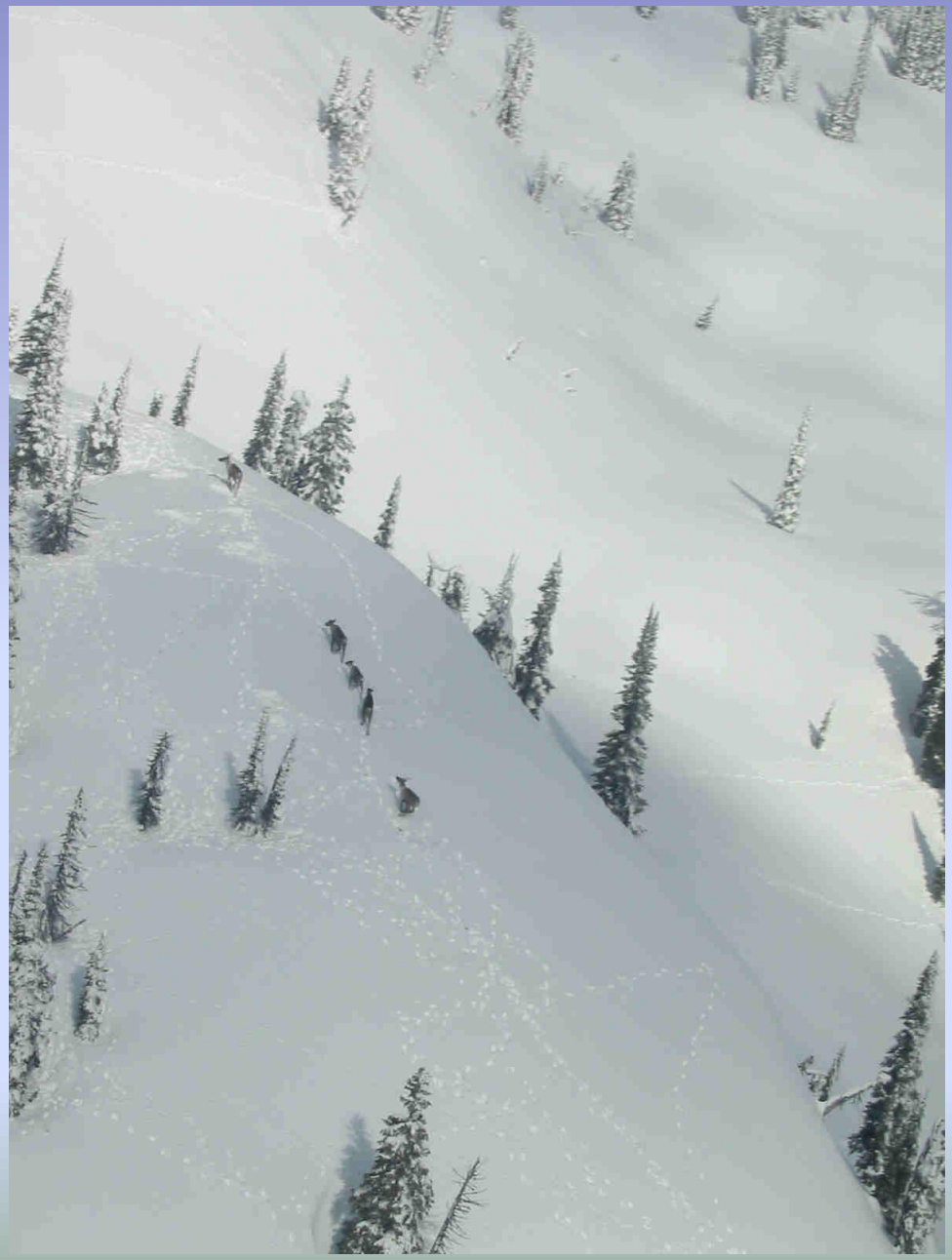
WOODLAND CARIBOU

SUMMARY OF AVAILABLE SCIENTIFIC DATA

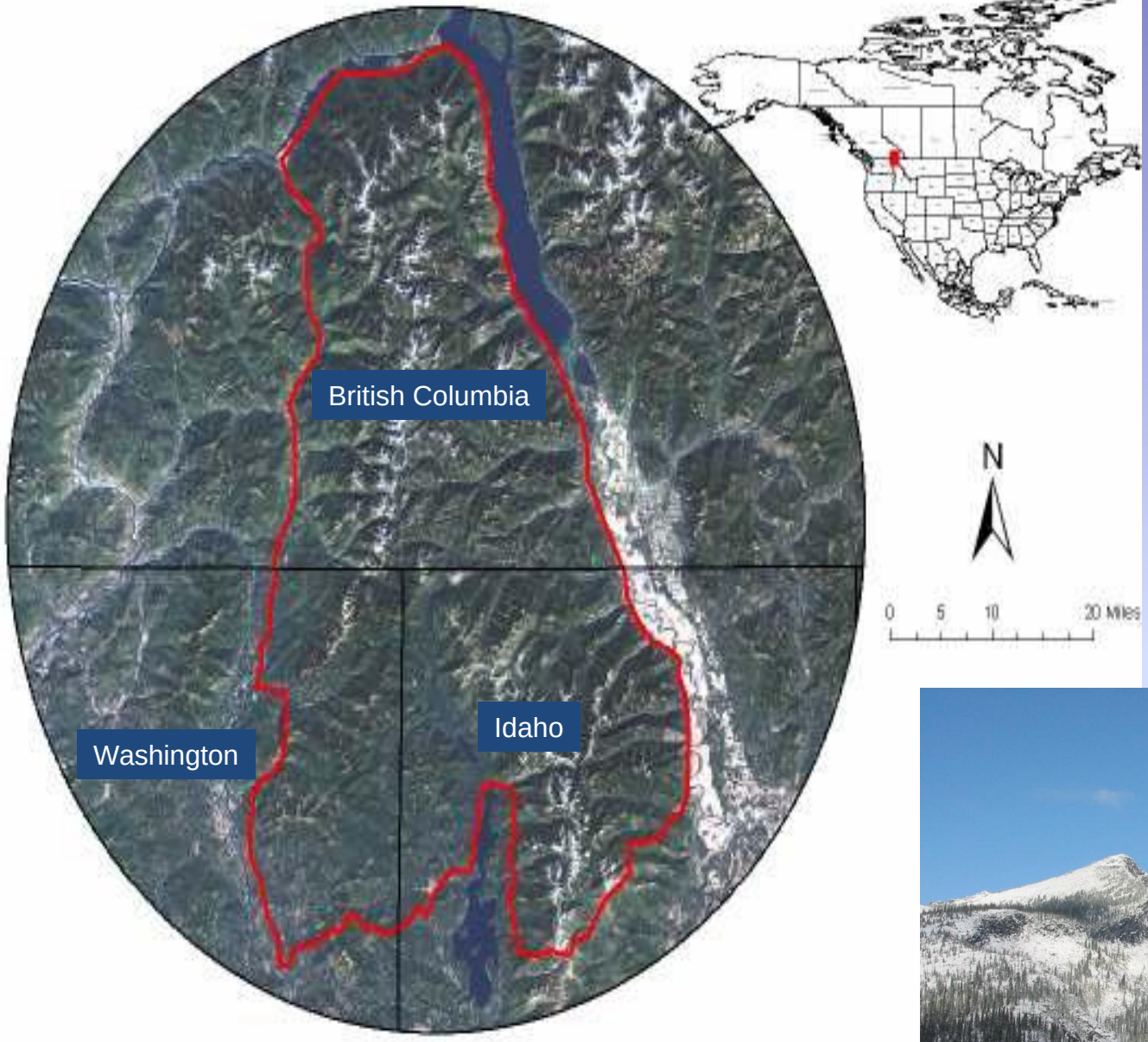


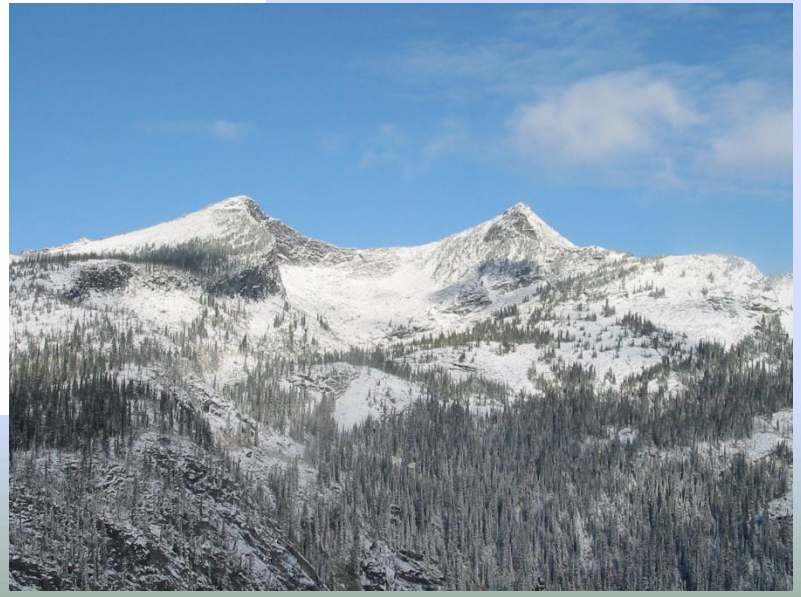
Critical Habitat Definition

i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection; and

ii) specific areas outside the geographical area occupied by the species at the time it is listed.... that such areas are essential for the conservation of the species.

STUDY AREA





BACK GROUND

Barren-Ground vs Woodland Caribou

BARREN-GROUND	WOODLAND
• Very large herd (10,000+)	• Small groups (1-25)
• Long distance migration	• Elevational migration
• Eat terrestrial lichen	• Eat arboreal lichen

TRANSPLANT SUMMARY

Year	Number	Release Site
1987	24	Ball Ck, ID
1988	24	Ball Ck, ID
1990	12	Ball Ck, ID
1996	19	Gypsy Mdws, WA
1997	13	Sullivan Ck, WA
1998	11	Kootenay Pass, BC

IMPORTANT SCIENTIFIC DATA THAT IS AVAILABLE

- Resident caribou telemetry
  Scott and Servheen 1985
- Habitat assessment
  Kinley and Apps 2008
- Home range and Movement analysis
  Wakkinen and Slone 2010
- Winter census results: 1983-1985 and 1991-2012

Caribou Habitat Modeling for the South Selkirk Ecosystem Including Habitat Assessments for the Priest Lake Endowment Lands

21 November 2007

Prepared for:
Idaho Department of Lands
Boise, Idaho

Trevor A. Kinley, R.P.Bio.* and Clayton D. Apps, R.P.Bio.

CARIBOU TELEMETRY DATABASE

- March 1987 – April 2004
- 8,564 locations
- Eliminated locations w/in 1 month of release
- 8,166 useable locations from 72 individuals
- *Strength of the database is the long-term monitoring, not in the number of locations per individual*

