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*Wildlife Research*

### Supplementary Material

#### **Improving the efficiency of aerial surveys for monitoring North American beaver population dynamics**

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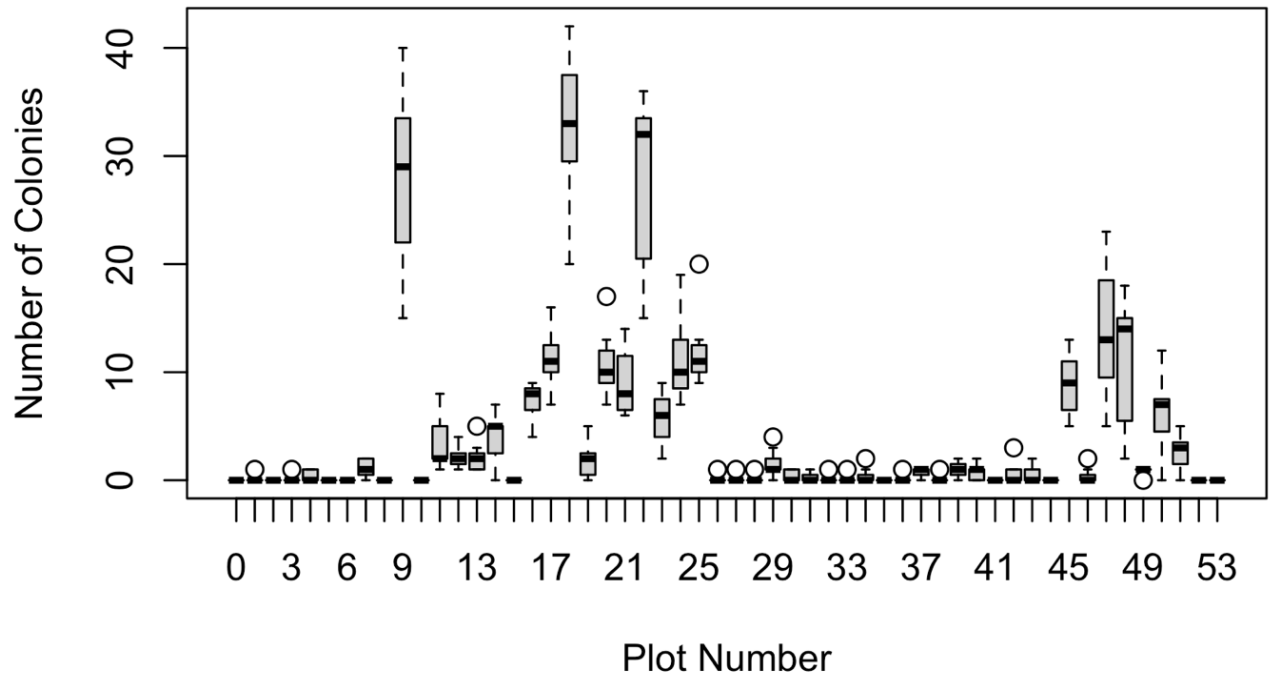
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**SUPPLEMENTARY MATERIAL**

**Figure S1.** Raw abundance of beaver colonies recorded via aerial survey within 54 40x40 km plots across Ohio, USA.



**Table S1.** Full model selection table using various combinations of anthropogenic impact, landcover, or climate variables and ranked by AICc (Akaike’s Information Criterion adjusted for small sample size).

<b>Model Rank</b>	<b>Model</b>		<b>logLik</b>	<b>AICc</b>	<b>Delta AICc</b>	<b>Weight AICc</b>
1	wetlands × surface mines + agriculture		-539.415	1092.8	0.00	0.692
2	surface mines × wetlands + open habitat + agriculture + low development + precipitation		-537.443	1094.9	2.06	0.248
3	surface mines × wetlands + open habitat + streams + agriculture + low development + precipitation + temperature		-536.952	1097.9	5.07	0.055
4	wetlands + agriculture		-546.263	1102.5	9.70	0.005
5	agriculture + surface mines		-549.258	1108.5	15.69	0.000
6	roads + surface mines + industrial mines + agriculture		-548.439	1110.9	18.05	0.000
7	roads + surface mines + industrial mines + agriculture + open habitat		-548.323	1112.6	19.82	0.000

