
Supplementary information

**Plant diversity dynamics over space and time
in a warming Arctic**

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Supplementary Discussion

Geography. Western North America contained the greatest number of more even communities, with a greater proportion of persisting species over time than any other regions (**Supplementary Table 3**). Eurasia experienced the greatest rates of Bray-Curtis turnover, while Greenland-Iceland had greater Jaccard turnover and more species gains than any other regions. Regional variation in biodiversity metrics might reflect landscape age following glaciation history and processes, such as the ‘founder effect’, where reduced genetic diversity is the result of a small number of ancestors⁹⁸, but they might also be the result of regional monitoring realities (see ‘Sampling realities’ below).

Richness and evenness. There was no relationship between mean plot species richness and species richness change over time. Spatial richness and evenness were correlated, with more diverse plots also being more even (**Supplementary Table 2, 3.6**). Mean evenness (Pielou) across the Arctic was 0.7 [data bounded by 0 - 1]. Evenness was greater in more diverse plots with high forb cover and low shrub cover, and in Western North America relative to other regions (**Supplementary Table 3.6 - 10**). Overall, evenness did not change over time (**Supplementary Table 1**), but increases occurred mostly in wetter versus drier plots where forb cover increased and shrub cover decreased over time (**Supplementary Table 3.56 - 58**).

Turnover. A key difference between turnover metrics was that more species-rich plots experienced greater abundance-related turnover (Bray-Curtis), while species-poor plots had more presence-absence (Jaccard) change (**Supplementary Table 2**). We contrasted these results with a null model that yielded no significant relationship between Jaccard and richness, and a negative relationship between Bray-Curtis and richness. Thus, this contrasting pattern is likely due to less diverse plots in colder sites dominated by a few species with higher abundance that do not experience as much proportional abundance change, but whose presence-absence change will be proportionally greater. Also, more diverse plots at lower and warmer latitudes can experience more proportional abundance change potentially due to increased biotic interactions^{99,100}.

Temporal turnover metrics can be calculated in different ways. Here, we chose to calculate temporal turnover by comparing species composition and abundance from the start to the end time point of plot surveying (calculated as β -diversity dissimilarity metrics). This method can lead to an influence of the baseline plot composition on turnover, and does not capture changes in timeseries within the start and end time points. Calculating turnover as changes in a system state from an ordination would capture time series change, but would require data from plots that were sampled more than twice. Thus, our chosen method maximises the sample size with this dataset, given that a large number of plots were only surveyed twice (35% of all plots surveyed twice and 21.5% more than twice).

Functional group composition. Most plots were dominated (i.e., cover was > 50%) by shrubs ($n = 1,170$, 53.8%), followed by graminoid-dominated plots (689, 31.7%); plots dominated by forbs (113, 5.2%) and those where no functional groups were clearly dominant (202, 9.3%) were less common. Similarly, mean cover across plots was greater for shrubs (50%), followed by graminoids (37.4%) and forbs (12.6%, **Extended Data Figure 5a-c**). Forb, shrub and graminoid cover did not directionally change over time on average across our plots (**Supplementary Table 8, 9**). Species-rich plots had higher forb cover and lower graminoid cover (**Supplementary Table 1, 3.4 - 5**).

Climate change. Regional climates across the Arctic varied widely in their annual coldest quarter temperatures, but less so in their warmest quarter temperatures (MTWQ, **Extended Data Figure 4a**). All subsites experienced MTWQ increases (**Extended Data Figure 4b**), and 87.6% of subsites experienced mean annual precipitation increases over time (**Extended Data Figure 4c**). The magnitude of warming over time was greater at northern latitudes (slope = $0.00033^{\circ}\text{C}/\text{year}$ per degree of latitude, 95% CI = 0.00018 to 0.00047, conditional and marginal $R_2 = 0.009$).

Sampling realities. There are a number of factors worth considering when interpreting the results in this study. First, sampling effort is uneven across the Arctic^{101,102} and those data biases are represented in the ITEX+ dataset. Some regions have long-established monitoring programmes in place, while other sites are not represented partly due to the inaccessibility of some Arctic regions. Second, particular

regions might also appear as biodiversity hotspots due to the botanist effect, where sampling effort has been concentrated in one region¹⁰³. Third, while monitoring might occur in certain regions (e.g., Russia), methods differ and are not directly comparable across the Arctic. Barriers to international collaboration between Russia and other Arctic nations can result in an increasingly biased view of Arctic change¹⁰². Even within the ITEX+ dataset with many sites using standardised sampling protocols¹⁰⁴, methods vary among sites and over time. We considered these sampling variables as fixed effects in the models in order to account for this variability (**Supplementary Table 2**).

We found that studies covering longer temporal extents had increased their abundance-related turnover (Bray-Curtis) and richness over time, but not increased species replacement (Jaccard; **Extended Data Figure 8g,h**). There was an indication that shorter studies identified more species losses, possibly suggesting that local extinctions might be due to stochastic processes or sampling effects during monitoring¹⁰⁵. These two results could confirm that long-term studies tend to reflect meaningful change in communities, while shorter timescales often overrepresent real changes in Arctic communities¹⁰⁶. Finally, larger plots were more even and had experienced less richness change^{37,107}. Together, these findings indicate the importance of scale, local context, study design and sampling effort when drawing global inferences from local-scale monitoring.

Supplementary Methods

Data harmonisation. While preparing the ITEX+ dataset for analyses, we removed non-comparable methods like biomass and number of shoots. We removed duplicate records, i.e., those where the same plot-by-year had repeated rows for each species and abundance values ($n = 26$ plot-by-year), and retained a single copy of those records in their particular plot-by-year combination.

We converted all values to relative cover to ensure consistency across survey methods (see **Extended Data Figure 2** for a detailed account of cover conversion), with a maximum cover value of 100% within a plot. In particular for X-Y grid coordinate data, we converted multiple hits of the same species from abundance records into presence/absence at a X-Y coordinate, since this most closely resembles cover. Subsequently, we calculated the proportion of total species hits per plot and species as a function of the total number of unique species hits in a plot. We retained only live plant records and calculated cover relative to vascular plants only, removing non-vascular plants, litter, dead biomass and non-biotic hits (rock, water, etc.) given that non-vascular plants and abiotic hits were not recorded consistently across sites.

Species names were standardised following the taxonomy of The Plant List (<http://www.theplantlist.org/>) at the species level (i.e., subspecies or varieties were retained as species). When species were identified only to family or genus level, they were retained and converted to a morphospecies (e.g., XXXLuzula:Abisko) to reflect a unique species hit per plot. We retained only the plots with less than 10% total cover of morphospecies. Therefore, 920 plot-by-year combinations were removed (13.4% of dataset plot-by-year). Only that particular plot-by-year combination was removed, and not all the years from a given plot. Mean morphospecies cover per plot was 15.9%, thus we applied a strict filter considered to ensure site comparability with no relevant effects on our results¹⁰⁸.

Supplementary References

98. Stewart, L. et al. The regional species richness and genetic diversity of Arctic vegetation reflect both past glaciations and current climate. *Global Ecology and Biogeography* 25, 430–442 (2016).
99. Hillebrand, H. On the generality of the latitudinal diversity gradient. *The American Naturalist* 163, 192–211 (2004).
100. Koleff, P. & Gaston, K. J. The relationships between local and regional species richness and spatial turnover. *Global Ecology and Biogeography* 11, 363–375 (2002).
101. Metcalfe, D. B. et al. Patchy field sampling biases understanding of climate change impacts across the Arctic. *Nature Ecology and Evolution* 2, 1443–1448 (2018).
102. López-Blanco, E. et al. Towards an increasingly biased view on Arctic change. *Nature Climate Change* 14, 152–155 (2024).
103. Moerman, D. E. & Estabrook, G. F. The botanist effect: counties with maximal species richness tend to be home to universities and botanists. *Journal of Biogeography* 33, 1969–1974 (2006).
104. Henry, G. H. R. & Molau, U. Tundra plants and climate change: the International Tundra Experiment (ITEX). *Global Change Biology* 3, 1–9 (1997).
105. Matthies, D., Bräuer, I., Maibom, W. & Tschamtkke, T. Population size and the risk of local extinction: empirical evidence from rare plants. *Oikos* 105, 481–488 (2004).
106. Valdez, J. W. et al. The undetectability of global biodiversity trends using local species richness. *Ecography*, e06604 (2023).
107. Drakare, S., Lennon, J. J. & Hillebrand, H. The imprint of the geographical, evolutionary and ecological context on species–area relationships. *Ecology Letters* 9, 215–227 (2006).
108. Cayuela, L., de la Cruz, M. & Ruokolainen, K. A method to incorporate the effect of taxonomic uncertainty on multivariate analyses of ecological data. *Ecography* 34, 94–102 (2011).

Supplementary Tables

Supplementary Table 1. Structure and summary results of the high-level models of richness and evenness change over time. CI are the 95% credible intervals.