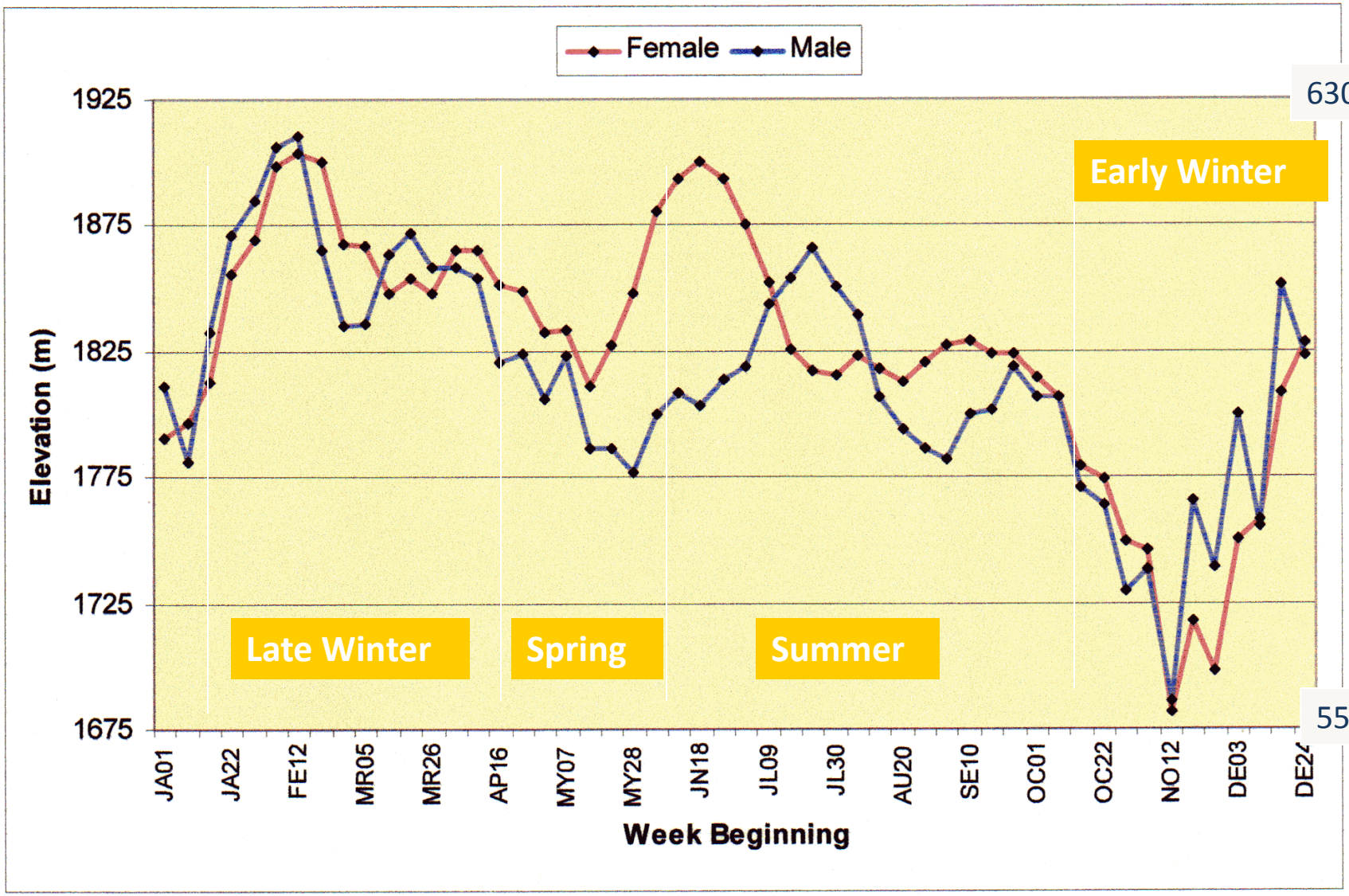
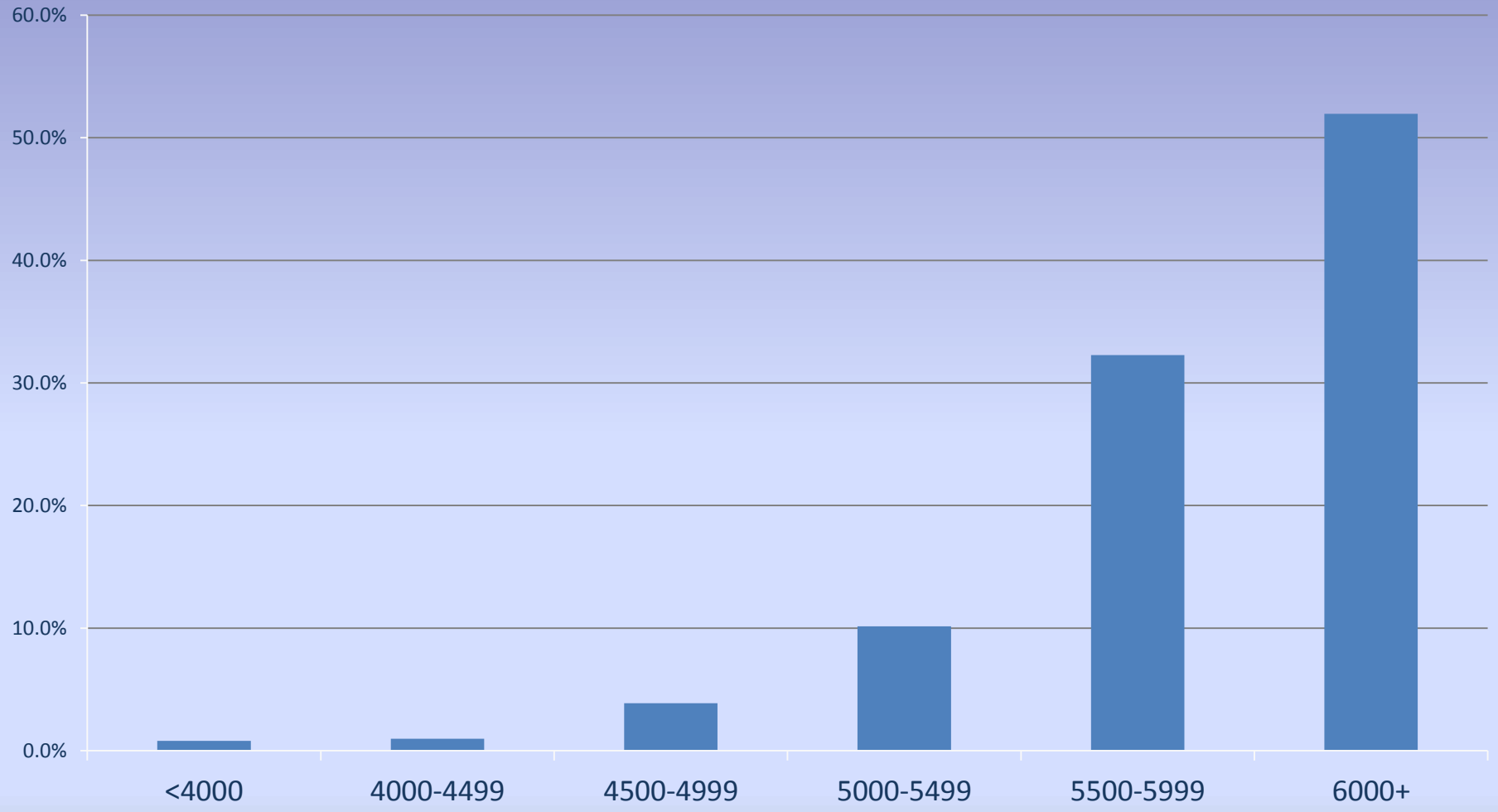


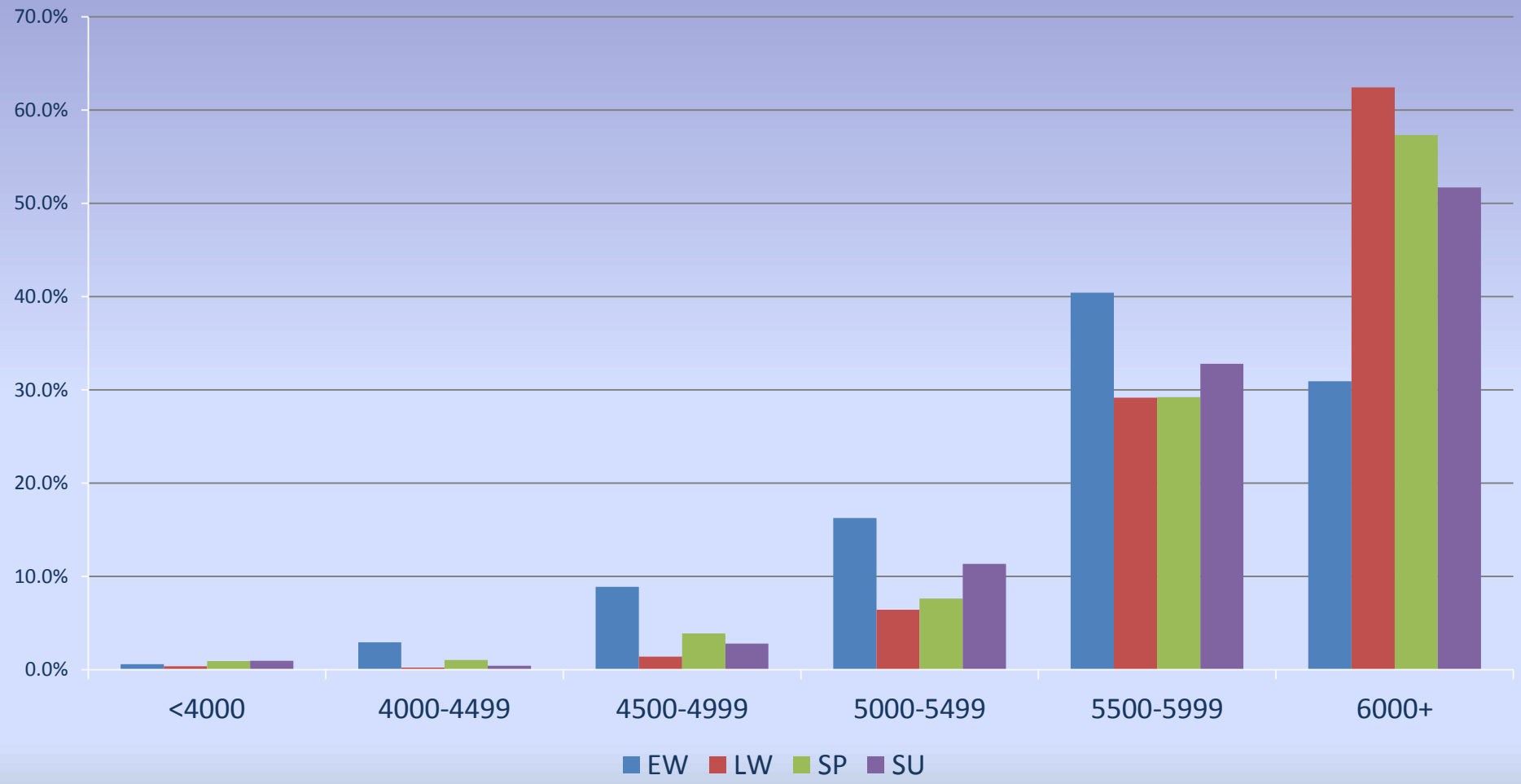
Figure 3. Running 3-week mean elevations used by radiocollared mountain caribou in the South Selkirk Ecosystem, Idaho, Washington, and British Columbia, 1987-2004.

Elevation Use (Transplanted Caribou)

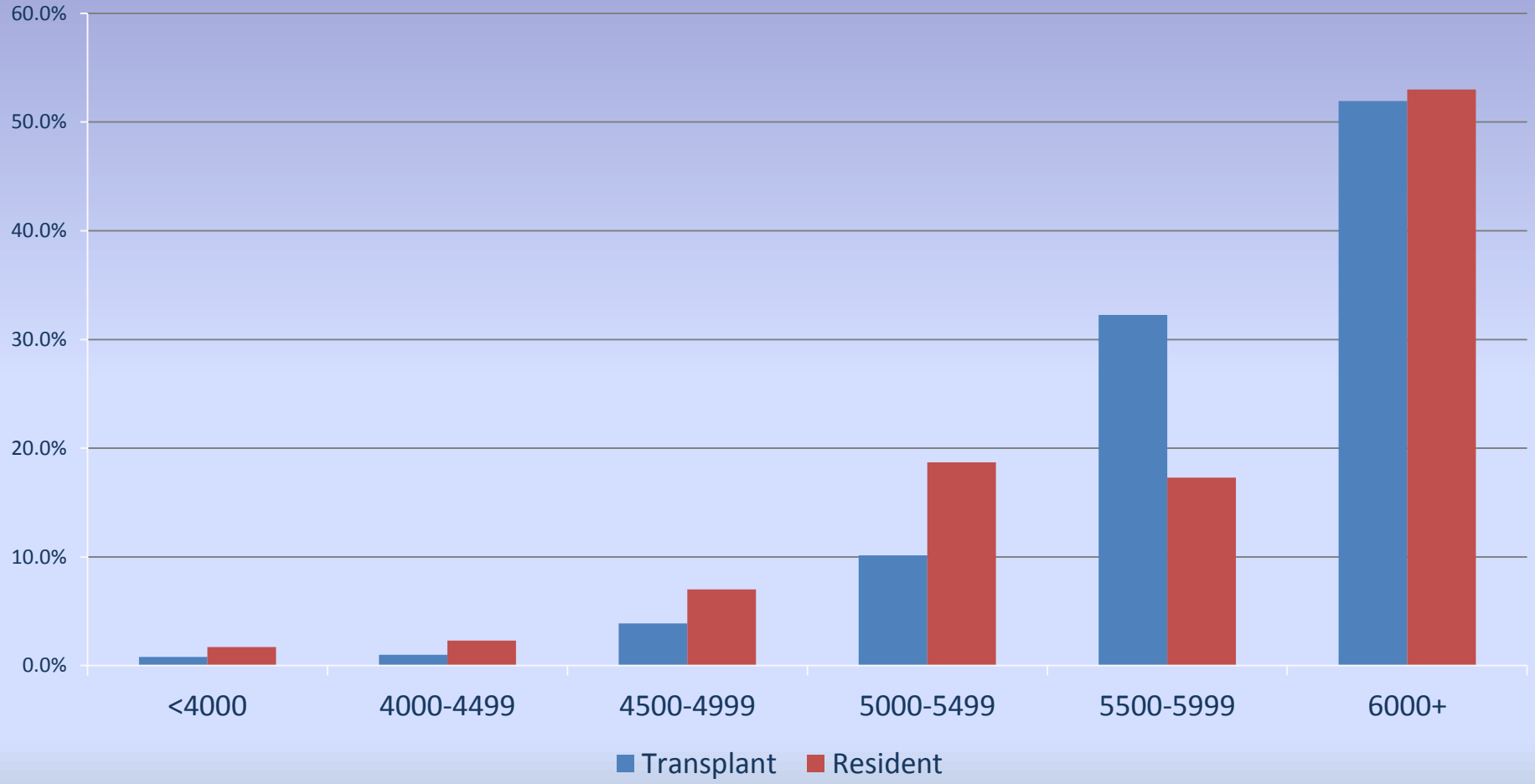


Elevation Use by Season

(Transplanted Caribou)

