

Supplement

Figure S1. Anomalies in annual precipitation of 2014 (a) and 2015 (b) in Oregon and Washington, USA. The study sites are sagebrush-steppe (US-Bsg) in the high desert of Eastern Oregon, young ponderosa pine (US-Me6) and mature ponderosa pine (US-Me2) in the semi-arid Great Basin of Central Oregon, and Douglas-fir (US-MRf) in the mesic ecoregion of Southwestern Washington. Anomalies in precipitation were calculated as deviations from the 30-year normal precipitation (1981-2010) versus annual precipitation. The 30-year norm was calculated using data from the Parameter–Elevation Regressions on Independent Slopes Model (PRISM Climate Group, Oregon State University, <http://prism.oregonstate.edu>).

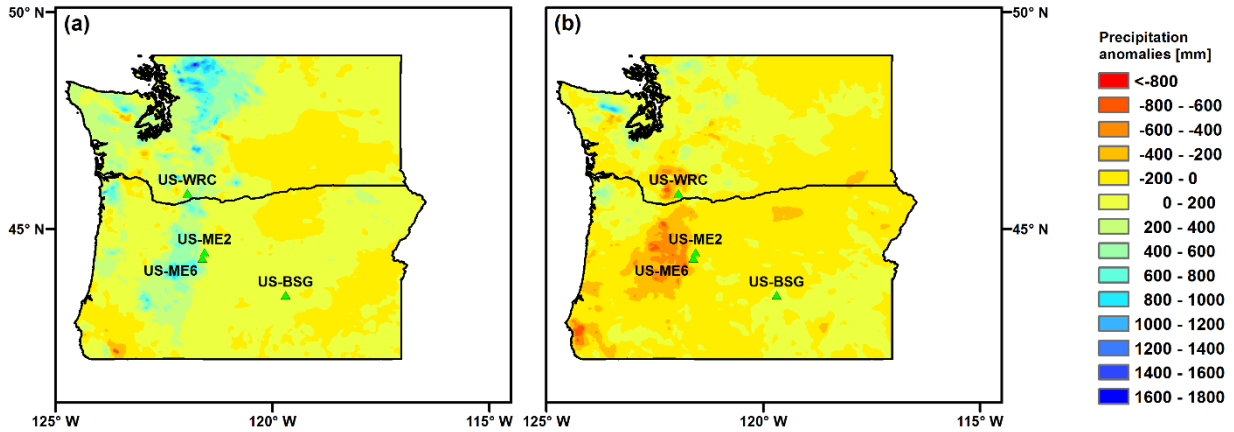


Figure S2. Frequency distribution and probability density of the monthly anomaly in air temperature (T_{air}) and vapor pressure deficit (VPD) at mature ponderosa pine (MP) and Douglas-fir (DF). Parameter–Elevation Regressions on Independent Slopes Model (PRISM) data were used from 1981-2010 for frequency distribution and probability density (gray bar and line). Black dots indicate the monthly anomaly in June denoted by the corresponding year.

