

Supplementary Material

Seasonal habitat suitability models for a threatened species: the Gunnison sage-grouse

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Fig. S1. The average distance moved (m) per day from capture and release (first record) of resident (blue; 1991-2016) and translocated (red; 2000-2014) Gunnison sage-grouse in five isolated populations in southwestern Colorado, USA. The solid lines represent the quadratic expression prediction curve.

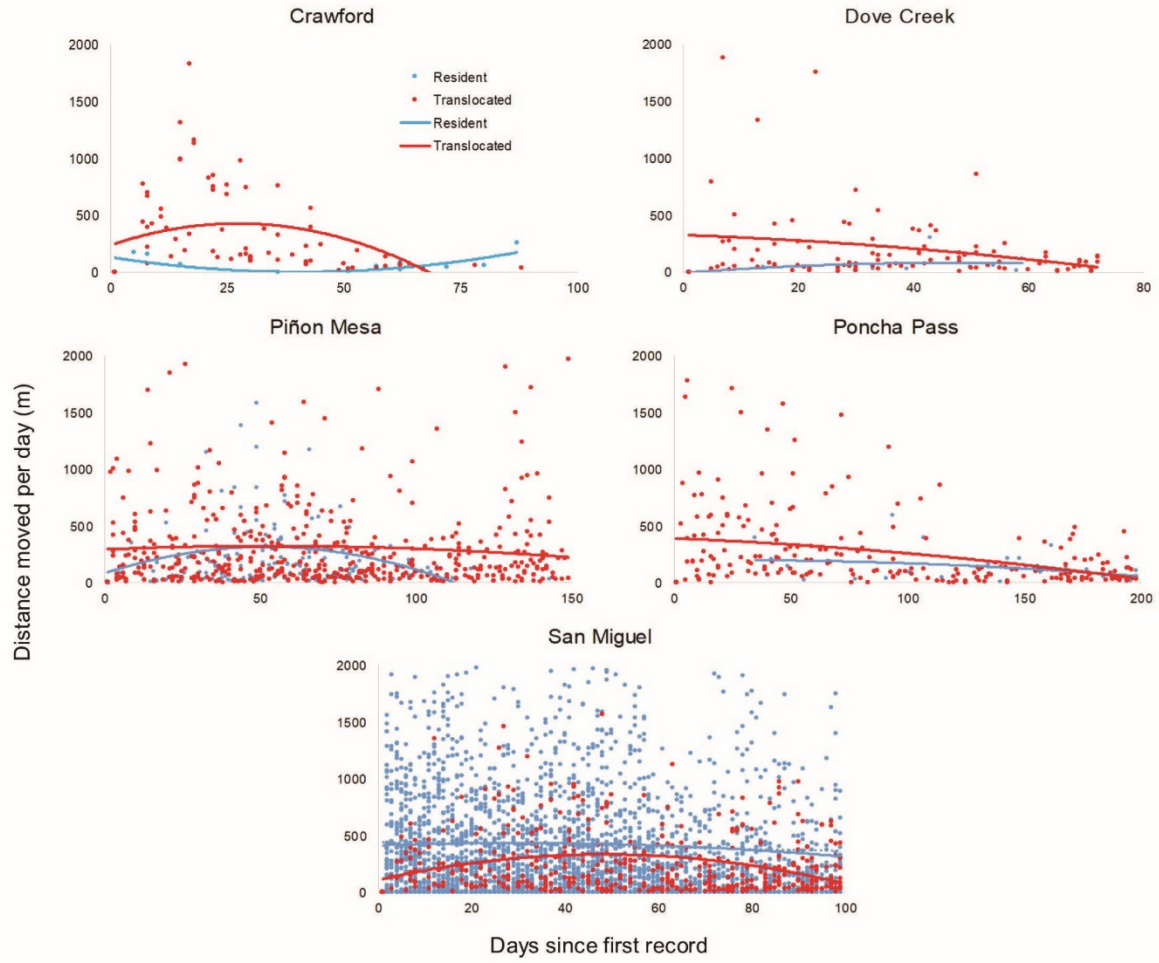


Fig. S2. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the breeding season (15 March–15 July) for the Crawford, Colorado, USA Gunnison sage-grouse population (1995–2014). Distance buffer (m) is in parentheses followed by the covariate name. TRI; terrain ruggedness index.

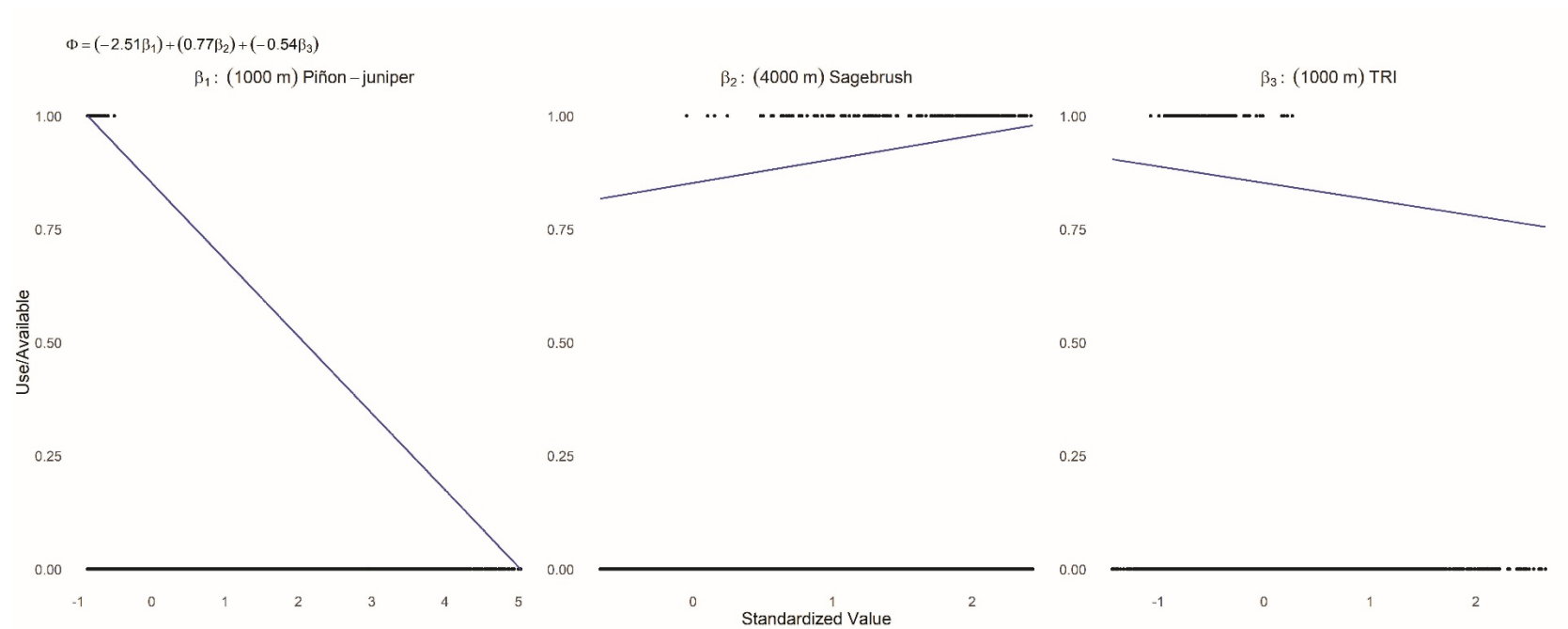


Fig. S3. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the summer season (16 July–30 September) for the Crawford, Colorado, USA Gunnison sage-grouse population (1995–2014). Distance buffer (m) is in parentheses followed by the covariate name. TRI, terrain ruggedness index.

