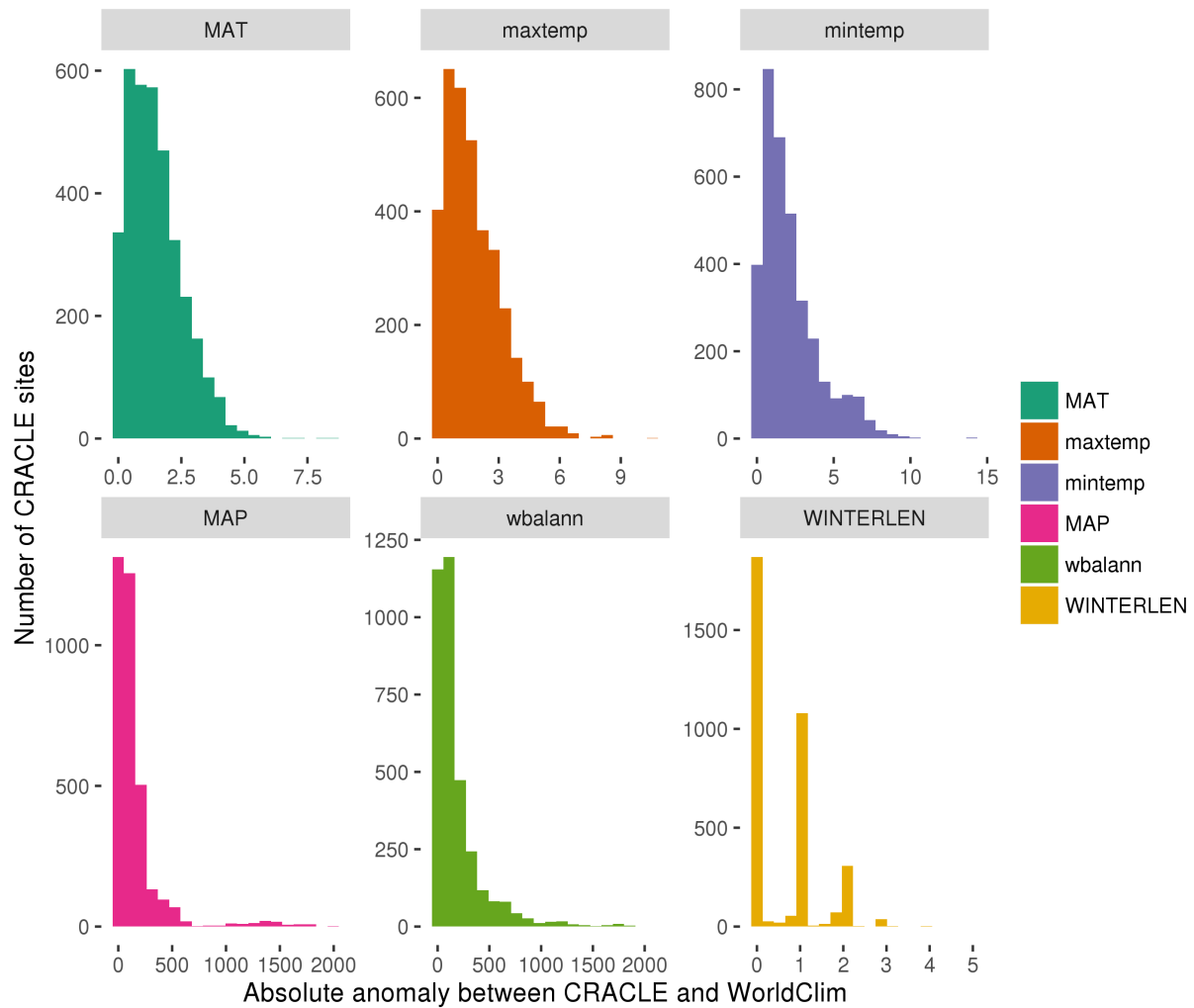
