

Supplemental Information

steppe

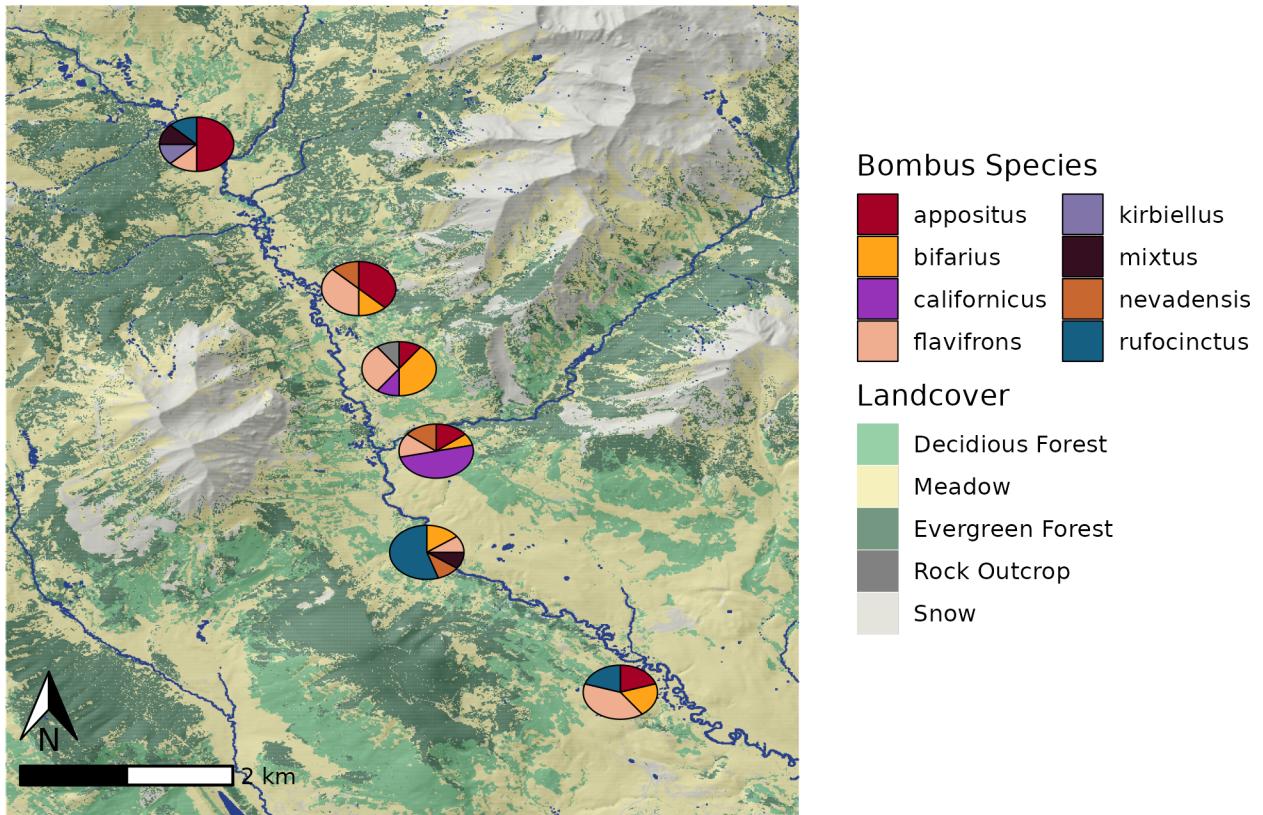
Table 1: Example of environmental variables and data sources commonly used in species distribution models that could be used during the spatial filtering step of our approach.

Variable	Data Source	Geographic Extent
Climate	WorldClim	Global
	CHELSA	Global
	Gridded Surface Meterological (GRIDMET)	CONUS
	PRISM	CONUS
Elevation	Multi-Error-Removed Improved-Terrain DEM	Global
	Global Multi-resolution Terrain Elevation Data (GMTED2010)	Global
	Aster Global Digital Elevation Model (ASTGTM)	Global
	United States National Elevation Dataset	CONUS
Land Uses / Land Covers	Dynamic World	Global
	Global Land Cover Characterization (GLCC)	Global
	Moderate Resolution Imaging Spectroradiometer (MODIS) Land Cover	Global
	National Land Cover Dataset (NLCD)	CONUS
Vegetation Cover	Remote Sensing Products (e.g. Landsat, MODIS)	Global
	SoilGrids	Global
	Harmonized World Soil Database	Global
Soils & Geomorphology	GeoMorpho90m	Global
	Web Soil Survey	CONUS

^a CONUS; CONtinental United States

Site Info

Origins of Corbiculae Loads



Upper East River Valley, Colorado

Table S2 - Models used for Species Distribution Model Ensembles

The two machine learning models utilize Ensemble learning.

