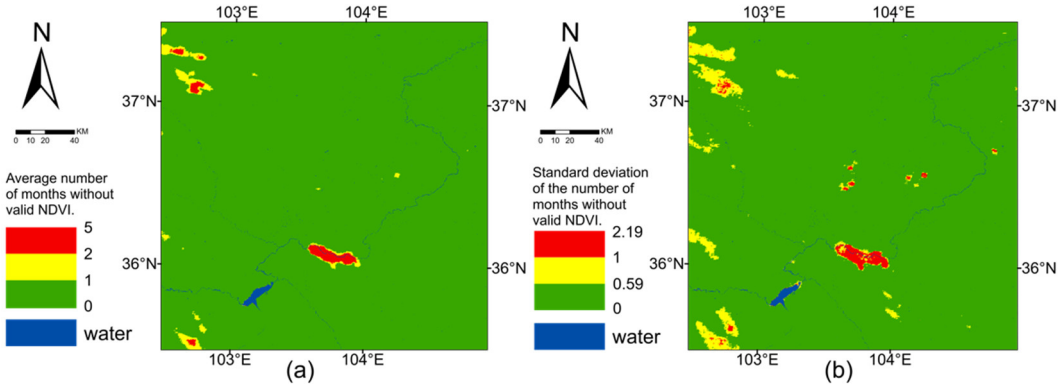

Figure S1. Availability of remote sensing observations for the study. (a) Average number of months without valid NDVI in the period from 2000 to 2019. (b) Standard deviation of the number of months without valid NDVI in the period from 2000 to 2019. In regions other than the Lanzhou basin, the monthly NDVI estimates during the growing season are almost complete.

