

NCDE

**GRIZZLY BEAR POPULATION MONITORING PROGRAM
Spring 2015**



Historical Background





Endangered Species Act

1975



Border Grizzly Project



1975-1980

East Front Studies: 1980-1986



South Fork Flathead: 1987-1995



Early Emphasis on Habitat/Human Impacts



CUMULATIVE
EFFECTS.



HOW ARE THE BEARS DOING??????????????



Fall chopper flights



Track surveys



Den surveys

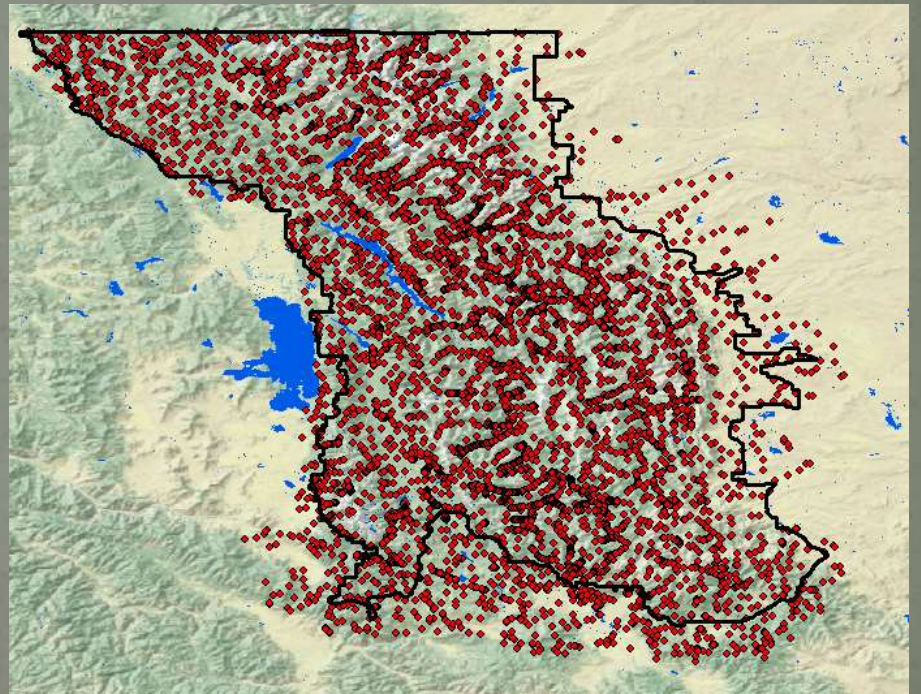


Camera sightings











USGS Effort:

765 grizzly bears in 2004

POPULATION TREND MONITORING



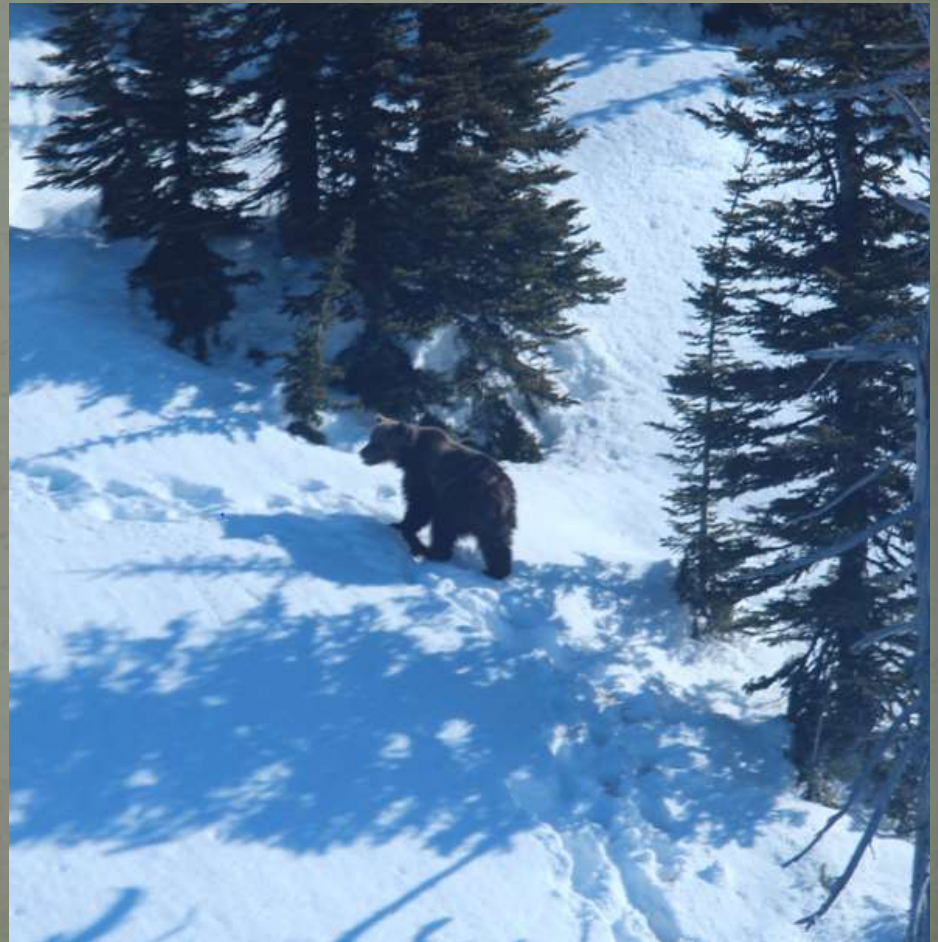
Estimate Demographics via “known-fate” Methods



Synthesis of Data: 2004-2014

Occupancy
Distribution
Density
Mortality
Vital Rates
Trend
Sustainable Mortality

Cecily Costello
Lori Roberts
All the bear managers



Reproductive Female Occupancy:

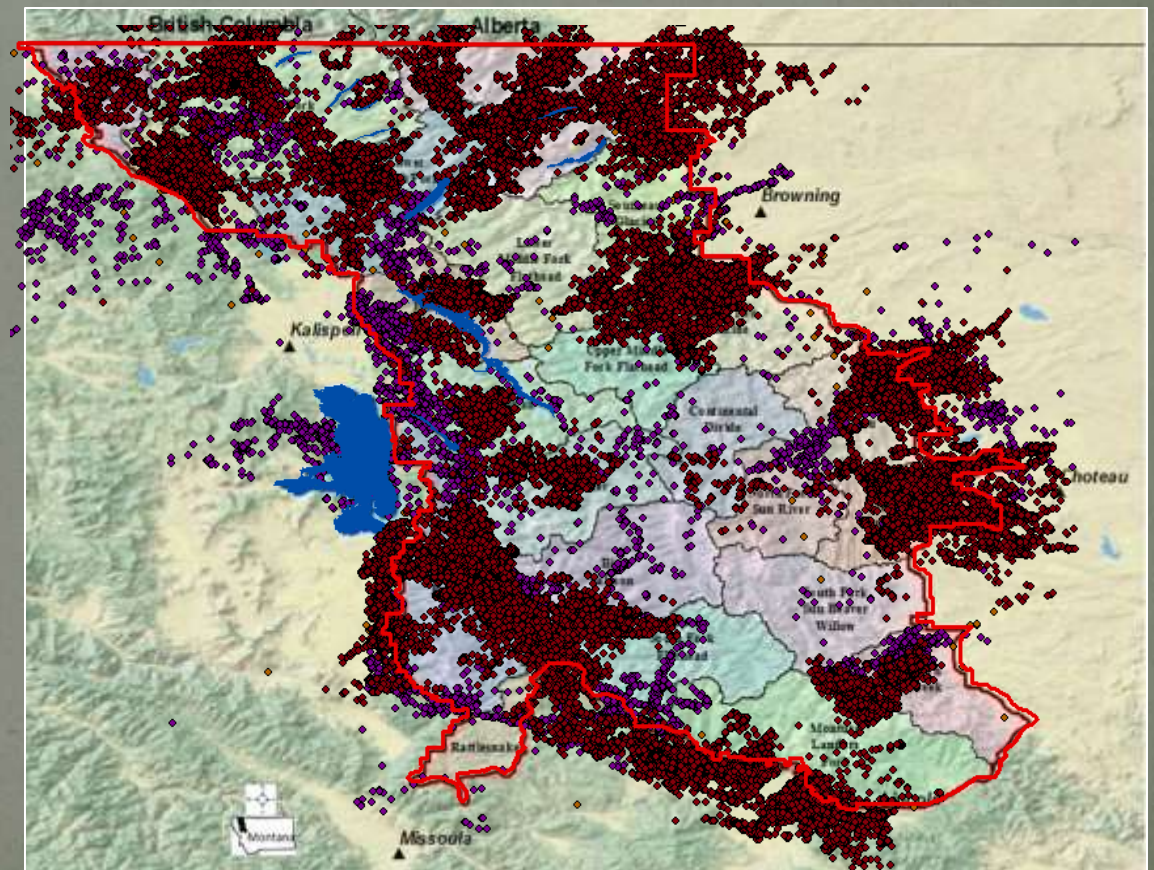
Standard: 21 of 23 BMU's at least every every 6 years