Model	Model structure	Data Distribution	Sample size	Summary
Richness over time	Annual Richness ~ Year + (Year Subsite/Plot)	Negative binomial	4,858	Slope = 0.0021, CI = -0.0002 to 0.0043
Evenness over time	Annual Evenness ~ Year + (Year Subsite/Plot)	Beta	4,822	Slope = 0.004, CI = -0.0049 to 0.0126

Supplementary Table 2. Model summaries for spatial, two time points and temporal multivariate models, represented in the 'Group' column by the globe, hour glass and clock, respectively. These icons were commissioned for this article and designed by Alberto S. Ballesteros, who grants permission for their display here. Multiple models were fitted per response variable containing the fixed effects that affect the response variable at the same level (e.g., subsite, plot). GEO = geographical model, CLIM = climatic model, FG = functional group composition model, CHG = change over time model, PCHG = plot change over time, SUBS = subsite model. Data distributions are indicated in brackets under each response variable as follows: NB = Negative Binomial distribution, ZOIB = Zero-One-Inflated Beta distribution, ZIB = Zero-Inflated Beta distribution, Gauss. = Gaussian distribution, Temp. = Temperature, Prec. = Precipitation, Gram. = Graminoid, Chg. = Change. The 'tick mark' in the random effect column indicates where a subsite random intercepts effect has been included in the model. Dark orange circles indicate a negative significant relationship at 97.5% CI, light orange circles a negative significant relationship at 95% CI, grey circles a non-significant relationship at both 95% and 97.5% CI, light green circles a positive significant relationship at 95% CI, and dark green circles a positive significant relationship at 97.5% CI. (*) for Region and Moisture indicates a categorical variable, thus a green point indicates a difference between some of the categories and a grey circle indicates no clear difference. When models featured functional group cover or functional group change as covariates, we fitted three models, each including change in one functional group, in order to achieve convergence given that functional group proportions were inherently negatively correlated. These three models included all the same covariates except for the functional group in question and are all represented in the same row under FG and PCHG models. Here, a pie chart showcases slopes for the three different functional group models per response variable, and the initial indicates the functional group that is different (S = shrub, G = graminoid, F = forb). The symbol '**' indicates that richness was significant in the graminoid model (97.5%) and in the forb model (95%), but non-significant in the shrub model (97.5%). For temporal models, change over time was modelled for each plot and the slopes from those linear regressions are the response variables used in subsequent models. For Jaccard and Bray-Curtis, the change in PCoA values per plot was calculated through Cartesian coordinates, and also as the difference in distance to centroid for each plot, and those values were the response variables in the subsequent models.

Group	Model	Response variable	Fixed effects															Random effect	
			Latitude	Region*	Moisture*	Temperature	Precipitation	Graminoid %	Forb %	Shrub %	Temp. chg.	Prec. chg.	Gram. % chg.	Forb % chg.	Shrub % chg.	Plot size	Richness	Duration	Subsite
	GEO	Richness (NB)																	✓
	CLIM																		✓
	FG																		✓
	GEO	Evenness (Beta)																	✓
	CLIM																		✓
	FG																		✓
	GEO	Jaccard Turn. (ZOIB)																	✓
	CLIM																		✓
	FG																		✓
	PCHG																		✓
	GEO	Bray-Curtis Turn. (ZOIB)																	✓
	CLIM																		✓
	FG																		✓
	PCHG																		✓
	GEO	Persisters (ZOIB)																	✓
	CLIM																		✓
	FG																		✓
	PCHG																		✓
	GEO	Losses (ZIB)																	✓
	CLIM																		✓
	FG																		✓
	PCHG																		✓
	GEO	Gains (ZIB)																	✓
	CLIM																		✓
	FG																		✓
	PCHG																		✓
	CHG	Richness	Richness over time (Richness ~ Year for each plot)																
	SUBS	Rich. Ch. Slopes (Gauss)																	✓
	PCHG	Rich. Ch. Slopes (Gauss)																	✓
	CHG	Evenness	Evenness over time (Evenness ~ Year for each plot)																
	SUBS	Even. Chg. Slopes (Gauss)																	✓
	PCHG	Even. Chg. Slopes (Gauss)																	✓
	CHG	Jaccard (ZIB)	Change in PCoA Jaccard values over time (through Cartesian coordinates)																
	SUBS	Jaccard (ZIB)																	
	CHG	Bray-C (Beta)	Change in PCoA Bray-Curtis values over time (through Cartesian coordinates)																
	SUBS	Bray-C (Beta)																	
	CHG	Jaccard (Beta)	Change in PCoA Jaccard distance to centroid																
	SUBS	Jaccard (Beta)																	
	CHG	Bray-C (Beta)	Change in PCoA Bray-Curtis distance to centroid																
	SUBS	Bray-C (Beta)																	

Supplementary Table 3. Summary of the key Bayesian models fitted in this study (as shown in **Supplementary Table 2**). Model outputs are shown for spatial, two time-point and temporal models. CI means credible intervals. Parameters in bold show those predictor variables whose 95% CI do not overlap zero (except for categorical variables), and thus can be considered to have a 'significant' effect in the response variable.

Model number	Model name	Term	Estimate	Std. error	Lower 95% CI	Upper 95% CI
Spatial models						
1	Richness GEO	b_Intercept	3.942	0.556	2.856	5.034
		b_LAT	-0.029	0.008	-0.045	-0.013
		b_LogPlotSize	0.027	0.053	-0.077	0.131
		b_RegionGreenIceLand	0.006	0.101	-0.19	0.206
		b_RegionNorthAmericaMEast	-0.057	0.133	-0.323	0.199
		b_RegionNorthAmericaMWest	0.106	0.11	-0.105	0.325
		sd_SiteSubsite__Intercept	0.437	0.029	0.384	0.497
		shape	603.93	176.896	326.976	1019.587
		lprior	-20.145	2.05	-24.861	-16.809
2	Richness CLIM	b_Intercept	1.332	0.134	1.063	1.596
		b_warmq	0.062	0.016	0.031	0.093
		b_prec	0.00009	0.00014	-0.0002	0.0004
		b_MOISTUREMOIST	0.204	0.103	-0.001	0.402
		b_MOISTUREWET	0.1	0.125	-0.147	0.338
		b_LogPlotSize	-0.024	0.068	-0.159	0.11
		sd_SiteSubsite__Intercept	0.405	0.031	0.348	0.47
		shape	555.492	169.364	295.487	953.224
		lprior	-19.572	1.984	-24.128	-16.391
3	Richness FG - Shrub	b_Intercept	1.864	0.078	1.713	2.014
		b_ShrubDivided	0.053	0.073	-0.09	0.195
		b_LogPlotSize	0.164	0.072	0.023	0.304
		sd_SiteSubsite__Intercept	0.465	0.044	0.386	0.562
		shape	422.404	147.341	208.154	765.103
		lprior	-17.964	1.802	-22.034	-15.176
4	Richness FG - Forb	b_Intercept	1.788	0.072	1.645	1.93
		b_ForbDivided	0.974	0.124	0.725	1.219
		b_LogPlotSize	0.153	0.07	0.01	0.289
		sd_SiteSubsite__Intercept	0.452	0.042	0.378	0.543
		shape	444.089	153.933	218.58	810.127
		lprior	-18.229	1.866	-22.538	-15.328
5	Richness FG - Graminoid	b_Intercept	2.041	0.079	1.885	2.194
		b_GramDivided	-0.37	0.074	-0.513	-0.227
		b_LogPlotSize	0.186	0.072	0.043	0.327
		sd_SiteSubsite__Intercept	0.475	0.045	0.395	0.574
		shape	433.55	153.022	212.93	797.25
		lprior	-18.102	1.86	-22.4	-15.249
6	Evenness GEO	b_Intercept	-0.847	0.678	-2.176	0.480
		b_LAT	0.017	0.01	-0.002	0.035
		b_RegionGreenIceLand	-0.062	0.113	-0.283	0.156
		b_RegionNorthAmericaMEast	0.074	0.163	-0.250	0.381
		b_RegionNorthAmericaMWest	0.449	0.124	0.202	0.696
		b_MeanRichness	0.046	0.007	0.031	0.060
		sd_SiteSubsite__Intercept	0.502	0.036	0.437	0.577
		phi	10.373	0.323	9.750	11.002

		lprior	-10.296	0.036	-10.364	-10.225
7	Evenness CLIM	b_Intercept	0.476	0.189	0.101	0.837
		b_MOISTUREMOIST	0.010	0.13	-0.24	0.267
		b_MOISTUREWET	0.091	0.175	-0.248	0.431
		b_warmq	-0.024	0.022	-0.07	0.02
		b_prec	-0.00012	0.0002	-0.04	0.075
		b_MeanRichness	0.06	0.008	0.044	0.076
		sd_SiteSubsite__Intercept	0.576	0.044	0.496	0.670
		phi	12.191	0.435	11.37	13.072
		lprior	-10.474	0.041	-10.556	-10.393
8	Evenness FG - Shrub	b_Intercept	0.423	0.096	0.237	0.615
		b_ShrubDivided	-0.294	0.090	-0.468	-0.118
		b_MeanRichness	0.056	0.008	0.041	0.072
		sd_SiteSubsite__Intercept	0.587	0.044	0.508	0.680
		phi	12.303	0.426	11.466	13.135
		lprior	-10.486	0.040	-10.564	-10.406
9	Evenness FG - Forb	b_Intercept	0.252	0.082	0.093	0.408
		b_ForbidDivided	1.177	0.16	0.868	1.487
		b_MeanRichness	0.042	0.008	0.026	0.058
		sd_SiteSubsite__Intercept	0.579	0.043	0.503	0.670
		phi	12.63	0.444	11.775	13.530
		lprior	-10.513	0.04	-10.594	-10.433
10	Evenness FG - Graminoid	b_Intercept	0.313	0.092	0.134	0.493
		b_GramDivided	-0.092	0.094	-0.277	0.089
		b_MeanRichness	0.057	0.008	0.042	0.072
		sd_SiteSubsite__Intercept	0.575	0.043	0.498	0.663
		phi	12.191	0.412	11.389	12.991
		lprior	-10.474	0.039	-10.551	-10.395
Two time-point models						
11	Jaccard GEO	b_Intercept	-0.706	0.734	-2.123	0.753
		b_zoi_Intercept	-0.338	0.056	-0.45	-0.228
		b_coi_Intercept	-5.838	0.807	-7.706	-4.557
		b_LAT	0.011	0.01	-0.009	0.031
		b_RegionGreenIceLand	0.421	0.153	0.115	0.718
		b_RegionNorthAmericaMEast	-0.114	0.174	-0.452	0.224
		b_RegionNorthAmericaMWest	-0.099	0.099	-0.292	0.099
		b_LogPlotSize	0.06	0.099	-0.129	0.253
		b_MeanRichness	-0.059	0.01	-0.08	-0.041
		b_duration	-0.005	0.007	-0.018	0.008
		sd_SiteSubsite__Intercept	0.299	0.041	0.226	0.383
		phi	16.573	0.866	14.927	18.337
		lprior	-18.027	0.805	-19.886	-16.749
12	Jaccard CLIM	b_Intercept	0.266	0.215	-0.153	0.691
		b_zoi_Intercept	-0.335	0.057	-0.448	-0.224
		b_coi_Intercept	-5.804	0.818	-7.621	-4.516
		b_MOISTUREMOIST	-0.056	0.111	-0.278	0.163
		b_MOISTUREWET	0.113	0.147	-0.179	0.411
		b_warmq	-0.055	0.02	-0.093	-0.016
		b_prec	0.001	0.0002	0.0004	0.01
		b_duration	-0.005	0.007	-0.019	0.009
		b_LogPlotSize	0.065	0.127	-0.189	0.316
		b_MeanRichness	-0.062	0.01	-0.082	-0.043