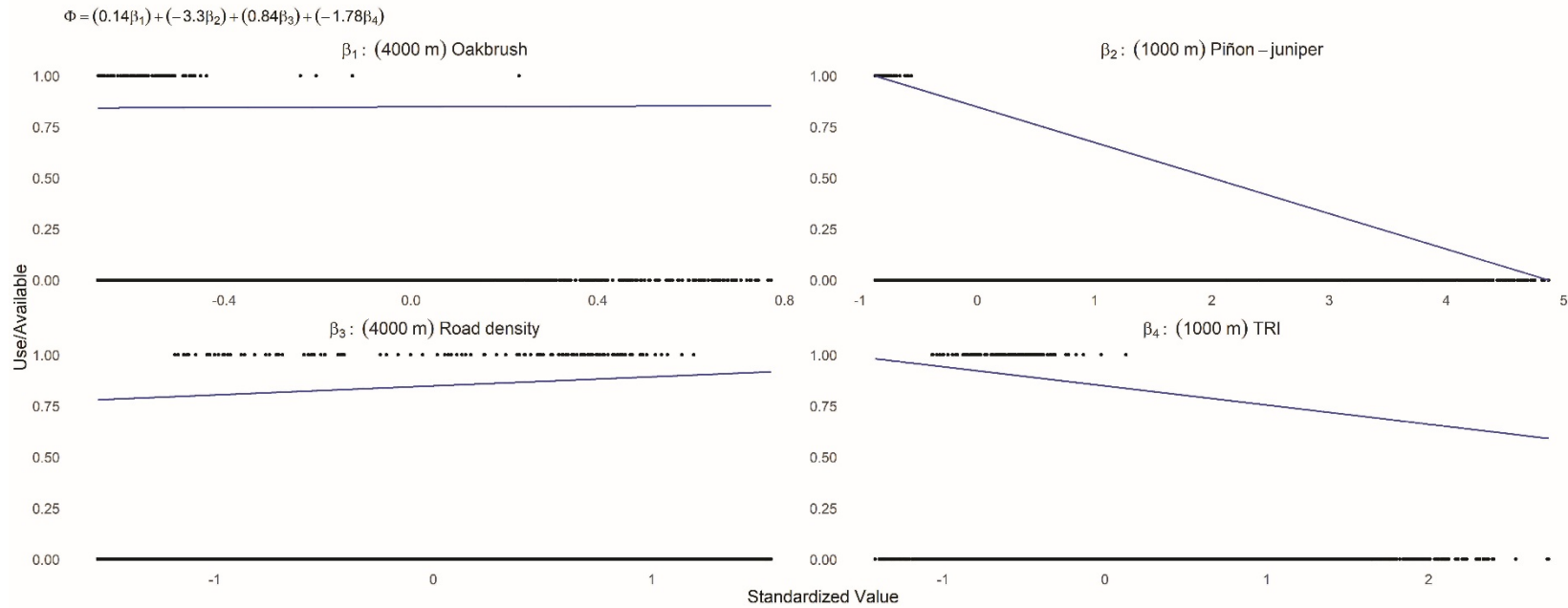


Fig. S4. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the breeding season (15 March–15 July) for the Dove Creek, Colorado, USA Gunnison sage-grouse population (1995–2011). Distance buffer (m) is in parentheses followed by the covariate name. TRI, terrain ruggedness index.

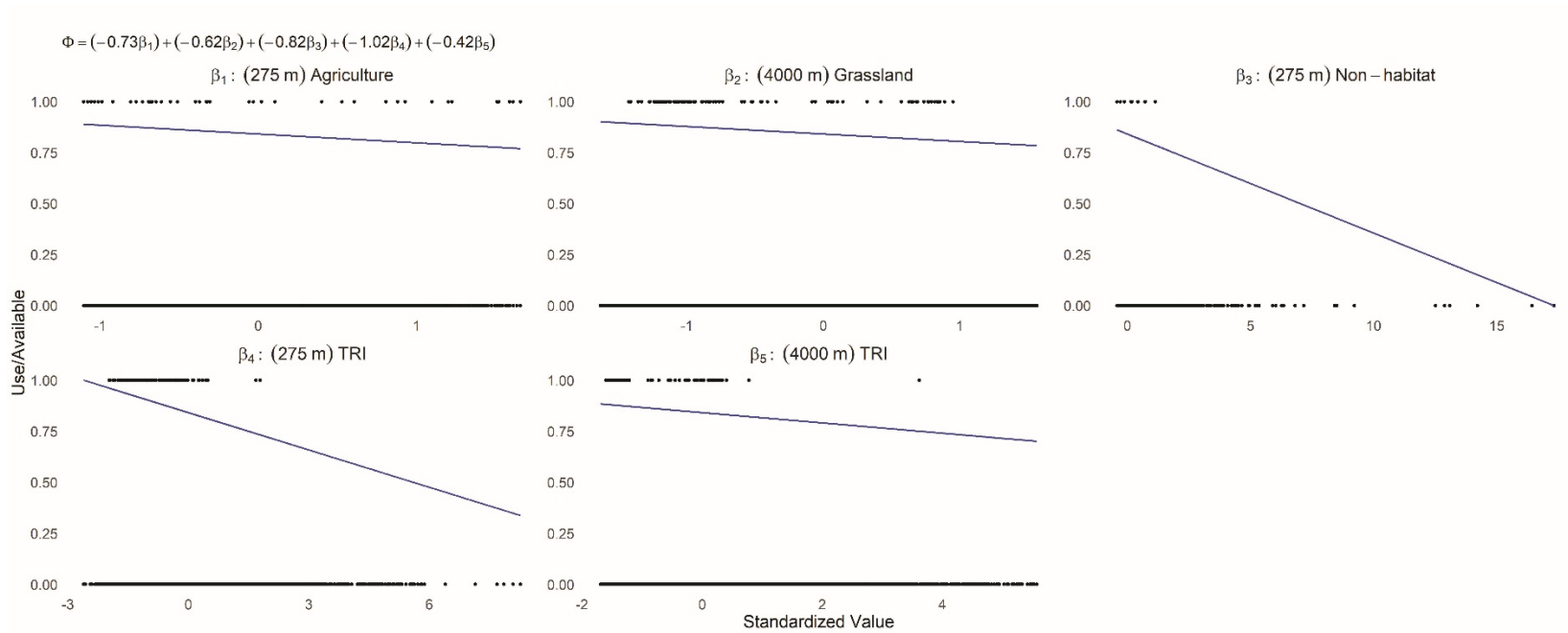


Fig. S5. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the breeding season (15 March–15 July) for the Piñon Mesa, Colorado, USA population Gunnison sage-grouse population (1991–2015). Distance buffer (m) is in parentheses followed by the covariate name. TRI, terrain ruggedness index.

