**Supplementary Material 1** Predictor variables considered for inclusion in models including the variable name, the processing steps taken to produce the variable, the original resolution of the data used to create the variable, which models the variable was considered (regional = coastal; Kenai = Kenai Peninsula; POW = Prince of Wales Island) and the source of the original data used to create the variable.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variable | Processing steps | Original resolution | Model | Source |
| Mean annual temperature | Calculated using bioclim formulas available from worldclim (http://www.worldclim.org/bioclim) using monthly mean temperature and total precipitation averaged across 1987 to 2006 for current climate (from the historical data set of 1901-2009 monthly average temperature and total precipitation from CRU TS 3.1 climate data, downscaled to 2 km via the delta method) and projected climate for 2030 for the b1 and a2 emissions scenarios (from a five model average of five AR4 GCMs that perform best across Alaska and the Arctic, downscaled to 2 km via the delta method). | 2km | Regional | <http://www.snap.uaf.edu/data.php> |
| Isothermality | 2km | Regional |
| Temperature seasonality | 2km | Regional |
| Mean temperature of the warmest month | 2km | Regional |
| Mean temperature of the coldest month | 2km | Regional |
| Temperature annual range | 2km | Regional |
| Mean temperature of wettest quarter | 2km | Regional |
| Mean temperature of driest quarter | 2km | Regional |
| Mean temperature of warmest quarter | 2km | Regional |
| Mean temperature of coldest quarter | 2km | Regional |
| Annual precipitation | 2km | Regional |
| Precipitation of wettest month | 2km | Regional |
| Precipitation of driest month | 2km | Regional |
| Precipitation seasonality | 2km | Regional |
| Precipitation of wettest quarter | 2km | Regional |
| Precipitation of driest quarter | 2km | Regional |
| Precipitation of warmest quarter | 2km | Regional |
| Precipitation of coldest quarter | 2km | Regional |
| Elevation | Alaska 300m digital elevation model. For local models this was resampled to 30m cell size. | 300m | RegionalKenai POW | <http://agdcftp1.wr.usgs.gov/pub/projects/dem/300m/akdem300m.tar.gz> |
| Slope | Derived from the 300m digital elevation model using ArcGIS 9.3 ArcToolbox Slope tool. | 300m | Regional |   |
| Eastness | Derived from the 300m digital elevation model using ArcGIS 9.3 ArcToolbox Aspect tool and taking the sin of the derived aspect layer. | 300m | Regional |   |
| Northness | Derived from the 300m digital elevation model using ArcGIS 9.3 ArcToolbox Aspect tool and taking the cosine of the derived aspect layer.  | 300m | Regional |   |
| NLCD 2001 vegetation | Natioanl Land Cover Database 2001 (Version 1.0) for Alaska. | 30m | Kenai POW | <http://www.mrlc.gov/nlcd01_data.php> |
| Distance to wetland | Euclidean distance from shapefile delineating wetlands. | 30m | Kenai POW | <http://www.fws.gov/wetlands/Data/DataDownload.html#State> |
| Distance to water | Euclidian distance from the water shapefiles calculated in ArcGIS 9.3. | 30m | Kenai POW | Kenai - Kenai Peninsula Borough (http://www2.borough.kenai.ak.us/GISDept/Downloads.html); POW - Alaska State Geo-Spatial Data Clearinghouse's Alaska Hydrography 1:63,360 (http://dnr.alaska.gov/SpatialUtility/SUC?cmd=vmd&layerid=119) |
| Distance to transportation corridor | Euclidian distance from shapefiles delineating roads (for Kenai including highways, roads, and forest roads within the state infrastructure layer). | 30m | Kenai | Kenai: Alaska State Geo-Spatial Data Clearinghouse's Infrastructure 1:63,360 (http://dnr.alaska.gov/SpatialUtility/SUC?cmd=vmd&layerid=75); POW: Forest Service, Region 10 Tongass National Forest database |
| Distance to roads | Euclidean distance from shapefile delineating roads. | 30m | POW | Forest Service, Region 10 Tongass National Forest database |
| Distance to trails | Euclidean distance from trails shapefiles (for Kenai including trails within the state infrastructure layer). | 30m | Kenai POW | POW: Forest Service, Region 10 Tongass National Forest database |
| Distance to urban areas | Euclidian distance to urban areas. | 30m | Kenai | TIGER/Line Shapefile, 2009 of the US Corrected Census 2000 Urban areas (http://tigerline.census.gov/cgi-bin/shapefiles2009/national-files) |
| Distance to recreation features | Euclidian distance to recreation location shapefile features. | 30m | POW | Forest Service, Region 10 Tongass National Forest database |
| Distance to utility features | Euclidian distance from utility features including railroads, electrical lines, and pipelines within the state infrastructure layer. | 30m | Kenai | Alaska State Geo-Spatial Data Clearinghouse's Infrastructure 1:63,360 (<http://dnr.alaska.gov/SpatialUtility/SUC>?cmd=vmd&layerid=75) |