		sd_SiteSubsite__Intercept	0.307	0.042	0.231	0.397
		phi	16.734	0.912	15.001	18.635
		lprior	-18.005	0.817	-19.826	-16.719
13	Jaccard FG - Shrub	b_Intercept	0.038	0.156	-0.266	0.347
		b_zoi_Intercept	-0.338	0.056	-0.448	-0.225
		b_coi_Intercept	-5.854	0.82	-7.69	-4.522
		b_ShruhDivided	-0.11	0.105	-0.319	0.101
		b_LogPlotSize	-0.068	0.09	-0.24	0.11
		b_MeanRichness	-0.068	0.01	-0.088	-0.048
		b_duration	0.002	0.006	-0.011	0.014
		sd_SiteSubsite__Intercept	0.32	0.041	0.246	0.409
		phi	16.591	0.928	14.81	18.458
		lprior	-18.043	0.816	-19.854	-16.724
14	Jaccard FG - Forb	b_Intercept	-0.02	0.139	-0.287	0.259
		b_zoi_Intercept	-0.338	0.056	-0.445	-0.23
		b_coi_Intercept	-5.836	0.785	-7.594	-4.537
		b_ForDivided	0.128	0.234	-0.332	0.58
		b_LogPlotSize	-0.064	0.09	-0.238	0.117
		b_MeanRichness	-0.068	0.01	-0.09	-0.049
		b_duration	0.001	0.006	-0.012	0.013
		sd_SiteSubsite__Intercept	0.322	0.04	0.248	0.406
		phi	16.601	0.907	14.902	18.41
		lprior	-18.026	0.783	-19.805	-16.745
15	Jaccard FG - Graminoid	b_Intercept	-0.067	0.146	-0.356	0.226
		b_zoi_Intercept	-0.338	0.057	-0.451	-0.227
		b_coi_Intercept	-5.848	0.795	-7.664	-4.567
		b_GramDivided	0.101	0.114	-0.123	0.328
		b_LogPlotSize	-0.068	0.091	-0.238	0.115
		b_MeanRichness	-0.067	0.01	-0.085	-0.048
		b_duration	0.002	0.006	-0.011	0.014
		sd_SiteSubsite__Intercept	0.322	0.041	0.248	0.408
		phi	16.594	0.907	14.864	18.404
		lprior	-18.038	0.794	-19.832	-16.748
16	Jaccard PCHG - Shrub	b_Intercept	-0.48	0.189	-0.848	-0.106
		b_zoi_Intercept	-0.456	0.062	-0.577	-0.338
		b_coi_Intercept	-5.629	0.823	-7.551	-4.286
		b_WarmQSlope	14.455	3.928	6.86	22.402
		b_PrecSlope	0.023	0.013	-0.002	0.049
		b_ShruhSlope	0.009	0.015	-0.02	0.039
		b_LogPlotSize	0.014	0.093	-0.165	0.203
		b_MeanRichness	-0.069	0.01	-0.089	-0.049
		b_duration	-0.005	0.007	-0.018	0.009
		sd_SiteSubsite__Intercept	0.311	0.041	0.236	0.395
17	Jaccard PCHG - Forb	phi	16.695	0.952	14.897	18.554
		lprior	-17.856	0.82	-19.799	-16.517
		b_Intercept	-0.516	0.196	-0.896	-0.135
		b_zoi_Intercept	-0.646	0.067	-0.779	-0.512
		b_coi_Intercept	-5.41	0.803	-7.269	-4.125
		b_WarmQSlope	13.645	4.038	5.763	21.597
		b_PrecSlope	0.022	0.013	-0.004	0.048
		b_ForSlope	0.039	0.021	-0.002	0.08
		b_LogPlotSize	0.005	0.095	-0.184	0.194

		b_MeanRichness	-0.064	0.01	-0.085	-0.044
		b_duration	-0.002	0.007	-0.016	0.01
		sd_SiteSubsite__Intercept	0.304	0.041	0.23	0.388
		phi	15.337	0.873	13.703	17.08
		lprior	-17.592	0.799	-19.444	-16.319
18	Jaccard PCHG - Graminoid	b_Intercept	-0.506	0.178	-0.85	-0.143
		b_zoi_Intercept	-0.369	0.058	-0.482	-0.259
		b_coi_Intercept	-6.8	1.243	-9.82	-4.943
		b_WarmQSlope	13.873	3.719	6.489	21.337
		b_PrecSlope	0.02	0.013	-0.005	0.044
		b_GraminoidSlope	-0.033	0.015	-0.063	-0.003
		b_LogPlotSize	-0.015	0.09	-0.184	0.167
		b_MeanRichness	-0.067	0.01	-0.086	-0.048
		b_duration	-0.003	0.006	-0.015	0.01
		sd_SiteSubsite__Intercept	0.295	0.038	0.226	0.375
		phi	16.738	0.881	15.06	18.509
		lprior	-19.006	1.241	-22.014	-17.157
19	Bray-Curtis GEO	b_Intercept	1.35	0.989	-0.628	3.247
		b_zoi_Intercept	-5.123	0.368	-5.911	-4.468
		b_coi_Intercept	-1.452	0.88	-3.354	0.085
		b_LAT	-0.033	0.014	-0.06	-0.005
		b_RegionGreenIceLand	-0.459	0.196	-0.828	-0.07
		b_RegionNorthAmericaMEast	-0.313	0.229	-0.766	0.146
		b_RegionNorthAmericaMWest	-0.458	0.133	-0.721	-0.198
		b_LogPlotSize	-0.014	0.118	-0.24	0.222
		b_MeanRichness	0.027	0.01	0.007	0.047
		b_duration	0.023	0.008	0.008	0.04
		sd_SiteSubsite__Intercept	0.445	0.046	0.362	0.542
		phi	8.828	0.349	8.162	9.518
		lprior	-17.223	0.674	-18.806	-16.213
20	Bray-Curtis CLIM	b_Intercept	-1.253	0.223	-1.696	-0.811
		b_zoi_Intercept	-5.099	0.375	-5.924	-4.431
		b_coi_Intercept	-1.444	0.89	-3.386	0.109
		b_MOISTUREMOIST	-0.22	0.135	-0.482	0.05
		b_MOISTUREWET	0.072	0.177	-0.264	0.424
		b_warmq	-0.025	0.022	-0.069	0.019
		b_prec	0.001	0.0003	0.001	0.002
		b_duration	0.014	0.008	-0.001	0.03
		b_LogPlotSize	0.042	0.138	-0.237	0.308
		b_MeanRichness	0.032	0.01	0.012	0.052
		sd_SiteSubsite__Intercept	0.407	0.048	0.323	0.509
		phi	8.735	0.353	8.069	9.439
		lprior	-17.177	0.677	-18.792	-16.145
21	Bray-Curtis FG - Shrub	b_Intercept	-1.127	0.17	-1.46	-0.79
		b_zoi_Intercept	-5.119	0.363	-5.892	-4.471
		b_coi_Intercept	-1.447	0.896	-3.416	0.11
		b_ShruhDivided	-0.198	0.122	-0.435	0.04
		b_LogPlotSize	0.008	0.119	-0.219	0.244
		b_MeanRichness	0.028	0.01	0.008	0.048
		b_duration	0.026	0.008	0.01	0.041
		sd_SiteSubsite__Intercept	0.522	0.049	0.435	0.626
		phi	8.836	0.349	8.166	9.529