Ensemble learning utilizes many sets of trees, each tree being composed of many binary decisions, to create a single model. Each independent variable (- or *feature*) may become a node on the tree - i.e. a location on the tree where a binary decision will move towards a predicted outcome. Each of the decision tree models which ensemble learning utilizes is a weak model, each of which may suffer due to high variance or bias, but which produce better outcomes than would be expected via chance. When ensembled these models generate a strong model, a model which should have more appropriately balanced variance and bias and predicts outcomes which are more strongly correlated with the expected values than the individual weak models.

Random Forest (RF) the training data are continually bootstrap re-sampled, in combination with random subsets of features, to create nodes which attempt to optimally predict a known outcome. A large number of trees are then aggregated, via the most common predictions, to generate a final classification prediction tree. Each individual prediction tree is generated independently of the others.

Boosted Regression Tree (BRT) (or Gradient Boosted tree) An initial tree is grown, and all other trees are derived sequentially from it, as each new tree is grown the errors in responses from the last tree are weighed more heavily so that the model focuses on selecting dependent variables which refine predictions. All response data and predictor variables are kept available to all trees.

Bias predictions from an algorithm are systematically in error due to being prejudiced for or against certain results, due to assumptions during learning.

Variance errors in models due to an over-reliance and sensitivity of training to outliers in training data.

In general, Random Forest models have high bias and low variance, where boosted regressions trees have lower bias and higher variance. Theoretically, the weaknesses and strengths of bootstrap aggregation (bagging) as implemented by Random Forests are supplemented by the boosting.

Table S3 - Species Distribution Models Predictors

Layer	LM	Description	Name	Source
1.	N	Mean annual cloudiness - MODIS	Cloud Cover (EarthEnv)	Wilson et al. 2016
2.	Y	Cloudiness seasonality 1 - MODIS	Cloud Cover (EarthEnv)	Wilson et al. 2016
3.	N	Cloudiness seasonality 2 - MODIS	Cloud Cover (EarthEnv)	Wilson et al. 2016
4.	Y	Cloudiness seasonality 3 - MODIS	Cloud Cover (EarthEnv)	Wilson et al. 2016
5.	N	Beginning of the frost-free period	ClimateNA	Wang et al. 2016
6.	N	Climatic moisture deficit	ClimateNA	Wang et al. 2016
7.	N	Degree-days above 5C	ClimateNA	Wang et al. 2016
8.	N	Mean annual precipitation	ClimateNA	Wang et al. 2016
9.	Y	Mean annual precipitation as snow	ClimateNA	Wang et al. 2016
10.	Y	Temperature seasonality	ClimateNA	Wang et al. 2016
11.	Y	2015 Percent Grass/Herbaceous cover - MODIS	(MOD44B)	
12.	Y	2015 Percent Tree cover from Landsat 7/8	(GLCC)	
13.	Y	Soil probability of bedrock (R Horizon)	SoilGrids	Hengl et al. 2017
14.	N	Soil organic carbon (Tonnes / ha)	SoilGrids	Hengl et al. 2017
15.	N	Surface soil pH in H ₂ O	SoilGrids	Hengl et al. 2017
16.	Y	Surface soil percent sand	SoilGrids	Hengl et al. 2017
17.	Y	Soil USDA class	SoilGrids	Hengl et al. 2017
18.	N	Topographic elevation	Topography (EarthEnv)	Amatulli et al. 2018
19.	Y	Topographic elevation, moving window.	Topography (EarthEnv)	Amatulli et al. 2018
20.	Y	Topographic percent slope	Topography (EarthEnv)	Amatulli et al. 2018
21.	Y	Topographic wetness index	Topography (EarthEnv)	Amatulli et al. 2018
22.	Y	Topographic aspect	Topography (EarthEnv)	Amatulli et al. 2018
23.	Y	Annual potential solar radiation computed	r.sun	
24.	N	Estimated actual (w/-cloud) solar radiation	r.sun	Wilson et al. 2016
25.	Y	Log-transformed distance to surface water	Global Surface Water Explorer	Pekel et al. 2016
26.	Y	Percent surface water	Global Surface Water Explorer	Pekel et al. 2016

Amatulli, G., Domisch, S., Tuanmu, M.-N., Parmentier, B., Ranipeta, A., Malczyk, J., and Jetz, W. (2018) A suite of global, cross-scale topographic variables for environmental and biodiversity modeling. Scientific Data volume 5, Article number: 180040. DOI: doi:10.1038/sdata.2018.40.