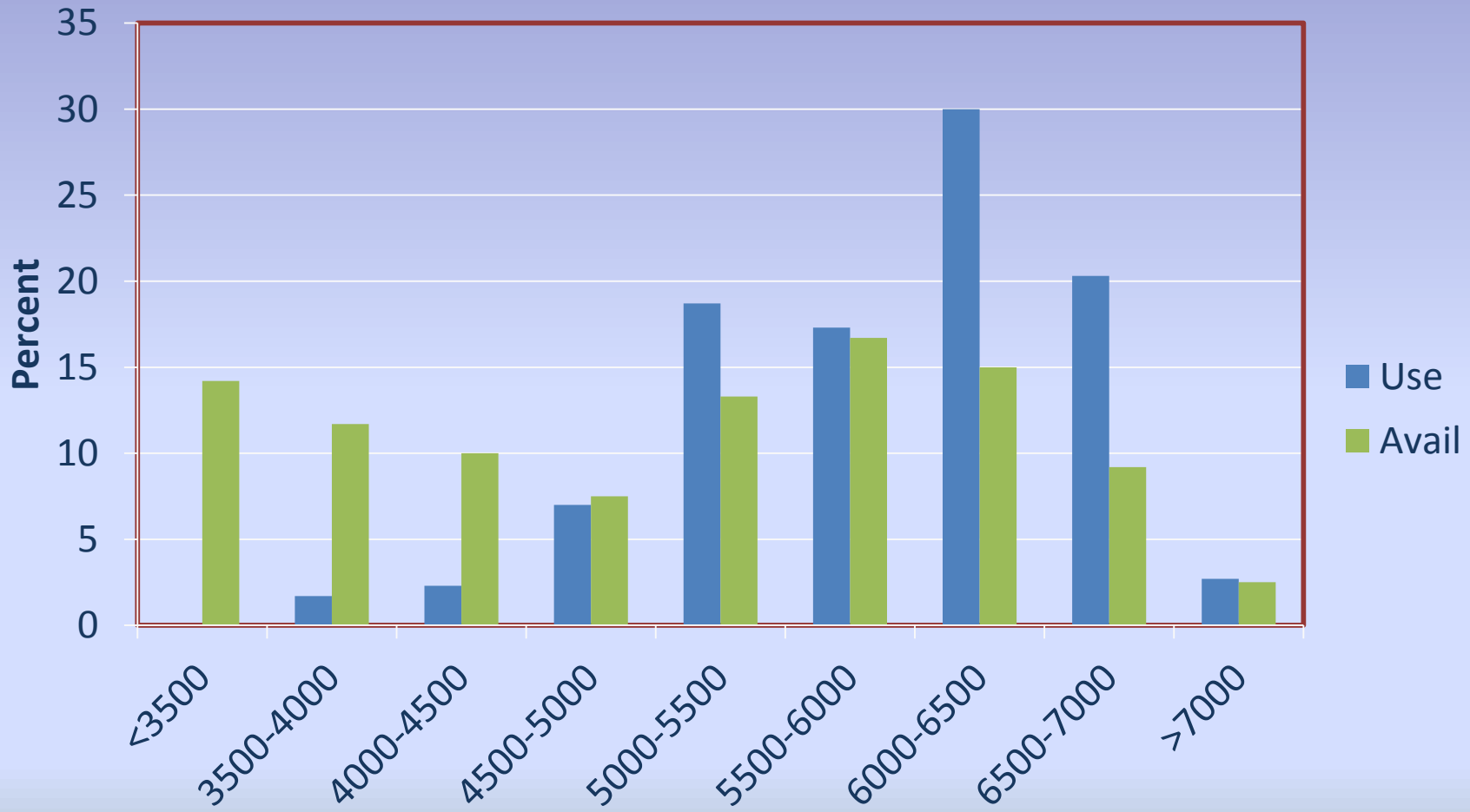


Resident / Transplant Elevation Use Comparison



ELEVATION USE BY RESIDENT CARIBOU

(1983-1995)



DATA ANALYSIS

- Univariate
  - Looked at only one variable at a time
- Multivariate
  - Looked at many variables considered together
- Multiple scale
  - Broader landscape scale
  - Mid-scale
  - Microsite scale

Table 3. Univariate analysis results of scale-dependent caribou habitat selection by season in the South Selkirk Ecosystem, Idaho, Washington, and British Columbia, 1987 – 2004. Results are based on univariate t tests.[a] Variables are defined in Table 2.

	EARLY WINTER			LATE WINTER			SPRING			SUMMER			CALVING		
Variable	1[b]	2	3	1	2	3	1	2	3	1	2	3	1	2	3
FC_S-F	+++	+++	+++	+++	++	+++	+++	+++	++	+++	+++	+++	+++	+++	o
FC_C-H	- - -	- - -	o	- - -	- - -	- -	- - -	- - -	-	- - -	- - -	- - -	- - -	- - -	-
FC_GF	- - -	+	o	-	o	o	- - -	-	o	- - -	o	o	o	o	o
FC_P-L	- - -	-	o	- - -	- -	o	- - -	- - -	o	- - -	- - -	- -	- - -	- -	o
FC_DF	- - -	- - -	o	- - -	- - -	o	- - -	- - -	- -	- - -	- - -	o	- - -	- - -	o
FC_WP	- - -	-	o	- - -	-	o	- - -	-	-	- - -	- - -	o	- - -	o	o
FC_MD	- - -	- - -	- -	-	- -	-	- -	- - -	o	- - -	- - -	- - -	- - -	- - -	-
FC_MM	+	o	o	-	- - -	- - -	- - -	- -	-	- - -	- - -	-	-	- - -	-
FC_ALP	+++	++	- - -	+++	+++	+	+++	+++	o	+++	+++	- - -	+++	+++	+
FC_SHB	-	- - -	o	o	- - -	-	- - -	- - -	-	- - -	- - -	- -	- -	- - -	-
FC_NF	+++	- -	- - -	+++	+++	- - -	+++	o	-	+++	- -	- - -	+++	o	o
SERAL_1	+++	- - -	- - -	+++	+++	- - -	+++	o	- - -	+++	- - -	- - -	+++	+	-
SERAL_2	- - -	- - -	- - -	- - -	- - -	-	-	- - -	- - -	- -	- - -	- -	- - -	- - -	o
SERAL_3	-	o	o	o	o	o	++	o	+	+++	++	o	+	o	o
SERAL_4	o	+++	++	- -	o	+	- - -	+	o	- - -	o	+	- - -	o	o
SERAL_5	+++	+++	+++	+++	+	+	+++	+++	++	+++	+++	+++	+++	++	+
CANOPY	- - -	o	+++	- - -	- -	o	- - -	-	o	- - -	-	+++	- - -	- - -	o
CANOPY_1	+++	- - -	- - -	+++	- -	- - -	+++	-	- -	+++	- - -	- - -	+++	o	-
CANOPY_2	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	++
CANOPY_3	- - -	-	o	- - -	- - -	o	- - -	- - -	o	- - -	- - -	+	- - -	-	o
CANOPY_4	- - -	- -	o	- - -	- - -	- - -	- - -	- - -	-	- - -	- - -	- - -	- - -	- - -	- -
ELEV	+++	+++	o	+++	+++	+++	+++	+++	+++	+++	+++	++	+++	+++	+++
SLOPE	+++	- - -	- - -	+++	- - -	- - -	+++	- -	- - -	+++	- - -	- - -	+++	+	- -
CURVA	+++	o	- - -	+++	+++	o	+++	+++	+	+++	+	- - -	+++	+++	+++
SOUTH	-	- -	o	- - -	-	o	- -	o	o	+	- - -	- -	o	- - -	-
WEST	+++	+++	++	o	o	o	- - -	o	-	-	o	- -	o	o	-
SOLAR[c]	o	- -	o	o	o	o	+++	+++	+++	+++	-	-	+++	o	+

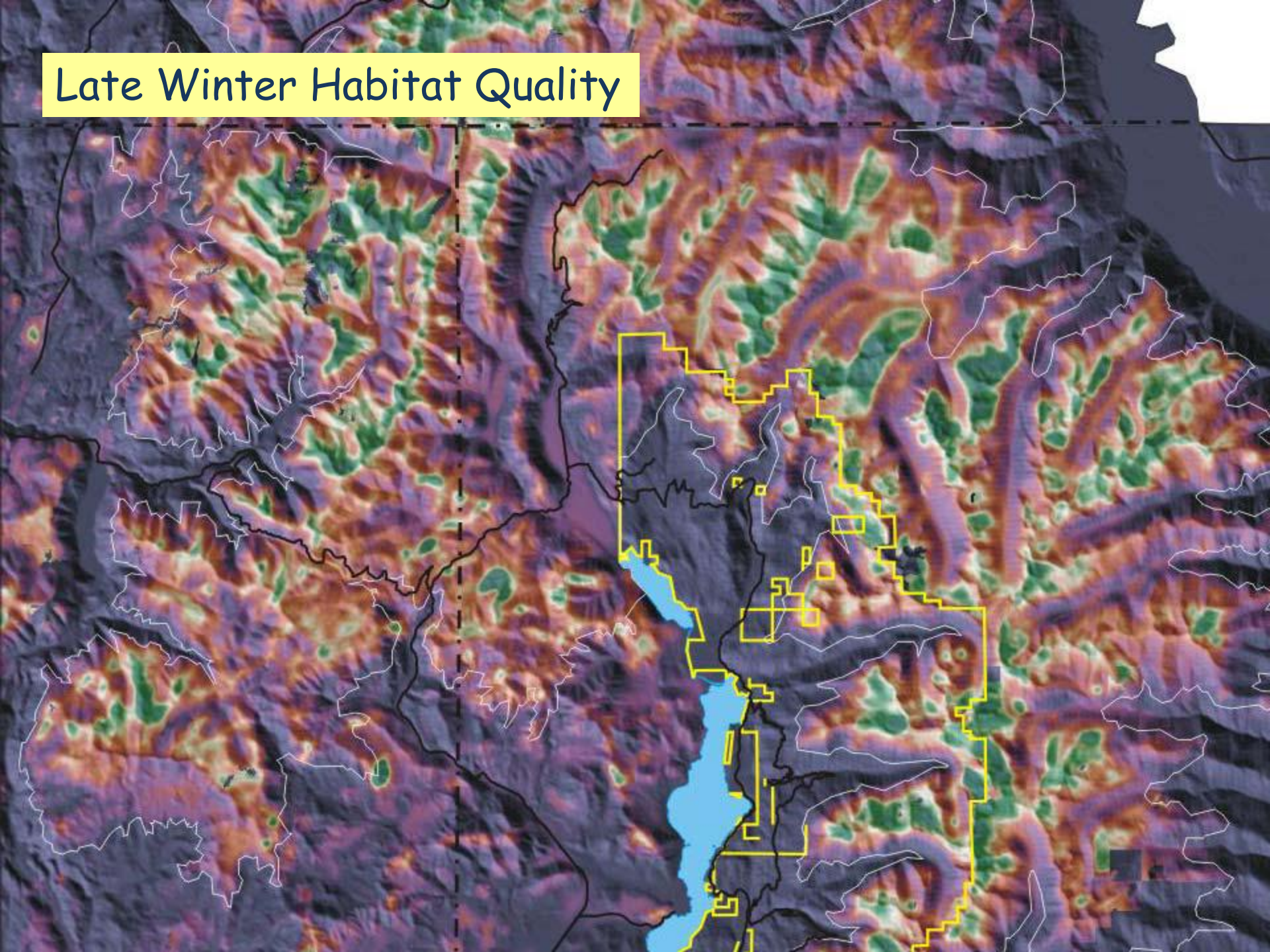
[a] Preference/avoidance (t-tests) is indicated by +++/- - - ($P < 0.00001$), ++/- - ($P < 0.001$), +/- ($P < 0.1$), or "0" ($P \geq 0.1$).

MULTIVARIATE ANALYSIS

Table 5. Variables and parameters associated with best-fit multiple logistic regression models of seasonal caribou habitat selection in the South Selkirk Ecosystem, Idaho, Washington, and British Columbia, 1987 – 2004.

