

## **Supplementary Material**

### **Grizzly bear response to translocation into a novel environment**

*Gordon B. Stenhouse<sup>A,\*</sup>, Terrence A. Larsen<sup>A</sup>, Cameron J. R. McClelland<sup>A</sup>, Abbey E. Wilson<sup>B</sup>, Karen Graham<sup>A</sup>, Dan Wismer<sup>A</sup>, Paul Frame<sup>C</sup> and Isobel Phoebus<sup>A</sup>*

<sup>A</sup>Grizzly Bear Program, fRI Research, 1176 Switzer Drive, Hinton, AB T7V 1V3, Canada

<sup>B</sup>Department of Veterinary Biomedical Sciences, University of Saskatchewan, 52 Campus Drive, Saskatoon, SK S7N 5B4, Canada

<sup>C</sup>Alberta Environment and Parks, 9920 108 Street NW, Edmonton, AB T5K 2M4, Canada

\*Correspondence to: Email: [gstenhouse@friresearch.ca](mailto:gstenhouse@friresearch.ca)

Table S1. Bear ID, sex, age, year, date range and duration of collar data including GPS locations from within the denning period for translocated and resident grizzly bears in west-central Alberta, Canada between 2016 and 2019. Cubs include yearlings (yr1s) and cubs of the year (coy).

Bear ID	Sex	Age	Cubs	Year	Data date range	Collar data duration (days)
<i>Translocated Bears</i>						
G162	Female	5		2016	Feb02:Nov16	288
G163	Female	7	2 coy	2018	Sep25:Dec05	71
		8	2 yr1s	2019	Jan26:Oct17	264
G172	Male	4		2017	Apr15:Dec12	241
		5		2018	Apr09:May28	49
G174	Female	4		2017	Apr21:Nov05	198
G175	Male	6		2017	Jul22:Nov19	120
		7		2018	Apr05:Aug01	118
G176	Female	14	2 coy	2017	Aug11:Dec31	142
		15		2018	Jan05:Nov30	329
		16	2 coy	2019	Apr03:Jul28	116
G177	Male	3		2017	Aug25:Dec31	128
		4		2018	Jan08:May27	139
G179	Male	4		2017	Sep30:Nov12	43
		5		2018	Apr04:May28	54
G180	Female	6		2017	Oct04:Dec19	76
		7		2018	Jan02:Jun13	162
G182	Male	3		2018	Jun26:Dec03	160
G183	Female	2		2018	Aug08:Nov05	89
G185	Male	1		2018	Aug31:Nov30	91
		2		2019	Apr09:Jun08	60
<i>Resident Bears</i>						
G113	Female	11		2016	Sep21:Dec31	101
		12		2017	Jan03:Dec27	358
G126	Female	6	2 coy	2016	Sep11:Dec01	81
		7	2 yr1s	2017	Mar30:Nov07	222
G143	Male	8		2018	Apr10:Jul09	90
		6		2017	May12:Oct30	171
G144	Female	7		2018	Apr09:Jul19	101
		5		2017	May31:Oct09	131
G160	Male	5		2016	Feb03:Sep10	220
G166	Male	11		2016	Mar10:Nov22	257
		12		2017	Mar23:Aug18	148
G167	Female	8		2016	May02:Oct30	181
		9		2017	May03:Oct22	172
G168	Female	3		2016	May08:Nov30	206
		4		2017	Mar27:Jul16	111
G169	Male	5		2016	May09:Oct03	147
G170	Female	2		2016	May12:Dec12	214
		3		2017	Mar29:Aug15	139
G171	Male	3		2016	May17:Nov20	187
G173	Male	7		2017	Apr21:Oct14	176

Table S2. Wilcoxon test statistics (*W*), *P*-values (*P*), and means  $\pm$  standard deviations for the comparison of translocated and resident bear road crossing ratios relative to all roads (total crossings), road type, and time of day. Translocated and resident bears were further separated by sex and the same comparisons were tested. Translocated bears were found to cross roads significantly more at night than resident bears relative to road density (shown in bold). Translocated and resident grizzly bears resided in west-central Alberta, Canada between 2016 and 2019 during the current study.

