Electronic Supplementary Material 1 – Supporting tables and figures

ESM1 Table S1. Study-unit specific monitoring data of female brown bears with dependent offspring that we monitored in south-central Sweden between 2005 and 2012 to assess effects of habitat selection on litter fate (complete mortality/complete survival of the cubs in the litter). We excluded one female that experienced partial litter loss from the analyses. The start day of the study was 1 May (i.e., start of the mating season). 'End day' indicates the day of complete litter loss, or a randomly assigned date that followed the previously documented distribution of sexually selected infanticide events or attempts on the study area [1]. 'Truncated' implies whether or not we truncated the data of a specific individual to the last day of litter loss (16 June) observed in this study. $N_{relocations}$ and GPS relocation fix rates were computed after conservative GPS data screening to retain only highly accurate GPS relocations. Fix rates between females that experienced litter survival (60.6%) and mortality (57.0%) were not statistically different (two Sample t-test, t = -0.571, df = 20.444, p = 0.575). We removed one successful mother from the analysis (*), because we started receiving GPS relocation data one day prior to the end of the truncated study period.

Bear ID	year	Start day	End day	Truncated	Nlocs	Fix rate	Fate
B7	2005	15 May	24 May	no	142	0.336	survival
B1	2007	1 May	28 May	no	554	0.437	survival
B10	2007	1 May	8 June	no	980	0.549	survival
B4	2008	6 May	5 June	no	765	0.531	mortality
B5	2008	6 May	5 June	no	553	0.384	mortality
B19	2008	6 May	8 May	no	84	0.875	mortality
B22	2008	6 May	27 May	no	619	0.627	survival
B2	2009	1 May	15 June	no	1499	0.694	mortality
B4	2009	1 May	8 May	no	201	0.598	mortality
B11	2009	1 May	15 June	no	500	0.744	mortality
B8	2009	1 May	6 June	no	890	0.526	survival
B17	2009	1 May	30 June	yes	1916	0.679	survival
B20	2009	1 May	14 June	no	1256	0.607	survival
B21	2009	1 May	24 May	no	906	0.838	survival
B13	2010	1 May	3 June	no	924	0.583	mortality
B16	2010	1 May	16 May	no	468	0.650	mortality
B9	2010	1 May	11 May	no	410	0.872	survival
B14	2010	1 May	5 June	no	1156	0.703	survival
B23 *	2010	14 June	19 June	yes	134	0.570	Survival
B22	2011	1 May	6 June	no	632	0.366	mortality
B3	2011	1 May	19 June	yes	868	0.377	survival
B7	2011	1 May	24 June	yes	1113	0.439	survival
B16	2011	1 May	6 June	no	809	0.478	survival
B19	2011	1 May	10 May	no	330	0.780	survival
B18	2012	1 May	29 May	no	405	0.301	mortality
B20	2012	1 May	30 May	no	757	0.544	mortality
B6	2012	1 May	22 June	yes	1768	0.723	survival
B9	2012	1 May	21 May	no	837	0.890	survival
B12	2012	1 May	14 June	no	933	0.451	survival
B15	2012	21 May	4 June	no	426	0.647	survival

17

ESM1 Table S2. Candidate models for third-order resource selection functions of female brown bears during the mating season in south-central Sweden (2005-2012), ranked according to the second-order, bias-corrected Akaike Information Criterion difference (ΔAIC_c) and weight (AIC_{cw}) values. '✓' indicates the inclusion of a landscape variable as a main term in a candidate model, '*' indicates the inclusion of the interaction term 'litter survival' with a certain landscape variable. NDVI = Normalized Difference Vegetation Index.