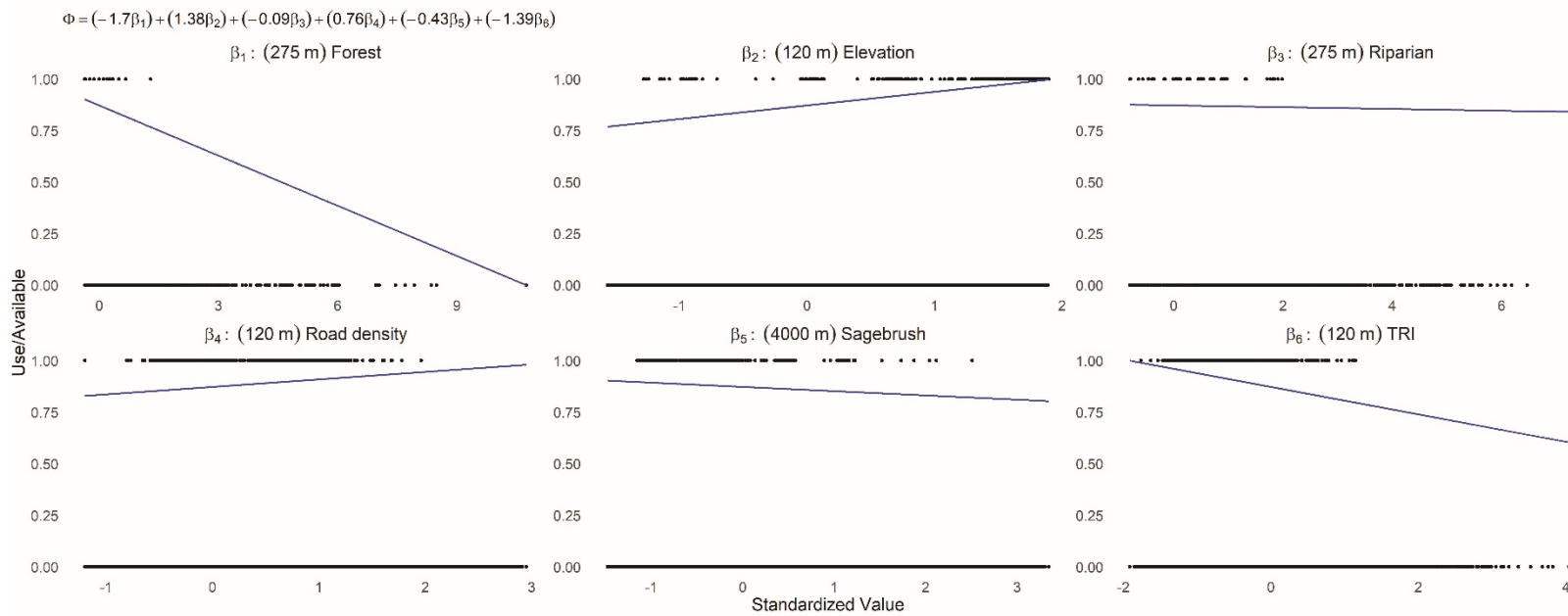


Fig. S6. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the summer season (16 July–30 September) for the Piñon Mesa, Colorado, USA Gunnison sage-grouse population (1991–2015). Distance buffer (m) is in parentheses followed by the covariate name. TRI, terrain ruggedness index.

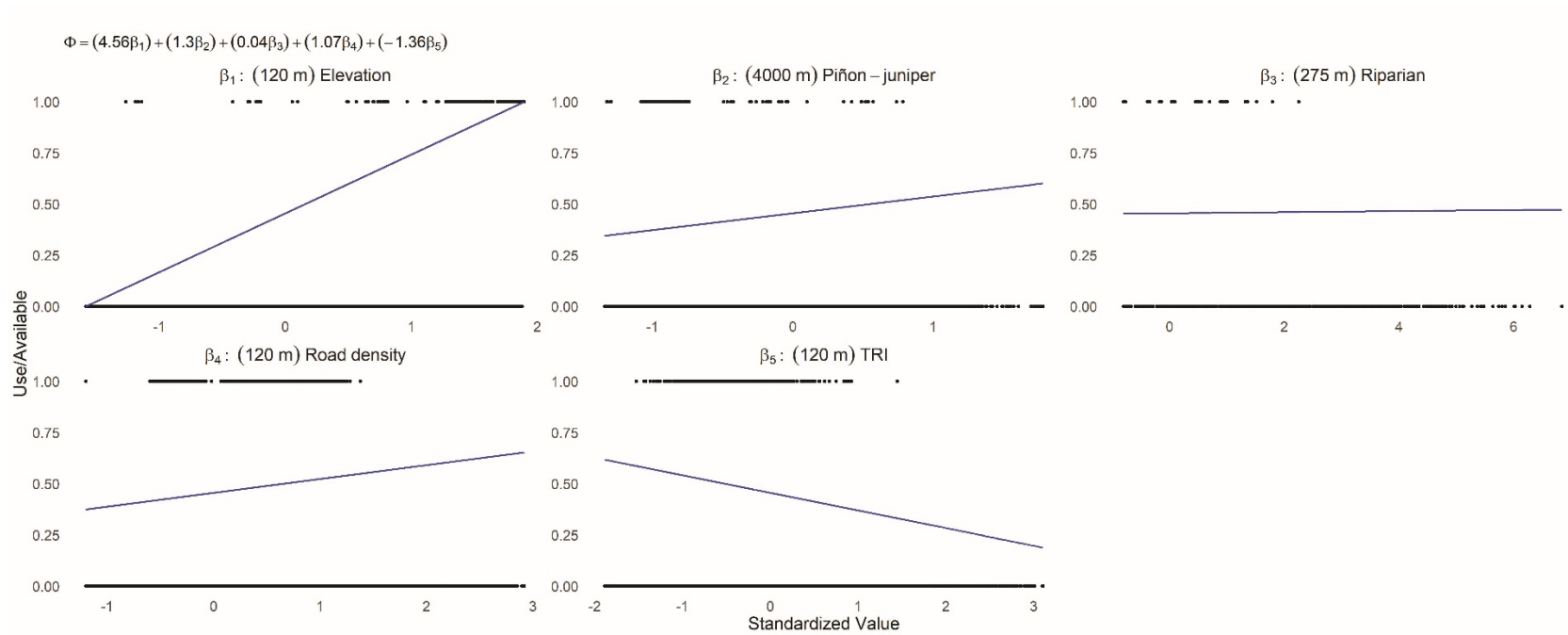


Fig. S7. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the breeding season (15 March–15 July) for the Poncha Pass, Colorado, USA Gunnison sage-grouse population (1999–2002). Distance buffer (m) is in parentheses followed by the covariate name.

