Table S1. Comparison of species richness (SR) models evaluated in the backward stepwise selection process, starting with a model containing all the variables and ending with the null model. The second column shows what variables were removed or added from the model in the previous row to create the current model. Each model was compared based on the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), degrees of freedom (D.F.) and residual deviance (Res. Dev).

SR Model	Variables Removed or Added	AIC	BIC	D.F.	Res. Dev
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Profile Curvature + Tangential Curvature		331.14	380	40	93.6
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Profile Curvature	Tangential Curvature Removed	329.16	371	41	93.62
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation	Profile Curvature Removed	327.2	367	42	93.66
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Area Solar Radiation	Flow Accumulation Removed	326.63	365	43	95.09
Terrain age + Drainage + Observed Concavity + Landform Feature + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Area Solar Radiation	% Fines-Sand Removed	325.81	362	44	96.27
Terrain age + Drainage + Observed Concavity + Landform Feature + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index	Area Solar Radiation Removed	323.82	358	45	96.28
Terrain age + Drainage + Observed Concavity + Landform Feature + % Gravel-Cobble + % Boulder + Process Domain + Eastness	Topographic Position Index Removed	321.84	353	46	96.3

		AIC	BIC	D.F.	Res. Dev
Terrain age + Drainage + Observed Concavity + Landform Feature + % Boulder + Process Domain + Eastness	% Gravel-Cobble Removed	319.88	349	47	96.34
Terrain age + Drainage + Observed Concavity + % Boulder + Process Domain + Eastness	Landform Feature Removed	319.48	345	49	99.94
Terrain age + Drainage + Observed Concavity + Process Domain + Eastness	% Boulder Removed	318.15	341	50	100.61
Terrain age + Drainage + Observed Concavity + Eastness	Process Domain Removed	324.22	345	51	108.68
Terrain age + Drainage + Observed Concavity + Process Domain	Process Domain Added; Eastness Removed	316.49	338	51	100.95
Terrain age + Drainage + Process Domain	Observed Concavity Removed	326.56	341	54	117.02
Drainage + Observed Concavity + Process Domain	Observed Concavity Added; Terrain age Removed	339.59	352	55	132.05
Terrain age + Observed Concavity + Process Domain	Terrain Age Added; Drainage Removed	319.73	339	52	106.19
Null Model	All Variables Removed	429.86	432	60	232.32

Table S2. Comparison of Shannon's Diversity (SD) models evaluated in the backward stepwise selection process, starting with a model containing all the variables and ending with the null model. The second column shows what variables were removed or added from the model in the previous row. Each model was compared based on the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), degrees of freedom (D.F.) and residual deviance (Res. Dev).

SD Model	Variables Removed or Added	AIC	BIC	D.F.	Res. Dev
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Gravel-Cobble + % Boulder + Process Domain + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Profile Curvature + Tangential Curvature		61.25	104	30	4.19
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Boulder + Process Domain + Eastness + Topographic Position Index + Flow Accumulation + Area	% Gravel-Cobble Removed	60.14	101	31	4.26

Solar Radiation + Profile Curvature + Tangential Curvature					
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Boulder + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Profile Curvature + Tangential Curvature	Process Domain Removed	58.29	96.9	32	4.27
Terrain age + Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Boulder + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Tangential Curvature	Profile Curvature Removed	56.3	93	33	4.27
Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Boulder + Eastness + Topographic Position Index + Flow Accumulation + Area Solar Radiation + Tangential Curvature	Terrain age Removed	50.14	79.1	37	4.43
Drainage + Observed Concavity + Landform Feature + % Fines-Sand + % Boulder + Eastness + Flow Accumulation + Area Solar Radiation + Tangential Curvature	Topographic Position Index Removed	48.14	75.2	38	4.43
Drainage + Observed Concavity + Landform Feature + % Fines-Sand + Eastness + Flow Accumulation + Area Solar Radiation + Tangential Curvature	% Boulder Removed	46.46	71.6	39	4.46
Drainage + Observed Concavity + Landform Feature + % Fines-Sand + Eastness + Flow Accumulation + Tangential Curvature	Area Solar Radiation Removed	46.01	69.2	40	4.6
Drainage + Observed Concavity + % Fines-Sand + Eastness + Flow Accumulation + Tangential Curvature	Landform Feature Removed	43.82	63.1	42	4.76
Drainage + Observed Concavity + % Fines-Sand + Eastness + Tangential Curvature	Flow Accumulation Removed	42.69	60.1	43	4.85
Drainage + % Fines-Sand + Eastness + Tangential Curvature	Observed Concavity Removed	52.7	64.3	46	6.63
Drainage + Observed Concavity + % Fines-Sand + Eastness	Observed Concavity Added; Tangential	43.62	59.1	44	5.13