		lprior	-17.222	0.675	-18.845	-16.203
22	Bray-Curtis FG - Forb	b_Intercept	-1.232	0.157	-1.538	-0.926
		b_zoi_Intercept	-5.121	0.36	-5.903	-4.467
		b_coi_Intercept	-1.465	0.895	-3.474	0.076
		b_ForbDivided	0.528	0.261	0.009	1.033
		b_LogPlotSize	0.014	0.123	-0.226	0.259
		b_MeanRichness	0.022	0.011	0.00003	0.044
		b_duration	0.025	0.008	0.009	0.04
		sd_SiteSubsite__Intercept	0.521	0.049	0.432	0.628
		phi	8.845	0.354	8.153	9.545
		lprior	-17.235	0.679	-18.904	-16.243
23	Bray-Curtis FG - Graminoid	b_Intercept	-1.287	0.168	-1.62	-0.967
		b_zoi_Intercept	-5.115	0.358	-5.878	-4.469
		b_coi_Intercept	-1.469	0.907	-3.472	0.122
		b_GramDivided	0.097	0.13	-0.159	0.35
		b_LogPlotSize	0.004	0.122	-0.232	0.244
		b_MeanRichness	0.03	0.01	0.009	0.051
		b_duration	0.025	0.008	0.01	0.041
		sd_SiteSubsite__Intercept	0.524	0.049	0.436	0.626
		phi	8.825	0.35	8.153	9.501
		lprior	-17.234	0.691	-18.896	-16.216
24	Bray-Curtis PCHG - Shrub	b_Intercept	-0.761	0.261	-1.283	-0.256
		b_zoi_Intercept	-5.478	0.48	-6.51	-4.647
		b_coi_Intercept	-0.849	0.981	-2.907	0.96
		b_WarmQSlope	-13.174	5.867	-24.276	-1.717
		b_PrecSlope	0.004	0.018	-0.031	0.04
		b_ShrubSlope	-0.03	0.016	-0.063	0.001
		b_LogPlotSize	0.034	0.127	-0.215	0.276
		b_MeanRichness	0.022	0.012	-0.002	0.044
		b_duration	0.027	0.009	0.009	0.044
		sd_SiteSubsite__Intercept	0.511	0.051	0.419	0.617
		phi	8.865	0.376	8.145	9.614
		lprior	-17.34	0.672	-18.941	-16.3
25	Bray-Curtis PCHG - Forb	b_Intercept	-0.925	0.285	-1.487	-0.365
		b_zoi_Intercept	-5.642	0.531	-6.796	-4.734
		b_coi_Intercept	-0.507	1.009	-2.562	1.393
		b_WarmQSlope	-9.214	6.605	-22.312	3.64
		b_PrecSlope	0.012	0.019	-0.026	0.049
		b_ForbSlope	0.04	0.02	-0.0003	0.08
		b_LogPlotSize	0.031	0.134	-0.232	0.289
		b_MeanRichness	0.024	0.011	0.003	0.045
		b_duration	0.024	0.008	0.007	0.04
		sd_SiteSubsite__Intercept	0.564	0.057	0.464	0.688
		phi	11.341	0.497	10.398	12.351
		lprior	-17.704	0.653	-19.191	-16.653
26	Bray-Curtis PCHG - Graminoid	b_Intercept	-0.786	0.253	-1.288	-0.291
		b_zoi_Intercept	-5.62	0.476	-6.67	-4.793
		b_coi_Intercept	-2.104	1.39	-5.338	0.065
		b_WarmQSlope	-12.887	5.92	-24.604	-1.144
		b_PrecSlope	-0.004	0.018	-0.038	0.032
		b_GraminoidSlope	0.013	0.017	-0.02	0.045
		b_LogPlotSize	-0.031	0.13	-0.289	0.219

		b_MeanRichness	0.026	0.011	0.004	0.047
		b_duration	0.027	0.008	0.012	0.043
		sd_SiteSubsite__Intercept	0.52	0.051	0.429	0.626
		phi	8.802	0.35	8.145	9.518
		lprior	-18.228	1.197	-21.224	-16.621
27	Persisters GEO	b_Intercept	1.629	0.831	-0.034	3.205
		b_zoi_Intercept	-2.388	0.101	-2.589	-2.192
		b_coi_Intercept	4.221	0.788	2.912	6.008
		b_LAT	-0.02	0.012	-0.043	0.004
		b_RegionGreenIceLand	-0.408	0.168	-0.74	-0.077
		b_RegionNorthAmericaMEast	0.11	0.194	-0.277	0.485
		b_RegionNorthAmericaMWest	0.171	0.113	-0.053	0.397
		b_LogPlotSize	-0.158	0.106	-0.363	0.048
		b_MeanRichness	0.025	0.01	0.006	0.045
		b_Duration	-0.005	0.007	-0.019	0.009
		sd_SiteSubsite__Intercept	0.37	0.042	0.293	0.459
		phi	10.665	0.439	9.817	11.535
		lprior	-17.093	0.772	-18.872	-15.829
28	Persisters CLIM	b_Intercept	-0.06	0.206	-0.458	0.345
		b_zoi_Intercept	-2.364	0.102	-2.566	-2.17
		b_coi_Intercept	4.242	0.807	2.916	6.062
		b_MOISTUREMOIST	0.059	0.122	-0.174	0.306
		b_MOISTUREWET	-0.012	0.165	-0.333	0.318
		b_warmq	0.074	0.021	0.032	0.114
		b_prec	-0.001	0.0003	-0.001	-0.00001
		b_Duration	-0.007	0.007	-0.022	0.007
		b_LogPlotSize	-0.066	0.134	-0.335	0.2
		b_MeanRichness	0.026	0.01	0.007	0.046
		sd_SiteSubsite__Intercept	0.375	0.045	0.293	0.47
		phi	10.869	0.462	9.973	11.797
		lprior	-17.114	0.79	-18.936	-15.843
29	Persisters FG - Shrub	b_Intercept	0.215	0.152	-0.081	0.512
		b_zoi_Intercept	-2.39	0.101	-2.588	-2.198
		b_coi_Intercept	4.231	0.786	2.966	6.013
		b_ShruhDivided	0.116	0.109	-0.104	0.323
		b_LogPlotSize	-0.025	0.102	-0.227	0.177
		b_MeanRichness	0.035	0.009	0.016	0.053
		b_Duration	-0.011	0.007	-0.024	0.003
		sd_SiteSubsite__Intercept	0.405	0.043	0.327	0.497
		phi	10.679	0.435	9.851	11.565
		lprior	-17.105	0.772	-18.867	-15.861
30	Persisters FG - Forb	b_Intercept	0.297	0.141	0.013	0.57
		b_zoi_Intercept	-2.389	0.101	-2.59	-2.195
		b_coi_Intercept	4.232	0.82	2.919	6.154
		b_ForbdDivided	-0.262	0.243	-0.727	0.223
		b_LogPlotSize	-0.023	0.101	-0.221	0.176
		b_MeanRichness	0.036	0.01	0.017	0.056
		b_Duration	-0.011	0.007	-0.024	0.003
		sd_SiteSubsite__Intercept	0.401	0.044	0.322	0.495
		phi	10.672	0.453	9.829	11.588
		lprior	-17.105	0.802	-19	-15.834
31		b_Intercept	0.324	0.145	0.031	0.608

	Persisters FG - Graminoid	b_zoi_Intercept	-2.389	0.1	-2.591	-2.198
		b_coi_Intercept	4.235	0.79	2.958	6.071
		b_GramDivided	-0.07	0.112	-0.29	0.156
		b_LogPlotSize	-0.021	0.101	-0.218	0.173
		b_MeanRichness	0.033	0.009	0.015	0.052
		b_Duration	-0.011	0.007	-0.024	0.002
		sd_SiteSubsite__Intercept	0.407	0.044	0.33	0.502
		phi	10.676	0.444	9.831	11.562
		lprior	-17.108	0.772	-18.9	-15.89
32	Persisters PCHG - Shrub	b_Intercept	0.903	0.207	0.503	1.306
		b_zoi_Intercept	-2.658	0.123	-2.904	-2.423
		b_coi_Intercept	3.806	0.785	2.505	5.567
		b_WarmQSlope	-18.053	4.465	-27.038	-9.45
		b_PrecSlope	-0.022	0.014	-0.05	0.006
		b_ShrubSlope	-0.023	0.014	-0.05	0.005
		b_LogPlotSize	-0.087	0.103	-0.292	0.119
		b_MeanRichness	0.029	0.01	0.008	0.049
		b_Duration	-0.003	0.007	-0.017	0.011
		sd_SiteSubsite__Intercept	0.38	0.043	0.303	0.475
		phi	10.795	0.485	9.869	11.786
		lprior	-16.941	0.759	-18.624	-15.718
33	Persisters PCHG - Forb	b_Intercept	0.776	0.223	0.338	1.204
		b_zoi_Intercept	-3.135	0.159	-3.454	-2.832
		b_coi_Intercept	3.252	0.79	1.946	4.979
		b_WarmQSlope	-17.508	4.875	-27.091	-7.987
		b_PrecSlope	-0.033	0.015	-0.063	-0.003
		b_Forbslope	-0.046	0.02	-0.085	-0.008
		b_LogPlotSize	-0.156	0.107	-0.367	0.053
		b_MeanRichness	0.037	0.01	0.018	0.057
		b_Duration	-0.003	0.007	-0.017	0.011
		sd_SiteSubsite__Intercept	0.398	0.045	0.317	0.493
		phi	11.113	0.508	10.134	12.123
		lprior	-16.886	0.752	-18.542	-15.674
34	Persisters PCHG - Graminoid	b_Intercept	0.908	0.193	0.518	1.285
		b_zoi_Intercept	-2.461	0.105	-2.667	-2.261
		b_coi_Intercept	5.164	1.283	3.292	8.244
		b_WarmQSlope	-19.262	4.25	-27.615	-10.838
		b_PrecSlope	-0.022	0.014	-0.049	0.004
		b_GraminoidSlope	0.048	0.015	0.019	0.077
		b_LogPlotSize	-0.104	0.098	-0.3	0.082
		b_MeanRichness	0.037	0.01	0.017	0.056
		b_Duration	-0.006	0.007	-0.018	0.008
		sd_SiteSubsite__Intercept	0.364	0.04	0.292	0.447
		phi	10.889	0.462	9.979	11.811
		lprior	-18.104	1.272	-21.14	-16.253
35	Losses GEO	b_Intercept	-1.271	0.856	-2.974	0.392
		b_zi_Intercept	-0.942	0.062	-1.066	-0.82
		b_LAT	0.013	0.012	-0.01	0.037
		b_RegionGreenIceLand	0.101	0.186	-0.276	0.457
		b_RegionNorthAmericaMEast	-0.066	0.2	-0.467	0.32
		b_RegionNorthAmericaMWest	-0.191	0.115	-0.412	0.04
		b_LogPlotSize	0.159	0.111	-0.058	0.387