Hengl T, Mendes de Jesus J, Heuvelink GBM, Ruiperez Gonzalez M, Kilibarda M, Blagotić A, et al. (2017) SoilGrids250m: Global gridded soil information based on machine learning. PLoS ONE 12(2): e0169748. <https://doi.org/10.1371/journal.pone.0169748>

Pekel, JF., Cottam, A., Gorelick, N. et al. High-resolution mapping of global surface water and its long-term changes. Nature 540, 418–422 (2016). <https://doi.org/10.1038/nature20584>

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Wilson AM, Jetz W (2016) Remotely Sensed High-Resolution Global Cloud Dynamics for Predicting Ecosystem and Biodiversity Distributions. PLoS Biol 14(3): e1002415. <https://doi.org/10.1371/journal.pbio.1002415>

Appendix 3 - Molecular Reference Specimen Table

Table 1: Samples Used to Supplement the Sequence Reference Library

Taxon	Family	Herbarium	Accession	Preservation	Locality	Date	Collector
<i>Cirsium parryi</i> (A. Gray) Petr.	Asteraceae			silica-dried	USA, Colorado, Gunnison	20.IX.2020	Benkendorf, R.C. 2318
<i>Cirsium parryi</i> (A. Gray) Petr.	Asteraceae			silica-dried	USA, Colorado, Gunnison	20.IX.2020	Benkendorf, R.C. 2318
<i>Ericameria parryi</i> (A. Gray) G.L. Nelson & Baird	Asteraceae	CHIC	23001	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2316
<i>Ericameria speciosa</i> (Lindley) De Candolle	Asteraceae	CHIC	23000	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2217
<i>Erigeron subtrinervis</i> Rydb. Ex Porter & Britton	Asteraceae			silica-dried	USA, Colorado, Gunnison	20.VII.2020	Benkendorf, R.C. 2216
<i>Helianthella quinquenervis</i> (Hook.) A. Gray	Asteraceae	CHIC	22989	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2200
<i>Heliomeris multiflora</i> Nutt.	Asteraceae	CHIC	22987	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2201
<i>Heterotheca villosa</i> (Pursh) Shummers	Asteraceae	CHIC	22986	silica-dried	USA, Colorado, Gunnison	20.IX.2020	Benkendorf, R.C. 2314
<i>Senecio serratus</i> Hook.	Asteraceae	CHIC	23008	silica-dried	USA, Colorado, Gunnison	20.IX.2020	Benkendorf, R.C. 2313
<i>Synphytodium foliacium</i> (Lindl.) Ex D.C. G.L. Nelson	Asteraceae	CHIC	22986	press-dried	USA, Idaho, Idaho	26.VII.2019	Benkendorf, R.C. 2192
<i>Taraxacum officinale</i> F.H. Wigg.	Asteraceae	CHIC	23011	silica-dried	USA, Illinois, McHenry	28.VII.2020	Benkendorf, R.C. 2326
<i>Taraxacum officinale</i> F.H. Wigg.	Asteraceae	CHIC	23011	silica-dried	USA, Illinois, McHenry	28.VII.2020	Benkendorf, R.C. 2326
<i>Mertensia ciliata</i> (James ex Torr.) G. Don	Boraginaceae	ID	175485	silica-dried	USA, Idaho, Valley	18.VI.2018	McCauley, S. 1846
<i>Mertensia ciliata</i> (James ex Torr.) G. Don	Boraginaceae	ID	169837	press-dried	USA, Idaho, Adams	10.VII.2014	Gilman, I. 2014-73, Tank, D., Latvis, M., Jacobs, S.J.
<i>Mertensia fusiformis</i> Greene	Boraginaceae	RM	720522	press-dried	USA, Colorado, Gunnison	7.VII.1907	Taylor, K.J. 1070
<i>Campanula rotundifolia</i> L.	Campanulaceae			press-dried	USA, Colorado, Gunnison	9.VII.1907	Taylor, K.J. 427
<i>Lathyrus lauszewskii</i> Kellogg var. <i>leucanthus</i> (Ryd.) Dorn	Fabaceae	CHIC	23002	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2213
<i>Lathyrus lauszewskii</i> Kellogg var. <i>leucanthus</i> (Ryd.) Dorn	Fabaceae	CHIC	23002	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2218
<i>Lupinus argenteus</i> Pursh	Fabaceae	CHIC	22997	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2211
<i>Lupinus argenteus</i> Pursh	Fabaceae	CHIC	22918	press-dried	USA, Nevada, Pershing	29.V.2018	Benkendorf, R.C. 1287
<i>Lupinus bakeri</i> Greene	Fabaceae	IDS	10387	press-dried	USA, Colorado, Gunnison	29.VI.2010	Williams, C.F. 2010-369.1
<i>Vicia americana</i> Muhl. ex Willd.	Fabaceae	CHIC	10142	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2209
<i>Vicia americana</i> Muhl. ex Willd. var. <i>minor</i> Hook.	Fabaceae	CHIC	22956	silica-dried	USA, Montana, Carbon	4.VII.2019	Benkendorf, R.C. 2071
<i>Frasera speciosa</i> Douglas ex Griseb	Gentianaceae	RM	721930	press-dried	USA, Colorado, Gunnison	20.VI.1997	Taylor, K.J. 1733
<i>Hydrophyllum capitatum</i> Douglas ex Bent	Hydrophyllaceae	RM	719305	press-dried	USA, Colorado, Gunnison	7.VII.1997	Taylor, K.J. 2578
<i>Hydrophyllum capitatum</i> Douglas ex Bent	Hydrophyllaceae	tba		press-dried	USA, Colorado, Mesa	30.VI.2011	Kirkpatrick, M. K. 6836
<i>Hydrophyllum fendleri</i> (Gray) Heller	Hydrophyllaceae	RM	22996	press-dried	USA, Colorado, Delta	8.VI.2011	Brummer, L.E. 3693
<i>Hydrophyllum fendleri</i> (Gray) Heller	Hydrophyllaceae	ID	161100	press-dried	USA, Washington, Yakima	9.VI.2008	Knoke, D. 1576
<i>Hydrophyllum fendleri</i> (Gray) Heller	Hydrophyllaceae	ID	164040	press-dried	USA, Idaho, Idaho	27.V.2009	Davidson, C. 11359
<i>Agastache pallidiflora</i> (Heller) Rydberg	Lamiaceae	CHIC	23007	silica-dried	USA, Arizona, Coconino	17.VIII.2020	Benkendorf, R.C. 2310
<i>Agastache pallidiflora</i> (Heller) Rydberg	Lamiaceae	CHIC	23007	silica-dried	USA, Arizona, Coconino	17.VIII.2020	Benkendorf, R.C. 2310
<i>Chamerion angustifolium</i> (L.) Holub	Ranunculaceae	CHIC	22998	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2212
<i>Delphinium barbeyi</i> (Huth) Huth	Ranunculaceae	CHIC	23005	silica-dried	USA, New Mexico, Catron	15.VIII.2020	Benkendorf, R.C. 2300
<i>Delphinium nuttallianum</i> Pritz.	Ranunculaceae	ID	166462	press-dried	USA, Idaho, Gem	15.VI.2011	Smith, J.F. 9594
<i>Delphinium nuttallianum</i> Pritz.	Ranunculaceae	ID	179376	press-dried	USA, Idaho, Gooding	29.IV.2017	Boyd, J. 14
<i>Potentilla fruticosa</i> Pursh	Rosaceae	CHIC	22999	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2215
<i>Potentilla fruticosa</i> Pursh	Rosaceae	CHIC	22999	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2215
<i>Potentilla hippiana</i> Lehman.	Rosaceae	CHIC	23005	silica-dried	USA, New Mexico, Catron	15.VIII.2020	Benkendorf, R.C. 2300
<i>Potentilla pulcherrima</i> Lehman.	Rosaceae	CHIC	22993	silica-dried	USA, Colorado, Gunnison	18.VII.2020	Benkendorf, R.C. 2205