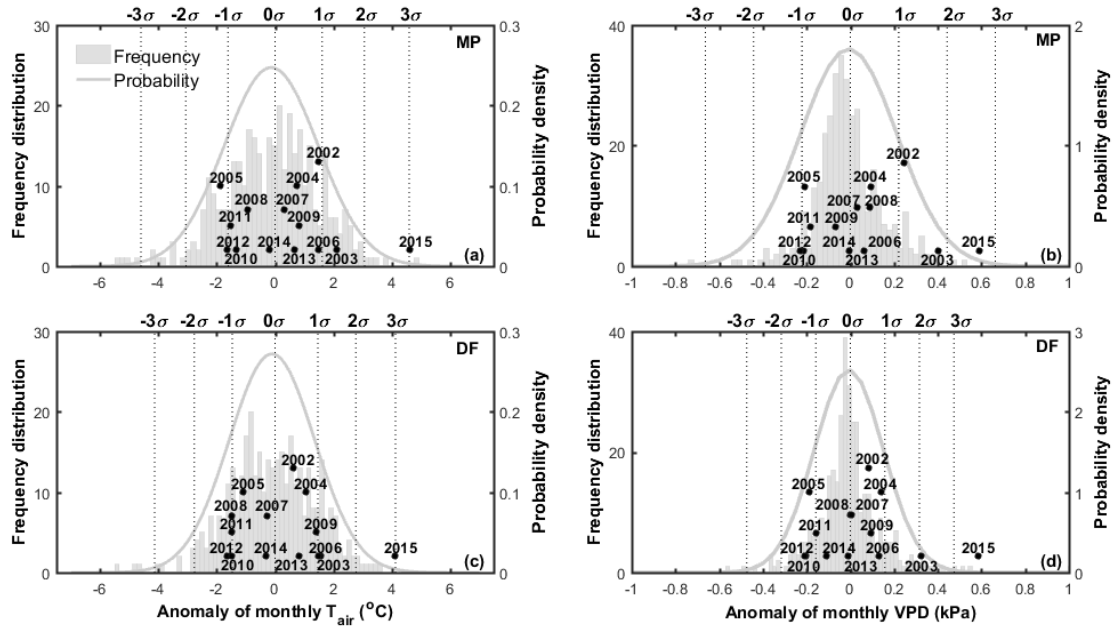


Figure S3. Monthly anomalies in (A) precipitation (P), (B) air temperature (T_{air}), and (C) vapor pressure deficit (VPD) in June 2014 and 2015 at the sagebrush-steppe (SB), young ponderosa pine (YP), mature ponderosa pine (MP), and Douglas-fir (DF) sites.

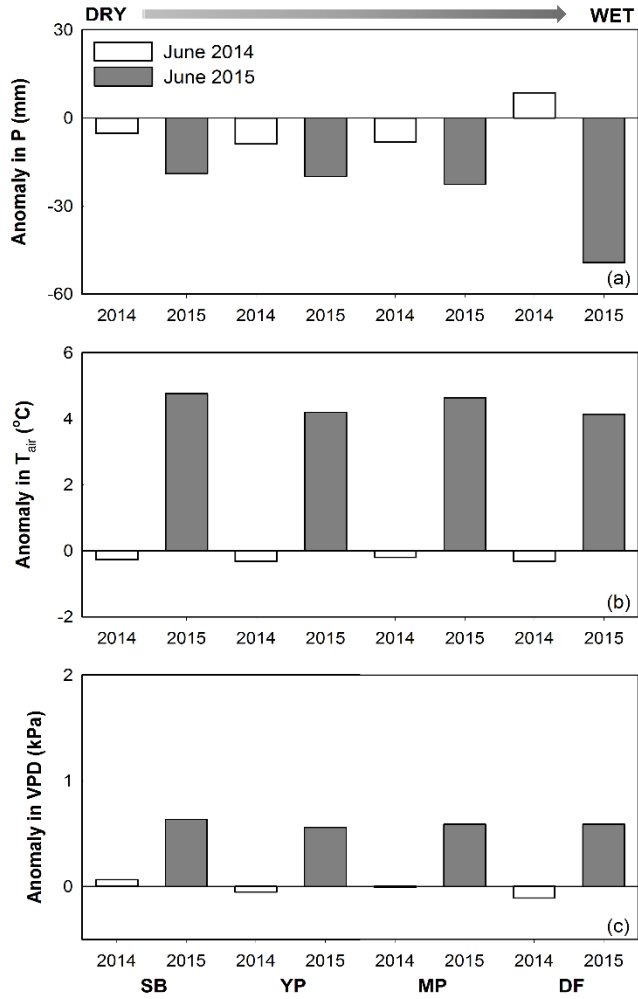


Figure S4. Monthly time-series of the standardized precipitation evapotranspiration index (SPEI) at (A) sagebrush-steppe (SB), (B) young ponderosa pine (YP), (C) mature ponderosa pine (MP), and (D) Douglas-fir (DF) sites. Positive values (gray) denote water surplus, whereas negative values (black) denote water deficit.