8	agriculture		-553.356	1114.7	21.88	0.000
9	precipitation + wetland + forest		-551.573	1115.1	22.32	0.000
10	wetland + forest + streams		-552.055	1116.1	23.28	0.000
11	streams + agriculture		-553.183	1116.4	23.54	0.000
12	agriculture + open habitat		-553.325	1116.7	23.82	0.000
13	forest + open habitat		-555.848	1121.7	28.86	0.000
14	forest + low development + open habitat		-555.580	1123.2	30.33	0.000
15	forest + open habitat + flowlines		-555.727	1123.5	30.62	0.000
16	forest + open water		-558.133	1126.3	33.44	0.000
17	forest		-559.480	1127.0	34.13	0.000
18	forest + open water + low development		-558.005	1128.0	35.18	0.000
19	forest + low development		-559.308	1128.6	35.79	0.000
20	wetlands × surface mines		-558.389	1128.8	35.95	0.000
21	forest + streams		-559.473	1128.9	36.11	0.000
22	open habitat + surface mines		-559.750	1129.5	36.67	0.000
23	low development + forest + flowlines + open water		-557.969	1129.9	37.11	0.000

24	flowlines + forest + roads		-559.271	1130.5	37.71	0.000
25	low development + forest + flowlines		-559.304	1130.6	37.78	0.000
26	roads + high development + open habitat + surface mines + industrial mines		-558.375	1132.7	39.92	0.000
27	wetlands + open habitat		-563.290	1136.6	43.75	0.000
28	wetlands + open water + flowlines		-563.211	1138.4	45.59	0.000
29	roads + surface mines		-566.538	1143.1	50.25	0.000
30	roads + surface mines + industrial mines		-566.318	1144.6	51.81	0.000
31	open habitat		-570.371	1148.7	55.91	0.000
32	barren land+ open habitat		-569.489	1149.0	56.15	0.000
33	flowlines		-571.422	1150.8	58.01	0.000
34	barren land + open habitat + high development		-569.488	1151.0	58.15	0.000
35	roads + high development + open habitat		-569.907	1151.8	58.98	0.000
36	open water		-573.176	1154.4	61.52	0.000
37	precipitation		-575.134	1158.3	65.44	0.000

38	roads		-575.249	1158.5	65.67	0.000
39	precipitation + temperature		-574.665	1159.3	66.50	0.000
40	low development		-575.881	1159.8	66.93	0.000

**Table S2.** Number of years each of the 54 surveyed 40x40 km plots was classified as either low, medium, or high suitability based on model-averaged predictions and median and interquartile range cutoffs.

Plot number	Number of years in <u>predicted</u> suitability category			Number of years surveyed	Mean # of colonies detected per year	Summed # of colonies detected across years	<u>Original</u> suitability classification
	Low	Medium	High				
0	6			6	0	0	Medium
1	7			7	0.14	1	Low
2	6			6	0	0	Medium
3	6			6	0.17	1	Medium
4	6			6	0.33	2	Medium
5	6			6	0	0	Medium
6	5			5	0	0	Medium
7	7			7	1.14	8	Low
8	6			6	0	0	Medium
9			7	7	27.9	195	Medium
10	6			6	0	0	Medium
11		6		6	3.33	20	Low
12		7		7	2.14	15	Medium
13		7		7	2.14	15	High
14		7		7	3.86	27	Medium
15	7			7	0	0	Medium
16		6	1	7	7.29	51	Medium
17		2	5	7	11.3	79	Medium
18			7	7	32.7	229	Medium
19	2	5		7	1.86	13	Medium
20		2	5	7	10.9	76	High
21		3	4	7	9.14	64	Medium