Appendix 6 - Pollen Key

- 1a: Pollen shed in clumps (tetrads/polyads); grains generally triangular, with an annulus subtending the porate apertures (go 34)
- 1b: Pollen generally dispersed as single units (monads); grains seldom if ever with annulus.
- 2a: Apertures porate, always lacking colpi
- 3a: grain outline from equatorial view circular
- 4a: Pores distributed along the equator.
- 5a: Pores > 5 (stephanoporate)
- 6a: Ornamentation homobrochate (~ *MENTZELIA*)
- 6b: Ornamentation otherwise (~ *POLYGALA*)
- 5b: Pores < 5 (*CURRENTLY OPEN*)
- 4b: Pores +/- distributed across grain (pantoporate)
- 7a: Ornamentation with striate ornamentation (~ *POLEMONIUM*)
- 7b: Ornamentation otherwise
- 8a: Ornamentation, slightly irregular - without regularly repeating features (scabrate) (~ *STELLARIA*)
- 8b: Ornamentation forming regularly repeating (reticulate) cells of varying shapes.
- 9a: spacing between the grid cells large (lophate), the walls of the cells with another set of projecting ornamentation (~ *OPUNTIA*)
- 9b: spacing between cells small, the wall of the cells without projecting features.
- 10a: Pores extending beyond the reticulate grids (~ *ARENARIA*)
- 10b: Pores extending beyond the reticulate grids (~ *PHLOX*)
- 3b: Outline from equatorial view otherwise (usually slightly triangular)
- 11a: Outline elliptic (*CURRENTLY EMPTY*)
- 11b: Outline not elliptic, grains often with acute, if rounded, angles along sides (e.g., triangular, polygonal) (*EMPTY*)
- 2b: Apertures with colpi, occasionally also with pores in addition (coporate)
- 12a: Grains with bristles tapering to points (echinate), and tri-colporate.
- 13a: Grains uniformly echinate, less the apertures. (Asteraceae 1)
- 13b: Grains with echinate bristles on ridges of lophae (Asteraceae 2)
- 12b: Grains without echinate ornamentation - this lead includes projections with ornamentation with round tips.
- 14a: Grains with either less than 3 apertures, or with two distinct ornamentation types (generally $\frac{1}{2}$ psilate, $\frac{1}{2}$ reticulate).
- 15a. Grains apparently lacking any apertures. (~ *IRIS*)
- 15b. Grains aperturate
- 16a. Ornamentation on one face of grain psilate, the other homobrochate (~ *ZIGADENUS + ANTICLEA*)
- 16b. Ornamentation psilate across both faces of grain (~*ERYTHONIUM*)
- 14b. Grains with either 3 or more apertures, or with an elongated spiral like aperture
- 17a. Grain with spiral like colpi
- 18a. Spiral with deep well-defined furrows (~ *ERYTHRANTHE GUTTATA*, syn. obsolete. *MIMULUS*)
- 18b. Spirals without well-defined grooves, ornamentation evidently perforate (~ *RANUNCULUS ALISMIFOLIUS*)
- 17b. Grains with colpi these not forming irregular spiral motifs.
- 19a. Grains elliptic, essentially perfectly cylindrical along longest axis, except for minor inundations along equatorial region. Apertures, of two types (heteroaperturate). (~ *BORAGINACEAE*)
- 19b Grains shaped similar or not, but never heteroaperturate.
- 20a. From a polar view, grains notably polygonal (hexagonal), also evident when seldom seen from a equatorial view. (~ *PHACELIA*/ maybe *Hydrophyllaceae*, *Hydrophyllum* not sampled)
- 20b. From a polar view, grains not with 6 convex apices