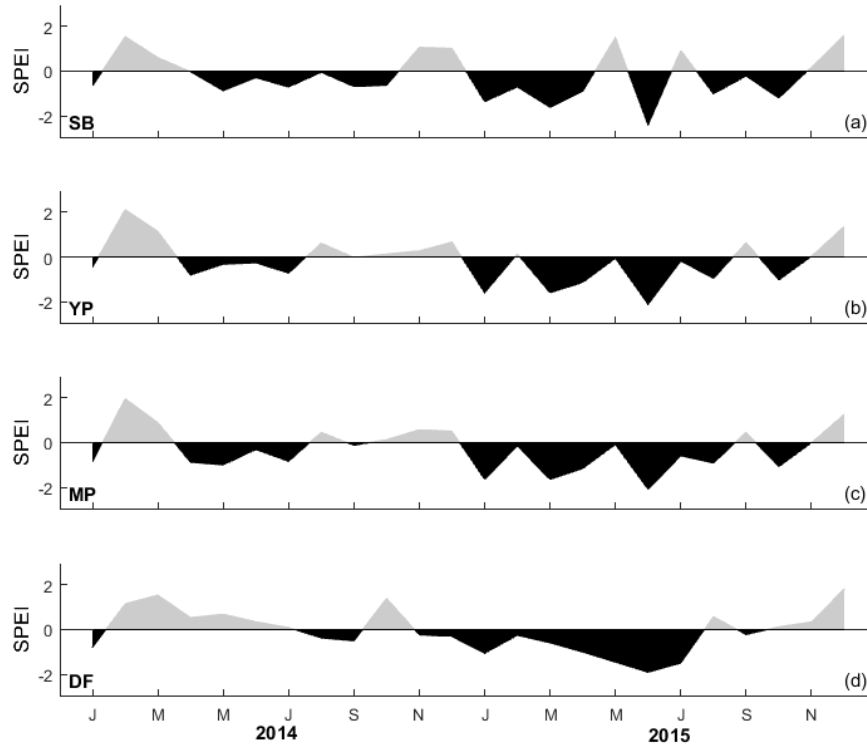


Figure S5. Daily soil moisture content at different depths from June to October in 2014 and 2015 at the sagebrush-steppe (SB), young ponderosa pine (YP), mature ponderosa pine (MP), and Douglas-fir (DF) sites.

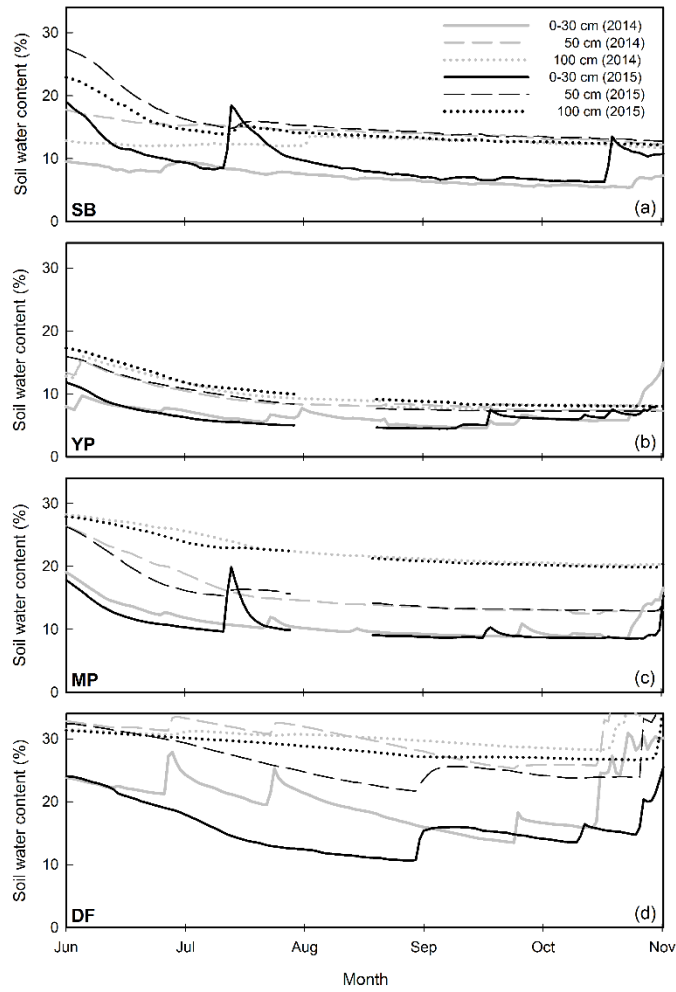


Table S1. Linear regression results (coefficient of determination and p-value) at the sagebrush-steppe (SB), young ponderosa pine (YP), mature ponderosa pine (MP), and Douglas-fir (DF) sites. The listed variables are air temperature (T_{air}), vapor pressure deficit (VPD), and soil water content (SWC) at 0-30 cm, 50 cm, and 100 cm as predictors, and net ecosystem production (NEP), ecosystem respiration (RE), and gross primary production (GPP), latent heat flux (λE), sensible heat flux (H), and the Bowen ratio (β) as response variables. Bold fonts indicate a significant correlation between the predictor and response variables.