Comparison	All bears				Female bears				Male bears			
	<i>W</i>	<i>P</i>	Translocated	Resident	<i>W</i>	<i>P</i>	Translocated	Resident	<i>W</i>	<i>P</i>	Translocated	Resident
<b>Total Crossings</b>	132	0.17	0.29 $\pm$ 0.18	0.24 $\pm$ 0.24	30	0.18	0.30 $\pm$ 0.21	0.16 $\pm$ 0.07	35	0.70	0.28 $\pm$ 0.17	0.34 $\pm$ 0.35
<b>Road Type</b>												
Gravel	103	0.10	0.32 $\pm$ 0.23	0.26 $\pm$ 0.34	21	0.06	0.36 $\pm$ 0.31	0.15 $\pm$ 0.09	32	0.87	0.29 $\pm$ 0.16	0.47 $\pm$ 0.53
Paved	105	0.80	0.43 $\pm$ 0.48	0.27 $\pm$ 0.25	35	1.00	0.26 $\pm$ 0.27	0.21 $\pm$ 0.12	15	0.45	0.60 $\pm$ 0.60	0.41 $\pm$ 0.37
Truck trail	175	0.92	0.22 $\pm$ 0.15	0.24 $\pm$ 0.15	42	0.68	0.23 $\pm$ 0.16	0.19 $\pm$ 0.08	45	0.36	0.22 $\pm$ 0.14	0.32 $\pm$ 0.20
Unimproved	174	0.10	0.28 $\pm$ 0.19	0.22 $\pm$ 0.30	23	0.06	0.28 $\pm$ 0.21	0.12 $\pm$ 0.07	39	0.97	0.27 $\pm$ 0.17	0.38 $\pm$ 0.44
Other	118	0.17	0.35 $\pm$ 0.28	0.24 $\pm$ 0.34	26	0.21	0.36 $\pm$ 0.28	0.21 $\pm$ 0.39	36	0.76	0.34 $\pm$ 0.29	0.27 $\pm$ 0.30
Gravel and paved	117	0.07	0.32 $\pm$ 0.21	0.25 $\pm$ 0.31	24	0.07	0.34 $\pm$ 0.24	0.17 $\pm$ 0.09	34	0.63	0.31 $\pm$ 0.19	0.36 $\pm$ 0.46
<b>Time of Day</b>												
Day	144	0.30	0.18 $\pm$ 0.11	0.18 $\pm$ 0.21	37	0.43	0.16 $\pm$ 0.01	0.13 $\pm$ 0.06	35	0.63	0.19 $\pm$ 0.11	0.25 $\pm$ 0.32
Night	<b>111</b>	<b>0.04</b>	<b>0.08<math>\pm</math>0.09</b>	<b>0.04<math>\pm</math>0.03</b>	25	0.08	0.11 $\pm$ 0.13	0.02 $\pm$ 0.03	34	0.70	0.06 $\pm$ 0.04	0.06 $\pm$ 0.02
Twilight Morning	152	0.42	0.01 $\pm$ 0.01	0.01 $\pm$ 0.01	34	0.31	0.11 $\pm$ 0.01	0.00 $\pm$ 0.00	44	0.75	0.01 $\pm$ 0.01	0.01 $\pm$ 0.01
Twilight Night	154	0.46	0.02 $\pm$ 0.01	0.01 $\pm$ 0.01	25	0.08	0.01 $\pm$ 0.02	0.01 $\pm$ 0.00	46	0.63	0.02 $\pm$ 0.01	0.02 $\pm$ 0.02

Table S3. Coefficient estimates ( $\beta$ ), standard errors (SE), z values, and P-values for the final model describing translocated and resident bear selection near anthropogenic features and mortality risk. Industrial facilities were not included in the final model for translocated bears (P>0.1 shown in bold). Agricultural lands and industrial facilities were not included in the final model for resident bears (P>0.1 shown in bold). Translocated and resident grizzly bears resided in west-central Alberta, Canada between 2016 and 2019 during the current study.