- 21a. Grains elliptic, with a short colporate aperture on each psilate face, the edges of each face and the apices with a distinct (homobrochate) textured ornamentation. (~ POLYGONUM)
- 21b. Grains otherwise, not featuring a mix of ornamentations independent of the apertures.
- 22a. Ornamentation perforate, the three colpi very short, their longest axis parallel to the equator rather than perpendicular. These colpi often times almost appearing to be slightly raised on an annulus like feature (~ LONICERA)
- 22b. Grains not as described in all aspects of the above.
- 23a. Apertures colporate
- 24a. Outline of grain in equatorial view circular, ornamentation smooth. (~MORPHOTYPE A).
- 24b. Grains otherwise
 - 25a Grains distinctly triangular from polar view (go 26)
 - 25b Grains elliptic (go 27)
 - 26a Grains very large, clearly strongly triangular in cross section. (~ GERANIUM)
 - 26b Grains smaller (SIZE), weakly triangular in cross section (~ POTENTILLA/DASIPHORA in part)
 - 27a Grains elliptic to weakly circular (~MORPHOTYPE B)
 - 27b Grains elliptic, much longer pole to pole than across equator.
 - 28a Grains with evident protrusions of the pore, colpi short, scarcely noticeable (~ APIACEAE)
- 23b. Apertures colpate
 - 30a Ornamentation psilate (~MORPHOTYPE C).
 - 30b Ornamentation otherwise
 - 31a Ornamentation homobrochate (~ MORPHOTYPE D)
 - 31b Ornamentation otherwise
 - 32a. Ornamentation bacculate, grains large, (~LINUM)
 - 32b. Ornamentation otherwise
 - 33a. Ornamentation of minor cross-corrugated grooves (fossulate) (~CORYDALIS)
 - 33b. Ornamentation of scarcely perceptible irregular features (scabrate) (~RANUNCULUS IN PART)

34a: Annula subtending the apertures – making grains appear more or less triangular; Pollen often with viscin threads (ONAGRACEAE)

34b: Apertures not annulate – grains appear more or less circular (~ERICACEAE)

Morphotype A: Trifolium, Lupinus, Glycrrhiza, Mitella, Geum

Morphotype B: Lupinus, Lathyrus, Potentilla, Androsace, Bistorta, Vicia

Morphotype C: Jeffersonia, Micranthes, Prunus, Delphinium, Androsace, Penstemon, Orthocarpus, Scutellaria, Aquilegia, Castilleja, Draba)

Morphotype D: Salix, Boechera

Appendix 9 - All Species in the Sequence Databases

Table 1: All species present in the Reference Sequence Databases
(Kraken and BLAST)