**Supplementary Material 2** Variable importance as measured by permutation importance (variable contribution) in the maxent models for a) the coast and interior regions, b) the Kenai Peninsula, and c) Prince of Wales Island. Values in bold indicate the three most influential predictors for each model according to the permutation importance.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **a)** | Canada thistle | White sweetclover | Reed canarygrass | Knotweed complex | Spotted knapweed | White sweetclover (interior) |
| Annual Mean Temperature |  |  |  | 19.9 (22.4) |  | 12.5 (8.5) |
| Mean Temperature of Warmest Quarter |  | 1.4 (1.1) |  | 0.1 (0.2) |  |  |
| Mean Temperature of Coldest Quarter |  |  |  |  | 0.1 (3.3) |  |
| Annual Precipitation |  |  | 5 (0.9) |  | 0 (0) |  |
| Precipitation of Wettest Month |  |  | 4.6 (0.3) |  | 0 (0) |  |
| Precipitation of Driest Month |  |  | 7 (13.6) |  | 0.6 (5) |  |
| Precipitation Seasonality (Coefficient of Variation) | 18.2 (7.6) | 40.7 (44.2) |  | 57 (63.7) | 1.1 (3.7) | 10.5 (33.4) |
| Precipitation of Wettest Quarter |  |  | 2.9 (1.1) |  | 44.7 (50.9) |  |
| Precipitation of Driest Quarter |  |  | 15.5 (51.2) |  | 0 (0) |  |
| Precipitation of Warmest Quarter | 44.3 (27.8) | 20.6 (1.9) |  | 1.7 (0.5) |  | 13.5 (5.4) |
| Precipitation of Coldest Quarter |  |  | 49.1 (10.6) |  | 23.1 (12.9) |  |
| Temperature Seasonality  |  | 5.7 (37) |  |  |  | 54.8 (48.2) |
| Max Temperature of Warmest Month | 22.6 (20.9) |  |  |  |  |  |
| Min Temperature of Coldest Month | 5.5 (37.5) |  |  |  | 0.7 (1.9) |  |
| Mean Temperature of Wettest Quarter | 2.5 (1) | 4 (4.5) | 5.4 (6.8) | 18.7 (10.5) | 22.1 (16) |  |
| Eastness | 1.8 (1.1) | 4.5 (1.6) | 0.9 (1.5) | 0.1 (0.2) | 1.4 (0.3) | 4.3 (1.8) |
| Northness | 0.4 (1.6) | 2.7 (2.1) | 2.1 (1.9) | 1.6 (1) | 6.2 (5.9) | 3.3 (1.7) |
| Slope | 4.6 (2.6) | 20.5 (7.6) | 7.3 (12.1) | 0.9 (1.4) |  | 1.1 (0.9) |

|  |  |  |  |
| --- | --- | --- | --- |
| **b)** | Canada thistle | White sweetclover | Reed canarygrass |
| Elevation | 0 (0) | **31.4 (14.9)** | **18.1 (17.8)** |
| Land cover | **35.5 (49.6)** | 6.2 (22.6) | 2.1 (3.2) |
| Distance to wetlands | **42.5 (33.7)** | 2.2 (5.8) | 5.1 (8.7) |
| Distance to water | 0.1 (0.8) | **25.6 (19.2)** | 5.3 (1.3) |
| Distance to roads | 1.4 (0.1) | 2.7 (3.2) | **21.6 (41.4)** |
| Distance to trails | 2.2 (1.3) | 1.5 (2.9) | 6 (3.4) |
| Distance to urban areas | 0 (0) | 13.2 (9.5) | **24.3 (13.1)** |
| Distance to utility lines | **18.3 (14.6)** | **17.3 (22)** | 17.5 (11.2) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **c)** | Canada thistle (with roads) | Canada thistle (without roads) | White sweetclover | Reed canarygrass |
| Elevation | **14 (14.8)** | **28.9 (40.2)** | **23 (20.5)** | **13.7 (12.4)** |
| Land cover | 2.4 (2.2) | 15.6 (7.7) | **20.6 (28.3)** | 4.2 (9.6) |
| Distance to wetlands | 1.6 (4.7) | 3.5 (12.4) | 0 (0) | 3.6 (2.9) |
| Distance to water | 9.8 (4.4) | **18.9 (11.2)** | 8.8 (2.3) | 13 (9.6) |
| Distance to roads | **42.3 (62.7)** |  | 0 (0) | **32.6 (45.4)** |
| Distance to trails | 0 (0.1) | 0.5 (0.1) | **47.6 (43.6)** | **20.3 (12.6)** |
| Distance to recreation areas | **29.8 (11.1)** | **32.6 (28.4)** | 0 (5.3) | 12.7 (7.5) |

**Supplementary Material 3** The model name (species and location/ scale), number of unique presence locations, number of unique background locations, the regularization value used in maxent, the average AUC values for the test data (and the training data), and the threshold value using the 10 percentile training presence rule (and the minimum training presence rule when indicated).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Model** | **Sample size** | **Background points** | **Regularization value** |  **Test AUC (Train)** |
| Knotweed complex – coastal | 72 | 628 | 4 | 0.732 (0.762) |
| Spotted knapweed- coastal | 18 | 351 | 1 | 0.682 (0.860) |
| White sweetclover(interior) | 302 | 949 | 7 | 0.679 (0.720) |

**Supplementary Material 4** Habitat suitability with a) current climate conditions, b) predicted climate for 2030 with an A2 emissions scenario, and c) predicted climate for 2030 with a B1 emissions scenario for Knotweed complex for the coastal region*,* spotted knapweed for the coastal region, and white sweetclover for the interior region. In all maps the grey transparent overlay indicates locations with novel environments according to the multivariate environmental similarity surface.