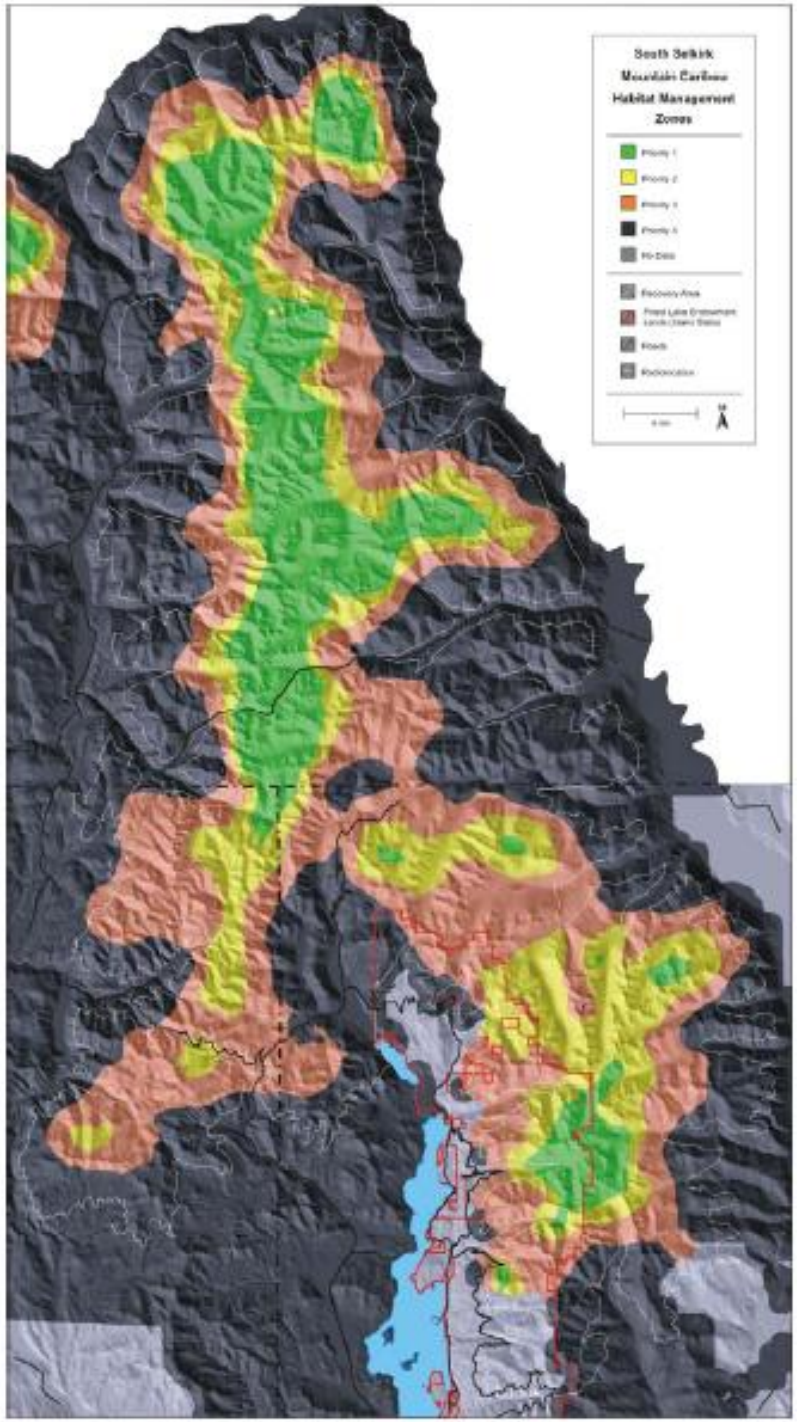
Season	Variable	Level [a]	β [b]	SE	*P* [c]	Exp(B) [d]	Tolerance [e]
EARLY WINTER	FCT_ALP	1	2.213	0.349	0.0000	9.1394	0.59
	FCT_LP-WL	1	-3.715	0.635	0.0000	0.0244	0.84
	ELEV	2	0.003	0.000	0.0000	1.0033	0.67
	SOLAR_EW	2	0.000	0.000	0.0001	0.9996	0.94
	CANOPY_2	2	0.701	0.254	0.0057	2.0162	0.62
	SERAL_4	2	1.061	0.184	0.0000	2.8884	0.67
	SLOPE	3	-0.044	0.004	0.0000	0.9568	0.88
	CANOPY_1	3	-1.078	0.205	0.0000	0.3404	0.67
	SERAL_1	3	-1.262	0.218	0.0000	0.2831	0.69
	SERAL_2	3	-1.810	0.347	0.0000	0.1637	0.74
	Constant	0	-3.532	0.569	0.0000	0.0292	

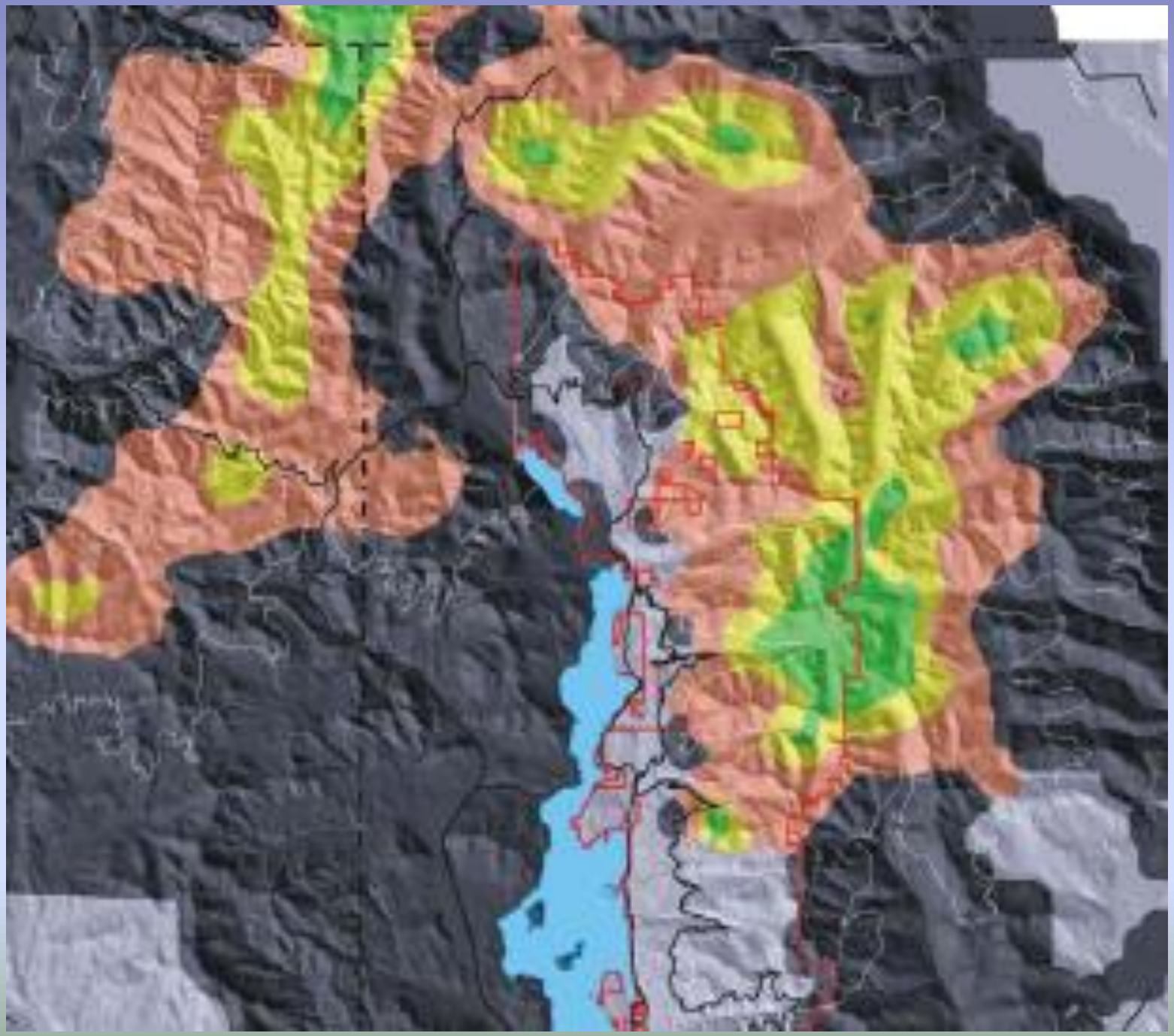
Late Winter Habitat Quality



ECOSYSTEM-LEVEL HABITAT PRIORITY AREAS

- Compilation of all seasonal maps
- "Best" overall habitat considering all seasons


South Selkirk
Mountain Caribou
Habitat Management
Zones



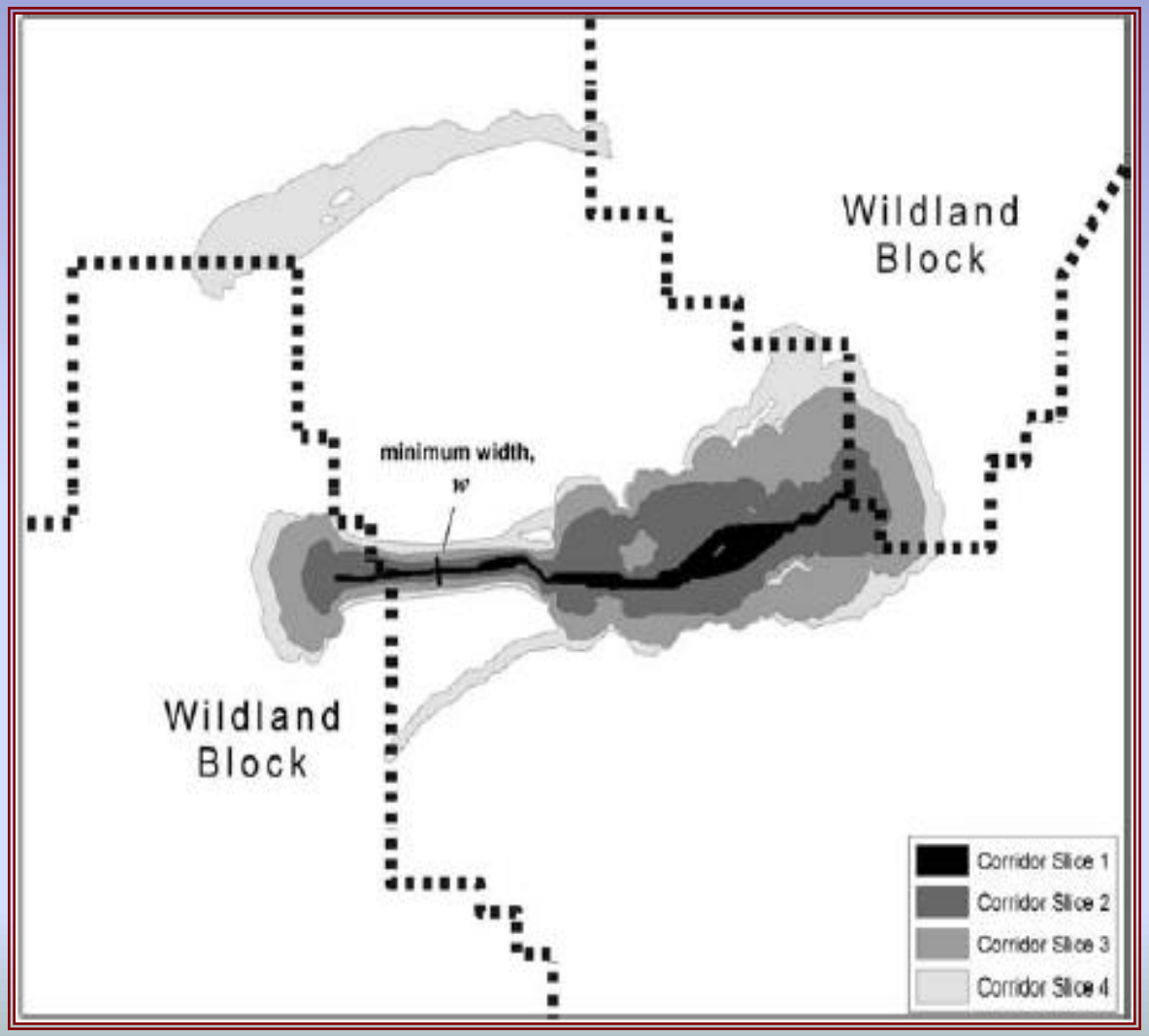
SHORTCOMING OF THIS ANALYSIS

"It should also be noted that locations important for caribou conservation may not be entirely circumscribed by Priority 1, 2 and 3 areas. Considerable suitable habitat and 8% of radiotelemetry locations, including both travel routes and sites of more prolonged residence, fall outside of the bounds of the Priority 3 polygon."