Predictor	Response	2014				2015			
		SB	YP	MP	DF	SB	YP	MP	DF
T_{air}	λE	0.1	0.1	0.1	0.2*	0.2*	<0.1	0.1	0.5***
	H	0.3*	0.1	0.1	0.3**	<0.1	0.3**	0.2*	0.1
	β	0.1	0.2	0.3**	<0.1	0.3**	0.3**	0.4***	0.1
	NEP	0.2	0.6***	0.3**	0.5***	0.5**	0.8***	0.7***	0.8***
	RE	0.1	0.7***	0.4***	0.9***	0.5***	0.3**	0.7***	1.0***
	GPP	0.1	0.4**	0.1	0.2*	0.6***	0.2	0.1	0.6***
VPD	λE	0.1	0.1	0.1	0.2*	0.2*	<0.1	0.2	0.5***
	H	0.4*	0.1	0.1	0.4**	<0.1	0.3**	0.2*	0.1
	β	0.2	0.1	0.2	<0.1	0.3**	0.2**	0.4***	0.1
	NEP	0.3	0.4**	0.3**	0.5***	0.4**	0.7***	0.4***	0.7***
	RE	0.3	0.5***	0.2*	0.9***	0.5***	0.3**	0.6***	0.9***
	GPP	0.2	0.3**	0.1	0.2*	0.6***	0.2	0.1	0.5***
SWC (0-30 cm)	λE	0.3**	0.1	<0.1	0.3*	0.4***	0.2*	0.1	0.3*
	H	0.1	0.1	0.1	0.1	0.2	0.1	0.1	<0.1
	β	0.2	0.1	0.1	0.7***	0.6***	0.1	0.1	0.1
	NEP	0.2*	0.1	0.1	<0.1	0.1	0.1	<0.1	0.1
	RE	0.1	0.1	<0.1	<0.1	0.8***	0.1	0.1	0.2*
	GPP	0.2*	0.1	0.1	<0.1	0.3**	0.4***	<0.1	0.1
SWC (50 cm)	λE	0.1	<0.1	<0.1	<0.1	0.6***	0.2*	<0.1	0.3**
	H	0.1	0.1	0.1	0.1	0.1	0.1	0.1	<0.1
	β	0.1	<0.1	0.1	0.5***	0.7***	0.1	0.1	<0.1
	NEP	0.5***	<0.1	0.1	<0.1	0.1	0.1	0.1	0.1
	RE	0.2*	0.1	<0.1	<0.1	0.6***	0.2*	0.1	0.2*
	GPP	0.5***	<0.1	0.1	<0.1	0.3**	0.5***	<0.1	0.1
SWC (100 cm)	λE	0.1	<0.1	<0.1	0.3**	0.6***	0.2*	<0.1	0.3**
	H	<0.1	0.1	0.1	0.5***	0.1	0.1	0.1	<0.1
	β	0.1	0.1	0.1	<0.1	0.7***	<0.1	0.1	<0.1
	NEP	0.5***	0.1	0.1	<0.1	0.1	0.1	0.1	0.1
	RE	0.2*	<0.1	0.1	0.1	0.6***	0.2	0.1	0.2**
	GPP	0.5***	0.1	0.1	<0.1	0.3**	0.6***	<0.1	<0.1

* significant at $p < 0.05$; ** significant at $p < 0.005$; *** significant at $p < 0.001$

Table S2. Monthly sum (June) and seasonal sum (May-October) of carbon fluxes at sagebrush-steppe (SB), young ponderosa pine (YP), mature ponderosa pine (MP), and Douglas-fir (DF) in June 2014 and 2015. The listed variables are net ecosystem production (NEP), ecosystem respiration (RE), and gross primary production (GPP).

		Monthly sum (g C m ⁻² mon ⁻¹)			Seasonal sum (g C m ⁻² season ⁻¹)		
		NEP	RE	GEP	NEP	RE	GEP
SB	2014	18	10	28	67	57	124
	2015	25	10	35	85	64	149
YP	2014	60	28	88	156	185	341
	2015	34	42	76	152	187	339
MP	2014	101	54	155	381	324	705
	2015	77	61	138	317	332	649
DF	2014	51	46	97	227	304	531
	2015	18	48	66	163	240	403