2004-2009:
22 of 23 BMU's

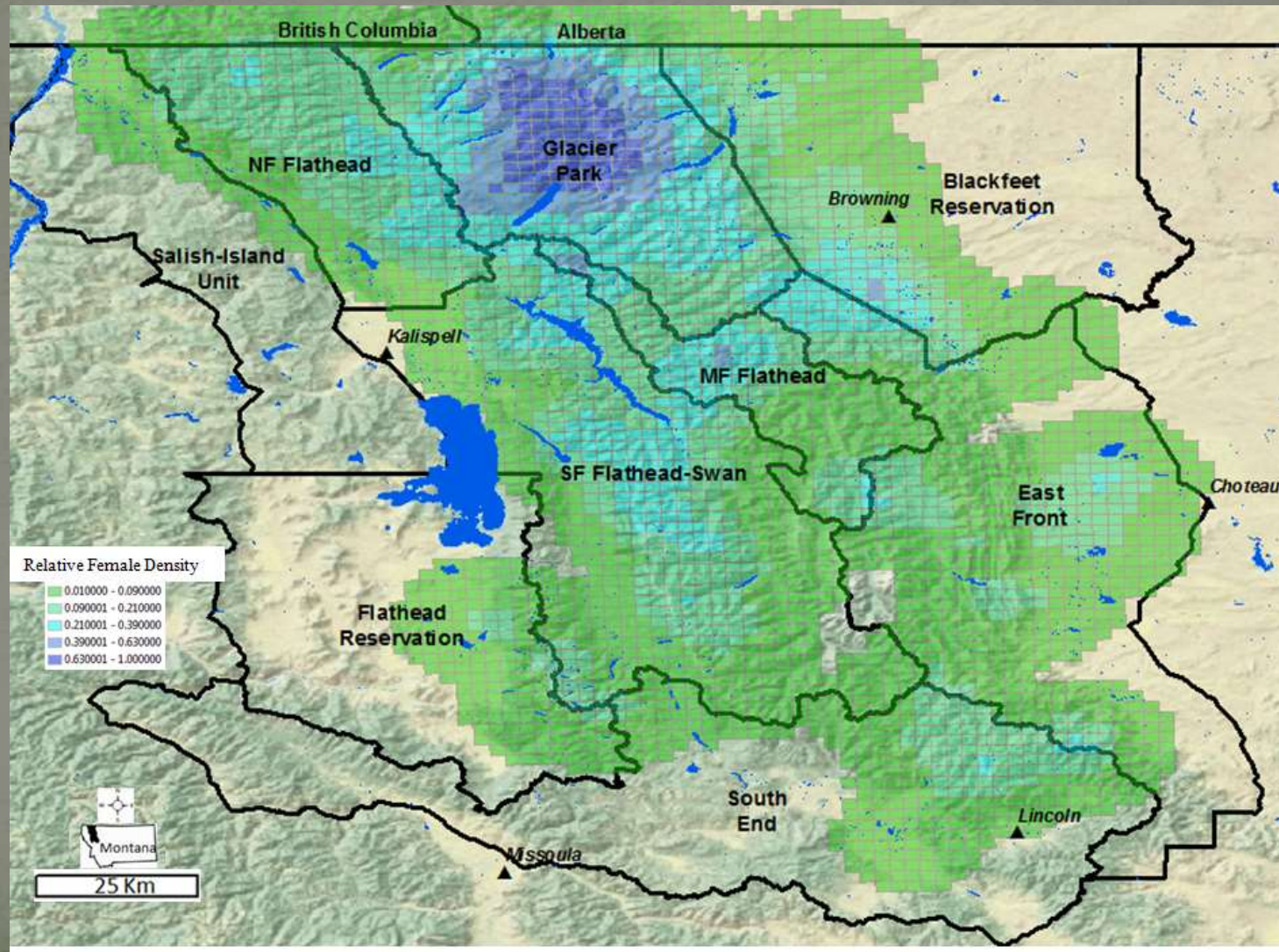
2010-2014:
23 of 23 BMU's

Any Single Year:
17 of 23 BMU's

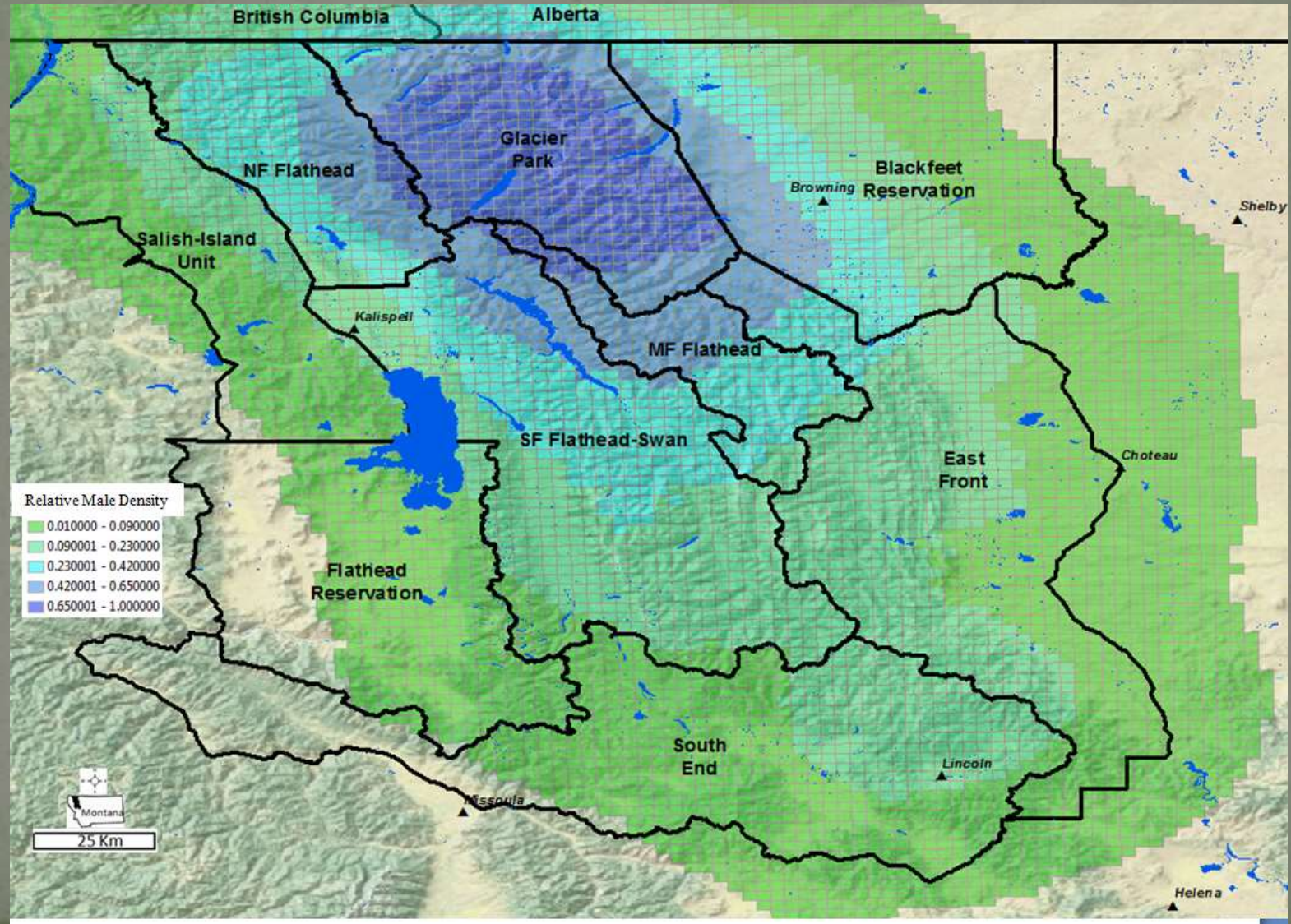
Relies on radioed females



Female Relative Population Density

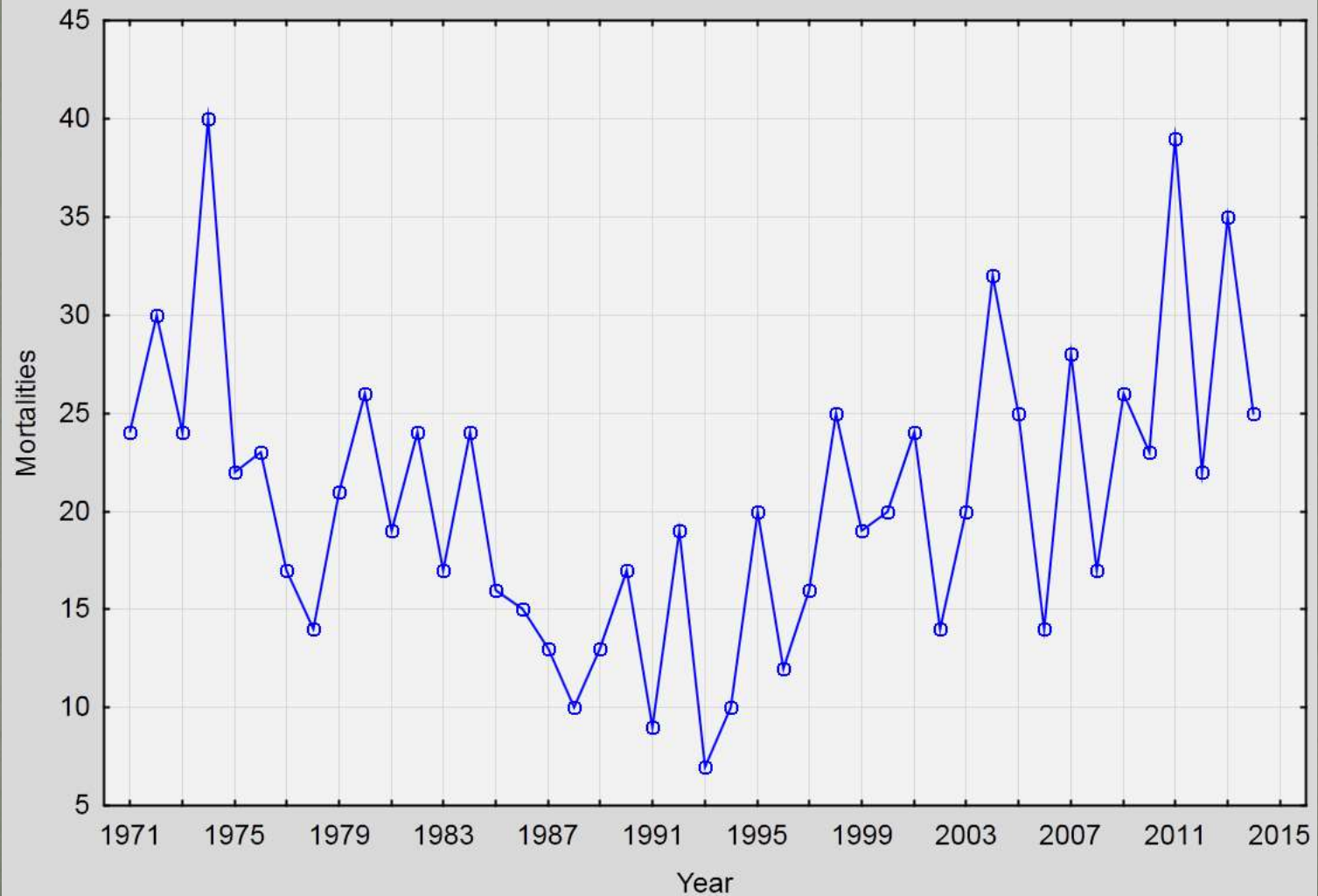


Male Relative Population Density



Population Management Unit	% of Total Population (both sexes) 2004
Glacier National Park	0.36
East Front	0.11
Flathead Reservation	0.01
Blackfeet Reservation	0.10
Middle Fork Flathead River	0.08
North Fork Flathead River	0.10
South Fork Flathead River-Swan Valley	0.18
South End	0.05
Flathead Valley	0.01