Order	Family	Taxon
Alismatales	Potamogetonaceae	<i>Potamogeton wrightii</i>
Apiales	Apiaceae	<i>Osmorhiza aristata</i>
Asparagales	Amaryllidaceae	<i>Allium stamineum</i>
	Asparagaceae	<i>Streptopus amplexifolius</i>
Asterales	Asteraceae	<i>Anaphalis margaritacea</i> <i>Antennaria carpatica</i> <i>Antennaria dioica</i> <i>Artemisia sibirica</i> <i>Brickellia dentata</i> <i>Chrysanthemus greenei</i> <i>Cirsium pannonicum</i> <i>Cirsium parryi</i> <i>Cirsium vulgare</i> <i>Crepis pygmaea</i> <i>Ericameria parryi</i> <i>Erigeron ecuadoriensis</i> <i>Erigeron grandiflorus</i> <i>Erigeron rosulatus</i> <i>Erigeron uniflorus</i> <i>Helianthella quinquenervis</i> <i>Heterotheca villosa</i> <i>Hieracium avilae</i> <i>Hieracium jubatum</i> <i>Hymenoxys hoopesii</i> <i>Leucanthemum graminifolium</i> <i>Microseris lindleyi</i> <i>Omalotheca supina</i> <i>Packera quercetorum</i> <i>Pseudognaphalium attenuatum</i> <i>Pseudognaphalium frigidum</i> <i>Pseudognaphalium lacteum</i> <i>Pseudognaphalium oxyphyllum</i> <i>Rudbeckia hirta</i> <i>Scabrethia scabra</i> <i>Senecio adenophyllus</i> <i>Senecio algens</i> <i>Senecio apolobambensis</i> <i>Senecio candollei</i> <i>Senecio chionogeton</i> <i>Senecio formosus</i> <i>Senecio funcii</i> <i>Senecio gilliesii</i> <i>Senecio humillimus</i> <i>Senecio nutans</i> <i>Senecio puchei</i> <i>Senecio rufescens</i> <i>Senecio spinosus</i> <i>Senecio tephrosioides</i>

(Continued on Next Page)

Table 1: All species present in the Reference Sequence Databases
(Kraken and BLAST) (*continued*)

Order	Family	Taxon
		<i>Solidago chilensis</i>
		<i>Stilpnolepis intricata</i>
		<i>Symphyotrichum foliaceum</i>
		<i>Taraxacum cucullatum</i>
		<i>Taraxacum officinale</i>
		<i>Tonestus lyallii</i>
		<i>Townsendia formosa</i>
		<i>Campanula argaea</i>
		<i>Campanula rotundifolia</i>
Boraginales	Boraginaceae	<i>Cynoglossum amplifolium</i>
		<i>Cynoglossum anchusoides</i>
		<i>Cynoglossum pringlei</i>
		<i>Mertensia ciliata</i>
		<i>Mertensia fusiformis</i>
	Hydrophyllaceae	<i>Hydrophyllum canadense</i>
		<i>Hydrophyllum capitatum</i>
		<i>Hydrophyllum fendleri</i>
		<i>Nemophila menziesii</i>
Caryophyllales	Caryophyllaceae	<i>Arenaria globiflora</i>
		<i>Arenaria serpyllifolia</i>
		<i>Cerastium arvense</i>
		<i>Cerastium lanceolatum</i>
		<i>Minuartia recurva</i>
		<i>Odontostemma leucasterium</i>
		<i>Pseudostellaria heterophylla</i>
		<i>Sagina procumbens</i>
		<i>Schizotechium monospermum</i>
		<i>Shivparvatia glanduligera</i>
		<i>Stellaria graminea</i>
		<i>Stellaria holostea</i>
		<i>Stellaria obtusa</i>
	Polygonaceae	<i>Rumex induratus</i>
		<i>Rumex spinosus</i>
Celastrales	Celastraceae	<i>Parnassia faberi</i>
		<i>Parnassia palustris</i>
		<i>Paxistima canbyi</i>
Ericales	Ericaceae	<i>Gaultheria prostrata</i>
		<i>Moneses uniflora</i>
		<i>Orthilia secunda</i>
		<i>Vaccinium vitis-idaea</i>
	Polemoniaceae	<i>Collomia grandiflora</i>
		<i>Ipomopsis aggregata</i>
		<i>Phlox douglasii</i>
	Primulaceae	<i>Androsace studiosorum</i>
		<i>Androsace vitaliana</i>
Fabales	Fabaceae	<i>Astragalus pelecinus</i>
		<i>Lupinus argenteus</i>
		<i>Lupinus sericeus</i>

(Continued on Next Page)

Table 1: All species present in the Reference Sequence Databases
(Kraken and BLAST) (*continued*)