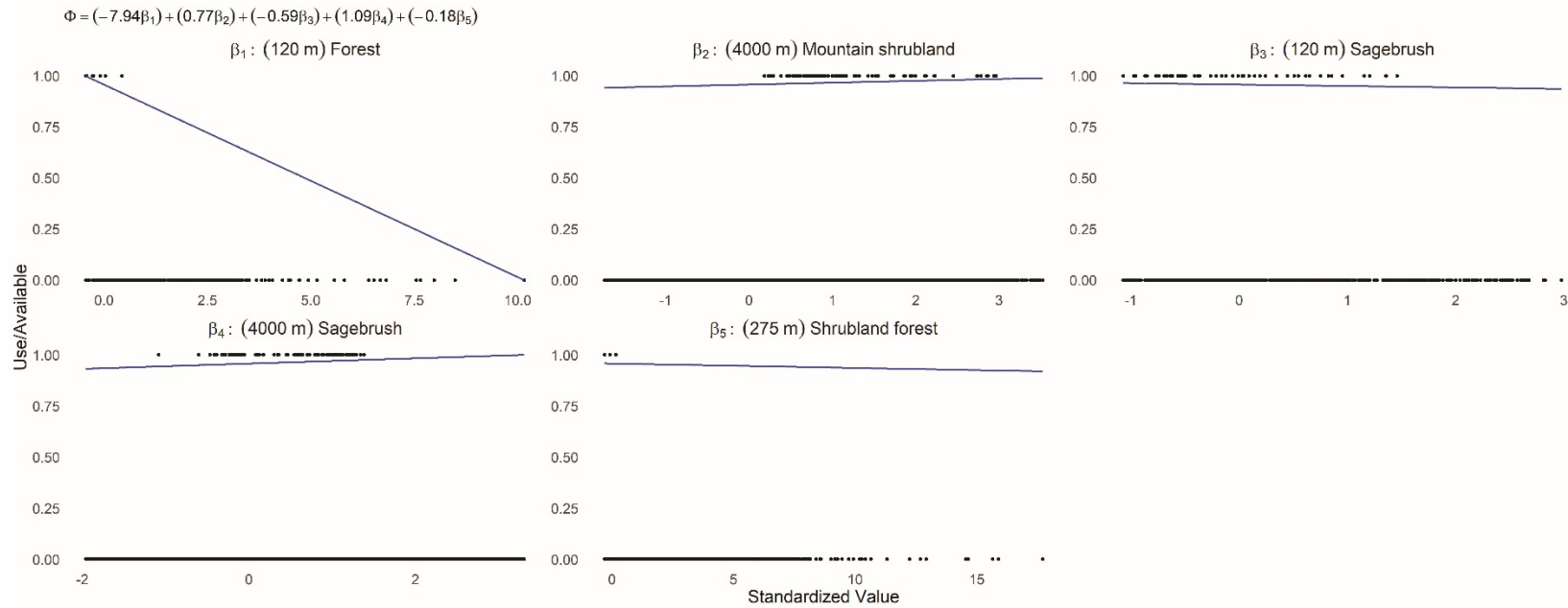


Figure S8. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the summer season (16 July–30 September) for the Poncha Pass, Colorado, USA Gunnison sage-grouse population (1999–2002). Distance buffer (m) is in parentheses followed by the covariate name.

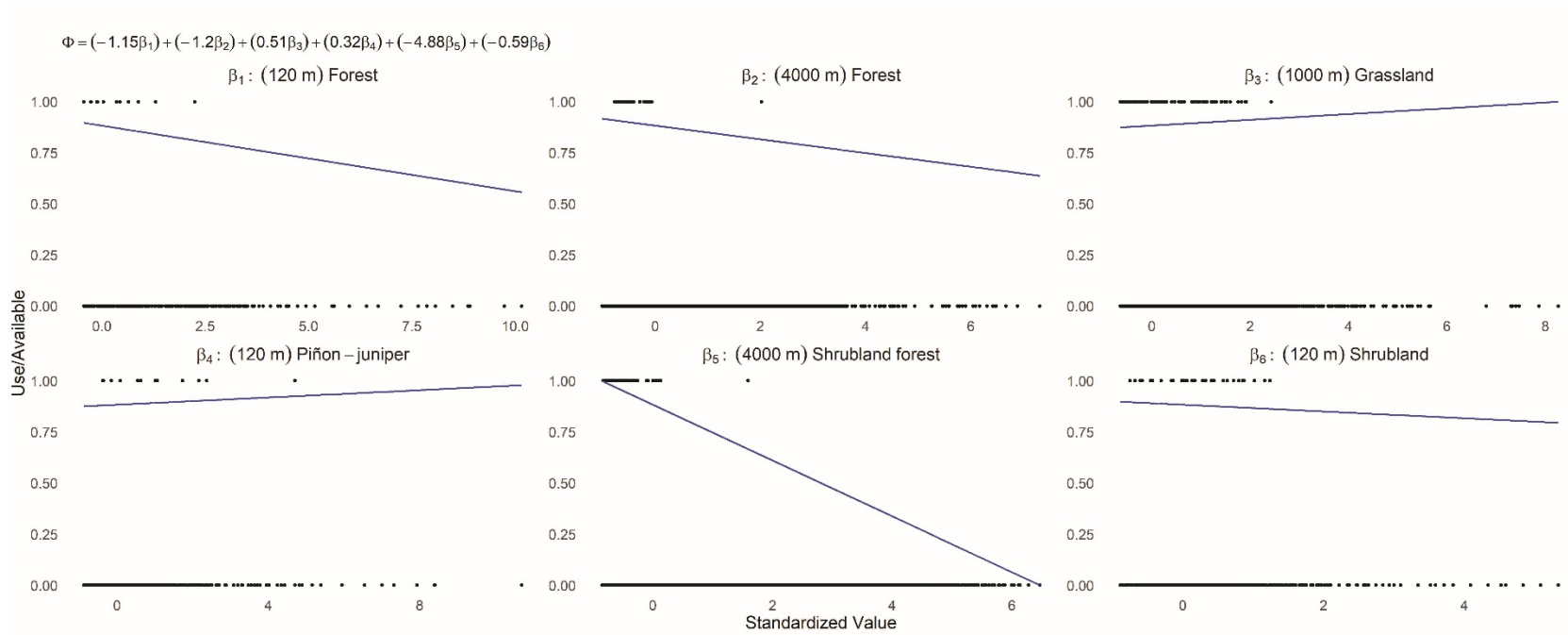


Fig. S9. The final linear logistic regression model standardised coefficient response curves in relation to use (1) and available (0) locations during the breeding season (15 March–15 July) for the San Miguel, Colorado, USA Gunnison sage-grouse population (1995–2016). Distance buffer (m) is in parentheses followed by the covariate name. TRI, terrain ruggedness index.

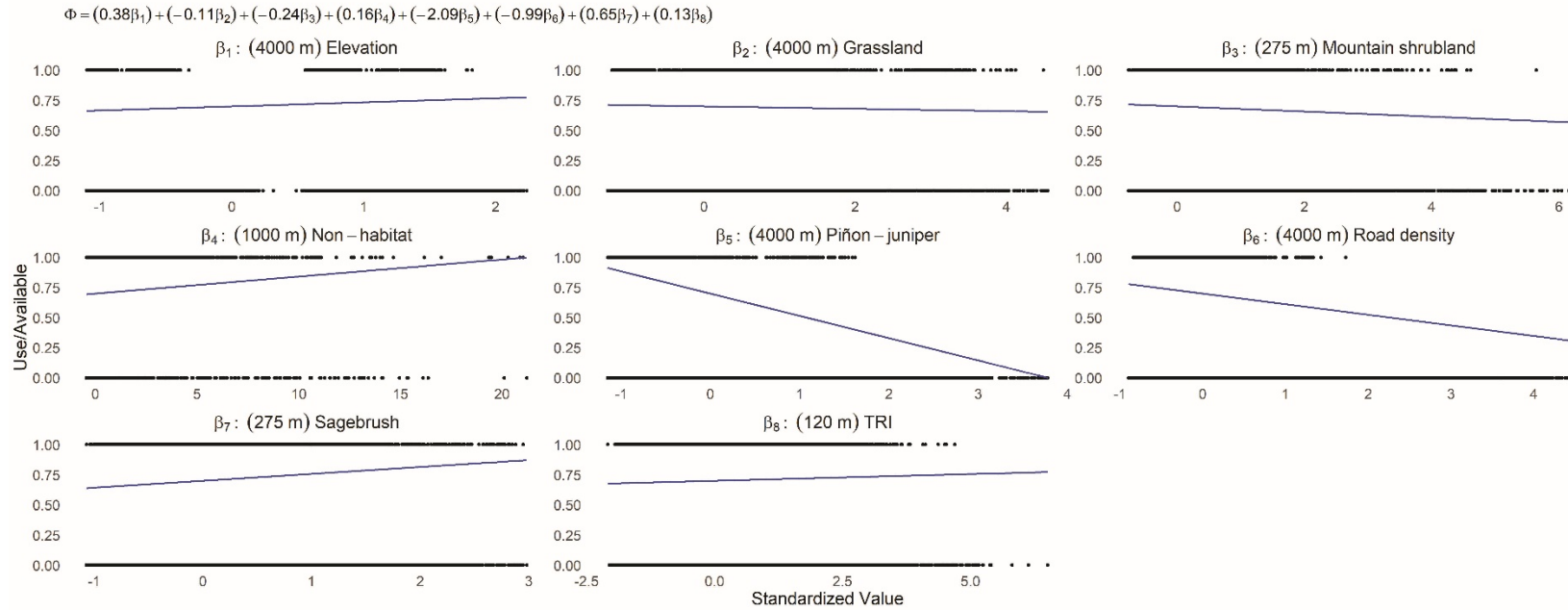


Fig. S10. The final linear logistic regression formula standardised coefficient response curves in relation to use (1) and available (0) locations during the summer season (16 July–30 September) for the San Miguel, Colorado, USA Gunnison sage-grouse population (1995–2016). Distance buffer (m) is in parentheses followed by the covariate name.