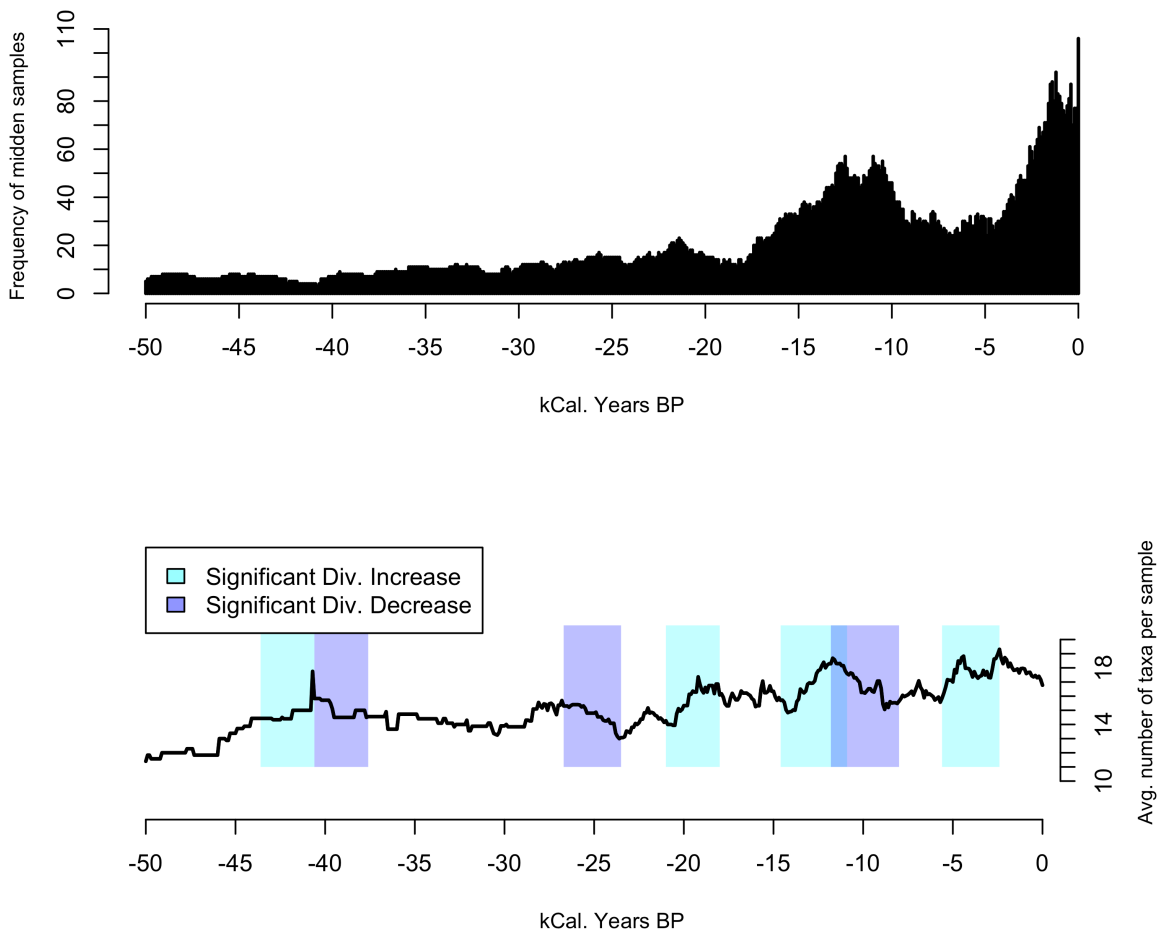


