

Table S1. The physical and chemical properties of the soil (0-30cm) in the study site.

PH value	Soil conductivity (ms m ⁻¹)	Soil organic matter (g kg ⁻¹)	Total nitrogen (g kg ⁻¹)	Total phosphorus (g kg ⁻¹)	Total potassium (g kg ⁻¹)	Available nitrogen (mg kg ⁻¹)	Available phosphorus (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)
8.31	153	19.27	1.27	0.31	35.45	74.07	8.61	146.27

Table S2. Species composition and division of plant communities in study site. PG is perennial grasses, PF is perennial forbs, SS is semi-shrubs, AH is annual herbs.

Species name	Functional group	Photosynthesis type
<i>Stipa breviflora</i> Griseb.	PG	C ₃
<i>Stipa krylovii</i> Roshev.	PG	C ₃
<i>Leymus chinensis</i> (Trin.) Tzvel.	PG	C ₃
<i>Cleistogenes songorica</i> (Roshev.) Ohwi.	PG	C ₄
<i>Allium mongolicum</i> Regel.	PF	C ₃
<i>Convolvulus ammannii</i> Desr.	PF	C ₃
<i>Potentilla bifurca</i> L.	PF	C ₃
<i>Aster altaicus</i> Willd.	PF	C ₃
<i>Iris tectorum</i> Maxim.	PF	C ₃
<i>Astragalus galactites</i> Pall.	PF	C ₃
<i>Melissilus ruthenicus</i> (L.) Peschkova.	PF	C ₃
<i>Allium polyrhizum</i> Turcz. ex Regel.	PF	C ₃
<i>Artemisia frigida</i> Willd.	SS	C ₃
<i>Kochia prostrata</i> (L.) Schrad.	SS	C ₄
<i>Caragana microphylla</i> Lam.	S	C ₃
<i>Caragana stenophylla</i> Pojark.	S	C ₃
<i>Neopallasia pectinata</i> (Palls) Poljak.	AH	C ₃
<i>Artemisia scoparia</i> Waldst. et Kit.	AH	C ₃
<i>Chenopodium glaucum</i> L.	AH	C ₄
<i>Chenopodium aristatum</i> L.	AH	C ₄
<i>Portulaca oleracea</i> L.	AH	C ₄
<i>Salsola collina</i> Pall.	AH	C ₄

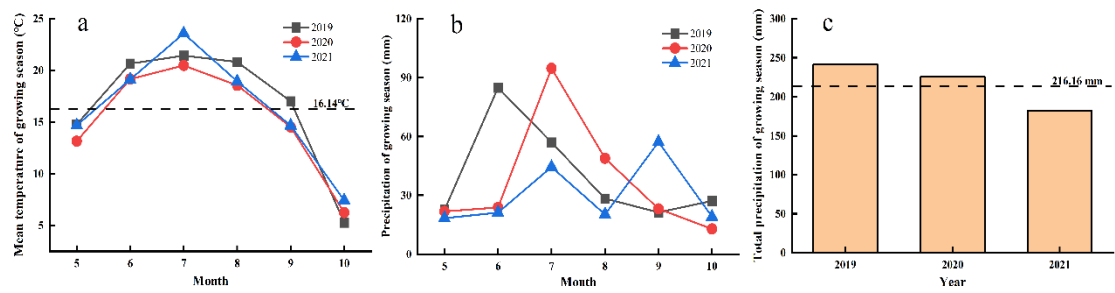


Figure S1. Mean temperature and total precipitation of the plant growing season (May to October) during the 2019-2021. The dotted line indicates the mean temperature and precipitation during the growing season of 2019-2021.

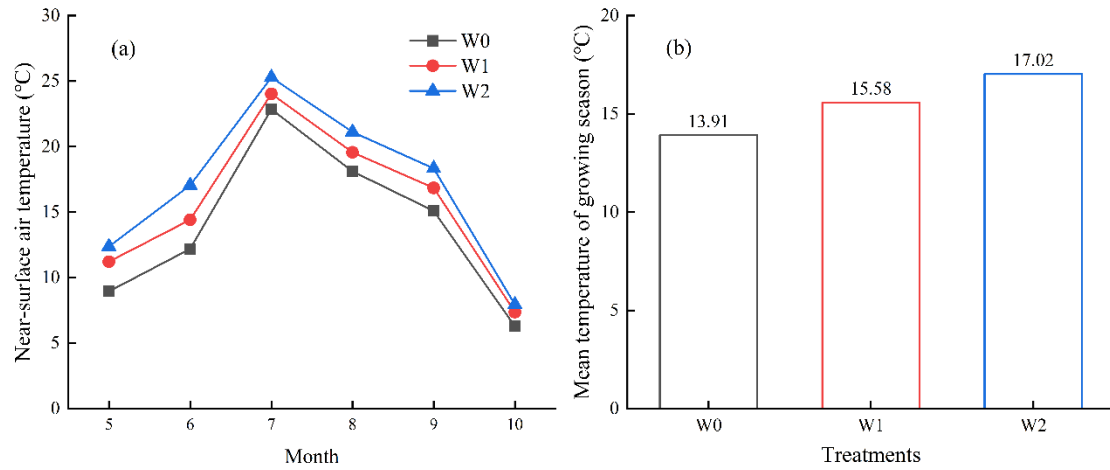


Figure S2. Effects of open top chamber (OTC) on near-surface air temperature during the growing season (May to October) in the 2021.

Calculation formulas for relative frequency, relative density, relative height, relative coverage and relative biomass of species:

In all treatments:

relative frequency (Fr) = Frequency of a species / Sum of frequency of all species

(Eq. 1)

In a treatment:

relative density (Dr) = Density of a species / Sum of density of all species

(Eq. 2)

relative height (Hr) = The average height of a species / The sum of the average heights of all species

(Eq. 3)

relative coverage (Cr) = Coverage of a species / Sum of coverage of all species

(Eq. 4)

relative biomass (Br) = Biomass of a species / Sum of biomass of all species

(Eq. 5)