Wolf spatial behaviour promotes encounter and capture of a recently supplanted primary prey. Sana Zabihi-Seissan, Christina M. Prokopenko\*, Eric Vander Wal

**DataESM1**

**Code and input data for wolf RSF and figures used in main text**

**Authors of the material provided in DataESM1.zip**

Christina Prokopenko

Memorial University

\*cmprokopenko@mun.ca

Sana Zabihi-Seissan

Memorial University

**File list**

01-Elk\_habitat\_RSF.R

02-Elk\_vulnerability\_RSF.R

03-Moose\_habitat\_RSF.R

04-Moose\_vulnerability\_RSF.R

05-Wolf\_RSF.R

06-Wolf\_RSF\_K-fold\_test.R

07-Supplementary\_materials.R

08-Supplementary\_materials\_prey layer K-fold\_tests.R

Code was run using R version 3.6.2, with packages updated accordingly.

**Description**

Resource selection functions were run for elk and moose using 1-Elk\_habitat\_RSF.R and 3-Moose\_habitat\_RSF.R. The resulting coefficients were used to calculate a raster surface in ArcMap using the raster calculator tool. Elk and moose habitat were covariates in the wolf RSF model.

Input data for elk (elk\_survey\_data.csv ) and moose (moose\_survey\_data.csv )

- FID: Unique ID for each row of data

- Count: Number of individuals of the species seen at this location

- Year: Year data was collected

- Used: 1 for used point, 0 is available

- ConBog: Proportion of bog and coniferous forest around data point (within 200m)

- MarshGrass: Proportion of marshes and grassland around data point (within 200m)

- Mixedwood: Proportion of mixed wood forest around data point (within 200m)

- Opendec: Proportion of open deciduous forest around data point (within 200m)

- BTrail\_D: Distance to nearest back country trail (m)

- Edge\_D: Distance to nearest hard habitat edge (m)

- Road\_D: Distance to nearest road (m)

- Trail\_D: Distance to nearest maintained trail (m)

- Water\_D: Distance to nearest body of water (m)

- Ruggedness: Ruggedness index

- Stream\_D: Distance to nearest stream (m)

Resource selection functions were run for elk and moose vulnerability using 2-Elk\_vulnerability\_RSF.R and 4-Moose\_vulnerability\_RSF.R. The resulting coefficients were used to calculate a raster surface in ArcMap using the raster calculator tool. Elk and moose vulnerability were covariates in the wolf RSF model.

Input data for elk vulnerability (elk\_kill\_data.csv ) and moose vulnerability(moose\_kill\_data.csv )

- FID: Unique ID for each row of data

- Month: Month data was collected

- Year: Year data was collected

- Used: 1 for used point, 0 is available

- ConBog: Proportion of bog and coniferous forest around data point (within 200m)

- MarshGrass: Proportion of marshes and grassland around data point (within 200m)

- Mixedwood: Proportion of mixed wood forest around data point (within 200m)

- Opendec: Proportion of open deciduous forest around data point (within 200m)

- BTrail\_D: Distance to nearest back country trail (m)

- Edge\_D: Distance to nearest hard habitat edge (m)

- Road\_D: Distance to nearest road (m)

- Trail\_D: Distance to nearest maintained trail (m)

- Water\_D: Distance to nearest body of water (m)

- Ruggedness: Ruggedness index

- Stream\_D: Distance to nearest stream (m)

- M\_Density: Moose density values from aerial survey. See methods.

- E\_Density: Elk density values from aerial survey. See methods.

Resource selection functions were run for wolves using 5-Wolf\_RSF.R.

Input data for wolves (wolf\_data.csv ) contain the following variables

- FID: Unique ID for each row of data

- WolfID: Unique ID for each wolf

- PackID: Unique ID for each wolf pack

- Year: Year data point was collected

- Month: Month data point was collected

- Day: Day data point was collected

- M\_D30: Moose density

- E\_D30: Elk density

- M\_H30: Moose habitat RSF score

- E\_H30: Elk habitat RSF score

- M\_V30: Moose vulnerability RSF score

- E\_V30: Elk vulnerability RSF score

K-fold cross validation for wolf RSF model was run using 6-Wolf\_RSF\_K-fold.R and based off of Roberts et al. 2017.

Supplementary material figures were created using 7-Supplementary\_materials.R.

Input data for kill site composition figure (kill\_site\_data.csv )

- FID: Unique ID for each row of data

- Pack\_ID: Unique ID for each wolf pack

- Year: Year data point was collected

- Month: Month data point was collected

- Prey\_spp: Prey species killed

Input data for snow accumulation figure (snow\_depth\_data.csv)

- year: Year data point was collected

- month: Month data point was collected

- day: Day data point was collected

- snow\_depth\_cm: Depth of snow recorded in centimeters

- julian\_day: Day data point was collected in julian day

Input data for elk GPS collar habitat selection RSF (elk\_gps\_data.csv)

- FID: Unique ID for each row of data

- LocNum\_Ori: Unique ID for each row of data by individual collared elk

- Year: Year data point was collected

- Month: Month data point was collected

- Day: Day data point was collected

- Hour: Hour data point was collected

- Minute: Minute data point was collected

- Used: 1 for used point, 0 is available

- elk\_id: Unique ID for each collared elk

- ConBog: Proportion of bog and coniferous forest around data point (within 200m)

- MarshGrass: Proportion of marshes and grassland around data point (within 200m)

- Mixedwood: Proportion of mixed wood forest around data point (within 200m)

- Opendec: Proportion of open deciduous forest around data point (within 200m)

- BTrail\_D: Distance to nearest back country trail (m)

- Edge\_D: Distance to nearest hard habitat edge (m)

- Road\_D: Distance to nearest road (m)

- Trail\_D: Distance to nearest maintained trail (m)

- Water\_D: Distance to nearest body of water (m)

- Ruggedness: Ruggedness index

- Stream\_D: Distance to nearest stream (m)

Input data for comparison figure between elk GPS collar RSF and aerial survey RSF (elk\_coef\_comp.csv)

- variable: Variable in the model

- coefficient: β coefficient for corresponding variable in model

- ci-low: Lower bound of 95% confidence interval of β coefficient

- ci-high: Higher bound of 95% confidence interval of β coefficient

- model: Model to which the data corresponds

Input data for comparison between prey catchability layers with and without density included into the RSF model (prey\_catchability\_comp.csv)

- Moose catchability 2016: Data from moose catchability RSF without density in 2016

- Moose catchability+density 2016: Data from moose catchability RSF with density in 2016

- Moose catchability 2017: Data from moose catchability RSF without density in 2017

- Moose catchability+density 2017: Data from moose catchability RSF with density in 2017

- Elk catchability 2016: Data from elk catchability RSF without density in 2016

- Elk catchability+density 2016: Data from elk catchability RSF with density in 2016

- Elk catchability 2017: Data from elk catchability RSF without density in 2017

- Elk catchability+density 2017: Data from elk catchability RSF with density in 2017

K-fold cross validation for prey habitat and catchability RSF models were run using 8-Supplentary\_materials\_prey layer K-fold\_tests.R and based off of Roberts et al. 2017.

.