		b_MeanRichness	-0.067	0.011	-0.089	-0.046
		b_Duration	-0.012	0.007	-0.026	0.003
		sd_SiteSubsite__Intercept	0.384	0.046	0.3	0.48
		phi	15.739	0.766	14.268	17.326
		lprior	-12.425	0.065	-12.552	-12.297
36	Losses CLIM	b_Intercept	-0.114	0.197	-0.495	0.275
		b_zi_Intercept	-0.941	0.064	-1.066	-0.814
		b_MOISTUREMOIST	-0.067	0.118	-0.295	0.173
		b_MOISTUREWET	0.005	0.161	-0.309	0.319
		b_warmq	-0.069	0.019	-0.107	-0.03
		b_prec	0.001	0.0003	0.0001	0.001
		b_Duration	-0.014	0.007	-0.028	0.001
		b_LogPlotSize	0.215	0.13	-0.042	0.475
		b_MeanRichness	-0.062	0.011	-0.083	-0.041
		sd_SiteSubsite__Intercept	0.338	0.046	0.255	0.433
		phi	15.85	0.773	14.367	17.391
		lprior	-12.426	0.065	-12.553	-12.299
37	Losses FG - Shrub	b_Intercept	-0.345	0.157	-0.653	-0.036
		b_zi_Intercept	-0.941	0.063	-1.065	-0.819
		b_ShruhDivided	-0.142	0.111	-0.351	0.076
		b_LogPlotSize	0.096	0.101	-0.092	0.302
		b_MeanRichness	-0.074	0.011	-0.094	-0.053
		b_Duration	-0.008	0.007	-0.022	0.006
		sd_SiteSubsite__Intercept	0.388	0.045	0.309	0.484
		phi	15.746	0.767	14.284	17.291
		lprior	-12.416	0.065	-12.544	-12.289
38	Losses FG - Forb	b_Intercept	-0.432	0.144	-0.713	-0.148
		b_zi_Intercept	-0.941	0.062	-1.063	-0.819
		b_ForDivided	0.046	0.244	-0.431	0.517
		b_LogPlotSize	0.094	0.101	-0.103	0.295
		b_MeanRichness	-0.072	0.011	-0.094	-0.052
		b_Duration	-0.009	0.007	-0.022	0.005
		sd_SiteSubsite__Intercept	0.39	0.045	0.309	0.484
		phi	15.731	0.766	14.275	17.27
		lprior	-12.417	0.065	-12.545	-12.293
39	Losses FG - Graminoid	b_Intercept	-0.493	0.149	-0.779	-0.203
		b_zi_Intercept	-0.941	0.062	-1.064	-0.822
		b_GramDivided	0.153	0.12	-0.077	0.385
		b_LogPlotSize	0.093	0.101	-0.098	0.29
		b_MeanRichness	-0.072	0.011	-0.093	-0.052
		b_Duration	-0.008	0.007	-0.021	0.006
		sd_SiteSubsite__Intercept	0.392	0.045	0.307	0.484
		phi	15.764	0.766	14.271	17.309
		lprior	-12.418	0.065	-12.546	-12.29
40	Losses PCHG - Shrub	b_Intercept	-1.023	0.201	-1.419	-0.633
		b_zi_Intercept	-1.033	0.069	-1.172	-0.897
		b_WarmQSlope	14.229	4.304	5.813	22.849
		b_PrecSlope	0.029	0.014	0.002	0.057
		b_ShruhSlope	0.05	0.014	0.022	0.078
		b_LogPlotSize	0.157	0.099	-0.032	0.357
		b_MeanRichness	-0.059	0.011	-0.08	-0.038
		b_Duration	-0.016	0.007	-0.03	-0.002

		sd_SiteSubsite__Intercept	0.359	0.045	0.279	0.456
		phi	16.765	0.87	15.131	18.546
		lprior	-12.55	0.071	-12.69	-12.411
41	Losses PCHG - Forb	b_Intercept	-0.834	0.218	-1.266	-0.409
		b_zi_Intercept	-1.256	0.077	-1.409	-1.109
		b_WarmQSlope	11.445	4.832	2.161	20.783
		b_PrecSlope	0.036	0.015	0.006	0.066
		b_Forbslope	-0.031	0.02	-0.071	0.007
		b_LogPlotSize	0.193	0.107	-0.015	0.404
		b_MeanRichness	-0.068	0.011	-0.089	-0.046
		b_Duration	-0.014	0.007	-0.028	0.0003
		sd_SiteSubsite__Intercept	0.387	0.048	0.3	0.488
		phi	15.75	0.848	14.139	17.423
		lprior	-12.589	0.077	-12.739	-12.434
42	Losses PCHG - Graminoid	b_Intercept	-0.897	0.194	-1.282	-0.516
		b_zi_Intercept	-0.965	0.063	-1.087	-0.843
		b_WarmQSlope	12.857	4.314	4.533	21.357
		b_PrecSlope	0.03	0.014	0.003	0.058
		b_GraminoidSlope	-0.036	0.016	-0.067	-0.005
		b_LogPlotSize	0.153	0.099	-0.036	0.35
		b_MeanRichness	-0.073	0.01	-0.094	-0.053
		b_Duration	-0.012	0.007	-0.025	0.001
		sd_SiteSubsite__Intercept	0.359	0.043	0.281	0.449
		phi	15.697	0.75	14.227	17.176
		lprior	-12.435	0.064	-12.56	-12.308
43	Gains GEO	b_Intercept	-1.448	0.627	-2.656	-0.187
		b_zi_Intercept	-1.275	0.068	-1.411	-1.145
		b_LAT	0.009	0.009	-0.009	0.026
		b_RegionGreenIceLand	0.342	0.124	0.101	0.584
		b_RegionNorthAmericaMEast	0.013	0.147	-0.279	0.298
		b_RegionNorthAmericaMWest	-0.016	0.082	-0.174	0.143
		b_LogPlotSize	0.03	0.083	-0.133	0.194
		b_MeanRichness	-0.057	0.009	-0.076	-0.039
		b_Duration	0.005	0.006	-0.007	0.017
		sd_SiteSubsite__Intercept	0.218	0.037	0.148	0.295
		phi	14.426	0.661	13.134	15.734
		lprior	-12.478	0.066	-12.606	-12.35
44	Gains CLIM	b_Intercept	-0.723	0.175	-1.062	-0.383
		b_zi_Intercept	-1.263	0.069	-1.4	-1.129
		b_MOISTUREMOIST	0.007	0.087	-0.168	0.176
		b_MOISTUREWET	0.062	0.119	-0.176	0.298
		b_warmq	-0.034	0.016	-0.065	-0.003
		b_prec	0.0002	0.0002	-0.0002	0.001
		b_Duration	0.009	0.006	-0.002	0.021
		b_LogPlotSize	-0.039	0.097	-0.233	0.153
		b_MeanRichness	-0.057	0.009	-0.074	-0.04
		sd_SiteSubsite__Intercept	0.208	0.037	0.14	0.284
		phi	14.641	0.682	13.332	16.001
		lprior	-12.491	0.067	-12.622	-12.363
45	Gains FG - Shrub	b_Intercept	-0.768	0.133	-1.03	-0.515
		b_zi_Intercept	-1.276	0.068	-1.409	-1.142
		b_ShruhDivided	-0.125	0.095	-0.312	0.065

		b_LogPlotSize	-0.067	0.076	-0.213	0.085
		b_MeanRichness	-0.065	0.009	-0.082	-0.047
		b_Duration	0.011	0.006	0.0002	0.022
		sd_SiteSubsite__Intercept	0.233	0.037	0.165	0.31
		phi	14.432	0.667	13.145	15.763
		lprior	-12.476	0.066	-12.606	-12.344
46	Gains FG - Forb	b_Intercept	-0.842	0.119	-1.068	-0.604
		b_zi_Intercept	-1.276	0.068	-1.407	-1.146
		b_ForbidDivided	0.077	0.237	-0.388	0.541
		b_LogPlotSize	-0.071	0.076	-0.213	0.085
		b_MeanRichness	-0.064	0.009	-0.082	-0.046
		b_Duration	0.01	0.006	-0.001	0.021
		sd_SiteSubsite__Intercept	0.233	0.037	0.166	0.31
		phi	14.407	0.671	13.126	15.747
		lprior	-12.475	0.068	-12.609	-12.341
47	Gains FG - Graminoid	b_Intercept	-0.9	0.128	-1.148	-0.645
		b_zi_Intercept	-1.278	0.067	-1.409	-1.148
		b_GramDivided	0.131	0.101	-0.066	0.329
		b_LogPlotSize	-0.073	0.075	-0.214	0.082
		b_MeanRichness	-0.063	0.009	-0.08	-0.046
		b_Duration	0.011	0.006	-0.00006	0.023
		sd_SiteSubsite__Intercept	0.234	0.037	0.164	0.31
		phi	14.431	0.677	13.142	15.763
		lprior	-12.477	0.067	-12.607	-12.347
48	Gains PCHG - Shrub	b_Intercept	-1.113	0.162	-1.438	-0.799
		b_zi_Intercept	-1.456	0.079	-1.613	-1.306
		b_WarmQSlope	7.599	3.399	1.032	14.337
		b_PrecSlope	0.012	0.011	-0.009	0.034
		b_ShruhSlope	-0.019	0.014	-0.046	0.009
		b_LogPlotSize	-0.032	0.082	-0.189	0.132
		b_MeanRichness	-0.059	0.009	-0.078	-0.04
		b_Duration	0.007	0.006	-0.005	0.019
		sd_SiteSubsite__Intercept	0.253	0.038	0.183	0.332
49	Gains PCHG - Forb	phi	14.956	0.737	13.566	16.503
		lprior	-12.631	0.077	-12.784	-12.481
		b_Intercept	-1.182	0.174	-1.522	-0.837
		b_zi_Intercept	-1.64	0.088	-1.816	-1.469
		b_WarmQSlope	8.831	3.582	1.894	16.114
		b_PrecSlope	0.015	0.012	-0.008	0.038
		b_ForbidSlope	0.084	0.02	0.043	0.124
		b_LogPlotSize	-0.024	0.081	-0.175	0.141
		b_MeanRichness	-0.061	0.01	-0.08	-0.041
50	Gains PCHG - Graminoid	b_Duration	0.009	0.006	-0.003	0.021
		sd_SiteSubsite__Intercept	0.235	0.044	0.155	0.325
		phi	14.418	0.726	12.972	15.883
		lprior	-12.713	0.085	-12.882	-12.548
		b_Intercept	-1.114	0.151	-1.408	-0.811
		b_zi_Intercept	-1.314	0.071	-1.455	-1.177
		b_WarmQSlope	8.648	3.099	2.647	14.851
		b_PrecSlope	0.01	0.01	-0.01	0.031
		b_GraminoidSlope	-0.027	0.015	-0.057	0.002
		b_LogPlotSize	-0.039	0.076	-0.186	0.119