Mortality

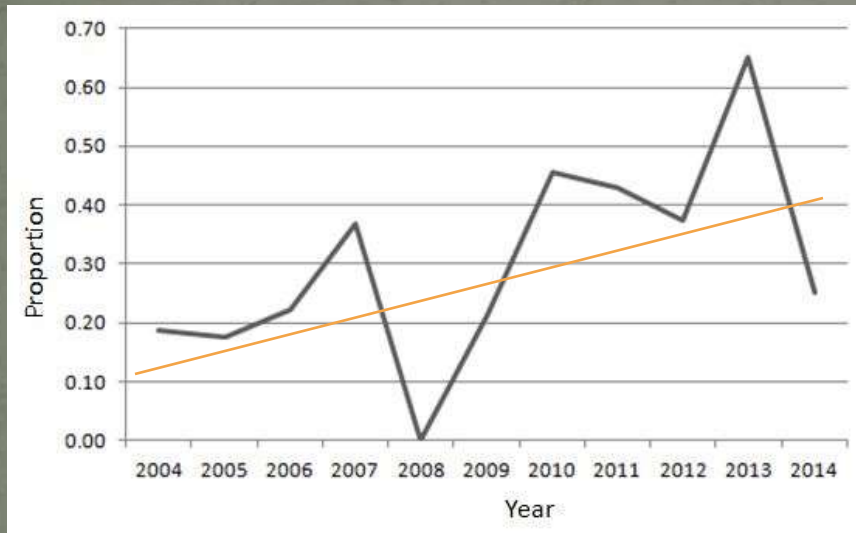


Mortality Causes

Mortality Cause	Sex		
	Female	Male	Combined
Natural	2.3	2.6	2.5
Vehicle collision	4.6	4.6	4.6
Train collision	4.5	5.3	4.9
Undetermined ^a	45.6	47.4	46.7
Mistaken Id	0.8	5.9	3.5
Poached/malicious	10.5	8.6	9.5
Defense-life	9.8	3.3	6.3
Defense-property	4.5	2.0	3.2
Agency <u>removal^b</u>	17.3	20.4	19.0

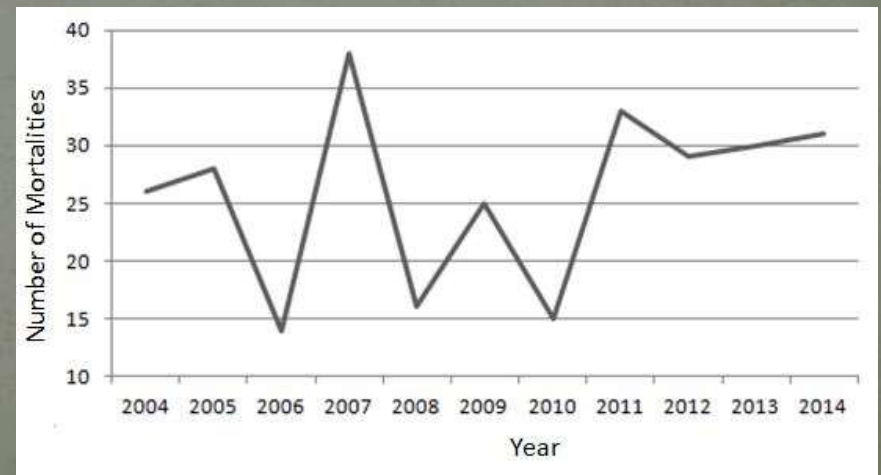


% Mortality Outside Recovery Line

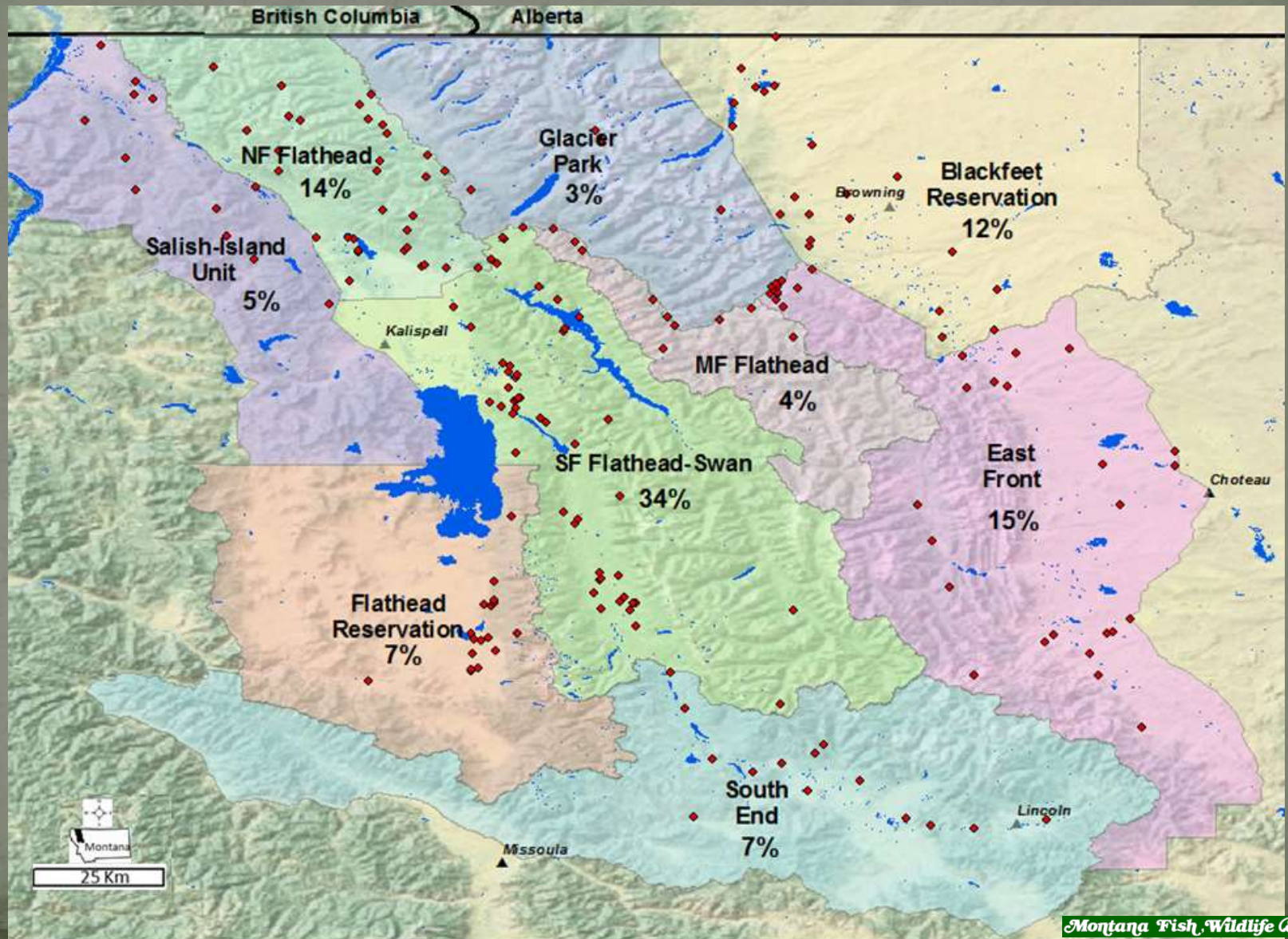


(Independent bears)