Order	Family	Taxon
Gentianales	Gentianaceae	<i>Vicia americana</i> <i>Frasera speciosa</i> <i>Gentiana cruciata</i>
Hyphomicrobiales	Xanthobacteraceae	<i>Azorhizobium caulinodans</i>
Lamiales	Lamiaceae	<i>Agastache pallidiflora</i>
Liliales	Colchicaceae	<i>Prosartes smithii</i>
	Liliaceae	<i>Erythronium dens-canis</i>
	Melanthiaceae	<i>Anticlea elegans</i> <i>Veratrum viride</i>
Malpighiales	Hypericaceae	<i>Hypericum perforatum</i>
	Salicaceae	<i>Populus alba</i>
	Violaceae	<i>Viola odorata</i>
Myrtales	Onagraceae	<i>Chamaenerion angustifolium</i> <i>Epilobium canum</i> <i>Epilobium parviflorum</i>
Ranunculales	Berberidaceae	<i>Berberis sibirica</i>
	Papaveraceae	<i>Corydalis aitchisonii</i>
	Ranunculaceae	<i>Actaea heracleifolia</i> <i>Anemone anemonoides</i> <i>Anemone obtusiloba</i> <i>Aquilegia ecalcarata</i> <i>Caltha palustris</i> <i>Delphinium barbeyi</i> <i>Delphinium gracile</i> <i>Delphinium nuttallianum</i> <i>Pulsatilla chinensis</i> <i>Thalictrum thalictroides</i> <i>Thalictrum tuberosum</i> <i>Trollius europaeus</i>
Rosales	Elaeagnaceae	<i>Shepherdia argentea</i>
	Rosaceae	<i>Crataegus bipinnatifida</i> <i>Dasiphora fruticosa</i> <i>Geum ternatum</i> <i>Hedlundia austriaca</i> <i>Holodiscus argenteus</i> <i>Karpatiosorbus devoniensis</i> <i>Micromeles japonica</i> <i>Potentilla anserina</i> <i>Potentilla pulcherrima</i> <i>Potentilla tetrandra</i> <i>Rubus chingii</i>
Sapindales	Sapindaceae	<i>Acer campestre</i>
Saxifragales	Crassulaceae	<i>Rhodiola rosea</i> <i>Sedum nudum</i>
	Grossulariaceae	<i>Ribes rubrum</i>
	Saxifragaceae	<i>Lithophragma parviflorum</i> <i>Saxifraga biflora</i> <i>Saxifraga fortunei</i>

(Continued on Next Page)

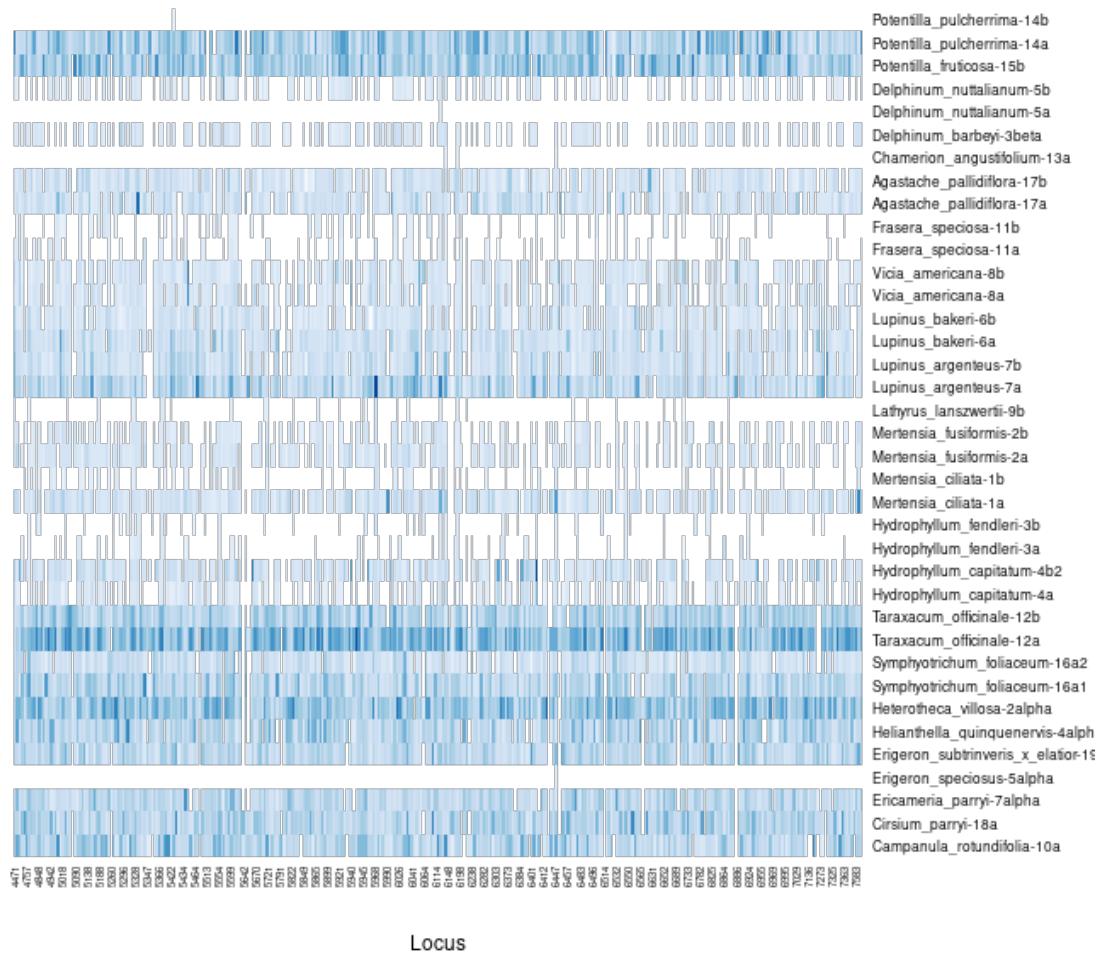
Table 1: All species present in the Reference Sequence Databases
(Kraken and BLAST) (*continued*)