Parameter	Translocated				Resident			
	$\beta$	SE	z value	P value	$\beta$	SE	z value	P value
Intercept	-4.07E+00	4.35E-01	-9.35	<2.00E-16	-3.02E+00	5.15E-01	-5.87	4.38E-09
Distance to roads	9.16E+00	6.06E+00	1.51	0.13	-9.21E+01	3.45E+00	-26.66	<2.00E-16
Distance to roads <sup>2</sup>	5.99E+01	4.94E+00	12.13	<2.00E-16	3.74E+01	2.66E+00	14.03	<2.00E-16
Compound topographic index	-7.64E+01	7.67E+00	-9.97	<2.00E-16	5.55E+01	3.57E+00	15.54	<2.00E-16
Compound topographic index <sup>2</sup>	3.62E+01	6.43E+00	5.62	1.87E-08	-4.39E+01	2.73E+00	-16.08	<2.00E-16
Edge	8.17E+01	1.19E+01	6.88	6.15E-12	1.18E+02	4.78E+00	24.59	<2.00E-16
Edge <sup>2</sup>	-2.48E+02	1.24E+01	-20.04	<2.00E-16	-1.43E+02	4.92E+00	-29.13	<2.00E-16
Landcover_snow/ice	1.94E+00	1.91E-01	10.17	<2.00E-16	3.25E+00	2.43E-01	13.36	<2.00E-16
Landcover_rock/rubble	-6.81E-03	1.80E-01	-0.04	0.97	1.19E+00	2.35E-01	5.06	4.23E-07
Landcover_exposed/barrenland	1.83E+00	1.72E-01	10.65	<2.00E-16	3.10E+00	2.32E-01	13.37	<2.00E-16
Landcover_bryoids (mosses)	-5.32E+00	1.20E+02	-0.05	0.96	1.10E+01	4.40E+01	0.25	0.80
Landcover_shrubland	1.94E+00	1.71E-01	11.35	<2.00E-16	3.70E+00	2.31E-01	15.98	<2.00E-16
Landcover_wetland	1.04E+00	1.88E-01	5.55	2.93E-08	2.37E+00	2.93E-01	8.08	6.67E-16
Landcover_treed wetland	3.34E+00	2.59E-01	12.87	<2.00E-16	NA	NA	NA	NA
Landcover_herbaceous resources	2.22E+00	1.71E-01	12.98	<2.00E-16	3.81E+00	2.32E-01	16.41	<2.00E-16
Landcover_coniferous forest	1.91E+00	1.70E-01	11.19	<2.00E-16	3.11E+00	2.31E-01	13.45	<2.00E-16
Landcover_broadleaf forest	2.03E+00	1.71E-01	11.86	<2.00E-16	2.74E+00	2.38E-01	11.53	<2.00E-16
Landcover_mixed wood forest	-5.73E+00	3.51E+01	-0.16	0.87	-3.54E+00	4.40E+01	-0.08	0.94
Elevation	-5.83E-04	3.35E-05	-17.39	<2.00E-16	-1.41E-04	3.33E-05	-4.24	2.25E-05
<b>Agricultural lands</b>	9.09E-01	2.45E-02	37.16	<2.00E-16	2.50E-01	1.94E-01	1.29	<b>0.20</b>
Residential lands	-8.77E-01	6.57E-02	-13.36	<2.00E-16	5.25E-01	1.15E-01	4.59	4.53E-06
Campgrounds and recreation sites	-9.20E-01	2.42E-01	-3.80	0.00	-2.01E+00	3.56E-01	-5.65	1.60E-08
<b>Industrial facilities</b>	-2.32E-02	6.03E-02	-0.39	<b>0.70</b>	1.02E-01	9.34E-02	1.09	<b>0.28</b>
Active wellsites	3.97E-01	2.78E-02	14.31	<2.00E-16	-1.26E-01	6.94E-02	-1.81	0.07
Mortality risk bin_1	6.08E-01	6.72E-02	9.04	<2.00E-16	2.77E-01	3.63E-02	7.63	2.43E-14
Mortality risk bin_2	7.91E-01	7.06E-02	11.20	<2.00E-16	9.11E-02	4.14E-02	2.20	0.03
Mortality risk bin_3	8.64E-01	7.17E-02	12.06	<2.00E-16	2.81E-01	4.29E-02	6.56	5.53E-11

Mortality risk bin_4	8.44E-01	7.24E-02	11.67	<2.00E-16	2.14E-01	4.41E-02	4.85	1.23E-06
Mortality risk bin_5	8.88E-01	7.25E-02	12.25	<2.00E-16	9.46E-02	4.49E-02	2.11	0.04
Mortality risk bin_6	9.20E-01	7.25E-02	12.69	<2.00E-16	8.63E-02	4.54E-02	1.90	0.06
Mortality risk bin_7	9.47E-01	7.25E-02	13.06	<2.00E-16	3.80E-02	4.62E-02	0.82	0.41
Mortality risk bin_8	1.23E+00	7.26E-02	16.97	<2.00E-16	1.46E-02	4.77E-02	0.31	0.76
Mortality risk bin_9	1.30E+00	7.35E-02	17.70	<2.00E-16	9.29E-02	5.09E-02	1.83	0.07
Mortality risk bin_10	1.37E+00	7.63E-02	17.89	<2.00E-16	-6.33E-02	6.32E-02	-1.00	0.32