	Curvature Removed				
Drainage + Observed Concavity + % Fines-Sand	Eastness Removed	41.86	55.4	45	5.16
Drainage + Observed Concavity	% Fines-Sand Removed	41.1	52.7	46	5.28
Observed Concavity	Drainage Removed	52.99	62.7	47	6.94
Null Model	All Variables Removed	58.06	61.9	50	8.62

Table S3. List of all species observed, number of associated plots, and average % cover, by species, within each terrain age range.

Taxa	# Plots	Avg Vegetation Cover (%)	1901-1927	1927-1959	1959-1993	1993-2022	Total
Asteraceae:							
Antennaria alpina (L.) Gaertn.	1	0	0	0.36	0	0	0.04
Antennaria media Greene	5	0.05	0.11	0.14	0	0	0.06
Antennaria sp.	1	0.05	0	0	0	0	0.01
Arnica cordifolia Hook.	7	0.55	0.22	0.07	0	0	0.17
Arnica latifolia Bong.	9	0.41	0.58	0.07	0	0	0.25
Arnica mollis Hook.	4	0.09	0.06	0	0.04	0	0.04
Arnica sp.	1	0.05	0	0	0	0	0.01
Crepis nana Richardson	1	0	0	0	0	0.19	0.04
Erigeron compositus Pursh	7	0.18	0.03	0.21	0	0	0.07
Erigeron nivalis Nutt.	2	0.05	0	0.07	0	0	0.02
Erigeron peregrinus (Banks ex Pursh) Greene	3	0	0.06	0.07	0	0	0.02
Packera cymbalaria (Pursh) W.A. Weber & Á. Löve	2	0	0.06	0	0	0	0.02
Packera subnuda (DC.) D.K. Trock & T.M. Barkley	1	0	0.03	0	0	0	0.01
Senecio fremontii Torr. & A. Gray	18	0.09	0.25	0.5	0.21	0.15	0.22
Senecio triangularis Hook.	1	1.36	0	0	0	0	0.25
Solidago multiradiata Aiton	4	0.27	0	0.14	0.04	0	0.07
Taraxacum ceratophorum (Ledeb.) DC.	1	0.05	0	0	0	0	0.01
Taraxacum sp.	3	0.05	0.03	0.07	0	0	0.02
Unknown Asteraceae sp.	2	0.05	0.03	0	0	0	0.02
Boraginaceae:							

Myosotis asiatica (Vestergr.) Schischk. & Serg.	1	0	0.03	0	0	0	0.01
Phacelia hastata Douglas ex Lehm.	3	0.09	0.06	0	0	0	0.03
Phacelia lyallii (A. Gray) Rydb.	2	0.05	0	0.07	0	0	0.02
Phacelia sericea (Graham) A. Gray	1	0.05	0	0	0	0	0.01
Brassicaceae:							
Arabis nuttallii (Kuntze) B.L. Rob.	1	0	0.03	0	0	0	0.01
Boechera lemmonii (S. Watson) W.A. Weber	7	0	0.03	0.36	0.04	0.04	0.07
Boechera lyallii (S. Watson) Dorn	3	0	0.06	0	0.04	0	0.02
Boechera sp.	1	0	0	0	0.04	0	0.01
Draba lonchocarpa Rydb.	3	0.05	0	0.07	0	0.04	0.02
Draba praealta Greene	1	0.05	0	0	0	0	0.01
Draba sp.	1	0	0.03	0	0	0	0.01
Brassicaceae sp.	1	0	0.03	0	0	0	0.01
Caryophyllaceae:							
Minuartia rubella (Wahlenb.) Hiern	3	0	0	0.14	0	0.04	0.02
Cerastium beeringianum Cham. & Schltdl.	5	0	0	0.36	0	0.08	0.06
Sagina saginoides (L.) H. Karst.	2	0	0.06	0	0	0	0.02
Silene acaulis (L.) Jacq.	4	0	0.08	0.5	0	0.04	0.09
Silene uralensis (Rupr.) Bocquet	2	0	0	0	0.04	0.04	0.02
Crassulaceae:							
Sedum lanceolatum Torr.	2	0	0.06	0	0	0	0.02
Cyperaceae:	21	0.41	0.89	1.86	0.17	0.08	0.60
Dryopteridaceae:							
Polystichum lonchitis (L.) Roth	3	0.05	0.06	0	0	0	0.02
Ericaceae:							
Phyllodoce empetriformis (Sm.) D. Don	1	0	0.17	0	0	0	0.05
Juncaceae:	4	0.64	0.81	0	0	0	0.35
Onagraceae:							
Epilobium anagallidifolium Lam.	14	0.05	0.11	0.07	0.17	0.23	0.13
Epilobium clavatum Trel.	2	0	0.06	0	0	0	0.02
Ophioglossaceae:							