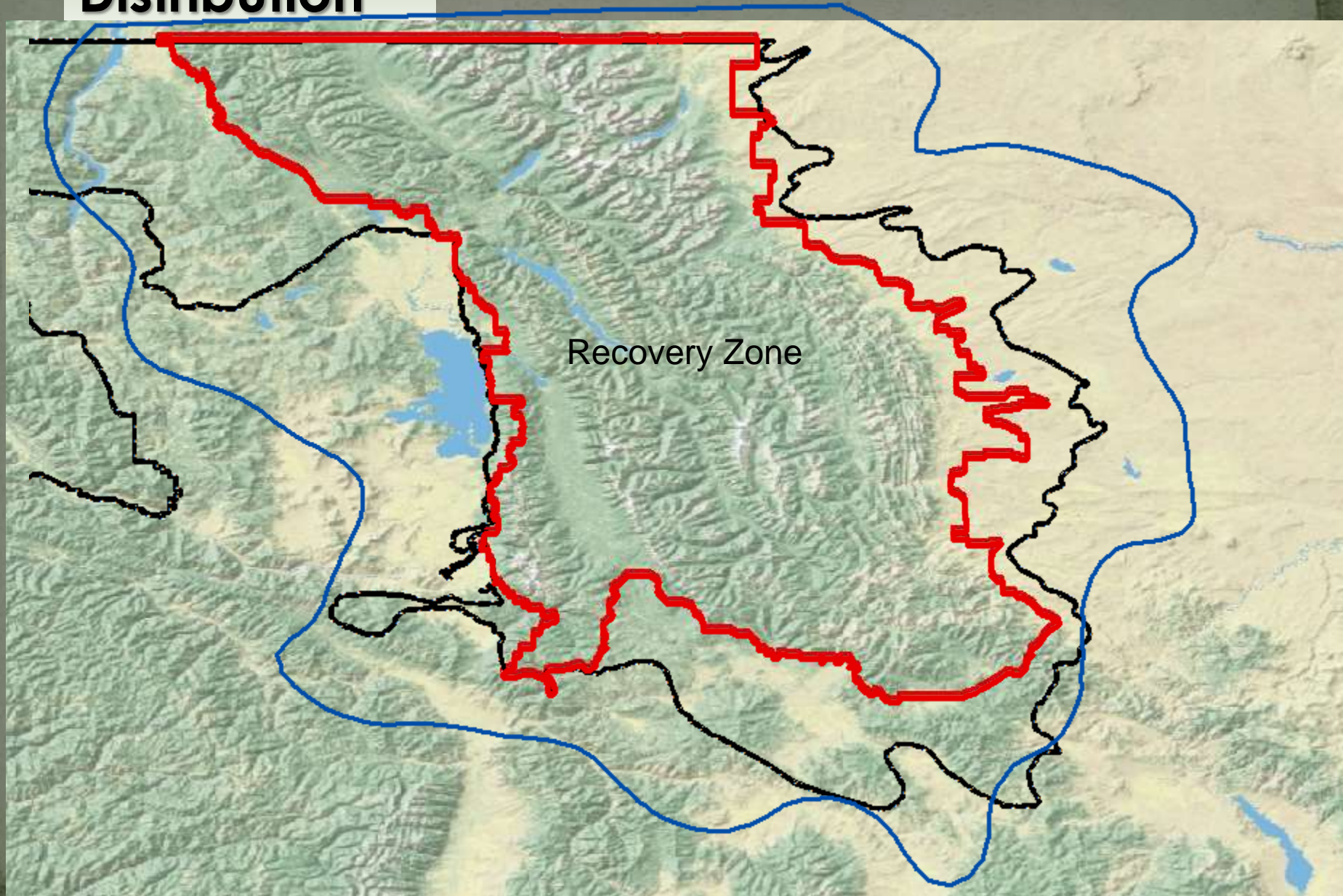
Number Mortalities



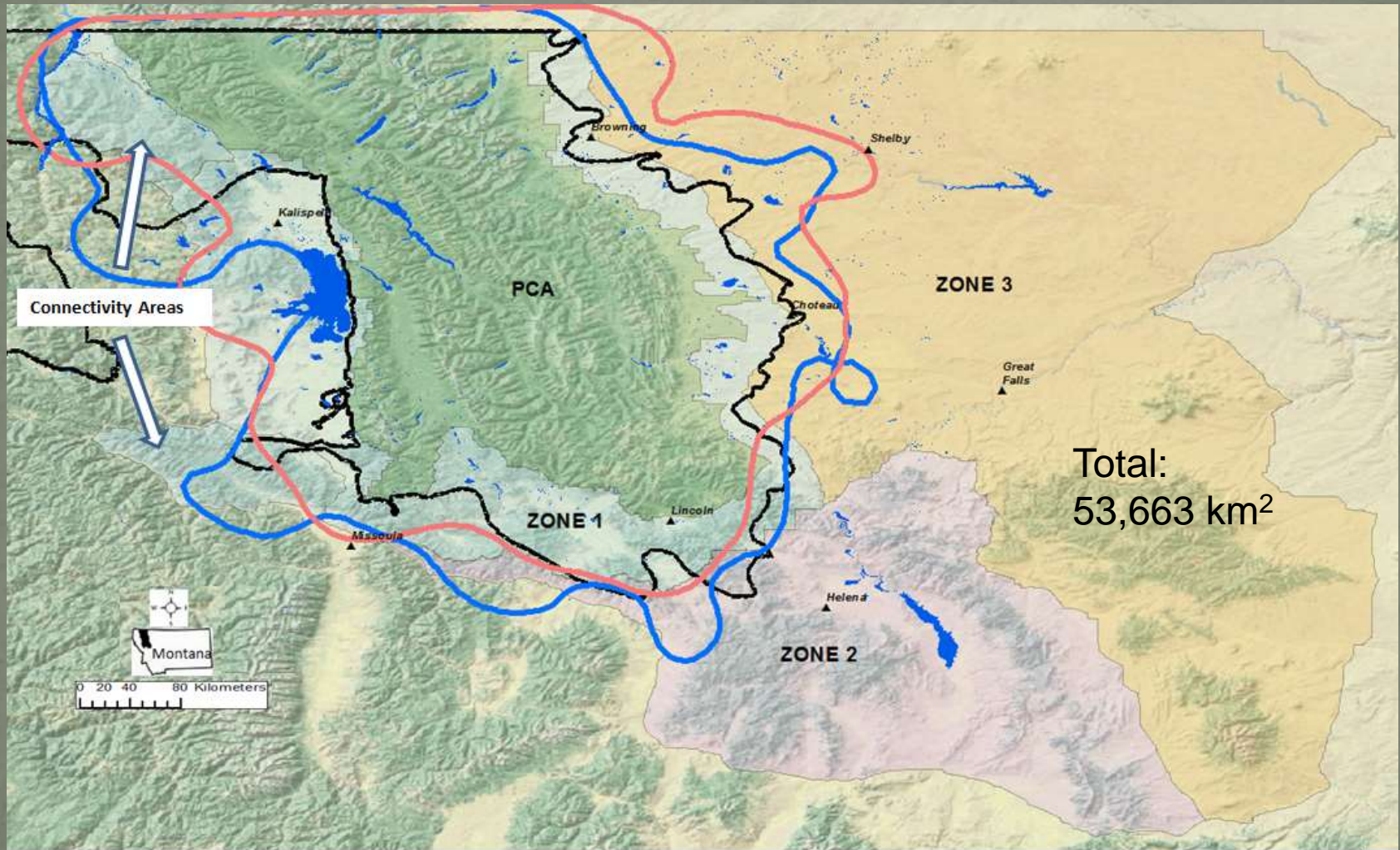
Distribution of Mortality (Independent bears)



Distribution



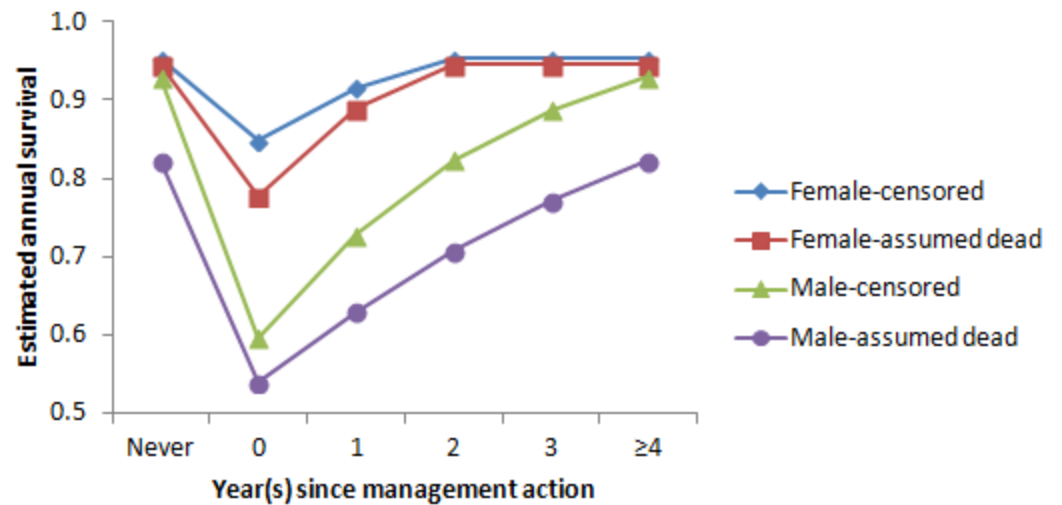
Distribution



2000-2013, methods of Bjornlie et al. 2013,
ordinary kriging

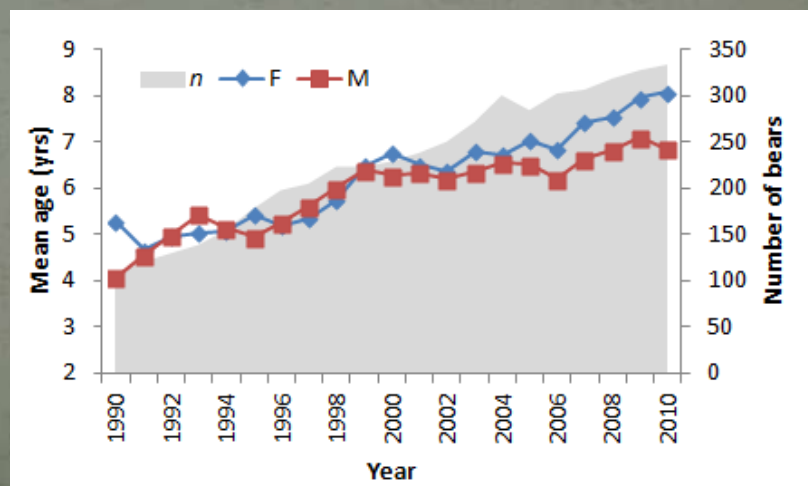
Survival

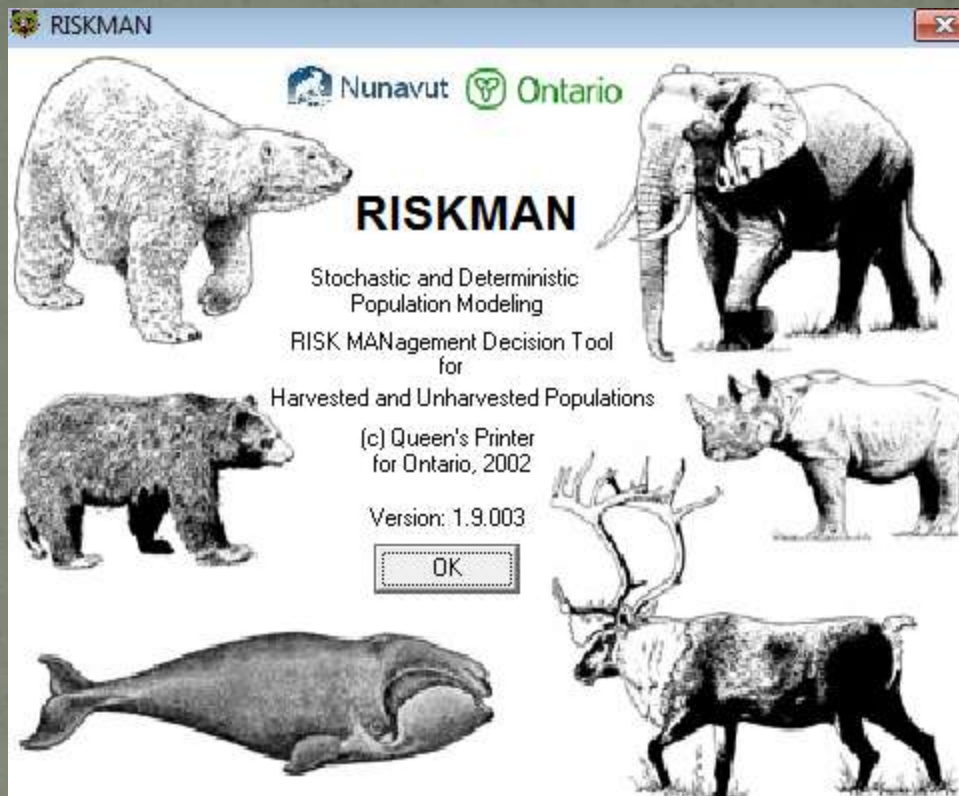
	Survival
Female	0.951
Male	0.916
Cub	0.55
Yearling	0.64