Model potential movement corridors

- *Purpose: Maintain gene flow and allow recolonization, not seasonal migration.*

CorridorDesigner software
(Northern Arizona Univ)

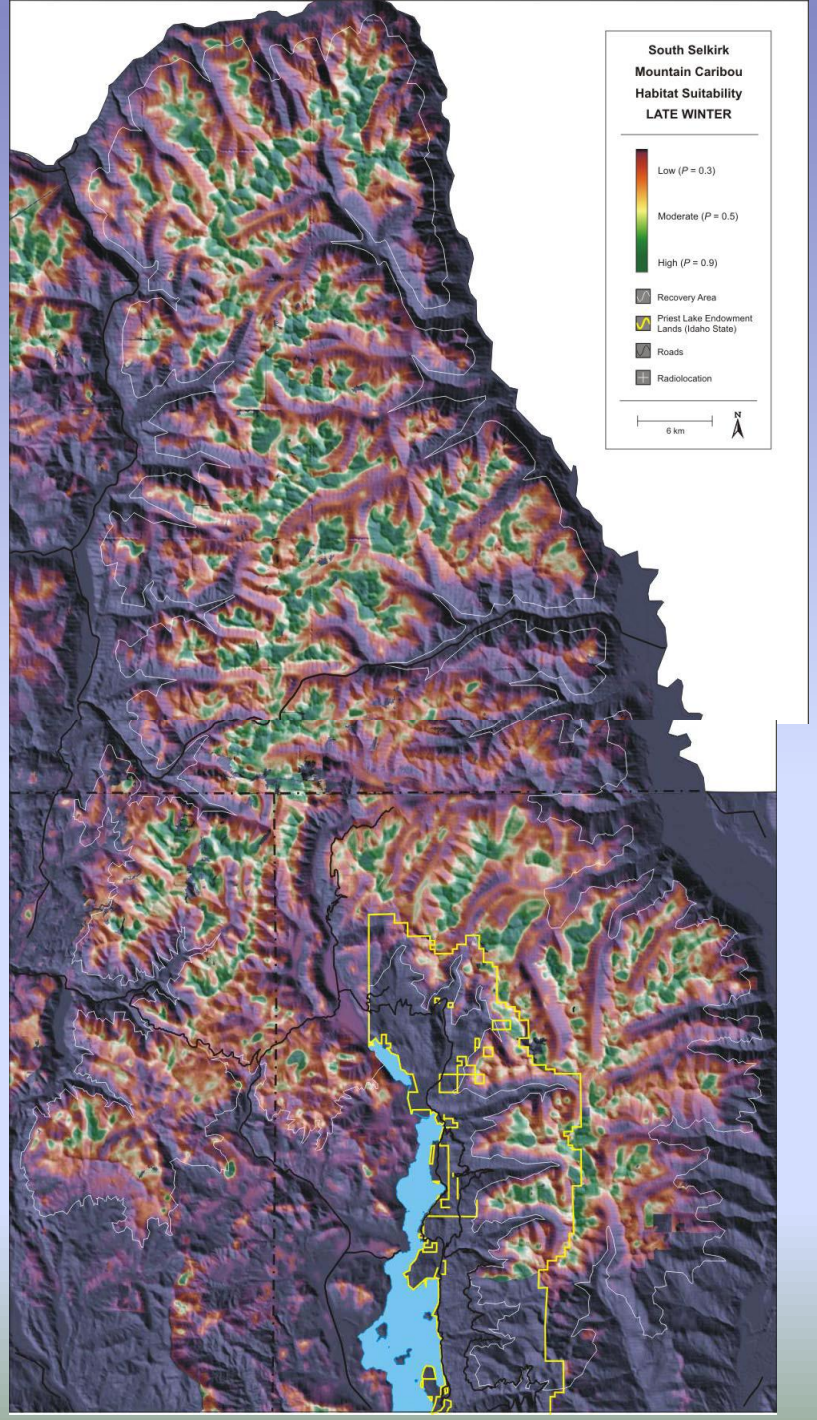


Least-cost modeling

Assumption

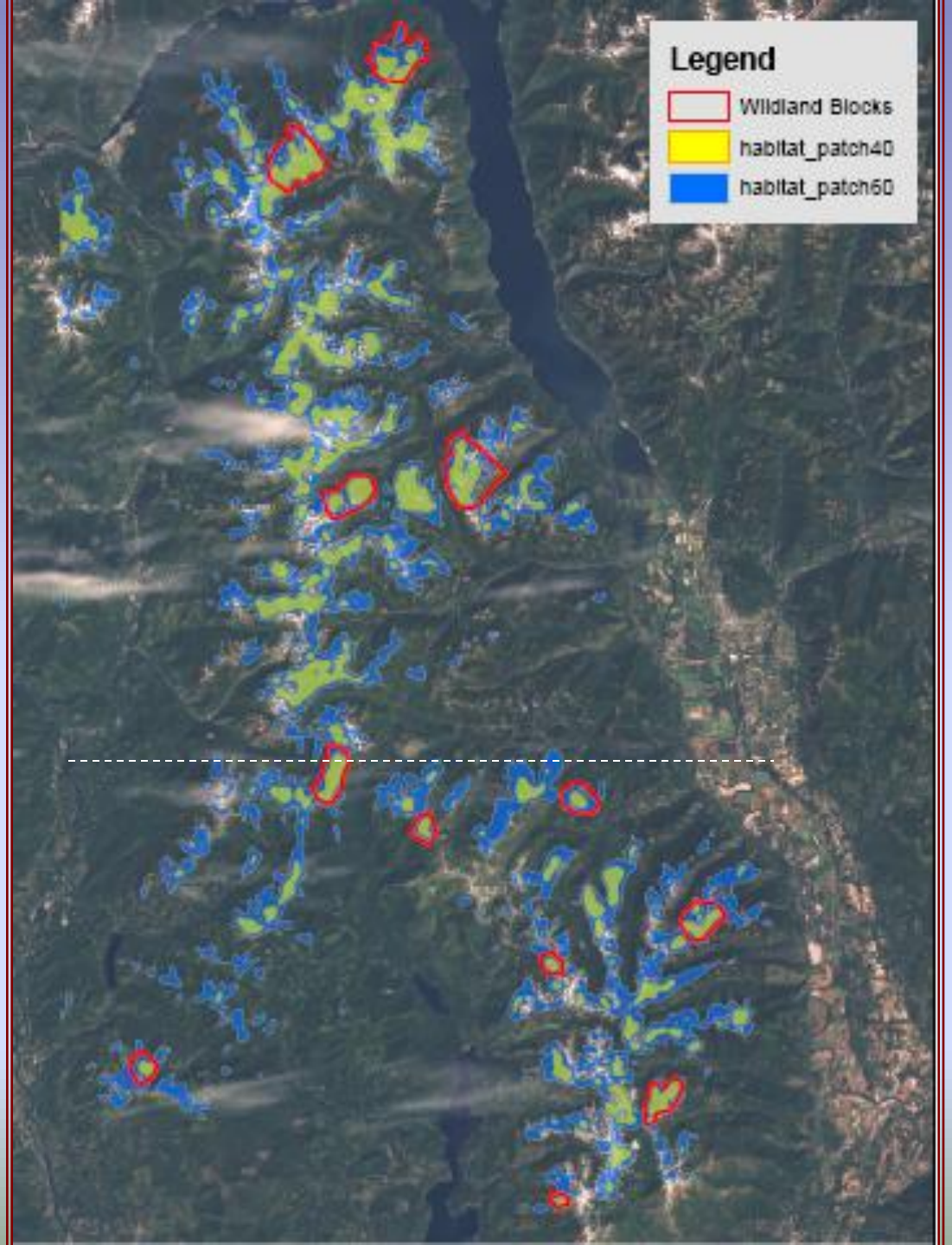
Habitat quality = permeability

Or; The ease at which an animal can move through the landscape



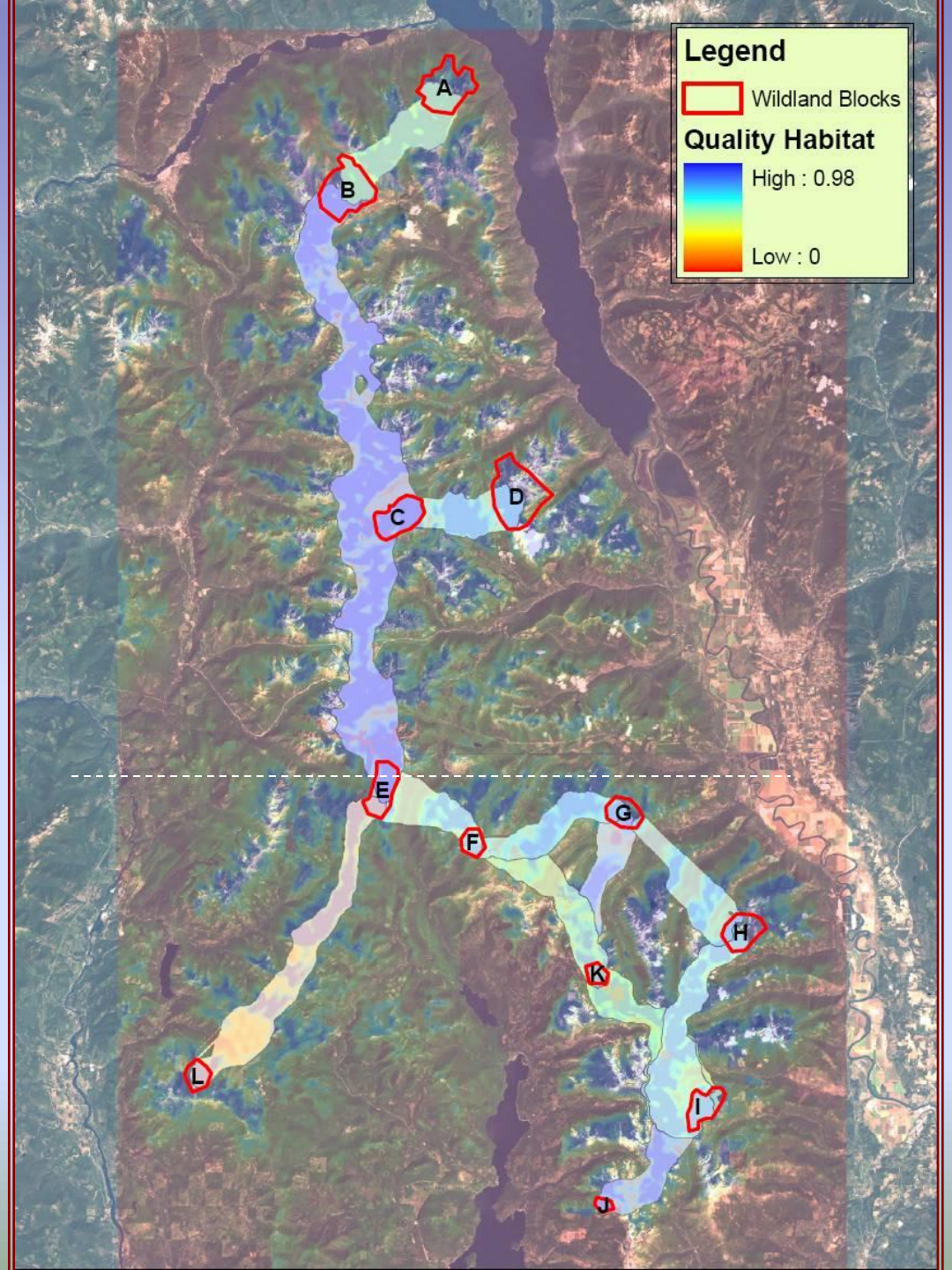
Where should we put the corridors?

Must identify "wildland blocks" which become corridor start and end points



Wildland Block ID

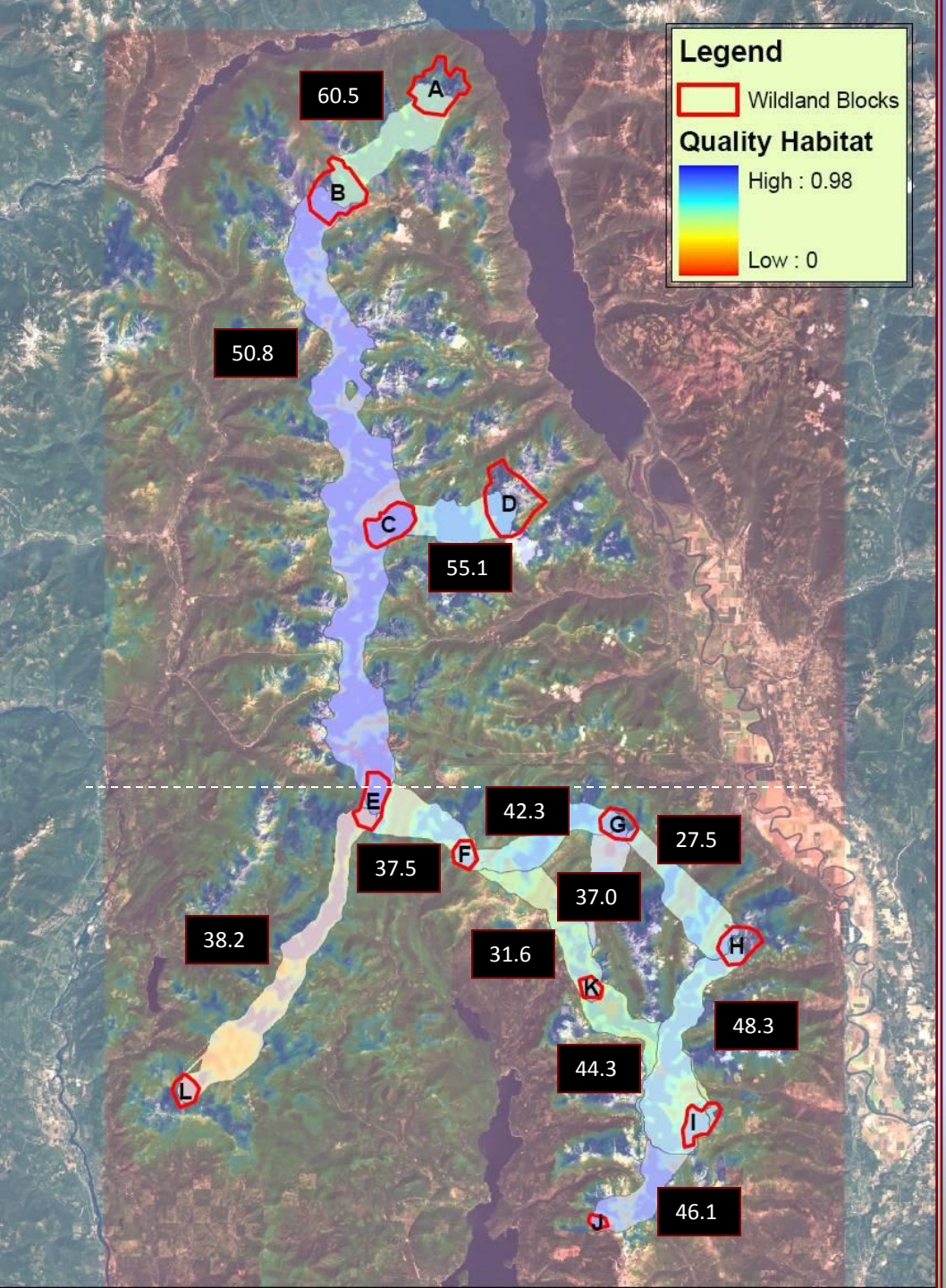
- Made Avg Hab Quality Map
- 62 sq km min patch size containing high quality habitat



Push the button and away she goes!