Botrychium lunaria (L.) Sw.	1	0	0	0.07	0	0	0.01
Orobanchaceae:							
Castilleja miniata Douglas ex Hook.	6	0.27	0.17	0	0	0	0.10
Castilleja occidentalis Torr.	1	0	0	0.07	0	0	0.01
Castilleja rhexiifolia Rydb.	1	0	0.03	0	0	0	0.01
Castelleja sp.	1	0	0.03	0	0	0	0.01
Pinaceae:							
Abies lasiocarpa (Hook.) Nutt.	4	2.09	0.61	0	0	0	0.56
Picea engelmannii Parry ex Engelm.	1	0	0	0.21	0	0	0.02
Plantaginaceae:							
Penstemon davidsonii Greene	1	0.05	0	0	0	0	0.01
Penstemon ellipticus J.M. Coult. & Fisher	16	2.14	1.11	0.36	0.04	0	0.76
Veronica wormskjoldii Roem. & Schult.	1	0	0.06	0	0	0	0.02
Poaceae:	39	4.46	2	4.07	0.33	1.23	2.19
Polygonaceae:							
Eriogonum ovalifolium Nutt.	1	0	0.03	0	0	0	0.01
Oxyria digyna (L.) Hill	21	0.32	0.22	0.29	0.17	0.19	0.23
Pteridaceae:							
Cryptogramma acrostichoides R. Br.	1	0	0.03	0	0	0	0.01
Ranunculaceae:							
Anemone multifida var. tetonensis (Porter ex Britton) C.L. Hitchc.	2	0	0.03	0.07	0	0	0.02
Anemone sp.	1	0.05	0	0	0	0	0.01
Ranunculus sp.	1	0.05	0	0	0	0	0.01
Rosaceae:							
Dryas drummondii Richardson ex Hook.	1	0	0	0.36	0	0	0.04
Dryas octapetala L.	4	0.46	0.72	2.86	0	0	0.62
Sibbaldia procumbens L.	1	0	0.11	0	0	0	0.03
Salicaceae:							
Salix arctica Pall.	3	0	0.03	0.36	0	0.04	0.06
Salix drummondiana Barratt ex Hook.	3	0	0.11	0.21	0.33	0	0.12
Salix nivalis Hook.	1	0	0.03	0	0	0	0.01
Salix vestita Pursh	1	0	0.17	0	0	0	0.05
Saxifragaceae:							
Micranthes occidentalis (S. Watson) Small	1	0	0	0.07	0	0	0.01

Saxifraga bronchialis L.	11	1.77	0.14	1.64	0	0.04	0.56
Saxifraga cespitosa L.	1	0	0	0	0.04	0	0.01
Saxifraga rivularis L.	6	0.27	0.03	0	0.04	0.08	0.08
Suksdorfia violacea A. Gray	1	0.05	0	0	0	0	0.01
Valerianaceae:							
Valeriana occidentalis A. Heller	1	0	0.03	0	0	0	0.01
Woodsiaceae:							
Cystopteris fragilis (L.) Bernh.	3	0.05	0.08	0	0	0	0.03
Woodsia oregana D.C. Eaton	1	0	0.03	0	0	0	0.01
Other:							
Lichen	17	5.23	1.17	0.07	0	0	1.30
Moss	34	0.64	1.36	1.29	0.71	0.31	0.87
Unknown	6	0.05	0.14	0	0.04	0	0.06
Dead	3	0	0.47	0	0	0.04	0.15