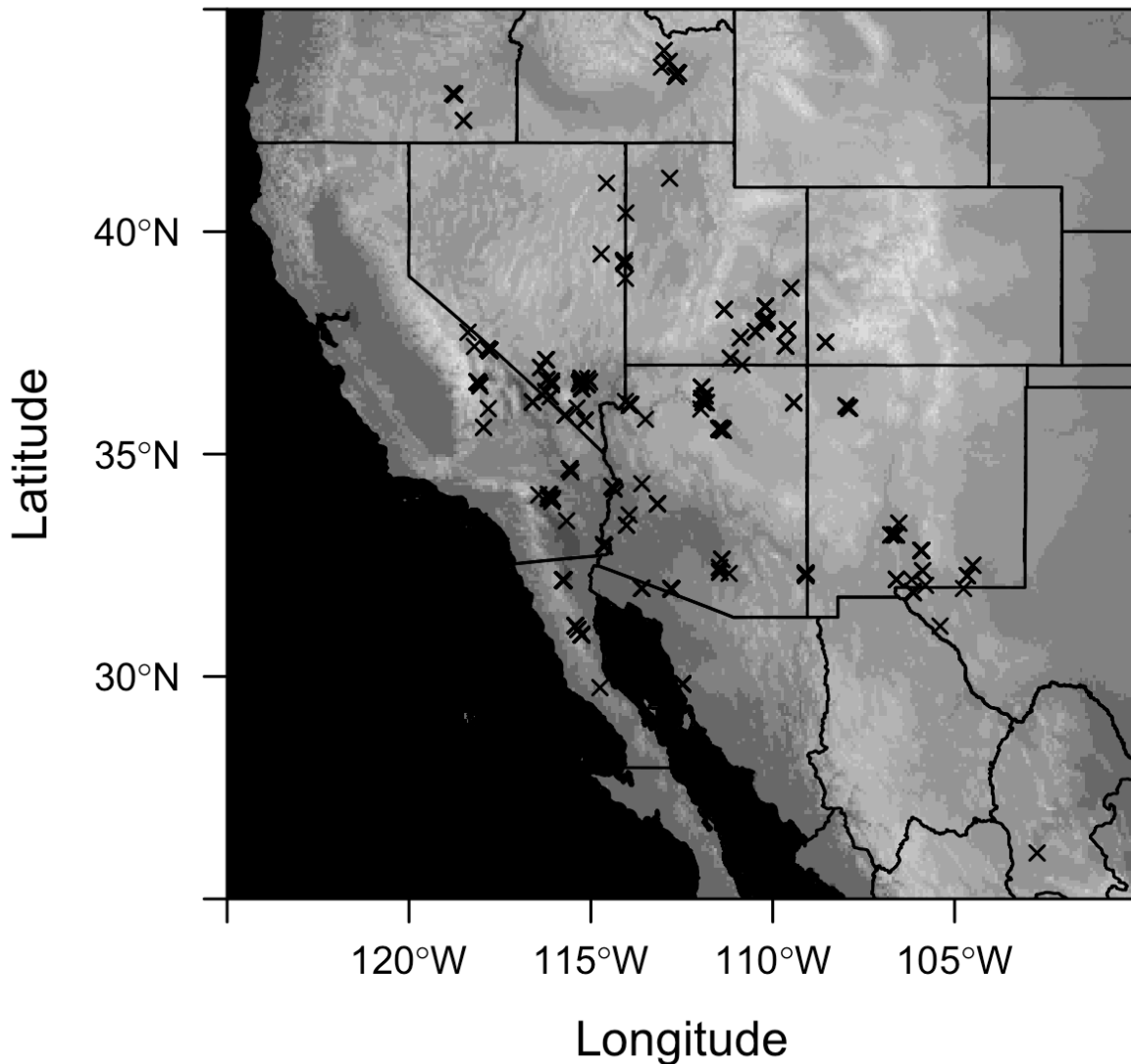
## SUPPLEMENTARY FIGURES



**Figure S1. Modern validation CRACLE Anomalies.** Climate estimation anomalies for 3,493 modern vegetation surveys across western North America. Survey data are harvested from the Botanical Information and Ecology Network (BIEN — <http://bien.nceas.ucsb.edu/bien/>). Modern validation code and sample data is available at [https://github.com/rsh249/cracle\\_examples/tree/master/BIEN](https://github.com/rsh249/cracle_examples/tree/master/BIEN).



**Figure S2. Midden count and mean taxon diversity timeline.** The 646 midden samples included in this analysis are all dated and with 10 or more taxa identified at least to the genus. The distribution of these middens through time (A) is not uniform and is biased towards the end of the Pleistocene and the last 4,000 years. Taxonomic diversity (B) is also variable through time. Significant changes in the average number of taxa per sample were found by taking 100,000 samples of the endpoint-change across random 3,000 year intervals. Intervals with rates of change outside of the middle 95% were considered significant and are highlighted. Increases in taxonomic diversity occur at 43kya, 21kya, 14kya, and 6kya. Decreases in diversity occur at 41kya, 27kya, and 12kya.



**Figure S3. Geographic distribution of 474 packrat midden fossil localities used for CRACLE paleoclimate proxy.** All data retrieved from <https://geochange.er.usgs.gov/midden/>. Closely clustered sites, or serial sampling of the same locality are not differentiated in this figure. For site locality details and references see Supplementary material Appendix 2. Maps were generated with R version 3.3.2 (R Core Team, 2016) and associated geospatial libraries *raster* version 2.5-8 (Hijmans, 2016) and *rasterVis* version 0.41 (Lamigueiro, 2016). Background shaded map shows topography of the study region and is derived from 2.5 arcminute altitude grids from the Worldclim v1.4 data repository ([http://biogeo.ucdavis.edu/data/climate/worldclim/1\\_4/grid/cur/alt\\_2-5m\\_bil.zip](http://biogeo.ucdavis.edu/data/climate/worldclim/1_4/grid/cur/alt_2-5m_bil.zip)). Geopolitical boundaries were obtained from the Global Administrative Areas database (GADM; <http://www.gadm.org/>).

Table S1: CRACLE performance parameters

Variable	Mean Anomaly	Mean Absolute Anomaly	Median Absolute Anomaly	RMSE	Pearson Correlation Coefficient	Spearman's Rank Correlation Coefficient	UNITS
MAT	1.005	1.477	1.302	1.828	0.939	0.931	Celcius
maxtemp	0.24	1.764	1.466	2.242	0.896	0.911	Celcius
mintemp	0.987	2.149	1.635	2.844	0.849	0.801	Celcius
MAP	99.055	149.56	79.193	287.323	0.519	0.642	Millimeters
wbalann	101.541	181.073	95.909	305.904	0.737	0.812	Millimeters
WINTERLEN	-0.313	0.597	0.052	0.939	0.89	0.918	Months