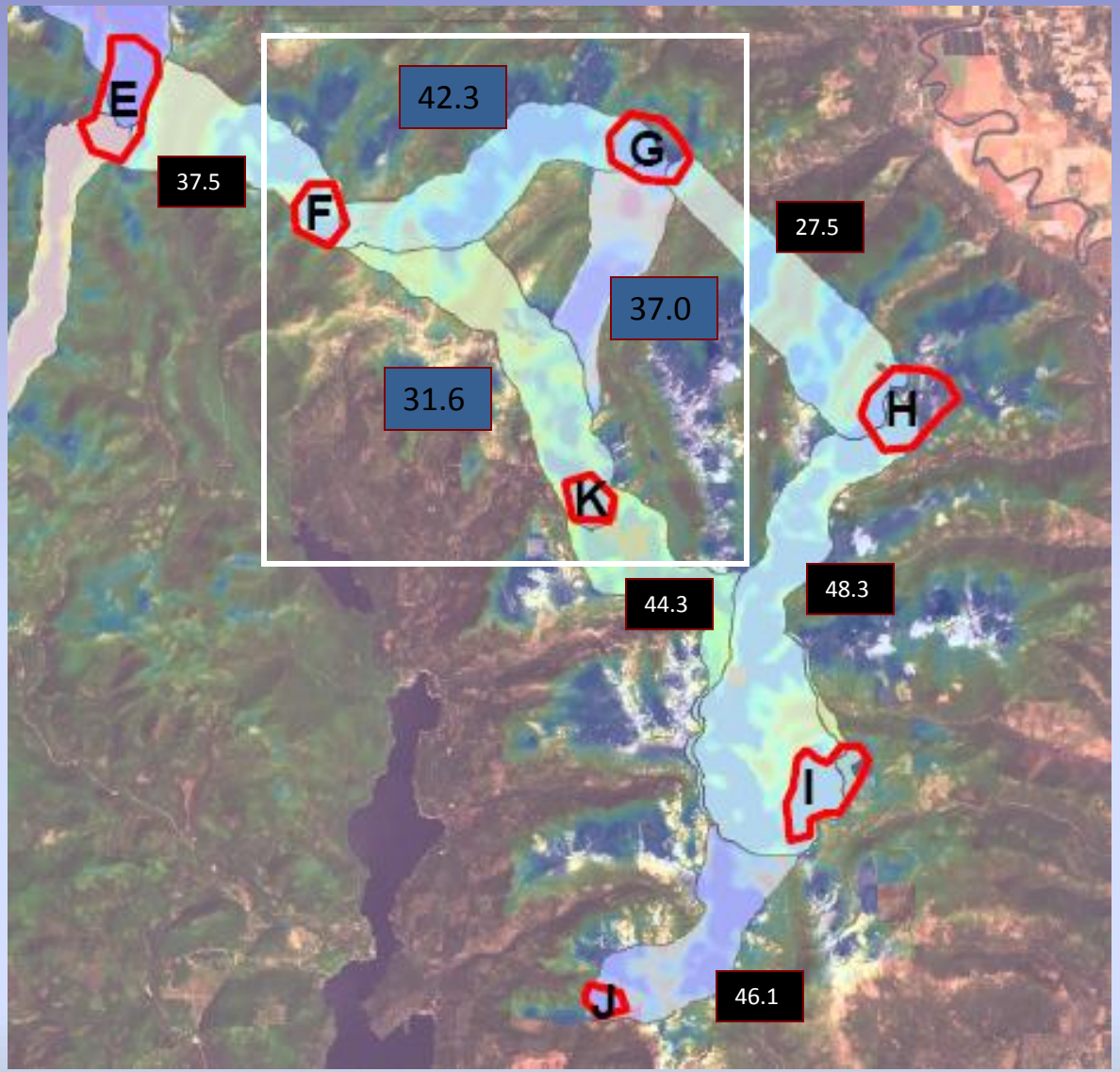
Resulting corridors generated between adjacent wildland blocks.

Now what?