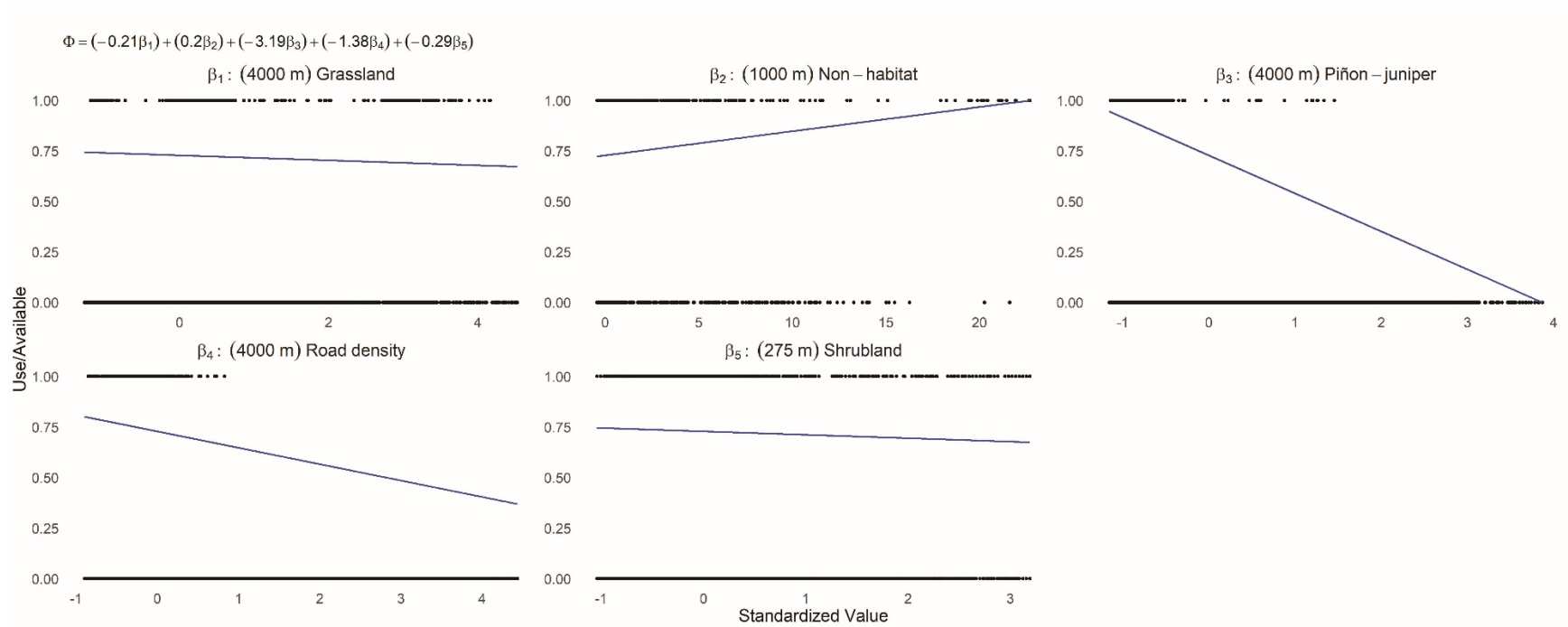


Table S1. Mean daily movement and the number of use and available locations used for seasonal habitat models for five isolated Gunnison sage-grouse populations

The breeding (15 March–15 July) and summer (16 July–30 September) seasons for each population in southwestern Colorado, USA (1991–2016).

Population	Season	Mean daily		
		movement (m)	Use locations (<i>n</i>)	Available locations (<i>n</i>)
Crawford	Breeding	121	195	10 000
	Summer	100	140	10 000
Dove Creek	Breeding	86	121	10 000
Piñon Mesa	Breeding	188	685	10 000
	Summer	192	646	10 000
Poncha Pass	Breeding	154	130	10 000
	Summer	107	149	10 000
San Miguel	Breeding	276	5258	10 000
	Summer	192	1816	10 000

Table S2. Colorado vegetation classification project spatial layer descriptions and combined classes for Gunnison sage-grouse seasonal habitat models

Spatial layer developed from 35-m Landsat imagery in Colorado, USA, 1993–1995.

Description and summary of classes ^A	Combined class for model development
Irrigated crops and fields, dryland agriculture, orchards.	Agriculture
Coniferous forest dominated or co-dominated by douglas-fir (<i>Pseudotsuga menziesii</i>), lodgepole pine (<i>Pinus contorta</i>), limber pine (<i>Pinus flexilis</i>), engleman spruce (<i>Picea engelmannii</i>), white fir (<i>Abies concolor</i>), or bristlecone pine (<i>Pinus aristata</i>), alpine meadow, forb or grass dominated > 11,500 feet and snowfields, wooded or herbaceous riparian dominated by cottonwood (<i>Populus spp.</i>), poplar (<i>Populus balsamifera</i>), mixed conifer species, with sedge (<i>Carex spp.</i>) understory.	Forest
Deciduous forest dominated by aspen (<i>Populus tremuloides</i>), co-dominate aspen and Gambel oak deciduous woodland.	Forest shrubland
Rangeland dominated by mixed shrubs, annual and perennial grasses, co-dominated by grasses and forbs, disturbed or sparse vegetation.	Grassland
Sagebrush, Gambel oak (<i>Quercus gambelii</i>) mix, snowberry (<i>Symphoricarpos albus</i>), mesic mountain shrubs, serviceberry (<i>Amelanchchierr alnifolia</i>), grass and forb understory.	Mountain shrub
High-density residential areas, lawns, planted trees, parking lots, buildings, lakes, reservoirs, rivers, streams, sand dune, barren land, rock outcrops, talus slopes.	Non-habitat
Gambel oak, mountain mahogany dominate or co-dominate.	Oakbrush

Twoneedle piñon (<i>Pinus edulis</i>) and Rocky Mountain juniper (<i>Juniperis scopulorum</i>) dominant or co-dominate mix with sagebrush, Gamble oak, mountain mahogany (<i>Cercocarpus spp.</i>), <25% juniper, pinyon, sagebrush and rock.	Piñon-juniper
Shrub riparian dominate or co-dominate by willow (<i>Salix spp.</i>), saltcedar (<i>Tamarix ramosissima</i>), Russian olive (<i>Elaeagnus angustifolia</i>), and herbaceous areas dominated or co-dominated by herbaceous vegetation and sedge (<i>Carex spp.</i>).	Riparian
Sagebrush (<i>Artemisia spp.</i>) with rabbitbrush and bitterbrush (<i>Purshia tridentata</i>) with perennial grass and forb understory and mix.	Sagebrush
Low elevation saline alluvial fans, shrub community dominated or co-dominated by greasewood (<i>Sarcobatus vermiculatus</i>), broom snakeweed (<i>Gutierrezia sarothrae</i>), rabbitbrush (<i>Chrysothamnus spp.</i>), and winterfat (<i>Krascheninnikovia lanata</i>).	Shrubland

^AFor a complete description of vegetation communities see

<https://www.arcgis.com/home/item.html?id=893739745fed4e05af8168b7448cda0c>.