		b_MeanRichness	-0.065	0.009	-0.082	-0.047
		b_Duration	0.008	0.006	-0.004	0.018
		sd_SiteSubsite__Intercept	0.221	0.037	0.154	0.297
		phi	14.424	0.667	13.171	15.747
		lprior	-12.505	0.067	-12.631	-12.374
Temporal models						
51	Richness change SUBS	b_Intercept	0.035	0.185	-0.323	0.405
		b_LAT	-0.001	0.003	-0.006	0.004
		b_RegionGreenIceLand	0.047	0.037	-0.026	0.12
		b_RegionNorthAmericaMEast	-0.015	0.044	-0.104	0.073
		b_RegionNorthAmericaMWest	0.0004	0.026	-0.051	0.052
		b_LogPlotSize	0.007	0.024	-0.038	0.054
		b_Duration	0.002	0.002	-0.001	0.006
		sd_SiteSubsite__Intercept	0.078	0.011	0.059	0.101
		sigma	0.162	0.003	0.156	0.169
		lprior	-4.369	0	-4.369	-4.368
52	Richness change PCHG - Shrub	b_Intercept	-0.024	0.047	-0.116	0.068
		b_MOISTUREMOIST	0.032	0.024	-0.017	0.08
		b_MOISTUREWET	0.051	0.037	-0.021	0.125
		b_WarmQSlope	-1.827	1.162	-4.109	0.467
		b_PrecSlope	0.001	0.003	-0.006	0.008
		b_ShrubSlope	-0.011	0.004	-0.018	-0.004
		b_LogPlotSize	-0.018	0.025	-0.067	0.031
		b_Duration	0.004	0.002	0.0002	0.007
		sd_SiteSubsite__Intercept	0.072	0.011	0.051	0.095
		sigma	0.157	0.004	0.15	0.164
		lprior	-4.368	0	-4.369	-4.368
52b	Richness change PCHG – with shrub categories interaction	b_Intercept	0.001	0.007	-0.014	0.016
		FGSlope	0.004	0.005	-0.006	0.014
		FuncGroupNonDwarfShrubCoverNew	0.002	0.006	-0.009	0.014
		FGSlope: FuncGroupNonDwarfShrubCoverNew	-0.013	0.006	-0.025	-0.001
		Sd_SiteSubsite__Intercept	0.04	0.006	0.02	0.05
		sigma	0.114	0.002	0.110	0.118
		lprior	-4.366	7.678	-4.367	-4.367
53	Richness change PCHG - Forb	b_Intercept	-0.082	0.054	-0.187	0.026
		b_MOISTUREMOIST	0.036	0.027	-0.017	0.089
		b_MOISTUREWET	0.024	0.038	-0.053	0.097
		b_WarmQSlope	-0.814	1.353	-3.503	1.885
		b_PrecSlope	0.002	0.004	-0.006	0.009
		b_Forbslope	0.028	0.005	0.018	0.039
		b_LogPlotSize	-0.012	0.027	-0.066	0.042
		b_Duration	0.004	0.002	0.001	0.008
		sd_SiteSubsite__Intercept	0.079	0.012	0.057	0.105
		sigma	0.169	0.004	0.161	0.177
		lprior	-4.369	0	-4.37	-4.369
54	Richness change PCHG - Graminoid	b_Intercept	-0.04	0.043	-0.124	0.045
		b_MOISTUREMOIST	0.041	0.023	-0.005	0.087
		b_MOISTUREWET	0.024	0.031	-0.037	0.085
		b_WarmQSlope	-1.576	1.12	-3.78	0.648
		b_PrecSlope	0.001	0.003	-0.005	0.007
		b_GraminoidSlope	-0.005	0.004	-0.012	0.003

		b_LogPlotSize	-0.019	0.024	-0.067	0.029
		b_Duration	0.004	0.002	0.001	0.007
		sd_SiteSubsite__Intercept	0.067	0.011	0.047	0.089
		sigma	0.161	0.004	0.154	0.168
		lprior	-4.369	0	-4.369	-4.368
55	Evenness SUBS	b_Intercept	-0.023	0.018	-0.059	0.012
		b_LAT	0.0003	0.0003	-0.0002	0.001
		b_RegionGreenIceLand	-0.001	0.003	-0.008	0.006
		b_RegionNorthAmericaMEast	-0.007	0.004	-0.016	0.001
		b_RegionNorthAmericaMWest	0.001	0.002	-0.004	0.006
		b_MeanRichness	0.0003	0.0002	-0.00009	0.001
		b_Duration	-0.00005	0.0002	-0.0003	0.0003
		sd_SiteSubsite__Intercept	0.009	0.001	0.007	0.011
		sigma	0.012	0.0003	0.012	0.013
		lprior	-4.365	0	-4.365	-4.365
56	Evenness PCHG - Shrub	b_Intercept	0.002	0.005	-0.007	0.011
		b_MOISTUREMOIST	0.002	0.002	-0.003	0.006
		b_MOISTUREWET	0.011	0.004	0.004	0.018
		b_WarmQSlope	-0.109	0.112	-0.335	0.101
		b_PrecSlope	-0.0001	0.0003	-0.001	0.001
		b_ShrubSlope	-0.002	0.0003	-0.003	-0.002
		b_MeanRichness	0.00034	0.0002	-0.00002	0.001
		b_Duration	-0.0001	0.0002	-0.0004	0.0002
		sd_SiteSubsite__Intercept	0.008	0.001	0.006	0.01
		sigma	0.011	0.0003	0.01	0.011
		lprior	-4.365	0	-4.365	-4.365
57	Evenness PCHG - Forb	b_Intercept	0.001	0.005	-0.008	0.01
		b_MOISTUREMOIST	0.002	0.002	-0.003	0.006
		b_MOISTUREWET	0.009	0.003	0.003	0.015
		b_WarmQSlope	-0.1	0.107	-0.306	0.12
		b_PrecSlope	-0.0002	0.0003	-0.001	0.0004
		b_Forbslope	0.004	0.0003	0.003	0.004
		b_MeanRichness	0.0004	0.0002	0.00000	0.001
		b_Duration	-0.0001	0.0001	-0.00037	0.0001
		sd_SiteSubsite__Intercept	0.007	0.001	0.006	0.009
		sigma	0.01	0.0003	0.01	0.011
		lprior	-4.365	0	-4.365	-4.365
58	Evenness PCHG - Graminoid	b_Intercept	0.001	0.005	-0.008	0.010
		b_MOISTUREMOIST	0.003	0.002	-0.002	0.008
		b_MOISTUREWET	0.009	0.003	0.003	0.015
		b_WarmQSlope	-0.101	0.12	-0.326	0.127
		b_PrecSlope	-0.0002	0.0003	-0.001	0.0004
		b_GraminoidSlope	0.0005	0.0003	-0.0001	0.001
		b_MeanRichness	0.0004	0.0002	-0.00001	0.001
		b_Duration	-0.0001	0.0002	-0.0004	0.0002
		sd_SiteSubsite__Intercept	0.008	0.001	0.006	0.01
		sigma	0.012	0	0.012	0.013
		lprior	-4.365	0	-4.365	-4.365
59	PCoA Jaccard Cartesian SUBS - Shrub	b_Intercept	-5.198	2.363	-9.823	-0.603
		b_RegionGreenIceLand	-1.503	0.492	-2.469	-0.527
		b_RegionNorthAmericaMEast	-1.679	0.626	-2.92	-0.435