Evaluate quality of the corridors

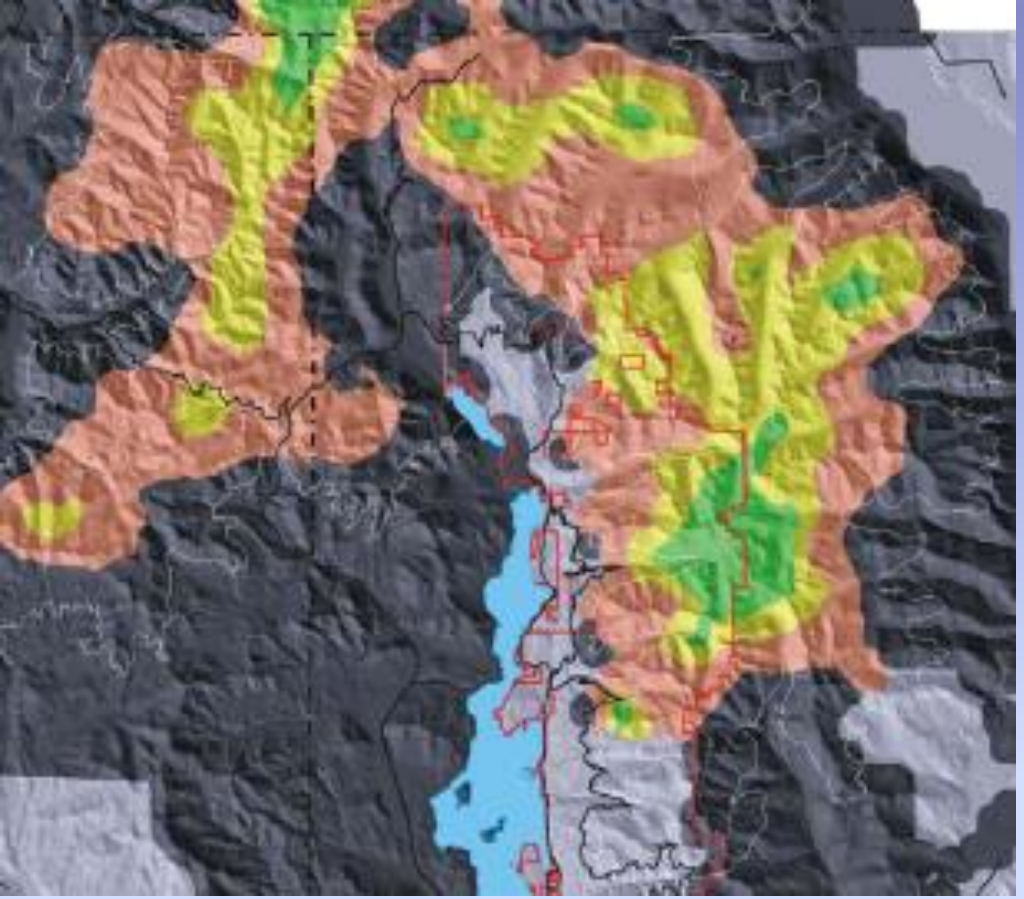
using underlying habitat maps



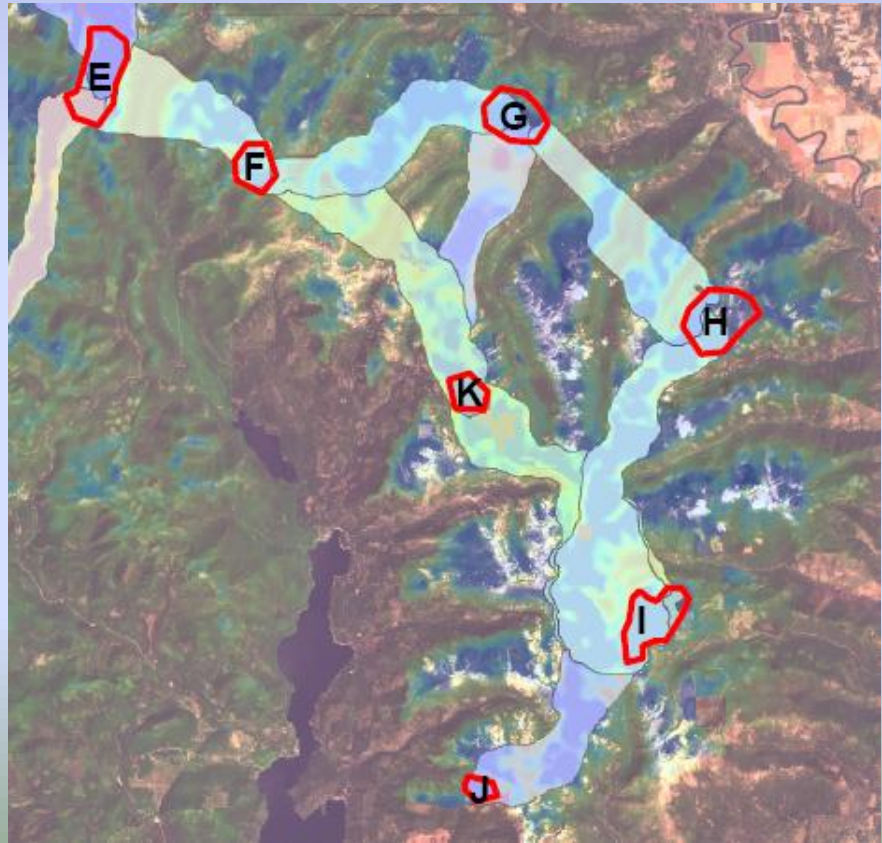
Compare alternate routes

F to K
or
F to G to K

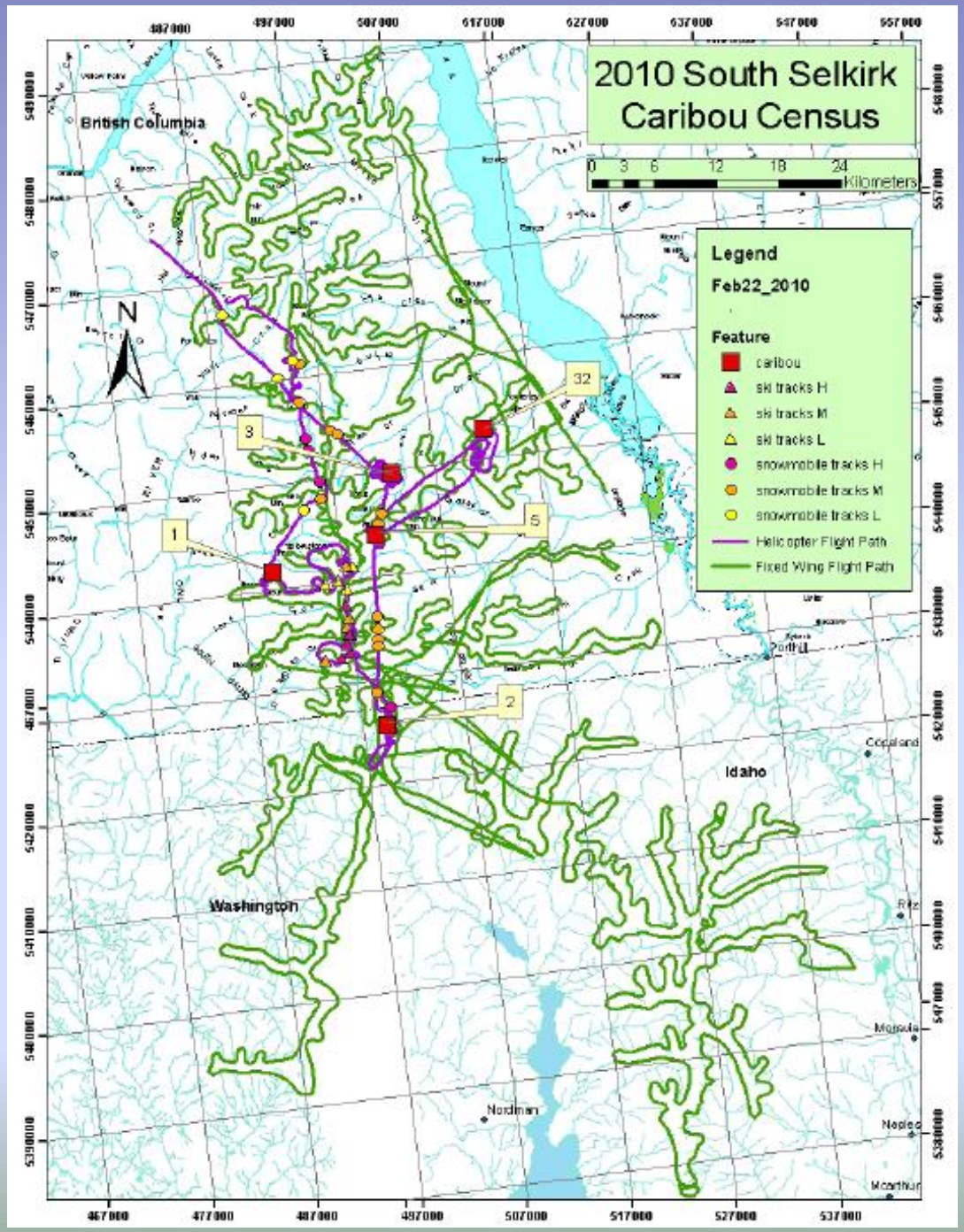
- Habitat
- Land Ownership
- Human Activity
- Management Options



COMBINATION OF PRIORITY AREAS AND MOVEMENT CORRIDORS



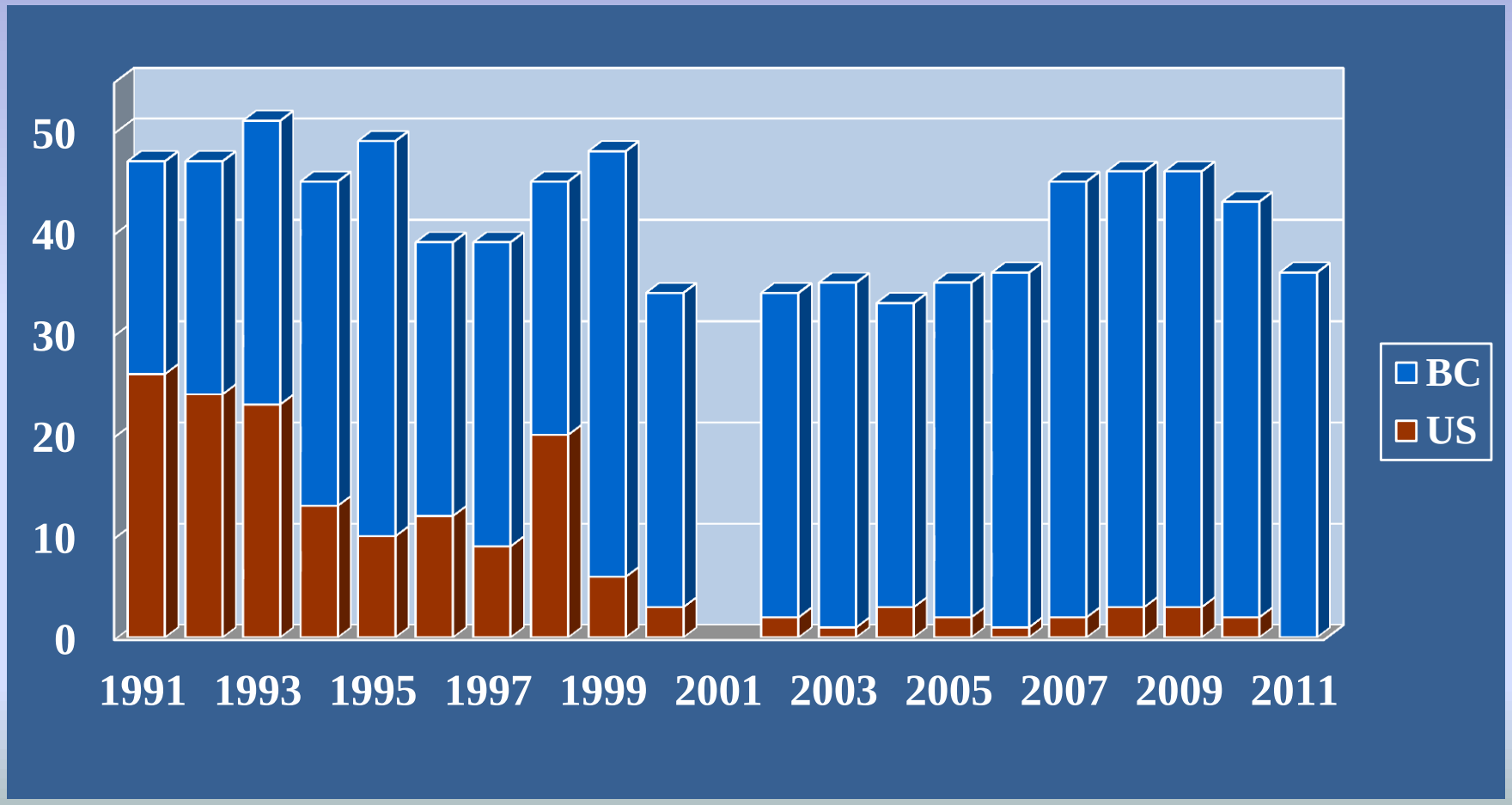
POPULATION STATUS and DISTRIBUTION


2010 South Selkirk Caribou Census
0 3 6 12 18 24 Kilometers
Legend
Feb22_2010
Feature
caribou
ski tracks H
ski tracks M
ski tracks L
snowmobile tracks H
snowmobile tracks M
snowmobile tracks L
Helicopter Flight Path
Fixed Wing Flight Path
British Columbia
Idaho
Washington
N
1
2
3
5
32
Nordman
Naples
Moyie
Coolland
Porthill
Rice
Mcarthur

DISTRIBUTION (1983-1985)

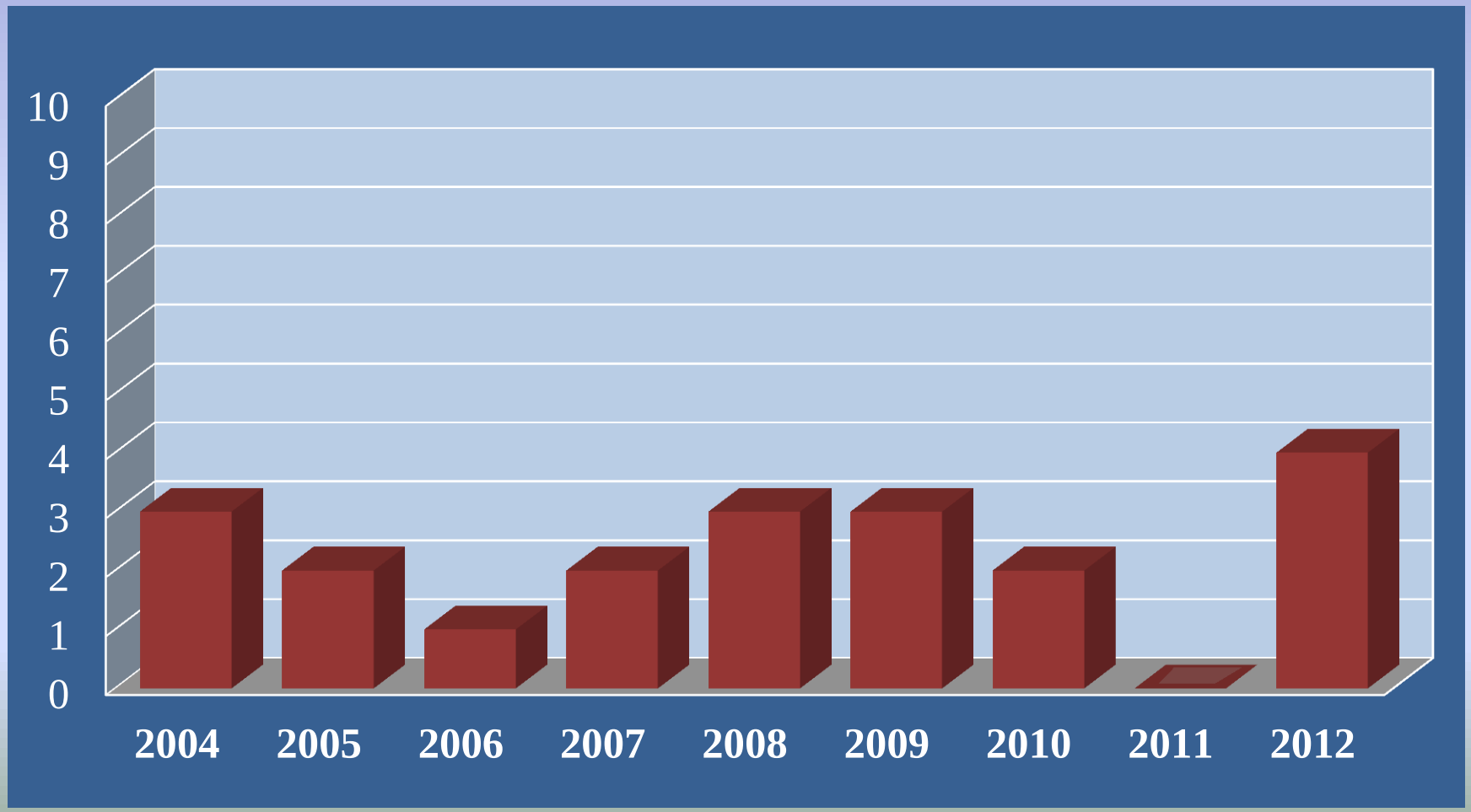
Year	B.C.	U.S.	Notes
1983	26	0	None observed in U.S.
1984	26	2	2 bulls near Little Snowy Top
1985	24	1	1 bull on upper Hughes Ridge

Woodland Caribou Winter Census 1991-2011



Woodland Caribou in U.S.

2004-2012



ARE THEY IN THE SAME AREA ALL YEAR?

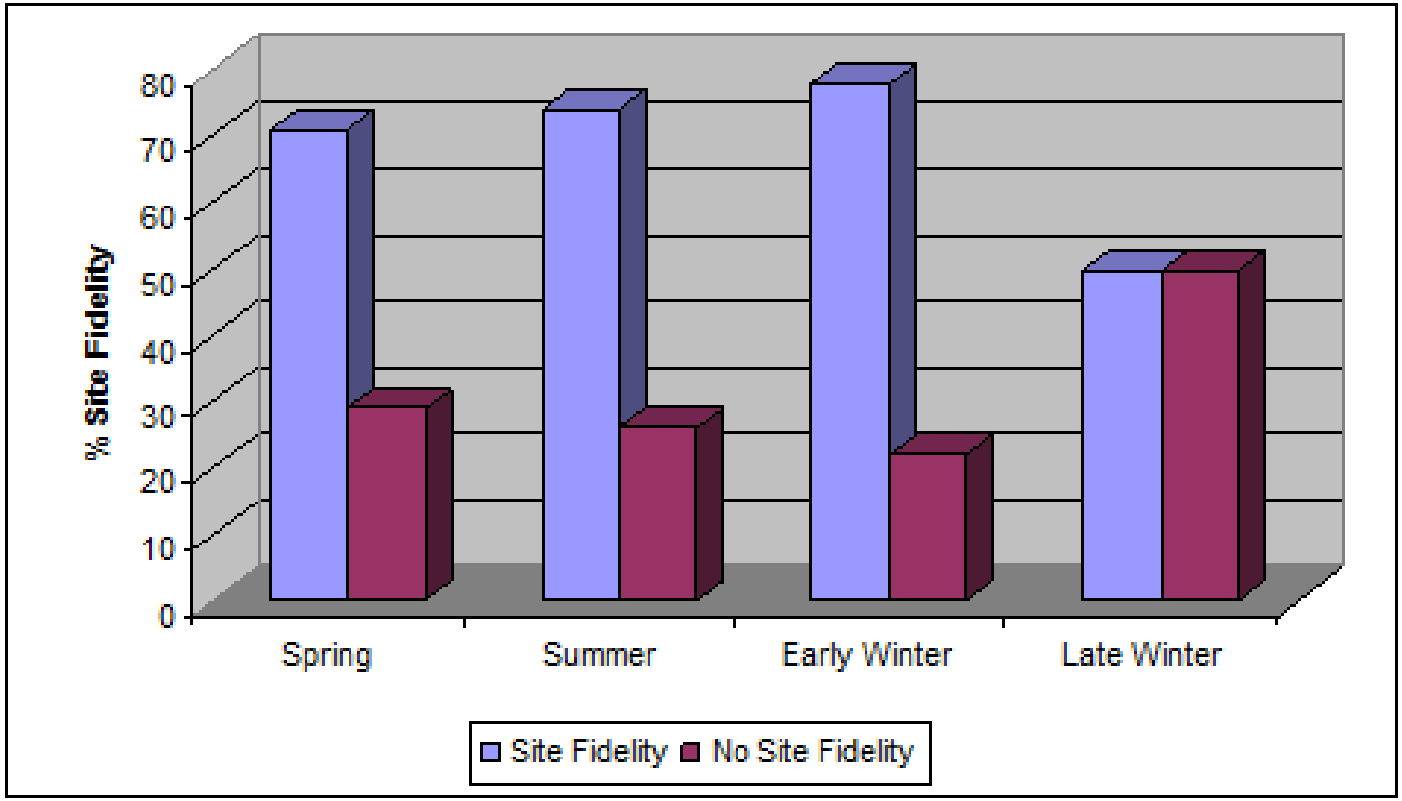
Table 8. Median inter-seasonal movements. Male and female data are pooled. Data obtained from radio-collared caribou in the Selkirk ecosystem, 1988-2006.