Table S3. Number of individuals and use locations from translocated and resident Gunnison sage-grouse to develop seasonal habitat models

Individuals and locations are identified for breeding (15 March–15 July) and summer (16 July–30 September) seasons for the final habitat use models by population in southwestern, Colorado, USA, 1991–2016.

Population	Status	Number of locations		Number of individuals		Number of individuals common across seasons
		Breeding	Summer	Breeding	Summer	
Crawford						
	Resident	74	47	13	9	7
	Translocated	121	93	23	28	23
Dove Creek						
	Resident	106		21		
	Translocated	15		8		
Piñon Mesa						
	Resident	168	48	21	10	10
	Translocated	517	598	42	38	35
Poncha Pass						
	Resident	15	18	2	2	2
	Translocated	115	131	15	15	13
San Miguel						
	Resident	4684	1455	185	77	66
	Translocated	574	361	46	42	35

Table S4. Covariates included in the final seasonal habitat models for Gunnison sage-grouse populations

Covariates are identified for each population and distance buffer for breeding (15 March–15 July) and summer (16 July–30 September) in southwestern Colorado, USA (1991–2016).

Covariate ^A	Buffer distance (m)							
	120		275		1000		4000	
	Breeding	Summer	Breeding	Summer	Breeding	Summer	Breeding	Summer
Agriculture			DC					
Elevation	PM	PM						
Forest	PP	PP	PM				SM	PP
Forest shrubland			PP					PP
Grassland						PP	DC, SM	SM
Mountain shrub			SM				PP	
Non-habitat			DC		SM	SM		
Oakbrush								CR
Piñon-juniper		PP			CR	CR	SM	PM, SM
Riparian			PM	PM				
Road density	PM	PM					SM	CR, SM
Sagebrush	PP		SM				CR, PP, PM	
Shrubland		PP		SM				
TRI	SM, PM	PM	DC		CR	CR	DC	

^ACR, Crawford; DC, Dove Creek, PM, Piñon Mesa; PP, Poncha Pass; SM, San Miguel.

Table S5. Seasonal habitat model selection rank for the Gunnison sage-grouse in the Crawford population

The ranking includes the top five habitat models for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1995–2015). Models are ranked by change in the Bayesian Information Criterion (ΔBIC) indicating the best of those considered (breeding $n = 128$, summer $n = 32$). BIC weights (w_i) indicate the weight of evidence that model i is the best approximating model given the data and set of candidate models, K = number of parameters. The model averaging procedure was used for models $< 2 \Delta\text{BIC}$ from the top model. See text and Table S2 for covariate descriptions.

BREEDING MODEL ^A	K	BIC	ΔBIC	w_i	Rank
PJ_1000 + SAGE_4000 + TRI_1000	4	1522.61	0.00	0.68	1
PJ_1000 + RD_4000 + SAGE_4000 + TRI_1000	5	1524.83	2.22	0.22	2
PJ_1000 + SAGE_4000 + TRI_1000 + TRI_4000	5	1528.36	5.75	0.04	3
PJ_1000 + RD_4000 + SAGE_4000	4	1529.86	7.24	0.02	4
PJ_1000 + SAGE_4000	3	1530.49	7.88	0.01	5
SUMMER MODEL ^A					
PJ_1000 + RD_4000 + TRI_1000 + OAK_4000	5	1264.24	0.00	0.64	1
PJ_1000 + RD_4000 + TRI_1000	4	1266.03	1.79	0.26	2
PJ_1000 + RD_4000 + TRI_1000 + NONHAB_275 + OAK_4000	6	1270.91	6.67	0.02	3
PJ_1000 + TRI_1000 + OAK_4000	4	1271.00	6.75	0.02	4
PJ_1000 + RD_4000 + TRI_1000 + NONHAB_275	5	1271.05	6.81	0.02	5

^AOAK, Gamble oak; NONHAB, non-habitat; PJ, piñon-juniper; RD, road density; SAGE, sagebrush; TRI, terrain ruggedness index. Covariate followed by the distance buffer (m).

Table S6. The estimated posterior covariate standardised coefficients for final seasonal habitat model for the Gunnison sage-grouse population in Crawford

Standardised coefficients include β , and the 95% lower (LCI) and upper (UCI) credible intervals during the breeding (15 March–15 July) and summer (16 July–30 September) season (1995–2014).

Covariate ^A	Breeding			Summer		
	β	LCI	UCI	β	LCI	UCI
Intercept	-7.368	-8.026	-6.736	-7.186	-7.932	-6.573
Oakbrush_4000				0.142	-1.216	0.508
Piñon-juniper_1000	-2.507	-3.610	-1.592	-3.300	-4.248	-1.735
Road density_4000				0.843	0.117	1.400
Sagebrush_4000	0.772	0.439	1.122			
TRI_1000	-0.539	-0.912	-0.253	-1.776	-2.316	-1.259

^ACovariate name followed by distance buffer (m)

Table S7. Breeding and summer habitat model summary statistics for Gunnison sage-grouse use and available locations in Crawford

Values included the covariate mean and standard error in parentheses for the top habitat model during the breeding (15 March–15 July) and summer (16 July–30 September) seasons, Crawford, Colorado, USA (1995–2014).

Covariate ^A	Breeding	Available	Summer	Available
Oakbrush_4000 (proportion)			0.013 (0.001)	0.026 (0.000)
Piñon-juniper_1000 (proportion)	0.004 (0.000)	0.072 (0.001)	0.006 (0.001)	0.070 (0.001)
Road density_4000 (km km ⁻²)			0.631 (0.040)	0.605 (0.001)
Sagebrush_4000 (proportion)	0.379 (0.004)	0.300 (0.001)		
Terrain ruggedness index_1000 (m)	165.000 (1.110)	192.000 (0.370)	164.000 (1.100)	192.000 (0.370)

^ACovariate name followed by distance buffer (m)

Table S8. Seasonal habitat model selection and rank for the Gunnison sage-grouse Dove Creek population

The ranking includes the top five models for the breeding (15 March–15 July) season model (1995–2011). Models are ranked by change in the Bayesian Information Criterion (ΔBIC) indicating the best of those considered ($n = 128$). BIC

weights (w_i) indicate the weight of evidence that model i is the best approximating model given the data and set of candidate models, K = number of parameters. The model averaging procedure was used for models $< 2 \Delta\text{BIC}$ from the top model. See text and Table S2 for covariate descriptions.

BREEDING MODEL ^A	K	BIC	ΔBIC	w_i	Rank ^b
NONHAB_275 + AGR_275 + GRASS_4000 + TRI_275	5	1174.65	0.00	0.49	1
TRI_4000 + NONHAB_275 + AGR_275 + GRASS_4000 + TRI_275	6	1175.25	0.60	0.36	2
AGR_275 + GRASS_4000 + TRI_275	4	1179.14	4.48	0.05	3
PJ_1000 + TRI_4000 + NONHAB_275 + AGR_275 + GRASS_4000 + TRI_275	7	1180.14	5.49	0.03	4
TRI_4000 + AGR_275 + GRASS_4000 + TRI_275	5	1180.84	6.18	0.02	5

^AAGR, agriculture; GRASS, grassland; NONHAB, non-habitat; PJ, piñon-juniper; SHRUB, shrubland; TRI, terrain ruggedness index followed by the distance buffer (m). Ranked models 1 and 2 were subject to model averaging and TRI_4000 ultimately was included in the top model.

Table S9. The estimated posterior covariate standardised coefficients for the final seasonal habitat model for the Gunnison sage-grouse population in Dove Creek

Standardised coefficients included β , and 95% lower (LCI) and upper (UCI) credible intervals for the breeding (15 March–15 July season (1995–2011)).