		b_RegionNorthAmericaMWest	-0.055	0.404	-0.854	0.717
		b_MOISTUREMOIST	0.097	0.322	-0.528	0.736
		b_MOISTUREWET	0.987	0.484	-0.017	1.899
		b_SubsiteLatitude	0.011	0.035	-0.057	0.078
		b_SubsiteTempChange	37.801	16.038	6.114	68.701
		b_SubsitePrecChange	0.012	0.045	-0.078	0.098
		b_LogPlotSize	0.184	0.306	-0.412	0.795
		b_SubsiteRichness	0.018	0.048	-0.081	0.11
		b_SubsiteDuration	-0.022	0.022	-0.065	0.022
		b_SubsiteShrubChange	-0.095	0.111	-0.305	0.126
		phi	15.304	3.421	9.267	22.676
		lprior	-10.446	0.327	-11.055	-9.771
60	PCoA Jaccard Cartesian SUBS - Forb	b_Intercept	-3.408	3.336	-10.074	2.999
		b_RegionGreenIceLand	-0.839	0.666	-2.201	0.396
		b_RegionNorthAmericaMEast	-1.27	0.696	-2.668	0.045
		b_RegionNorthAmericaMWest	-1.188	0.411	-2.002	-0.388
		b_MOISTUREMOIST	0.47	0.359	-0.218	1.185
		b_MOISTUREWET	-0.816	0.609	-2.018	0.377
		b_SubsiteLatitude	0.014	0.045	-0.075	0.1
		b_SubsiteTempChange	3.505	21.279	-38.625	45.228
		b_SubsitePrecChange	-0.054	0.043	-0.143	0.031
		b_LogPlotSize	1.244	0.393	0.482	2.022
		b_SubsiteRichness	0.031	0.05	-0.065	0.13
		b_SubsiteDuration	-0.038	0.034	-0.103	0.032
		b_SubsiteForbChange	-0.151	0.143	-0.471	0.09
		phi	26.061	6.505	14.76	40.048
		lprior	-11.148	0.379	-11.85	-10.365
61	PCoA Jaccard Cartesian SUBS - Graminoid	b_Intercept	-5.043	2.177	-9.273	-0.73
		b_RegionGreenIceLand	-0.716	0.535	-1.782	0.321
		b_RegionNorthAmericaMEast	-0.558	0.594	-1.702	0.636
		b_RegionNorthAmericaMWest	-0.4	0.397	-1.161	0.376
		b_MOISTUREMOIST	-0.199	0.347	-0.852	0.497
		b_MOISTUREWET	-0.537	0.511	-1.541	0.446
		b_SubsiteLatitude	0.016	0.031	-0.046	0.077
		b_SubsiteTempChange	25.444	15.798	-6.66	55.221
		b_SubsitePrecChange	0.018	0.042	-0.067	0.097
		b_LogPlotSize	0.193	0.306	-0.385	0.806
		b_SubsiteRichness	0.112	0.047	0.019	0.204
		b_SubsiteDuration	-0.066	0.024	-0.113	-0.018
		b_SubsiteGraminoidChange	0.228	0.161	-0.104	0.535
		phi	13.502	2.982	8.239	19.903
		lprior	-10.307	0.322	-10.911	-9.643
62	PCoA Bray- Curtis Cartesian SUBS - Shrub	b_Intercept	-5.337	1.545	-8.435	-2.327
		b_RegionGreenIceLand	0.266	0.343	-0.431	0.921
		b_RegionNorthAmericaMEast	-0.067	0.423	-0.902	0.752
		b_RegionNorthAmericaMWest	-0.127	0.3	-0.715	0.471
		b_MOISTUREMOIST	0.037	0.24	-0.443	0.501
		b_MOISTUREWET	0.34	0.341	-0.365	0.977
		b_SubsiteLatitude	0.034	0.022	-0.011	0.078
		b_SubsiteTempChange	-14.701	13.577	-41.808	11.192
		b_SubsitePrecChange	0.013	0.037	-0.062	0.083
		b_LogPlotSize	-0.104	0.225	-0.531	0.369

		b_SubsiteRichness	0.02	0.039	-0.056	0.098
		b_SubsiteDuration	0	0.017	-0.033	0.034
		b_SubsiteShrubChange	0.005	0.088	-0.162	0.188
		phi	39.012	7.235	26.017	54.72
		lprior	-11.455	0.281	-12.009	-10.894
63	PCoA Bray-Curtis Cartesian SUBS - Forb	b_Intercept	-2.322	2.335	-7.041	2.111
		b_RegionGreenIceLand	-0.36	0.543	-1.475	0.679
		b_RegionNorthAmericaMEast	-0.156	0.487	-1.113	0.78
		b_RegionNorthAmericaMWest	-0.587	0.376	-1.311	0.158
		b_MOISTUREMOIST	0.232	0.277	-0.311	0.768
		b_MOISTUREWET	0.161	0.354	-0.566	0.826
		b_SubsiteLatitude	0.003	0.031	-0.059	0.064
		b_SubsiteTempChange	-27.158	17.613	-62.455	6.425
		b_SubsitePrecChange	-0.016	0.043	-0.103	0.069
		b_LogPlotSize	0.119	0.287	-0.411	0.7
		b_SubsiteRichness	0.015	0.04	-0.066	0.093
		b_SubsiteDuration	-0.005	0.021	-0.047	0.036
		b_SubsiteForbChange	0.01	0.09	-0.178	0.176
		phi	40.693	9.15	24.561	60.241
		lprior	-11.526	0.346	-12.181	-10.828
64	PCoA Bray-Curtis Cartesian SUBS - Graminoid	b_Intercept	-4.754	1.562	-7.875	-1.761
		b_RegionGreenIceLand	0.189	0.363	-0.535	0.886
		b_RegionNorthAmericaMEast	0.219	0.444	-0.656	1.075
		b_RegionNorthAmericaMWest	0.01	0.29	-0.553	0.589
		b_MOISTUREMOIST	-0.035	0.233	-0.482	0.427
		b_MOISTUREWET	0.095	0.285	-0.467	0.649
		b_SubsiteLatitude	0.027	0.022	-0.018	0.072
		b_SubsiteTempChange	-13.875	12.183	-38.861	9.102
		b_SubsitePrecChange	0.03	0.034	-0.04	0.096
		b_LogPlotSize	-0.109	0.219	-0.521	0.338
		b_SubsiteRichness	0.011	0.033	-0.055	0.078
		b_SubsiteDuration	-0.013	0.017	-0.046	0.019
		b_SubsiteGraminoidChange	-0.077	0.12	-0.314	0.154
		phi	38.981	6.963	26.525	53.764
		lprior	-11.44	0.272	-11.965	-10.892
65	PCoA Jaccard Centroid SUBS - Shrub	b_Intercept	-6.143	1.476	-9.068	-3.282
		b_RegionGreenIceLand	0.039	0.332	-0.627	0.682
		b_RegionNorthAmericaMEast	-0.172	0.384	-0.927	0.562
		b_RegionNorthAmericaMWest	-0.022	0.285	-0.599	0.529
		b_MOISTUREMOIST	-0.191	0.226	-0.628	0.26
		b_MOISTUREWET	0.724	0.291	0.122	1.28
		b_SubsiteLatitude	0.019	0.021	-0.022	0.059
		b_SubsiteTempChange	8.556	11.399	-14.046	30.601
		b_SubsitePrecChange	0.029	0.031	-0.033	0.087
		b_SubsiteShrubChange	-0.116	0.071	-0.249	0.032
		b_LogPlotSize	-0.034	0.228	-0.457	0.444
		b_SubsiteRichness	-0.026	0.034	-0.094	0.04
		b_SubsiteDuration	-0.016	0.016	-0.046	0.015
		phi	213.005	40.234	141.669	298.662
		lprior	-15.613	0.612	-16.853	-14.463
66		b_Intercept	-3.654	2.48	-8.618	0.994
		b_RegionGreenIceLand	-0.463	0.567	-1.635	0.617

	PCoA Jaccard Centroid SUBS - Forb	b_RegionNorthAmericaMEast	0.018	0.504	-0.968	0.981
		b_RegionNorthAmericaMWest	-0.595	0.347	-1.268	0.096
		b_MOISTUREMOIST	-0.006	0.284	-0.576	0.553
		b_MOISTUREWET	0.304	0.373	-0.436	1.018
		b_SubsiteLatitude	-0.008	0.034	-0.072	0.057
		b_SubsiteTempChange	7.164	17.567	-27.329	41.594
		b_SubsitePrecChange	0.004	0.036	-0.07	0.073
		b_SubsiteForbChange	0.01	0.094	-0.193	0.18
		b_LogPlotSize	0.093	0.272	-0.418	0.671
		b_SubsiteRichness	-0.024	0.039	-0.1	0.053
		b_SubsiteDuration	-0.035	0.022	-0.077	0.008
		phi	194.513	43.048	118.332	288.576
		lprior	-15.344	0.678	-16.744	-14.06
67	PCoA Jaccard Centroid SUBS - Graminoid	b_Intercept	-6.167	1.486	-9.1	-3.249
		b_RegionGreenIceLand	0.216	0.366	-0.514	0.927
		b_RegionNorthAmericaMEast	0.104	0.408	-0.699	0.917
		b_RegionNorthAmericaMWest	-0.302	0.284	-0.847	0.254
		b_MOISTUREMOIST	-0.353	0.238	-0.811	0.116
		b_MOISTUREWET	0.244	0.282	-0.323	0.794
		b_SubsiteLatitude	0.026	0.021	-0.016	0.066
		b_SubsiteTempChange	3.082	12.35	-21.915	26.74
		b_SubsitePrecChange	0.036	0.029	-0.021	0.092
		b_SubsiteGraminoidChange	0.166	0.106	-0.048	0.365
		b_LogPlotSize	-0.005	0.233	-0.441	0.469
		b_SubsiteRichness	0.002	0.033	-0.066	0.069
		b_SubsiteDuration	-0.045	0.018	-0.079	-0.01
		phi	198.172	35.897	133.607	273.893
		lprior	-15.417	0.561	-16.553	-14.341
68	PCoA Bray- Curtis Centroid SUBS - Shrub	b_Intercept	-5.771	1.738	-9.213	-2.464
		b_RegionGreenIceLand	-0.459	0.392	-1.256	0.288
		b_RegionNorthAmericaMEast	-0.655	0.428	-1.495	0.171
		b_RegionNorthAmericaMWest	-0.2	0.288	-0.763	0.374
		b_MOISTUREMOIST	0.383	0.239	-0.087	0.868
		b_MOISTUREWET	0.724	0.341	0.024	1.361
		b_SubsiteLatitude	0.022	0.025	-0.027	0.07
		b_SubsiteTempChange	-6.215	14.332	-34.66	21.525
		b_SubsitePrecChange	0.011	0.032	-0.053	0.073
		b_SubsiteShrubChange	0.033	0.097	-0.147	0.231
		b_LogPlotSize	-0.033	0.245	-0.496	0.469
		b_SubsiteRichness	-0.024	0.036	-0.095	0.047
		b_SubsiteDuration	0.013	0.018	-0.023	0.048
		phi	102.964	19.509	68.398	143.744
		lprior	-13.59	0.412	-14.388	-12.806
69	PCoA Bray- Curtis Centroid SUBS - Forb	b_Intercept	-8.32	3.018	-14.413	-2.611
		b_RegionGreenIceLand	-0.46	0.585	-1.651	0.653
		b_RegionNorthAmericaMEast	-0.437	0.548	-1.542	0.619
		b_RegionNorthAmericaMWest	0.058	0.411	-0.713	0.907
		b_MOISTUREMOIST	0.277	0.307	-0.31	0.9
		b_MOISTUREWET	0.353	0.369	-0.375	1.071
		b_SubsiteLatitude	0.041	0.039	-0.037	0.119
		b_SubsiteTempChange	9.93	16.756	-22.711	42.726
		b_SubsitePrecChange	0.058	0.043	-0.028	0.143