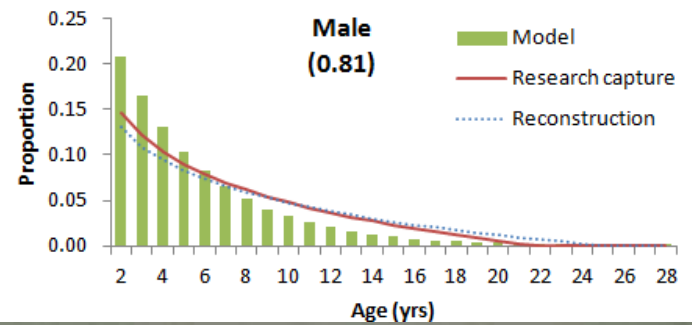
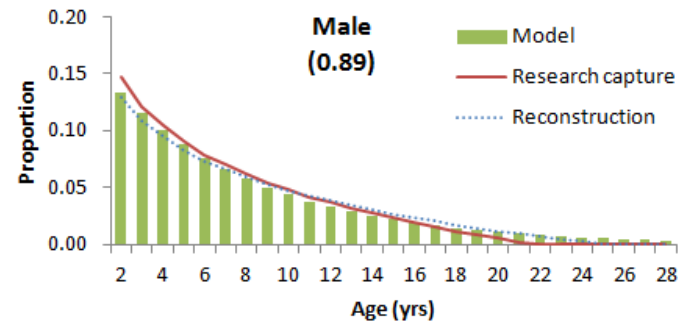
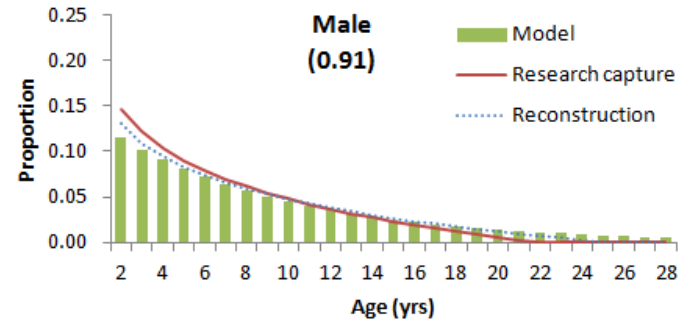
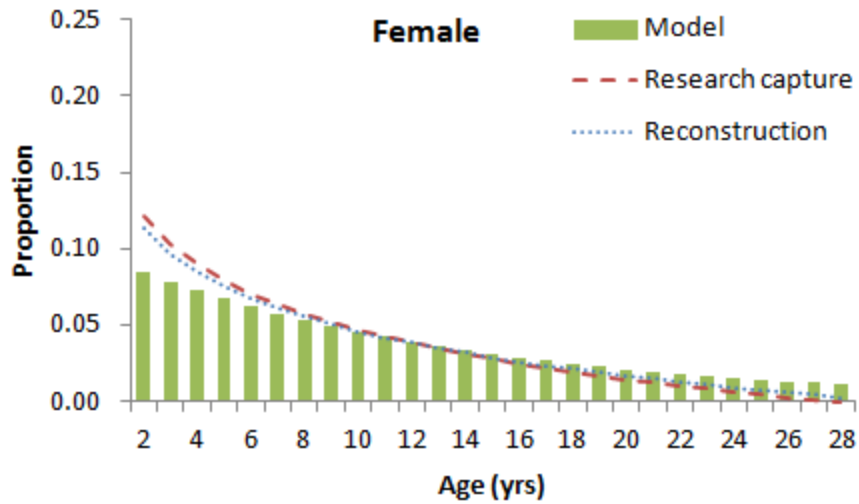
Population Structure

AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
		0	1	2	3	4	5	6	7	8	9	10	11
							0	1	2	3	4	5	6
						0	1	2	3	4			
0	1	2	3	4	5	6	7	8	9	10	11	12	13
							0	1	2	3	4	5	6
	0	1	2	3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	5	6	7	8	9	10	11	12	13	14	15		
7	8	9	10	11	12	13	14	15	16	17	18	19	20
7	8	9	10	11	12	13	14	15	16	17	18	19	20
11	12	13	14	15	16	17	18	19	20	21			
7	8	9	10	11	12	13	14	15	16	17	18	19	20
						0	1	2	3	4	5	6	7

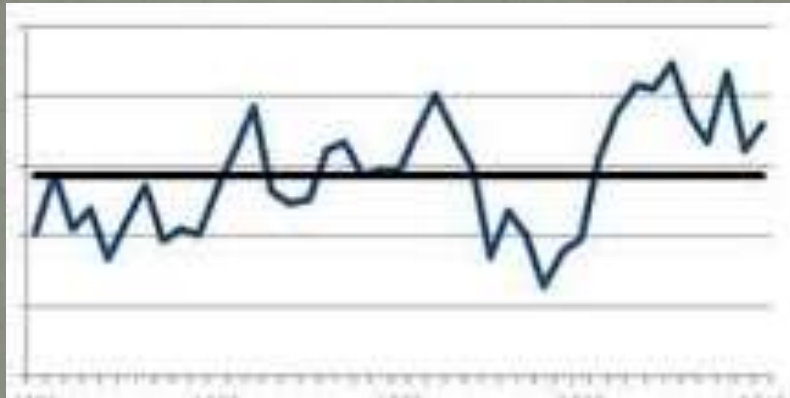




A	B	C
Age	male	female
0	99.77118	99.77118
1	53.79182	53.79182
2	33.57291	33.57291
3	29.84024	31.05353
4	26.52258	20.56582
5	23.57377	19.02252
6	20.95282	17.59502
7	18.62326	16.27465
8	16.55271	15.05337
9	14.71237	13.92374
10	13.07664	12.87887
11	11.62276	11.91241
12	10.33053	11.01847
13	9.18198	10.19164
14	8.161121	9.426836
15	7.253764	8.71943
16	6.447284	8.065104
17	5.73047	7.459882
18	5.093354	6.900082
19	4.527071	6.382285
20	4.023746	5.903343
21	3.576384	5.460349
22	3.178756	5.050589
23	2.82534	4.67158
24	2.511214	4.321014
25	2.232014	3.996753
26	1.983855	3.696827
27	1.763287	3.419406
28	1.567242	3.162803
29	1.392993	2.925457
30	1.238119	2.705925



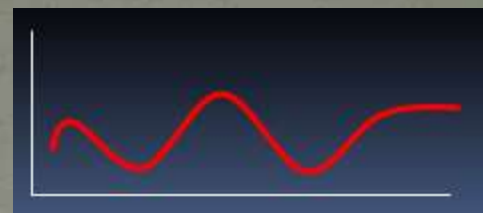
Management of Future Mortality Levels:



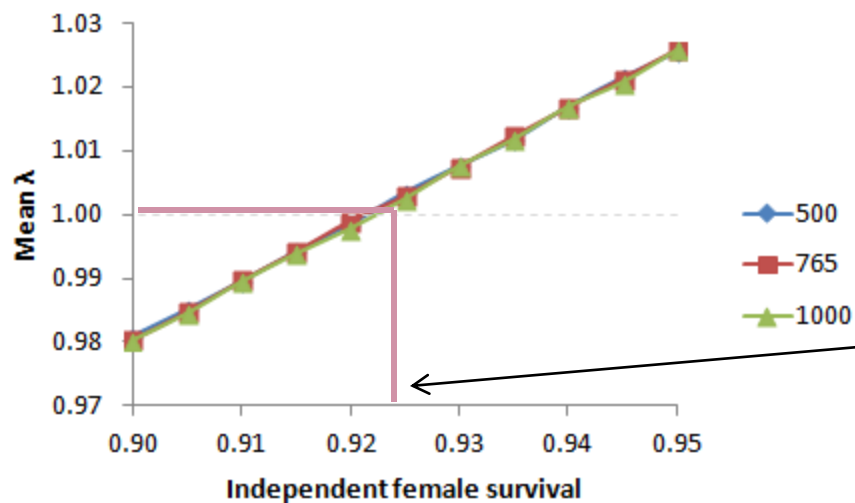
All depends on Management Objectives for Population Size/Trajectory