Covariate ^A	β	LCI	UCI
Intercept	-5.868	-6.185	-5.519
Agriculture_275	-0.727	-1.003	-0.450
Grassland_4000	-0.617	-0.901	-0.327
Non-habitat_275	-0.816	-1.318	-0.347
TRI_275	-1.025	-1.322	-0.700
TRI_4000	-0.423	-0.704	-0.145

^ACovariate name followed by distance buffer (m)

Table S10. Breeding and summer final habitat model summary statistics for Gunnison sage-grouse sue and available locations in Dove Creek

Values included the covariate mean and standard errors in parentheses for the final habitat model during the breeding (15 March–15 July) season (1995–2011).

Covariate ^A	Breeding	Available
Agriculture_275 (proportion)	0.171 (0.026)	0.264 (0.003)
Grassland_4000 (proportion)	0.090 (0.004)	0.125 (0.001)
Non-habitat_275 (proportion)	0.006 (0.001)	0.014 (0.000)
Terrain ruggedness index_275 (m)	84.300 (2.570)	116.000 (0.413)
Terrain ruggedness index_4000 (m)	103.000 (2.380)	122.000 (0.331)

^ACovariate name followed by distance buffer (m)

Table S11. Seasonal habitat model selection rank for the Gunnison sage-grouse Piñon Mesa population

The ranking includes the top five models for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1991–2015). Models are ranked by change in the Bayesian Information Criterion (Δ BIC) indicating the best of those considered (breeding $n = 128$, summer $n = 32$). BIC weights (w_i) indicate the weight of evidence that model i is the best approximating model given the data and set of candidate models, K = number of parameters. The model averaging procedure was used for models $< 2 \Delta$ BIC from the top model.

BREEDING ^A	K	BIC	Δ BIC	w_i	Rank
SAGE_4000 + FOR_275 + ELEV_120 + RIP_275 + RD_120 + TRI_120	7	3824.32	0.00	0.95	1
SAGE_4000 + FOR_275 + ELEV_120 + RD_120 + TRI_120	6	3830.29	5.97	0.05	2
SAGE_4000 + ELEV_120 + RIP_275 + RD_120 + TRI_120	6	3843.28	18.95	0.00	3
FOR_275 + ELEV_120 + RD_120 + TRI_120	5	3858.38	34.05	0.00	4
SAGE_4000 + ELEV_120 + RD_120 + TRI_120	5	3861.45	37.13	0.00	5
SUMMER ^A					
ELEV_120 + RIP_275 + RD_120 + TRI_120 + PJ_4000	6	3005.45	0.00	1.00	1
ELEV_120 + RIP_275 + RD_120 + TRI_120	5	3021.60	16.14	0.00	2
ELEV_120 + RD_120 + TRI_120 + PJ_4000	5	3057.26	51.80	0.00	3
ELEV_120 + RD_120 + TRI_120	4	3069.09	63.63	0.00	4
ELEV_120 + RIP_275 + RD_120 + PJ_4000	5	3240.76	235.30	0.00	5

^AELEV, elevation; FOR=forest; PJ, piñon-juniper; RIP, riparian; RD, Road density; SAGE, sagebrush; TRI, terrain ruggedness index. Covariate name followed by the distance buffer (m).

Table S12. The estimated posterior covariate standardised coefficients for final seasonal habitat model for Gunnison sage-grouse population in Piñon Mesa

Standardised coefficients include β , and the 95% lower (LCI) and upper (UCI) credible intervals for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1991–2015).

Covariate ^A	Breeding			Summer		
	β	LCI	UCI	β	LCI	UCI
Intercept	-5.282	-5.608	-4.878	-7.700	-8.194	-7.291
Elevation_120	1.380	1.167	1.591	4.560	4.219	4.827
Forest_275	-1.697	-2.341	-1.004			
Piñon-juniper_4000				1.303	0.816	1.655
Riparian_275	-0.089	-0.246	0.062	0.043	-0.079	0.173
Road density_120	0.761	0.617	0.911	1.073	0.905	1.251
Sagebrush_4000	-0.432	-0.614	-0.242			
TRI_120	-1.394	-1.599	-1.192	-1.363	-1.563	-1.142

^ACovariate name followed by distance buffer (m)

Table S13. Breeding and summer final habitat model summary statistics for Gunnison sage-grouse use and available locations in Piñon Mesa

Values include the covariate mean and standard error in parentheses for the final seasonal habitat models during the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1991–2015).

Covariate ^A	Breeding	Available	Summer	Available
Elevation_120 (m)	2670.000 (8.480)	2430.000 (2.930)	2760.000 (4.770)	2430.000 (2.950)
Forest_275 (proportion)	0.001 (0.000)	0.009 (0.000)		
Piñon-juniper_4000 (proportion)			0.110 (0.002)	0.190 (0.001)
Riparian_275 (proportion)	0.007 (0.000)	0.012 (0.000)	0.006 (0.000)	0.012 (0.000)
Road density_120 (km km ⁻²)	0.606 (0.001)	0.584 (0.000)	0.603 (0.001)	0.584 (0.000)
Sagebrush_4000 (proportion)	0.154 (0.002)	0.228 (0.001)		
Terrain ruggedness index_120 (m)	155.000 (1.690)	178.000 (0.761)	163.000 (1.440)	179.000 (0.765)

^ACovariate name followed by distance buffer (m)

Table S14. Seasonal habitat model selection rank for the Gunnison sage-grouse Poncha Pass population

The ranking includes the top five habitat models for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1999–2002). Models are ranked by change in the Bayesian Information Criterion (Δ BIC) indicating the best of those considered (breeding $n = 128$, summer $n = 256$). BIC weights (w_i) indicate the weight of evidence that model i is the best approximating model given the data and set of candidate models, K = number of parameters. The model averaging procedure was used for models $< 2 \Delta$ BIC from the top model.

BREEDING ^A	K	BIC	Δ BIC	w_i	Rank ^b
SAGE_4000 + FOR_120 + MTSHB_4000 + SAGE_120 + FORSHB_275	6	1002.48	0.00	0.71	1
SAGE_4000 + FOR_120 + MTSHB_120 + MTSHB_4000 + SAGE_120 + FORSHB_275	7	1005.30	2.82	0.17	2
SAGE_4000 + FOR_120 + GRASS_1000 + MTSHB_4000 + SAGE_120 + FORSHB_275	7	1007.52	5.04	0.06	3
SAGE_4000 + FOR_120 + MTSHB_4000 + SAGE_120	5	1007.98	5.50	0.05	4
SAGE_4000 + FOR_120 + GRASS_1000 + MTSHB_4000 + SAGE_120	6	1012.11	9.63	0.01	5
SUMMER ^A					
GRASS_1000 + FOR_4000 + PJ_120 + FORSHB_4000 + SHRUB_120	6	1207.61	0.00	0.39	1
GRASS_1000 + FOR_4000 + FORSHB_4000 + SHRUB_120	5	1208.04	0.43	0.31	2
FOR_120 + GRASS_1000 + FOR_4000 + PJ_120 + FORSHB_4000 + SHRUB_120	7	1209.17	1.56	0.18	3
FOR_120 + GRASS_1000 + FOR_4000 + FORSHB_4000 + SHRUB_120	6	1211.52	3.90	0.06	4
GRASS_1000 + FOR_4000 + OAK_4000 + PJ_120 + FORSHB_4000 + SHRUB_120	7	1212.58	4.97	0.03	5

^AFOR, forest; FORSHB, forest shrubland; OAK, Gamble oak; GRASS, grassland; MTSHB, mountain shrubland; PJ, piñon-juniper; SAGE, sagebrush; SHRUB, shrubland; TRI, terrain ruggedness index followed by the distance buffer (m). Ranked summer models 1, 2, and 3 were subject to model averaging and FOR_120 ultimately was included in the top model.