Movement Interval	n	Distance Moved (km)	
Sp-Su	51	6.2	3.9 miles
Su-EW	48	7.8	4.8 miles
EW-LW	52	6.2	3.9 miles
LW-Sp	55	6.1	3.8 miles

SITE FIDELITY

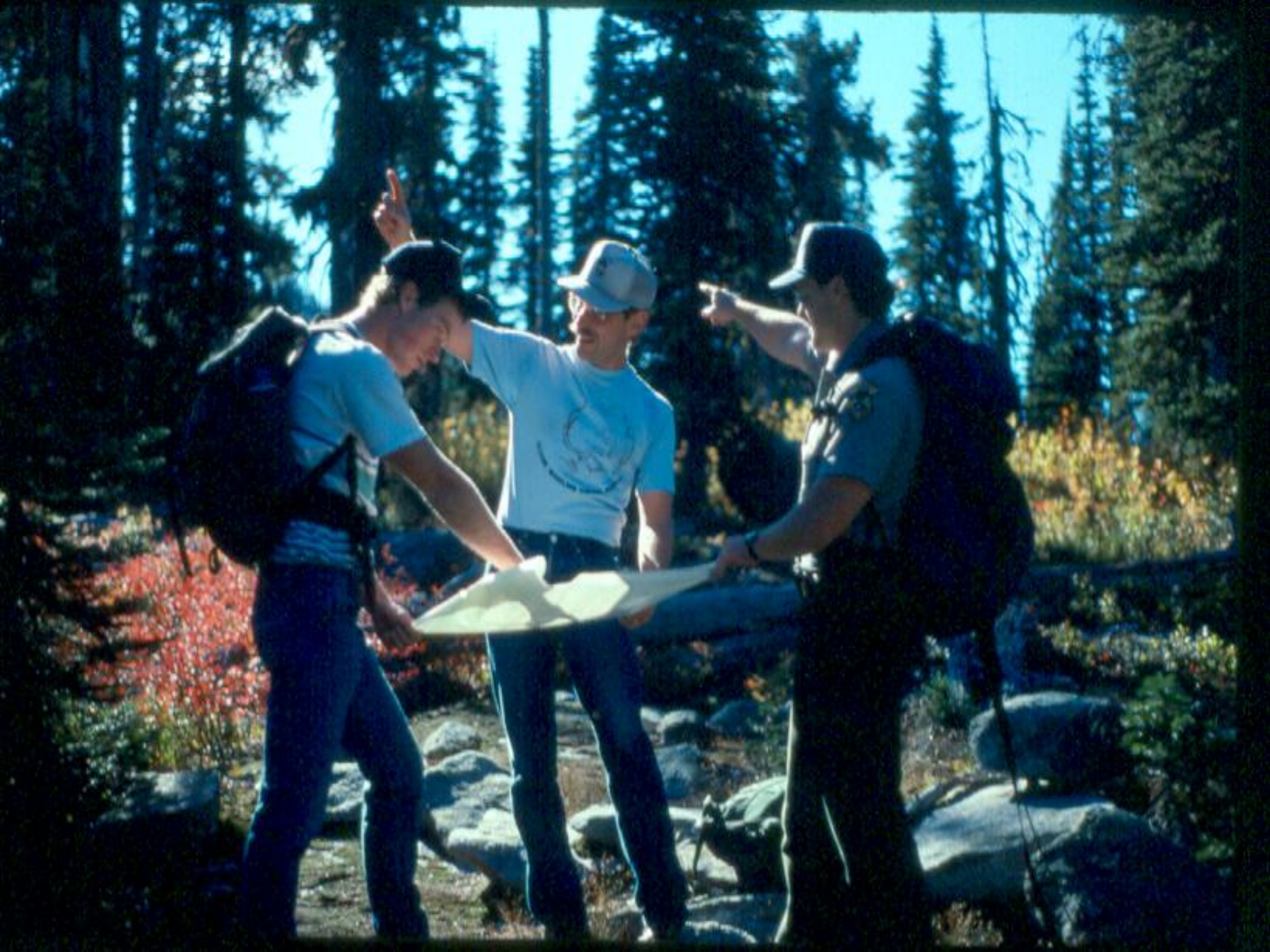
Do they come back to the same area next year?

Figure 9. Site fidelity by season, male and female data pooled. Selkirk caribou, 1988-2006.



SUMMARY

- Resident and transplanted caribou appear to use the habitat in a similar way.
- Habitat quality maps and priority areas are identified in Kinley and Apps
- Info on movement corridors, site fidelity, and seasonal movements are in Wakkinen and Slone
- Census and distribution data is available from IDFG



QUESTIONS / COMMENTS ?

Lindsley, N.C. 1889 Pend Oreille County

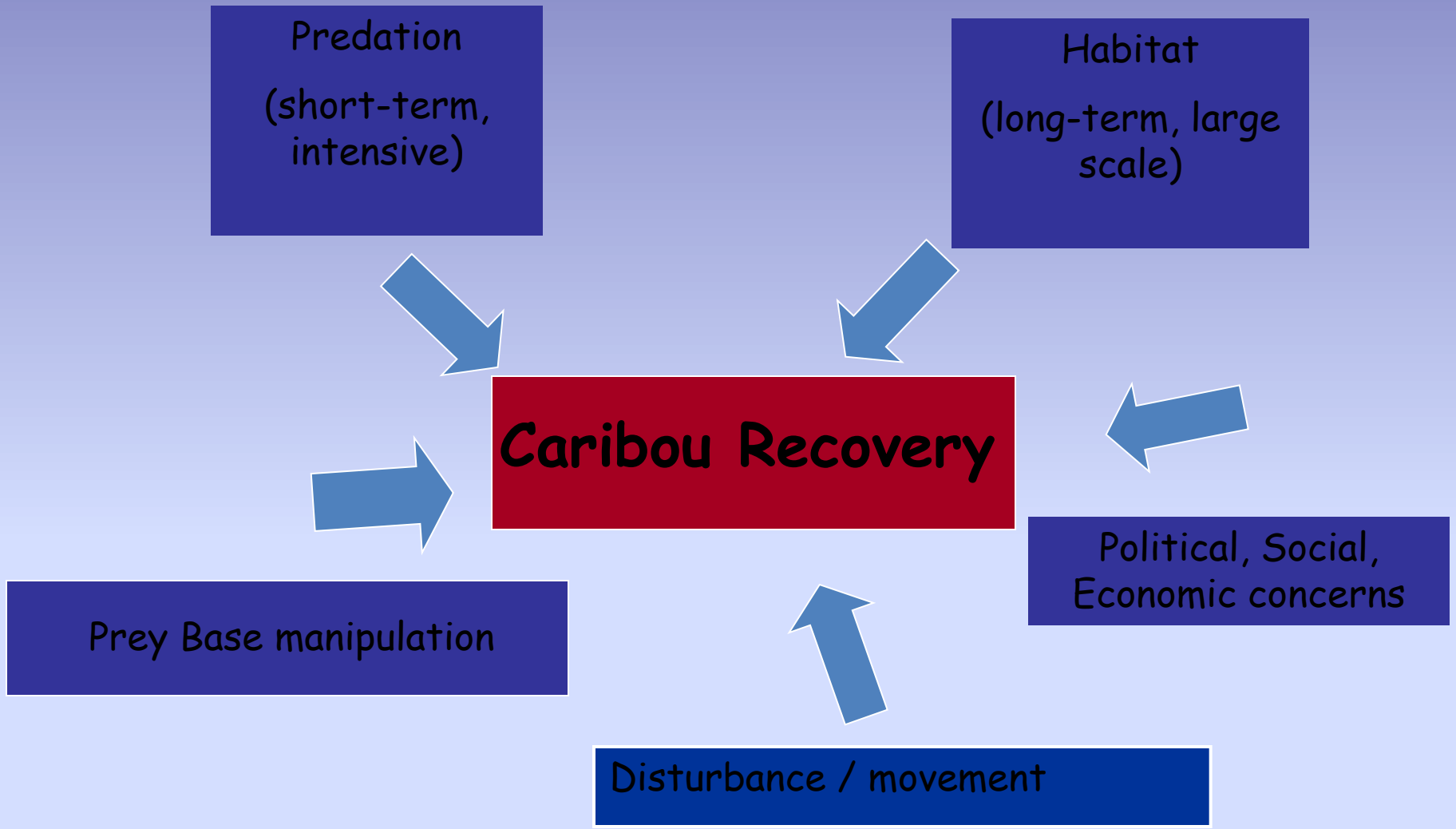
(Aug 1888 to April 1889)

"killed 10 grizzly bears, 41 black bears, 25 caribou, 40 wolves, 88 beaver, 39 otter, 50 fisher, and 3 mountain sheep"

"I never kill deer except when I need meat, so that we did not bother them."

WINTER DISTRIBUTION DATA SINCE 1991

				NAD83 Zone 11		WGS84		
Year	Adults	Young	Total	Easting	Northing	Lat	Long	Location
1991	22	3	25	524600	5392800	48.6878	-116.6658	Harrison Basin
1991	1	0	1	520300	5410200	48.8444	-116.7233	Bear Ck/Smith Ck
1991	17	4	21	499600	5447300	49.1785	-117.0055	Devils Hole Lake
1992	16	2	18	505400	5444300	49.1515	-116.9259	Bluebird Lake
1992	5	0	5	501200	5440600	49.1182	-116.9836	Carolina Ck ridge
1992	1	0	1	522200	5422300	48.9532	-116.6968	Lone Tree
1992	11	0	11	525800	5391300	48.6742	-116.6495	Harrison Lake
1992	11	1	12	525900	5394800	48.7057	-116.6480	Two Mouth Lake
1993	20	3	23	524800	5393500	48.6940	-116.6630	Harrison Basin
1993	1	0	1	495600	5431300	49.0346	-117.0602	N or Ripple Mtn
1993	4	0	4	501400	5439200	49.1056	-116.9808	Carolina Ck ridge
1993	19	4	23	511200	5449600	49.1991	-116.8463	Wood Peak
1994	6	0	6	524400	5393700	48.6959	-116.6684	Harrison Basin
1994	6	1	7	525600	5393800	48.6967	-116.6521	Upper 2-mouth Lake
1994	4	0	4	498400	5429300	49.0166	-117.0219	NW of Snowy Top
1994	2	0	2	501600	5440400	49.1164	-116.9781	Carolina Ck ridge
1994	23	3	26	511400	5450800	49.2099	-116.8435	Wood Peak
1995	6	1	7	522900	5384700	48.6150	-116.6893	Chimney Rock
1995	6	2	8	525600	5391800	48.6787	-116.6522	Harrison Lake
1995	3	0	3	499700	5425700	48.9842	-117.0041	Snowy Top
1995	2	0	2	494800	5442200	49.1326	-117.0713	Muskrat Lake
1995	34	5	39	512400	5451600	49.2171	-116.8297	Wood Peak
1996	15	4	19	513400	5453400	49.2332	-116.8159	Wood Peak
1996	1	0	1	500200	5440000	49.1128	-116.9973	Upper Carolina Ck
1996	5	1	6	522700	5380100	48.5736	-116.6923	Hunt Peak
1996	3	1	4	525800	5389100	48.6544	-116.6497	Beehive Lake
1996	3	0	3	499600	5424800	48.9761	-117.0055	Snowy Top


Predation
(short-term, intensive)
Habitat
(long-term, large scale)
Caribou Recovery
Political, Social, Economic concerns
Prey Base manipulation
Disturbance / movement