Order	Family	Taxon
		<i>Saxifraga maderensis</i>
		<i>Saxifraga oppositifolia</i>
		<i>Saxifraga portosanctana</i>
		<i>Saxifraga x geum</i>

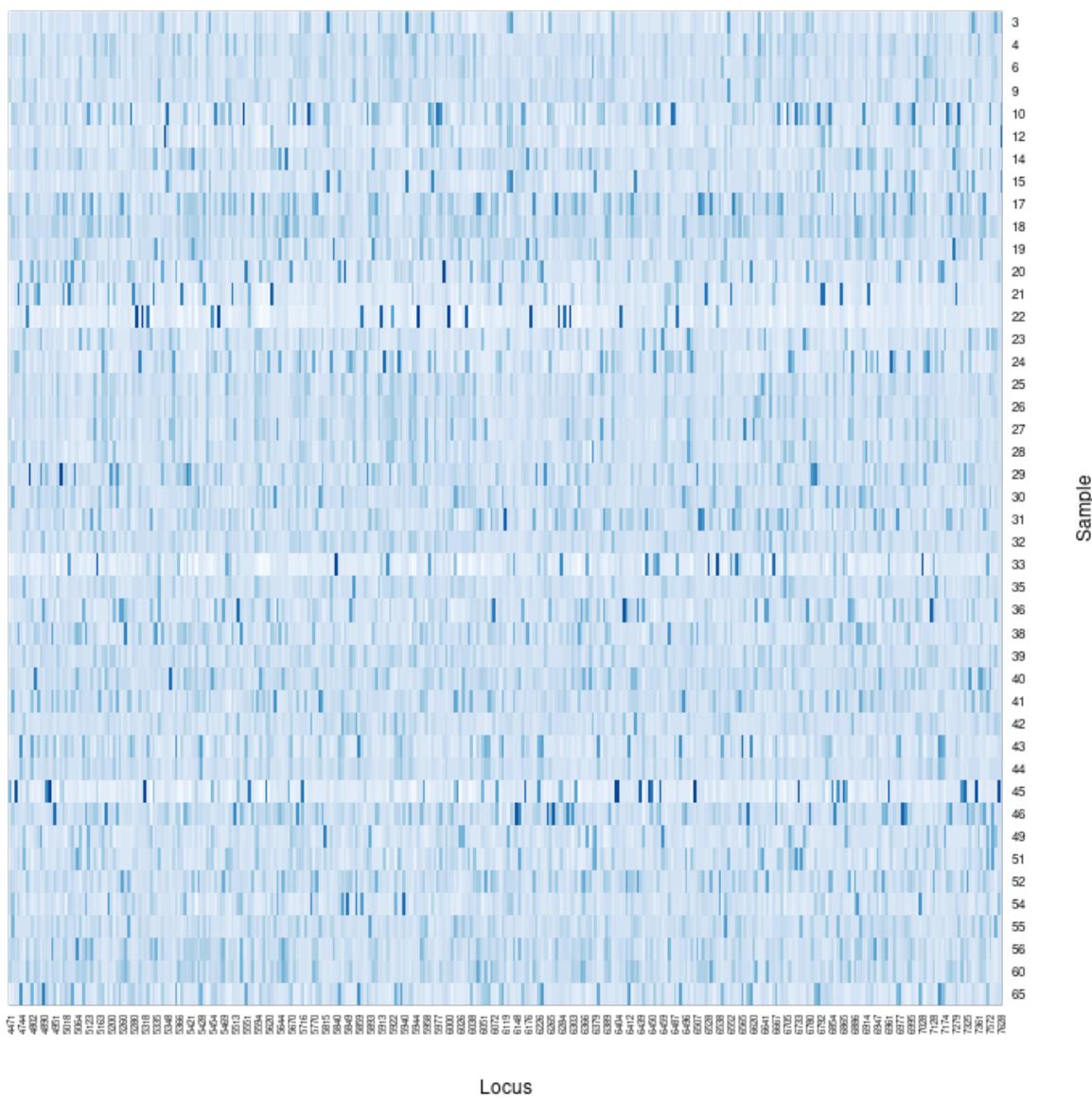
x geum* \end{longtable}

Appendix 11 - Reads Per Loci

Loci & Nucleotides Returned per Reference Sample



Percent matched reads



Appendix 12 - Comparison of Kraken2, Bracken, and BLAST

Comparision of Foraging Patterns from Three Sequence Alignment Algorithms