Model selection diagnostics			Landscape variables									
Rank	ΔAICc	AICcw	Distance to the nearest *forest road*	Distance to the nearest *road*	Distance to the nearest *habitation*	NDVI	Bog	Tree-rich bog	Clearcut	Young forest	Mid-aged forest	Old forest
1	-	1	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *
2	20.8	0	✓	✓ *	✓ *	✓ *	✓	✓	✓ *	✓ *	✓ *	✓ *
3	53.0	0	✓ *	✓ *	✓ *	✓ *	✓	✓	✓ *	✓	✓	✓ *
4	202.7	0	✓	✓	✓ *	✓	✓	✓	✓	✓	✓	✓ *
5	1206.1	0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	2028.9	0	✓ *	✓ *	✓ *							
7	2036.7	0	✓	✓ *	✓ *							
8	2065.0	0	✓	✓	✓ *							
9	2477.2	0				✓	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *
10	2479.1	0				✓ *	✓ *	✓ *	✓ *	✓ *	✓ *	✓ *
11	2526.5	0				✓ *	✓	✓	✓ *	✓ *	✓ *	✓ *
12	2562.6	0				✓ *	✓	✓	✓ *	✓	✓	✓ *
13	2848.1	0				✓	✓	✓	✓	✓	✓	✓
14	2921.4	0	✓	✓	✓							
15	4478.4	0										

ESM1 Table S3. Most parsimonious candidate model to evaluate third-order resource selection of female brown bears in relation to litter fate (survival/mortality) during the mating season in south-central Sweden (2005-2012). NDVI = Normalized Difference Vegetation Index. '*' indicates statistically significant model terms (i.e., 0 not included in the 95% confidence interval). Note that we reversed the sign of parameter estimates of the 'distance to' variables to facilitate interpretation; positive values indicated 'selection for' whereas negative values indicated 'avoidance'.

Model term	**β**	**σ**	**95% confidence interval**		
			Lower level	***Upper level***	
Intercept	-0.323	0.109	-0.537	-0.109	*
Survival vs. Mortality	0.023	0.087	-0.148	0.194	
Distance to the nearest forest road	-0.420	0.025	0.370	0.470	*
Distance to the nearest road	-0.557	0.031	0.496	0.618	*
Distance to the nearest habitation	-0.210	0.022	0.167	0.253	*
Bog (1 vs 0)	-0.761	0.091	-0.939	-0.583	*
Tree-rich bog (1 vs 0)	0.452	0.135	0.187	0.718	*
Clearcut (1 vs 0)	-0.501	0.102	-0.700	-0.302	*
Young forest (1 vs 0)	0.504	0.075	0.357	0.650	*
Mid-aged forest (1 vs 0)	0.348	0.066	0.217	0.478	*
Old forest (1 vs 0)	0.675	0.074	0.530	0.819	*
NDVI	0.188	0.020	0.150	0.227	*
Distance to the nearest forest road * Survival	0.071	0.030	-0.130	-0.013	*
Distance to the nearest road * Survival	0.219	0.036	-0.290	-0.149	*
Distance to the nearest habitation * Survival	0.734	0.027	-0.787	-0.681	*
Bog * Survival	-0.398	0.114	-0.621	-0.174	*
Tree-rich bog * Survival	-0.341	0.165	-0.665	-0.017	*
Clearcut * Survival	1.061	0.117	0.831	1.291	*
Young forest * Survival	-0.067	0.091	-0.245	0.111	
Mid-aged forest * Survival	0.210	0.081	0.051	0.369	*
Old forest * Survival	-0.485	0.090	-0.662	-0.307	*
NDVI * Survival	-0.006	0.024	-0.053	0.040	

ESM1 Table S4: Descriptive statistics of continuous model terms included in the most parsimonious model to assess habitat selection of successful (i.e., experiencing complete litter survival) and unsuccessful (i.e., experiencing loss of the entire litter) female brown bears during the mating season in south-central Sweden (2005-2012). Note that NVDI (Normalized Difference Vegetation Index) is a unitless index, whereas the other covariates are expressed in kilometers. Use and availability were sampled in a 1:1 ratio of GPS relocations and random locations, respectively, and within annual individual-based 100% MCP home ranges.