Table S15. The estimated posterior covariate standardised coefficients for final seasonal habitat models for Gunnison sage-grouse in the Poncha Pass population

Standardised coefficients include β , and the 95% lower (LCI) and upper (UCI) credible intervals for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1999–2002).

Covariate ^A	Breeding			Summer		
	β	LCI	UCI	β	LCI	UCI
Intercept	-7.645	-8.989	-6.412	-6.744	-7.157	-6.288
Forest_120	-7.941	-11.218	-4.724	-1.149	-1.904	-0.065
Forest_4000				-1.200	-1.932	-0.438
Forest shrubland_275	-0.178	-1.072	0.138			
Forest shrubland_4000				-4.884	-5.673	-3.954
Grassland_1000				0.508	0.337	0.675
Mountain shrub_4000	0.771	0.540	0.999			
Piñon-juniper_120				0.320	0.095	0.519
Sagebrush_120	-0.590	-0.970	-0.190			
Sagebrush_4000	1.094	0.580	1.489			
Shrubland_120				-0.590	-0.860	-0.314

^ACovariate name followed by distance buffer (m)

Table S16. Breeding and summer final habitat model summary statistics for Gunnison sage-grouse use and available locations in Poncha Pass

Values include the covariate mean and standard error in parentheses for the final seasonal habitat models during the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1999–2002).

Covariate ^A	Breeding	Available	Summer	Available
Forest_120 (proportion)	0.008 (0.003)	0.055 (0.002)	0.023 (0.007)	0.060 (0.002)
Forest_4000 (proportion)			0.039 (0.005)	0.092 (0.002)
Forest shrubland_275 (proportion)	0.030 (0.011)	0.048 (0.001)		
Forest shrubland_4000 (proportion)			0.028 (0.005)	0.055 (0.001)
Grassland_1000 (proportion)			0.101 (0.006)	0.032 (0.001)
Mountain shrub_4000 (proportion)	0.094 (0.004)	0.107 (0.001)		
Piñon-juniper_120 (proportion)			0.024 (0.005)	0.101 (0.002)
Sagebrush_120 (proportion)	0.388 (0.027)	0.333 (0.003)		
Sagebrush_4000 (proportion)	0.438 (0.013)	0.260 (0.002)		
Shrubland_120 (proportion)			0.161 (0.011)	0.178 (0.002)

^ACovariate name followed by distance buffer (m)

Table S17. Seasonal habitat model selection rank for the Gunnison sage-grouse San Miguel population

The rankings include the top five habitat models for the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1995–2016). Models are ranked by change in the Bayesian Information Criterion (Δ BIC) indicating the best of those considered (breeding $n = 512$, summer $n = 128$). BIC weights (w_i) indicate the weight of evidence that model i is the best approximating model given the data and set of candidate models, K = number of parameters. The model averaging procedure was used for models $< 2 \Delta$ BIC from the top model.

BREEDING ^A	K	BIC	Δ BIC	w_i	Rank
RD_4000 + GRASS_4000 + TRI_120 + PJ_4000 + ELEV_4000 + MTSHB_275 + NONHAB_1000 + SAGE_275	9	14984.60	0.00	0.99	1
RD_4000 + GRASS_4000 + FOR_275 + TRI_120 + PJ_4000 + ELEV_4000 + MTSHB_275 + NONHAB_1000 + SAGE_275	10	14994.20	9.61	0.01	2
RD_4000 + TRI_120 + PJ_4000 + ELEV_4000 + MTSHB_275 + NONHAB_1000 + SAGE_275	8	14994.63	10.03	0.01	3
RD_4000 + FOR_275 + TRI_120 + PJ_4000 + ELEV_4000 + MTSHB_275 + NONHAB_1000 + SAGE_275	9	15004.25	19.66	0.00	4
RD_4000 + GRASS_4000 + PJ_4000 + ELEV_4000 + MTSHB_275 + NONHAB_1000 + SAGE_275	8	15010.55	25.95	0.00	5
SUMMER ^A					
RD_4000 + GRASS_4000 + PJ_4000 + NONHAB_1000 + SHRUB_275	6	7751.21	0.00	0.80	1
RD_4000 + SAGE_4000 + GRASS_4000 + PJ_4000 + NONHAB_1000 + SHRUB_275	7	7756.69	5.48	0.05	2
RD_4000 + TRI_1000 + GRASS_4000 + PJ_4000 + NONHAB_1000 + SHRUB_275	7	7757.13	5.92	0.04	3
RD_4000 + TRI_1000 + PJ_4000 + NONHAB_1000	5	7757.21	6.00	0.04	4
RD_4000 + PJ_4000 + NONHAB_1000 + SHRUB_275	5	7758.37	7.16	0.02	5

^AELEV, elevation; FOR, forest; GRASS, grassland; MTSHB, mountain shrubland; NONHAB, non-habitat; PJ, piñon-juniper; RD, road density; SAGE, sagebrush; SHRUB, shrubland; TRI, terrain ruggedness index. Covariate followed by the distance buffer (m).

Table S18. The estimated posterior covariate standardised coefficients for final seasonal habitat models for Gunnison sage-grouse in the San Miguel population

Standardised coefficient include β , and the 95% lower (LCI) and upper (UCI) credible intervals during the breeding (15 March–15 July) and summer (16 July–30 September) seasons (1995–2016).

Covariate ^A	Breeding			Summer		
	β	LCI	UCI	β	LCI	UCI
Intercept	-2.073	-2.232	-1.926	-3.951	-4.238	-3.690
Elevation_4000	0.382	0.237	0.530			
Grassland_4000	-0.112	-0.256	0.031	-0.209	-0.350	-0.056
Mountain shrub_275	-0.241	-0.386	-0.096			
Non-habitat_1000	0.160	0.037	0.271	0.203	0.064	0.339
Piñon-juniper_4000	-2.091	-2.262	-1.924	-3.194	-3.582	-2.843
Road density_4000	-0.994	-1.160	-0.843	-1.376	-1.618	-1.148
Sagebrush_275	0.649	0.509	0.785			
Shrubland_275				-0.286	-0.446	-0.121
TRI_120	0.127	-0.002	0.259			

^ACovariate name followed by distance buffer (m)

Table S19. Breeding and summer habitat summary statistics for Gunnison sage-grouse use and available locations in San Miguel

Values include covariate mean and standard error in parentheses for the final habitat models for breeding (15 March–15 July) and summer (16 July–30 September) seasons (1995–2016).

Covariate ^A	Breeding	Available	Summer	Available
Elevation_4000 (m)	2320.000 (2.660)	2220.000 (2.650)		
Grassland_4000 (proportion)	0.121 (0.001)	0.101 (0.001)	0.121 (0.001)	0.101 (0.001)
Mountain shrub_275 (proportion)	0.100 (0.001)	0.112 (0.001)		
Non-habitat_1000 (proportion)	0.034 (0.001)	0.013 (0.000)	0.052 (0.003)	0.013 (0.000)
Piñon-juniper_4000 (proportion)	0.069 (0.001)	0.162 (0.001)	0.064 (0.001)	0.164 (0.001)
Road density_4000 (km km ⁻²)	0.580 (0.000)	0.607 (0.001)	0.572 (0.001)	0.607 (0.001)
Sagebrush_275 (proportion)	0.305 (0.003)	0.259 (0.002)		
Shrubland_275 (proportion)			0.312 (0.006)	0.245 (0.002)
Terrain ruggedness index_275 (m)	115.000 (0.635)	111.000 (0.450)		

^ACovariate name followed by distance buffer (m)