Lambda = 1.023

Approx 980 bears in 2015



Lambda and female survival



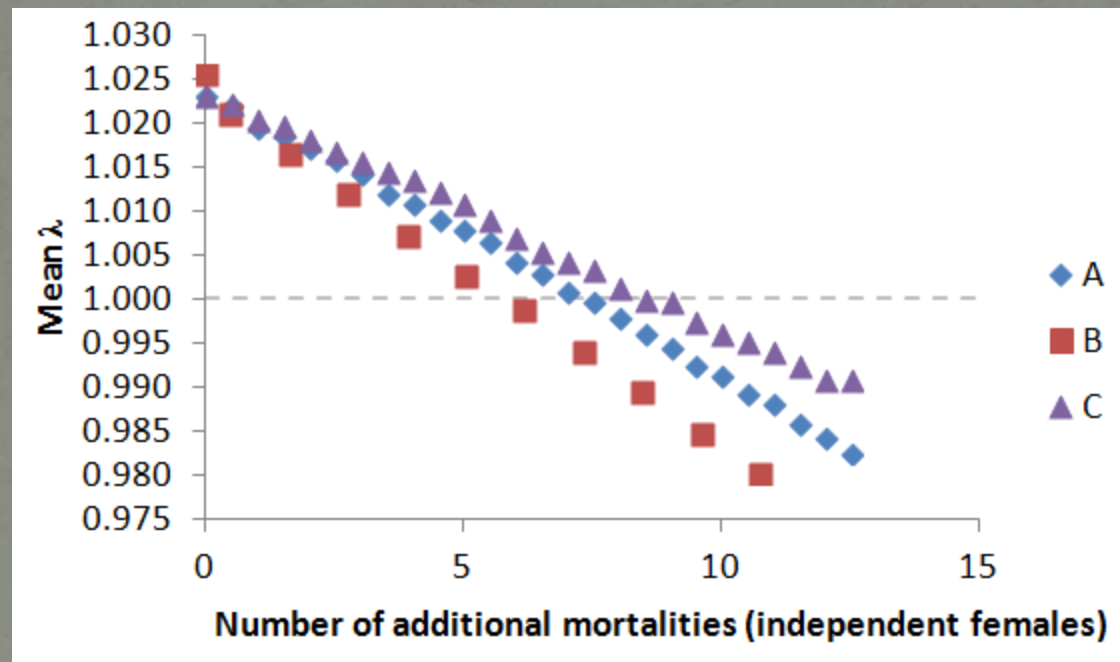
7.5 % Mort Rate

Population Size, Mortality, and Lambda

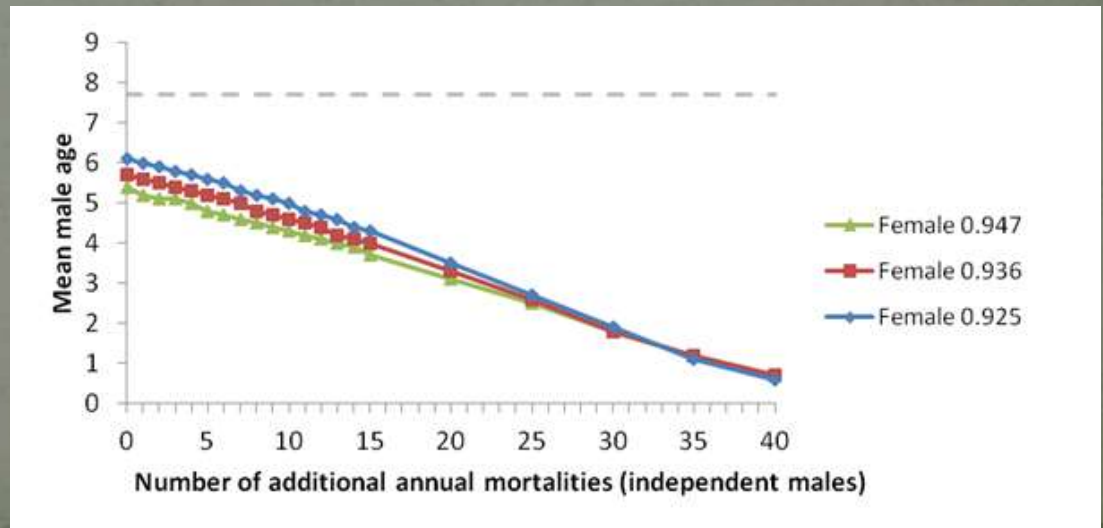
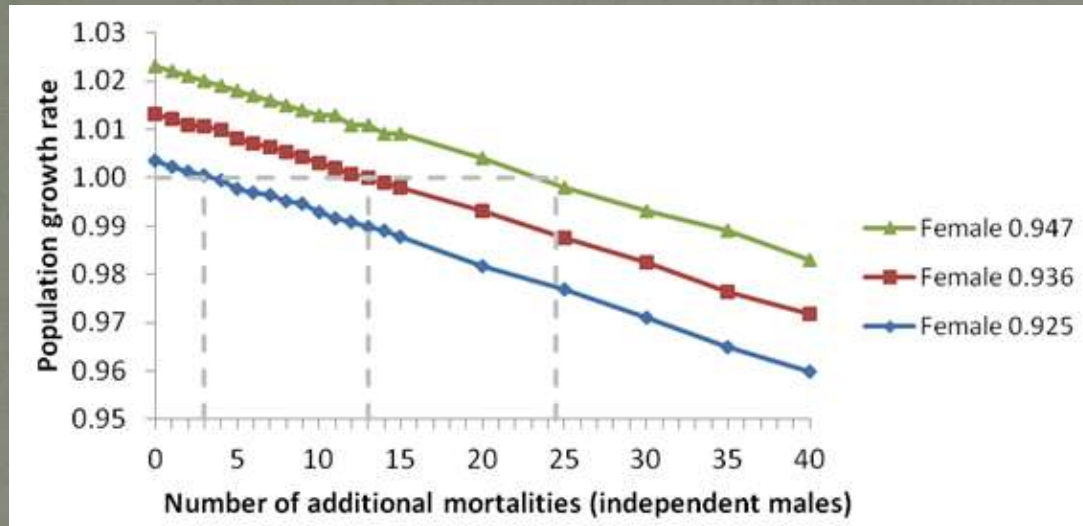
Values entered into models						Output from models								
Starting N ^a	Independent survival		Additional mortalities of independent bears ^b			Proportion of runs sustainable ^c (95% of starting population)				Proportion of runs sustainable ^d (90% of starting population)			Final N ^e (mean)	Final N ^e (lower 95% CI)
	Female	Male	Total	Mean female	Mean male	Mean λ	1 yr	5yrs	10 yrs	1 yr	5yrs	10 yrs		
960	0.947	0.860	0	0.0	0.0	1.023	0.98	1.00	1.00	1.00	1.00	1.00	1207	1063
960	0.947	0.860	1	0.5	0.5	1.022	0.99	1.00	1.00	1.00	1.00	1.00	1192	1045
960	0.947	0.860	2	1.0	1.0	1.020	0.98	1.00	1.00	1.00	1.00	1.00	1174	1026
960	0.947	0.860	3	1.5	1.5	1.020	0.98	1.00	1.00	1.00	1.00	1.00	1164	1021
960	0.947	0.860	4	2.0	2.0	1.018	0.98	1.00	1.00	1.00	1.00	1.00	1149	1009
960	0.947	0.860	5	2.5	2.5	1.017	0.98	0.99	1.00	1.00	1.00	1.00	1134	978
960	0.947	0.860	6	3.0	3.0	1.016	0.97	0.99	1.00	1.00	1.00	1.00	1120	978
960	0.947	0.860	7	3.5	3.5	1.014	0.97	0.99	1.00	1.00	1.00	1.00	1109	968
960	0.947	0.860	8	4.0	4.0	1.014	0.98	0.99	1.00	1.00	1.00	1.00	1095	957
960	0.947	0.860	9	4.5	4.5	1.012	0.96	0.98	0.99	1.00	1.00	1.00	1080	932
960	0.947	0.860	10	5.0	5.0	1.011	0.97	0.97	0.98	1.00	1.00	1.00	1064	916
960	0.947	0.860	11	5.5	5.5	1.009	0.96	0.96	0.98	1.00	1.00	0.99	1050	914
960	0.947	0.860	12	6.0	6.0	1.007	0.96	0.96	0.97	1.00	1.00	0.99	1025	888
960	0.947	0.860	13	6.5	6.5	1.005	0.96	0.95	0.95	1.00	0.99	0.99	1007	868
960	0.947	0.860	14	7.0	7.0	1.004	0.96	0.93	0.91	1.00	0.99	0.98	995	862
960	0.947	0.860	15	7.5	7.5	1.003	0.95	0.90	0.87	1.00	0.99	0.98	985	843
960	0.947	0.860	16	8.0	8.0	1.001	0.95	0.89	0.85	1.00	0.98	0.95	967	831
960	0.947	0.860	17	8.5	8.5	1.000	0.95	0.86	0.79	1.00	0.98	0.95	952	814
960	0.947	0.860	18	9.0	9.0	1.000	0.95	0.82	0.70	1.00	0.97	0.91	946	808
960	0.947	0.860	19	9.5	9.5	0.997	0.94	0.81	0.69	1.00	0.96	0.87	923	791