Successful females					
Covariate		***Mean***	***Median***	***Minimum***	***Maximum***
Distance to the nearest forest road	*use*	0.660	0.525	0.000	3.060
	availability	0.605	0.456	0.000	4.364
Distance to the nearest road	*use*	5.026	3.932	0.000	12.951
	availability	4.581	3.966	0.000	14.812
Distance to the nearest habitation	*use*	0.979	0.783	0.025	3.083
	availability	1.179	1.070	0.000	3.784
NDVI	*use*	0.422	0.425	-1.000	1.000
	availability	0.392	0.402	-1.000	1.000
Unsuccessful females					
Covariate		***Mean***	***Median***	***Minimum***	***Maximum***
Distance to the nearest forest road	*use*	0.624	0.467	0.000	2.260
	availability	0.487	0.460	0.000	2.525
Distance to the nearest road	*use*	5.880	5.274	0.000	15.080
	availability	5.127	4.572	0.000	16.086
Distance to the nearest habitation	*use*	1.128	1.213	0.025	3.116
	availability	1.090	1.035	0.000	3.559
NDVI	*use*	0.431	0.430	-1.000	1.000
	availability	0.395	0.405	-1.000	1.000

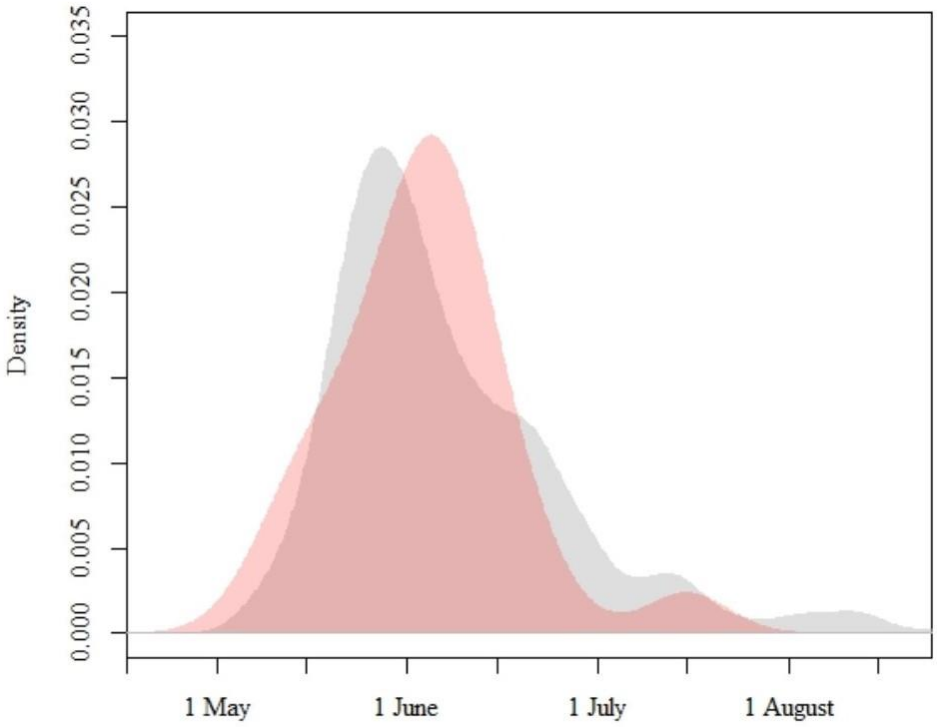
ESM1 Table S5: Proportion of use and availability of landscape variables included as dummies in the most parsimonious model to assess habitat selection of successful (i.e., experiencing complete litter survival) and unsuccessful (i.e., experiencing loss of entire litter) female brown bears during the mating season in south-central Sweden (2005-2012). Use and availability were sampled in a 1:1 ratio of GPS relocations and random locations, respectively, and within annual individual-based 100% MCP home ranges.