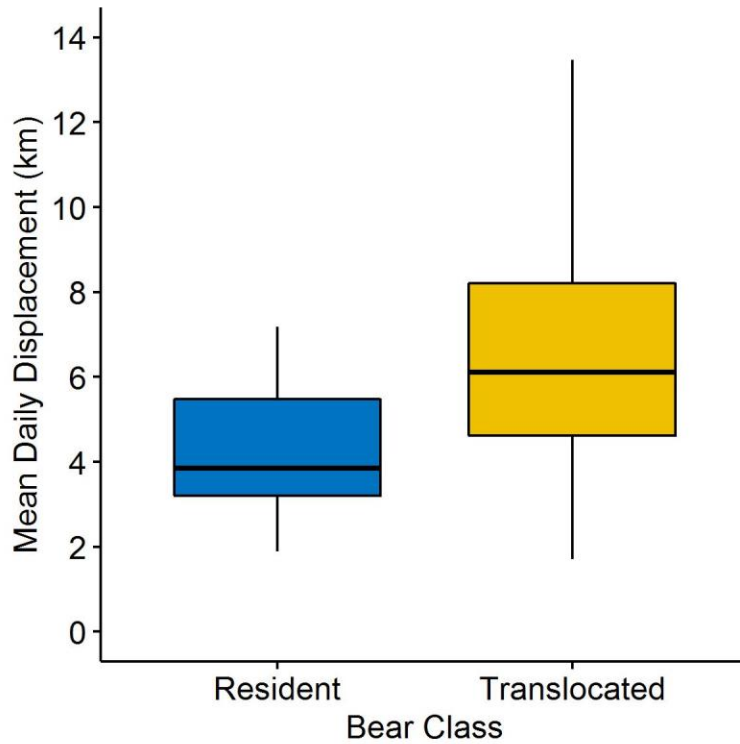


Figure S1. Mean daily displacement for translocated and resident grizzly bears in west-central Alberta, Canada between 2016 and 2019. The box-and-whisker plots provide: (i) the median represented by a thick horizontal line; (ii) the interquartile range represented by the box; and (iii) the minimum and maximum values, excluding outliers, represented by the lower and upper whiskers.

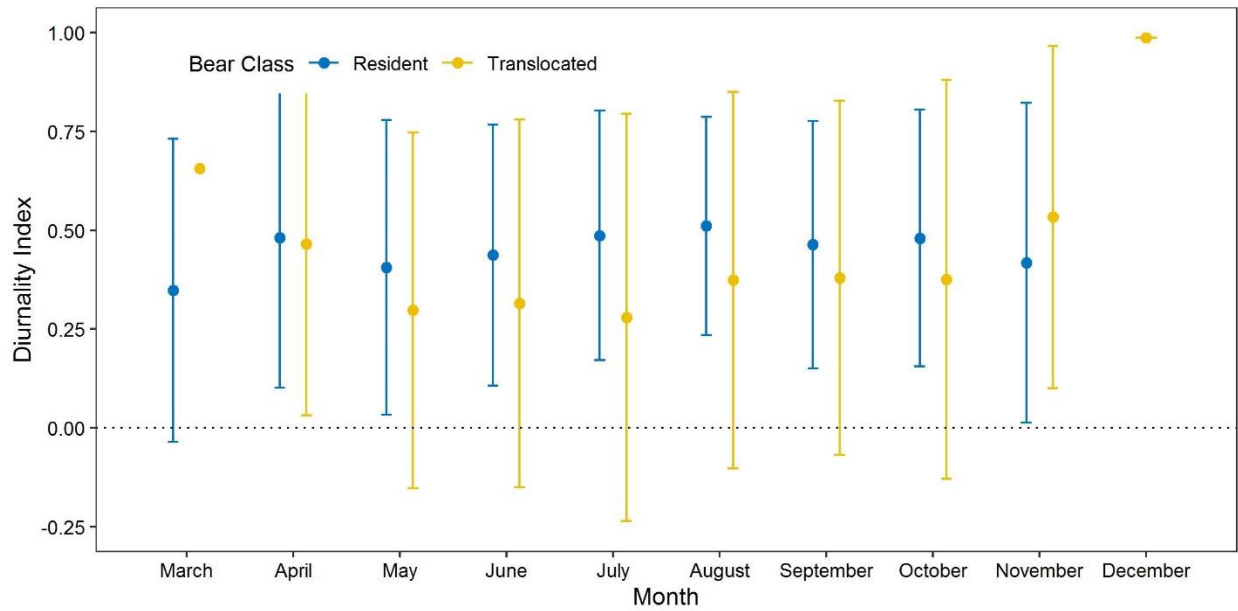


Figure S2. Monthly diurnality index of translocated and resident grizzly bears in west-central Alberta, Canada between 2016 and 2019. Values above zero are day active and below zero are night active. The closed circle is the mean value and the protruding lines indicate the standard deviation.



Figure S3. The percentage of time resident (R) and translocated (T) grizzly bears spent within poor to high quality habitat (1-10 RSF bin values, respectively) per year in west-central Alberta, Canada between 2016 and 2019.