22			7	7	27.3	191	Medium
23		7		7	5.71	40	Medium
24		2	5	7	11.3	79	High
25			7	7	12.1	85	High
26	6			6	0.17	1	Medium
27	7			7	0.14	1	Medium
28	6			6	0.17	1	Medium
29	7			7	1.57	11	Medium
30	6			6	0.33	2	Medium
31	7			7	0.29	2	Medium
32	7			7	0.14	1	Medium
33	6			6	0.17	1	Medium
34	7			7	0.43	3	Medium
35	6			6	0	0	Medium
36	7			7	0.14	1	Low
37	7			7	0.71	5	Low
38	6			6	0.17	1	Medium
39	7			7	1	7	Low
40	7			7	0.71	5	Medium
41	7			7	0	0	Medium
42	7			7	0.71	5	Medium
43	7			7	0.57	4	Medium
44	7			7	0	0	Medium
45		3	4	7	8.86	62	High
46	7			7	0.43	3	Medium
47			7	7	13.9	97	Medium
48		2	5	7	10.7	75	High
49	7			7	0.86	6	Low
50		7		7	6.14	43	High



51		7	7	2.57	18	Medium
52	7		7	0	0	Medium
53	6		6	0	0	Medium

	National Land Cover Dataset 2016 categories (proportions)													
	Stream Lengths	Surface Mines	Industrial Mines	Open Water	Low Development	High Development	Barren Land	Forest	Open Habitat	Agriculture	Wetland	WTAWS	Road density	Mean Winter Temperature
Streams	1.00	0.08	-0.13	0.03	0.03	-0.04	-0.08	0.52	0.24	-0.50	-0.07	0.07	0.01	0.18
Surface Mines	0.08	1.00	-0.12	-0.00	-0.08	-0.08	0.40	0.48	0.02	-0.39	-0.07	0.17	-0.04	0.09
Industrial Mines	-0.13	-0.12	1.00	-0.04	0.06	0.19	0.49	-0.26	0.00	0.20	-0.13	-0.12	0.10	-0.01
Open Water	0.03	-0.00	-0.04	1.00	0.06	0.12	-0.05	0.24	0.15	-0.33	0.06	0.43	-0.20	-0.07
Low Development	0.03	-0.08	0.06	0.06	1.00	*0.80	-0.13	-0.01	-0.03	-0.11	0.26	-0.01	*0.72	-0.08
High Development	-0.04	-0.08	0.19	0.12	*0.80	1.00	-0.10	-0.14	0.03	-0.02	0.25	-0.03	0.64	0.04
Barren Land	-0.08	0.40	0.49	-0.05	-0.13	-0.10	1.00	0.09	0.20	-0.14	-0.13	0.06	-0.10	0.09
Forest	0.52	0.48	-0.26	0.24	-0.01	-0.14	0.09	1.00	0.30	*-0.92	-0.22	0.19	-0.12	0.25
Open Habitat	0.24	0.02	0.00	0.15	-0.03	0.03	0.20	0.30	1.00	-0.62	0.02	0.07	-0.12	0.19
Agriculture	-0.50	-0.39	0.20	-0.33	-0.11	-0.02	-0.14	*-0.92	-0.62	1.00	0.07	-0.23	0.06	-0.24
Wetland	-0.07	-0.07	-0.13	0.06	0.23	0.25	-0.13	-0.22	0.02	0.07	1.00	0.47	0.30	-0.41
WTAWS	0.07	0.17	-0.12	0.43	-0.01	-0.03	0.06	0.19	0.07	-0.23	0.47	1.00	-0.12	-0.35
Roads	0.01	-0.04	0.10	-0.20	0.72	0.64	-0.10	-0.12	-0.12	0.06	0.30	-0.11	1.00	-0.15
Mean Temperature	0.18	0.09	-0.01	-0.07	-0.08	0.04	0.09	0.25	0.19	-0.24	-0.41	-0.35	-0.15	1.00

**Table S3.** Pearson correlation ( $r$ ) values between predictors. WTAWS is the total area of wetland per plot based on the National Wetland Inventory dataset.