Impact of Added Mortality- Females

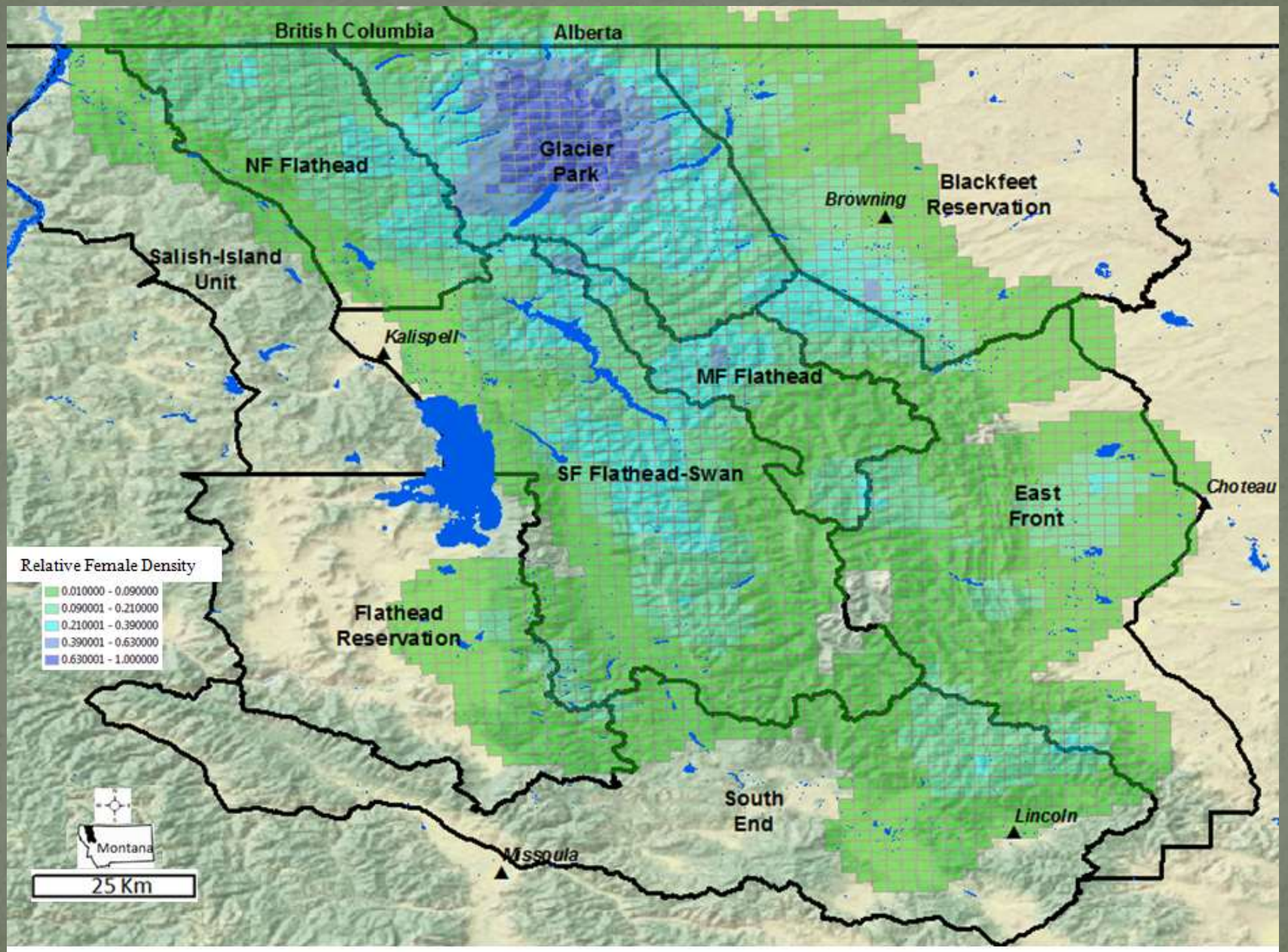
Females drive lambda

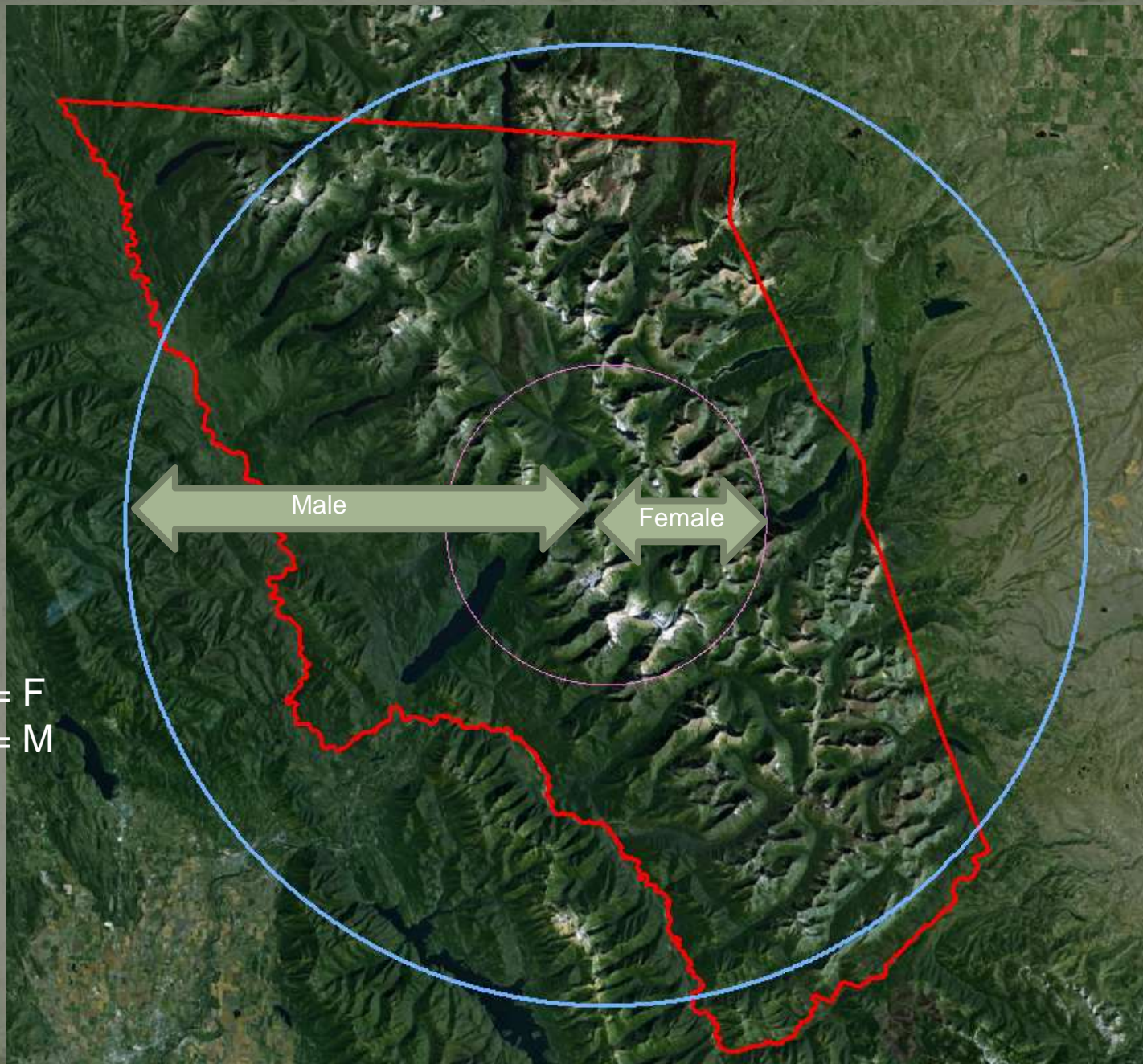


Impact of Additional Mortality- Males

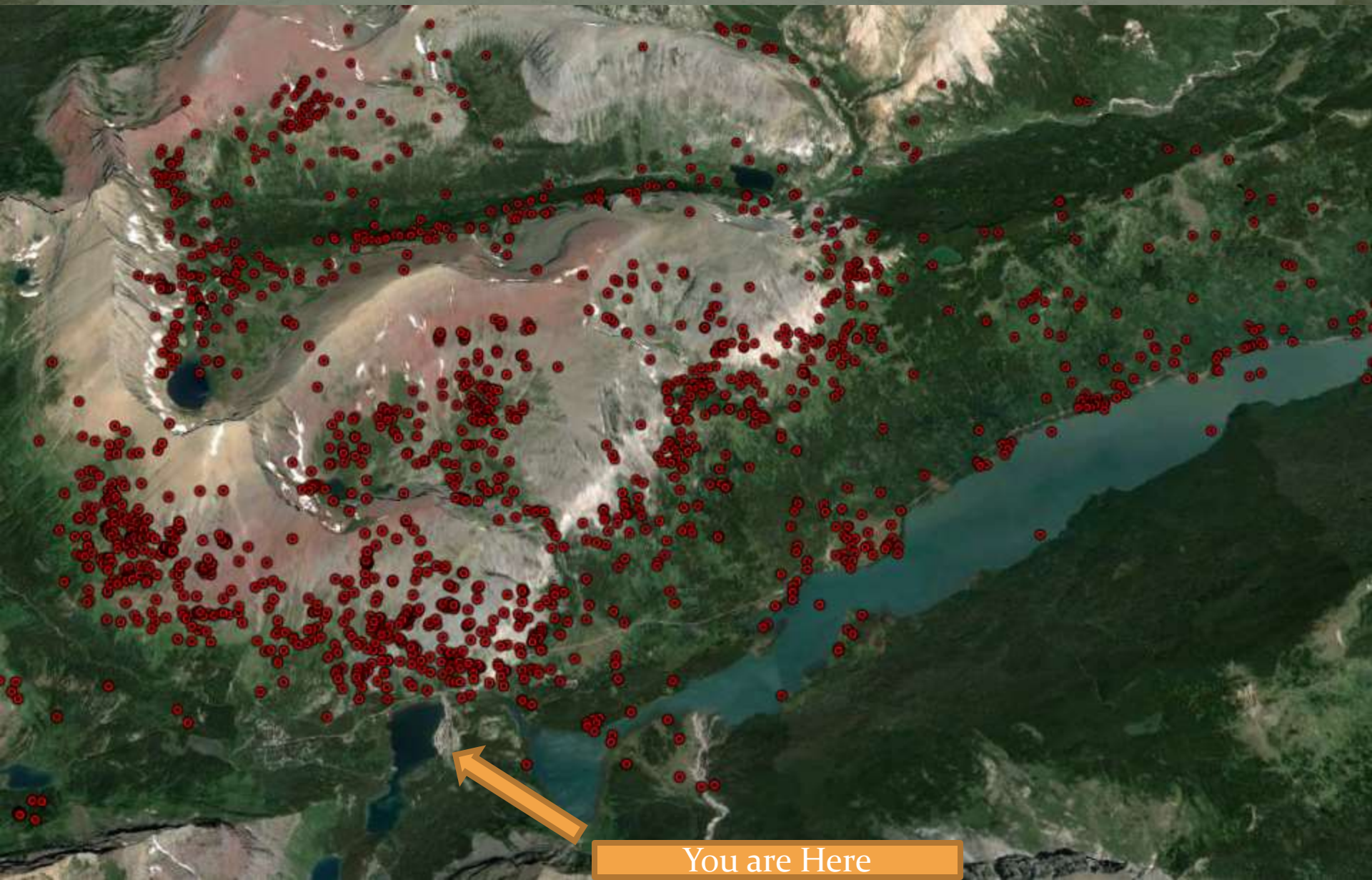


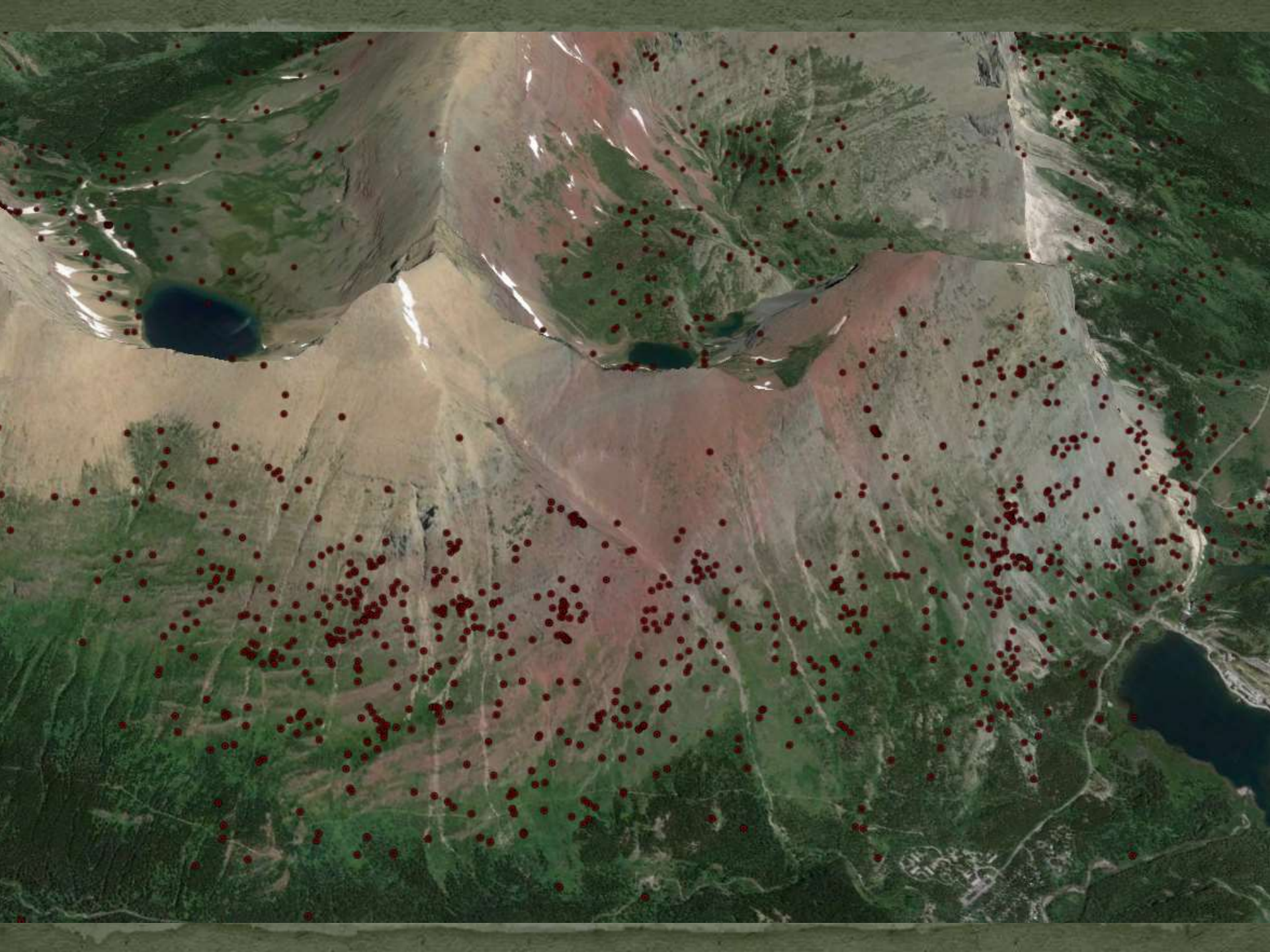