		b_SubsiteForbChange	0.028	0.111	-0.218	0.216
		b_LogPlotSize	-0.095	0.318	-0.681	0.563
		b_SubsiteRichness	0.009	0.041	-0.072	0.089
		b_SubsiteDuration	0.006	0.023	-0.042	0.05
		phi	109.169	25.218	65.793	164.58
		lprior	-13.788	0.52	-14.831	-12.787
70	PCoA Bray-Curtis Centroid SUBS - Graminoid	b_Intercept	-4.72	1.719	-8.049	-1.296
		b_RegionGreenIceLand	-0.545	0.414	-1.372	0.258
		b_RegionNorthAmericaMEast	-0.159	0.449	-1.044	0.712
		b_RegionNorthAmericaMWest	-0.305	0.286	-0.87	0.257
		b_MOISTUREMOIST	0.522	0.263	0.009	1.047
		b_MOISTUREWET	0.096	0.329	-0.545	0.738
		b_SubsiteLatitude	0.005	0.025	-0.046	0.053
		b_SubsiteTempChange	-1.642	13.168	-28.256	22.955
		b_SubsitePrecChange	0.028	0.03	-0.032	0.085
		b_SubsiteGraminoidChange	-0.103	0.119	-0.342	0.123
		b_LogPlotSize	0.149	0.253	-0.32	0.67
		b_SubsiteRichness	-0.024	0.035	-0.091	0.042
		b_SubsiteDuration	0.007	0.018	-0.027	0.042
		phi	104.578	19.384	69.63	146.053
		lprior	-13.645	0.408	-14.459	-12.853

Supplementary Table 4. Comparison of model outputs for a selection of models that were fitted both as univariate and as multivariate models (**Supplementary Table 2**). We consider a slope from a univariate model to be significant when the 95% credible intervals did not overlap zero. We consider a slope from the multivariate model to be significant when the 95% or the 97.5% credible intervals did not overlap zero (**Supplementary Table 2**). The richness change ~ temperature change model was run at the subsite-level by extracting subsite-level slopes from the richness over time hierarchical model (**Supplementary Table 1**). Positive and negative significant relationships are indicated by the symbols '+' and '-', respectively, while 'ns' indicates a non-significant relationship.

Relationship	Univariate model	Multivariate model
Richness change ~ temperature change	ns	ns
Jaccard ~ temperature	-	-
Jaccard ~ temperature change	+	+
Bray-Curtis ~ temperature	+	ns
Bray-Curtis ~ temperature change	ns	-
Species losses ~ temperature	-	-
Species losses ~ precipitation	ns	+
Species losses ~ shrub change	+	+
Species losses ~ temperature change	+	+
Species gains ~ temperature	-	-
Species gains ~ shrub change	ns	ns
Species gains ~ temperature change	+	+

Supplementary Table 5. Structure and summary results of the model behind **Extended Data Figure 7a**. We report slopes and 95% credible intervals. Only plots where shrub cover had increased over time are included.

Model structure	Sample size	Summary
Richness change ~ Shrub change over time * Start shrub cover + (1 SiteSubsite)	528	Shrub change over time: -0.02 (CI = -0.047 to 0.0026) Start shrub cover: -0.0006 (CI = -0.0014 to 0.0002) Shrub change over time * Start shrub cover: -0.0003 (CI = -0.0009 to 0.0002)

Supplementary Table 6. Top 10 species in each trajectory, ordered by the number of times a species has been identified as a persisting, becoming lost or gained across all plots. Percentages per trend are calculated relative to the overall number of times a species has been recorded across plots (considering unique trajectories only as opposed to multiple timepoints). FG = functional group.

	Persisters				Losses				Gains			
	Species	FG	#	%	Species	FG	#	%	Species	FG	#	%
1	<i>Vaccinium vitis-idaea</i>	Shrub	471	87.2	<i>Luzula confusa</i>	Graminoid	57	26.3	<i>Carex bigelowii</i>	Graminoid	59	11.5
2	<i>Carex bigelowii</i>	Graminoid	403	78.4	<i>Carex bigelowii</i>	Graminoid	52	10.1	<i>Betula nana</i>	Shrub	55	15.2
3	<i>Carex aquatilis</i>	Graminoid	286	92.9	<i>Salix herbacea</i>	Shrub	46	23.2	<i>Poa arctica</i>	Graminoid	53	21.0
4	<i>Betula nana</i>	Shrub	276	76.2	<i>Poa arctica</i>	Graminoid	42	16.6	<i>Luzula confusa</i>	Graminoid	51	23.5
5	<i>Cassiope tetragona</i>	Shrub	271	88.3	<i>Carex lachenalii</i>	Graminoid	38	82.6	<i>Arctagrostis latifolia</i>	Graminoid	47	25.0
6	<i>Salix arctica</i>	Shrub	233	81.8	<i>Stellaria longipes</i>	Forb	37	30.1	<i>Vaccinium vitis-idaea</i>	Shrub	47	8.7
7	<i>Eriophorum vaginatum</i>	Graminoid	189	85.1	<i>Saxifraga cernua</i>	Forb	36	25.7	<i>Phyllodoce caerulea</i>	Shrub	47	39.8
8	<i>Empetrum nigrum</i>	Shrub	181	74.2	<i>Armeria maritima</i>	Forb	36	36.0	<i>Petasites frigidus</i>	Forb	45	26.6
9	<i>Empetrum hermaphroditum</i>	Shrub	160	78.4	<i>Bistorta vivipara</i>	Forb	35	22.2	<i>Vaccinium myrtillus</i>	Shrub	41	20.6
10	<i>Dupontia fisheri</i>	Graminoid	159	74.3	<i>Arctagrostis latifolia</i>	Graminoid	34	18.1	<i>Cassiope hypnoides</i>	Shrub	41	40.6

Supplementary Table 7. Structure and summary results of the *post hoc* analyses behind **Extended Data Figure 9**. We report slopes and 95% credible intervals. Bold indicates terms whose credible intervals do not overlap zero.

Model structure	Sample size	Summary
Shrub cover increases ~ Latitude + (1 Subsite)	503	Latitude: -0.004 (CI = -0.04 to 0.03)
Shrub cover ~ Temperature mean of past 5 years * Shrub type + (Temperature mean of past 5 years Subsite/Plot)	6,715	Temperature mean of past 5 years: -0.12 (CI: -0.24 to -0.004) Erect Shrubs: 1.40 (CI: 1.35 to 1.44) Temperature mean of past 5 years * Erect Shrubs: 0.20 (CI: 0.08 to 0.32)
Shrub cover change ~ Temperature change * Shrub type + (1 Subsite)	665	Erect shrubs: 1.35 (-0.88 to 3.66) Temperature change: 33.83 (CI = -16.61 to 86.41) Temperature change * Erect shrubs: -18.26 (-78.88 to 41.33)

Supplementary Table 8. Number and percentage of plots with different trends for each of the three functional groups. Increasing, stable and decreasing trends are defined by the change in cover values per functional group per plot. Never present indicates those functional groups that were not present in a plot either the start or the end monitoring time point.

Trend	Shrub	Forb	Graminoid
Decrease	556 (43.9%)	490 (38.7%)	599 (47.3%)
Increase	527 (41.6%)	483 (38.1%)	588 (46.4%)
Stable	7 (0.5%)	2 (0.2%)	46 (3.6%)
Never present	176(13.9%)	291 (22.9%)	33 (2.6%)

Supplementary Table 9. Structure and summary results of the functional group change over time models. CI are the 95% credible intervals. The response variables are the slopes of change per functional group, as calculated in a linear model per plot (as cover in functional group ~ year). All estimates and credible intervals overlapped zero.

Model structure	Sample size	Summary
Shrub change over time ~ 1 + (1 SiteSubsite)	1,091	0.05 (CI = -0.21 to 0.3)
Forb change over time ~ 1 + (1 SiteSubsite)	995	0.09 (CI = -0.12 to 0.31)
Graminoid change over time ~ 1 + (1 SiteSubsite)	1,240	-0.15 (CI = -0.36 to 0.05)