Land cover type	**Successful mothers**		**Unsuccessful mothers**	
	Use (%)	***Availability (%)***	***Use (%)***	***Availability (%)***
Bog	2.6	12.0	4.6	10.1
Tree-rich bog	1.6	3.1	2.1	2.4
Clearcut	9.8	8.3	3.4	8.9
Young forest	17.5	16.5	18.3	16.0
Mid-aged forest	48.0	37.4	43.6	40.5
Old forest	14.6	16.5	23.0	15.2

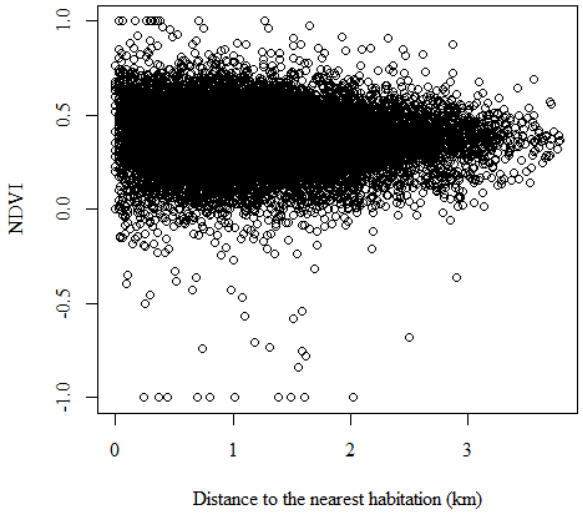
ESM1 Table S6: Comparison of resource availability within home ranges of successful (i.e., experiencing complete litter survival) and unsuccessful (i.e., experiencing loss of entire litter) female brown bears during the mating season in south-central Sweden (2005-2012). We tested if resource availability differed between successful and unsuccessful mother with mixed effect regression models with the landscape covariate as response variable. We fitted linear models for the continuous landscape covariates and logistic models for the binomial land cover classes as response variables and 'survival' (1 vs 0) as the only fixed effect. We included 'bear identity' and 'year' as random factors on the intercept. '*' indicates statistically significant model terms (i.e., 0 not included in the 95% confidence interval).

Landscape covariate	**β**	**σ**	**95% confidence interval**		
			Lower level	***Upper level***	
Distance to the nearest forest road	-0.031	0.043	-0.115	0.053	
Distance to the nearest road	-0.322	0.041	-0.402	-0.242	*
Distance to the nearest habitation	-0.085	0.051	-0.185	0.015	
Bog (1 vs 0)	-0.173	0.088	-0.345	-0.001	*
Tree-rich bog (1 vs 0)	0.089	0.157	-0.219	0.397	
Clearcut (1 vs 0)	0.266	0.096	0.078	0.454	*
Young forest (1 vs 0)	-0.146	0.083	-0.309	0.017	
Mid-aged forest (1 vs 0)	0.037	0.064	-0.089	0.162	
Old forest (1 vs 0)	0.026	0.075	-0.121	0.173	
NDVI	0.004	0.032	-0.059	0.067	

ESM1 Figure S1. Length and intensity of the mating season (gray) of brown bears in south-central Sweden, based on the density distribution of interactions (i.e., co-occurence within 30 m) between GPS-collared adult males and females. We recorded 96 unique male-female pairs, yielding 6,475 interactions between 2007 and 2011. The density distribution of sexually selected infanticide (N = 20), infanticide attempts (N = 2), and cub loss due to reasons unknown (N = 2) (red) matches well with the mating season of the study population. Figure reproduced from Steyaert [1].



ESM1 Figure S2. Plotting normalized difference vegetation index (NDVI) values (as a proxy for vegetation density which may) against distance to the nearest habitation (km) of all random locations used in this study revealed no strong relationship between the two covariates (Pearson correlation coefficient r = -0.07).



References

[1] Steyaert, S.M.J.G. 2012 *The mating system of the brown bear in relation to the sexually selected infanticide theory*. Aas, Norway, PhD thesis, Norwegian University of Life Sciences.