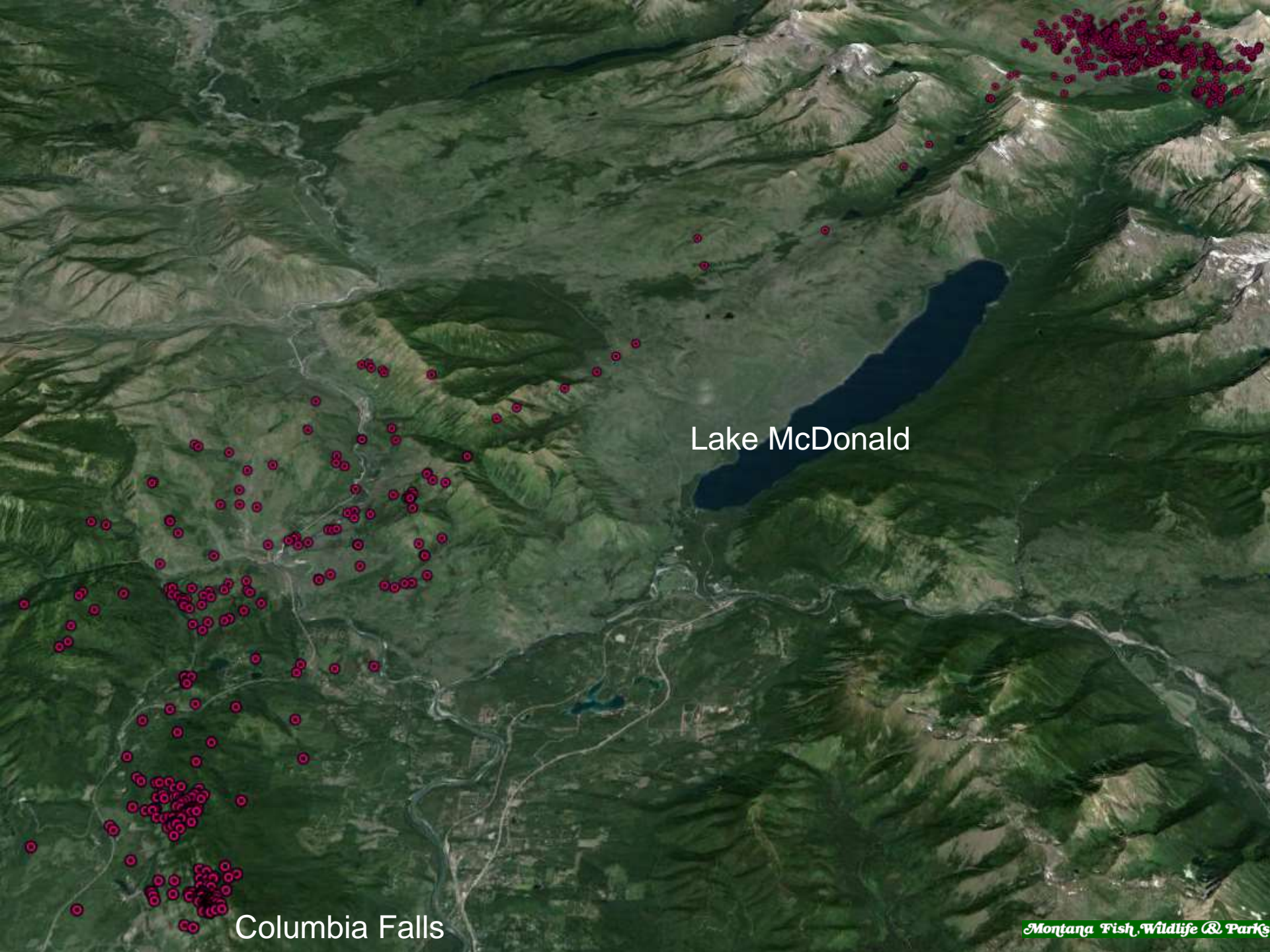




15000 m = F
45000 m = M



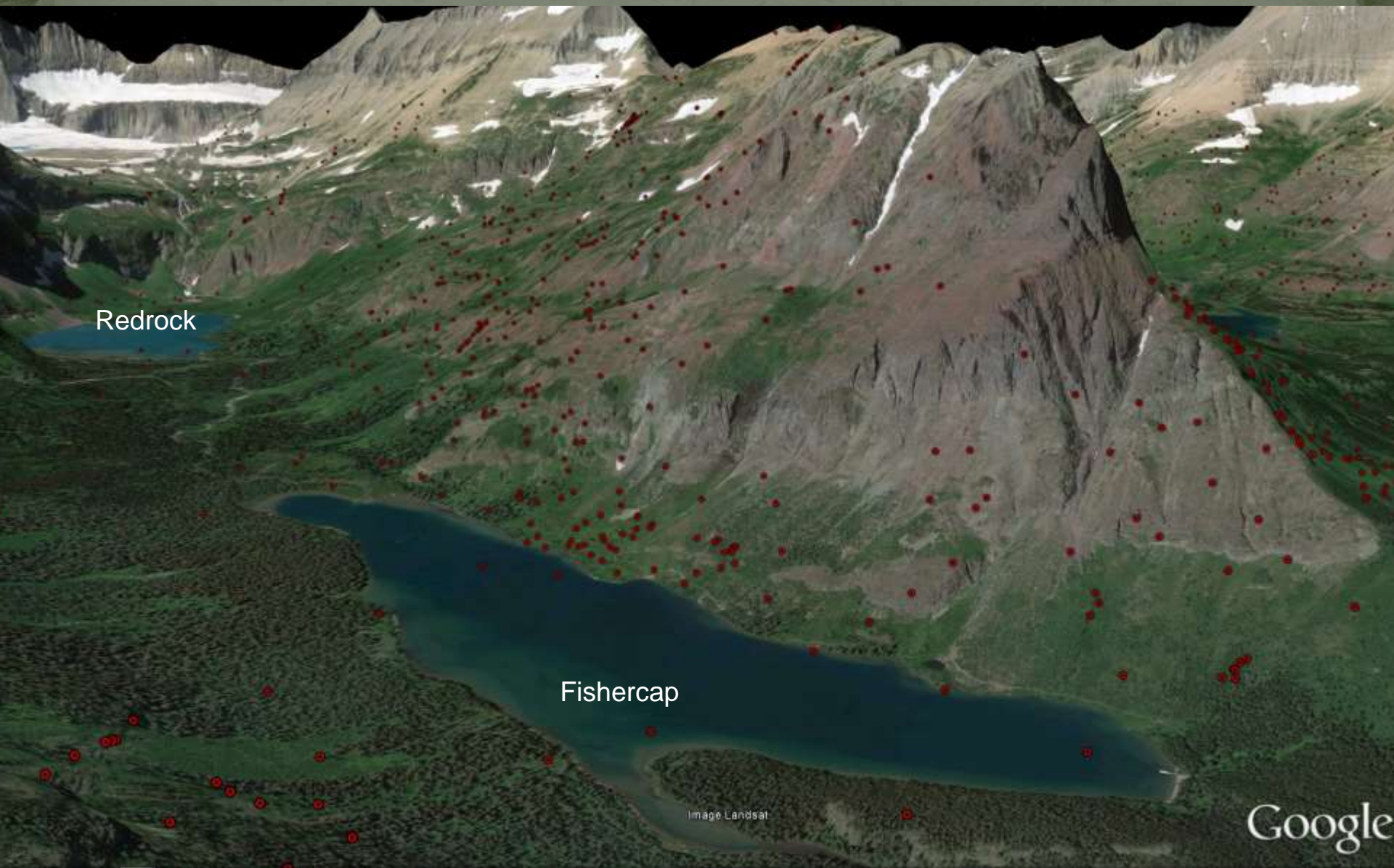




Lake McDonald

Columbia Falls



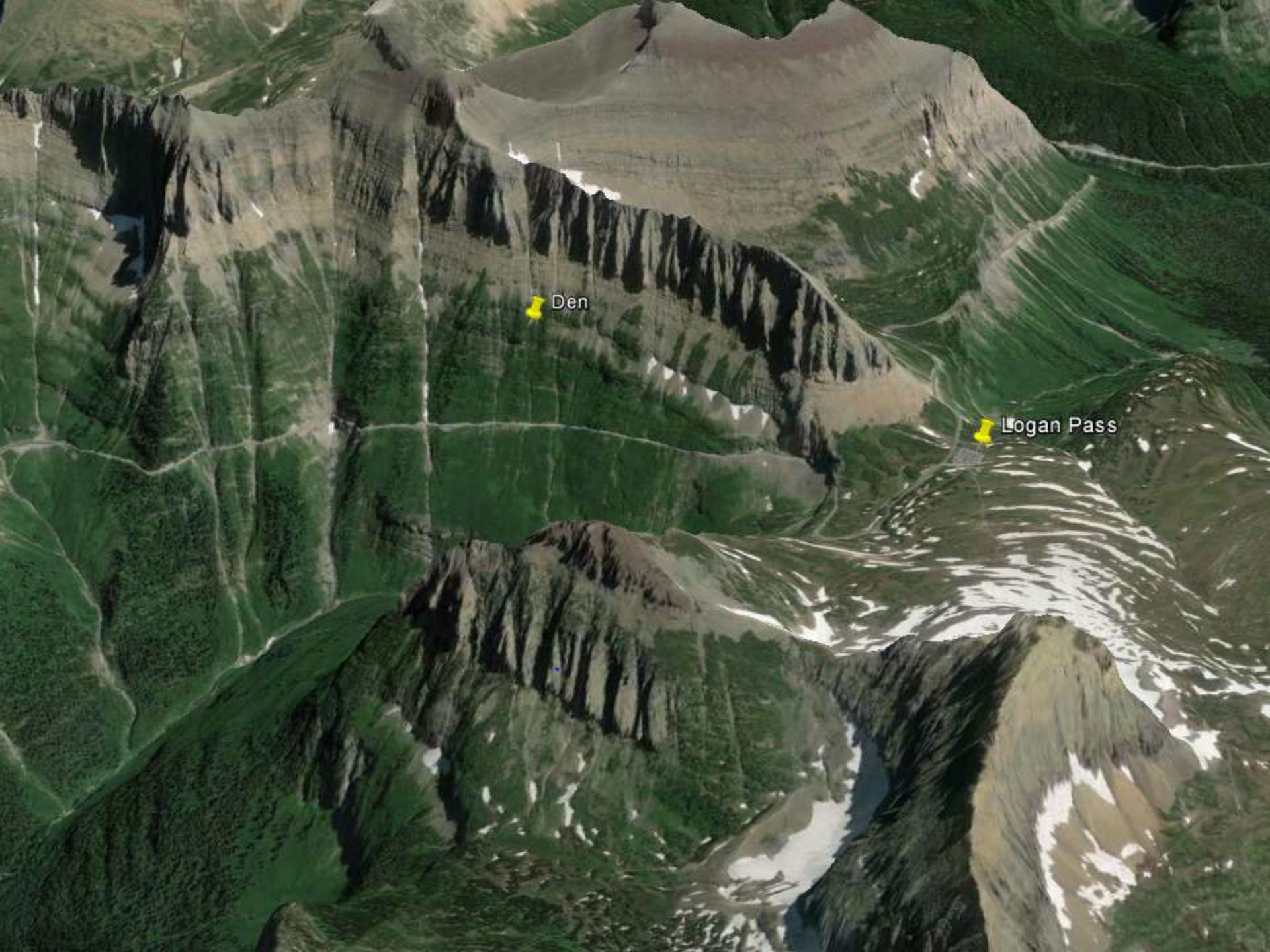


Redrock

Fishercap

Image Landsat

Google



Den

Logan Pass



QUESTIONS?????