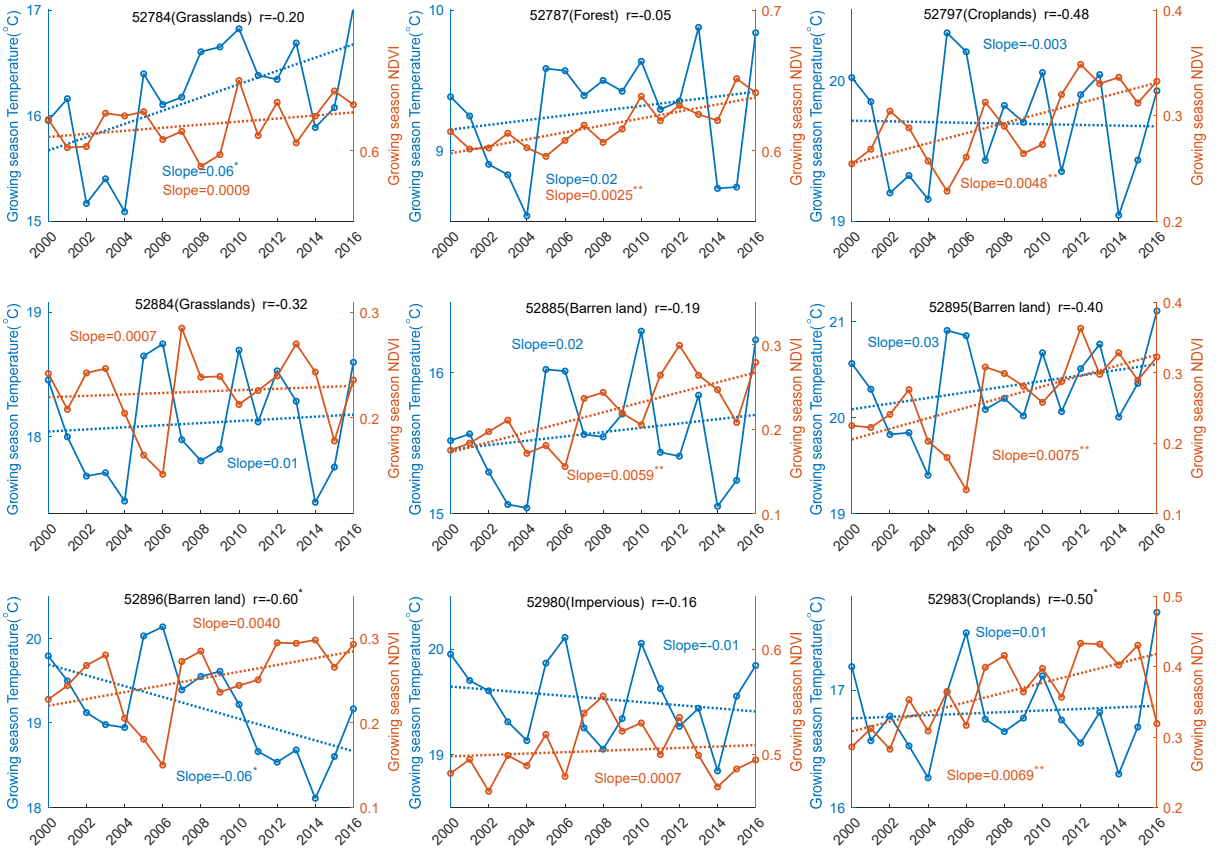

Figure S2. Inter-annual covariation of growing season NDVI and temperature at the nine meteorological stations for the years from 2000 to 2016. NDVI for a meteorological station is the average of NDVI values in the 3 by 3 kilometers square collocated with the meteorological station. One asterisk indicates the coefficient is at the 0.05 level of statistical significance, and two asterisks at the 0.01 level of statistical significance. NDVI for the nine stations all experienced positive trends, five of which were statistically significant. In comparison, one of the nine stations experienced statistically significant warming, one experienced statistically significant cooling, and the other seven stations experienced no statistically significant temperature trends. The detrended NDVI and temperature are correlated significantly at only two stations, the land cover types of which are barren land and cropland respectively. Additionally, these significant correlations are negative. This suggests that temperature plays a minor role in vegetation inter-annual dynamics in the study region, and conversely, temperature is affected by vegetation dynamics at the inter-annual scale, probably through evapotranspiration.

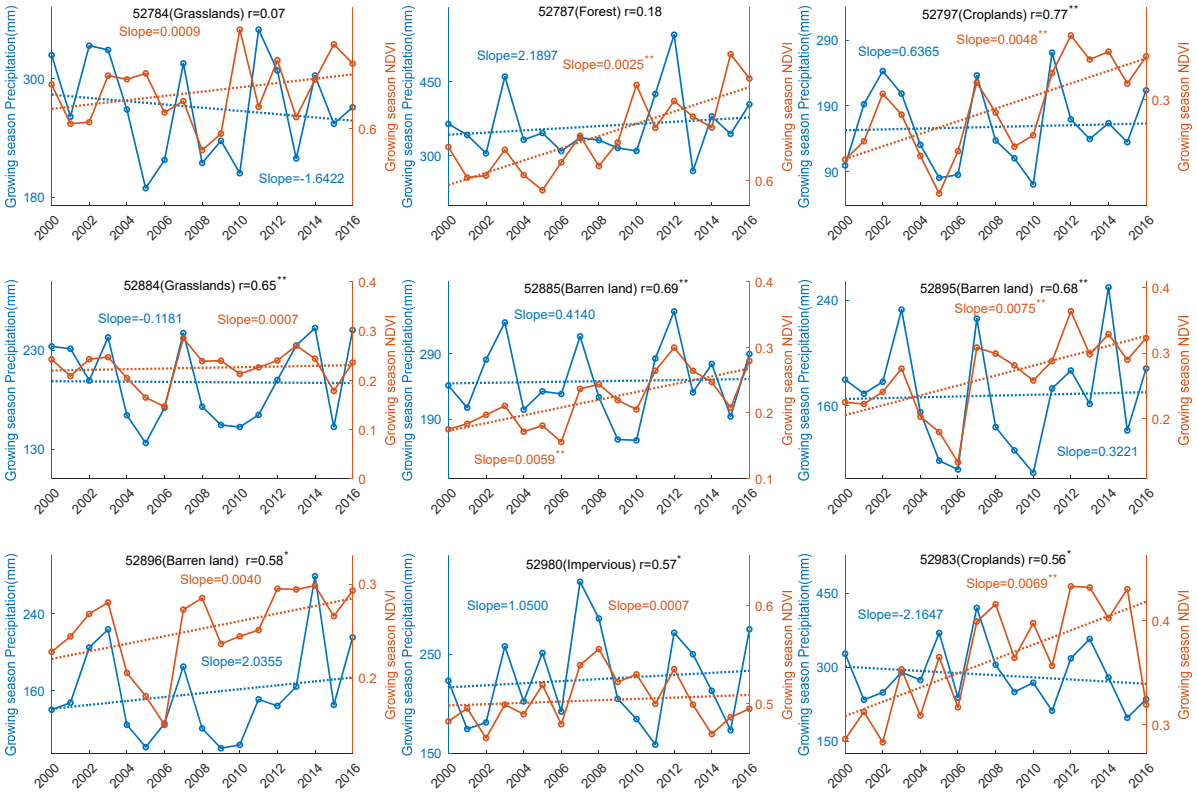

Figure S3. Inter-annual covariation of growing season NDVI and precipitation at the nine meteorological stations for the years from 2000 to 2016. NDVI for a meteorological station is the average of NDVI values in the 3 by 3 kilometers square collocated with the meteorological station. One asterisk indicates the coefficient is at the 0.05 level of statistical significance, and two asterisks at the 0.01 level of statistical significance. NDVI for the nine stations all experienced positive trends, five of which were statistically significant. In contrast, precipitation at the nine stations experienced large inter-annual variations, and hence no statistically significant trends. The detrended NDVI and precipitation are positively correlated at the nine stations, and seven of the correlation coefficients are larger than 0.5 and statistically significant. This suggests that precipitation plays a major role in the vegetation inter-annual dynamics in the study region.

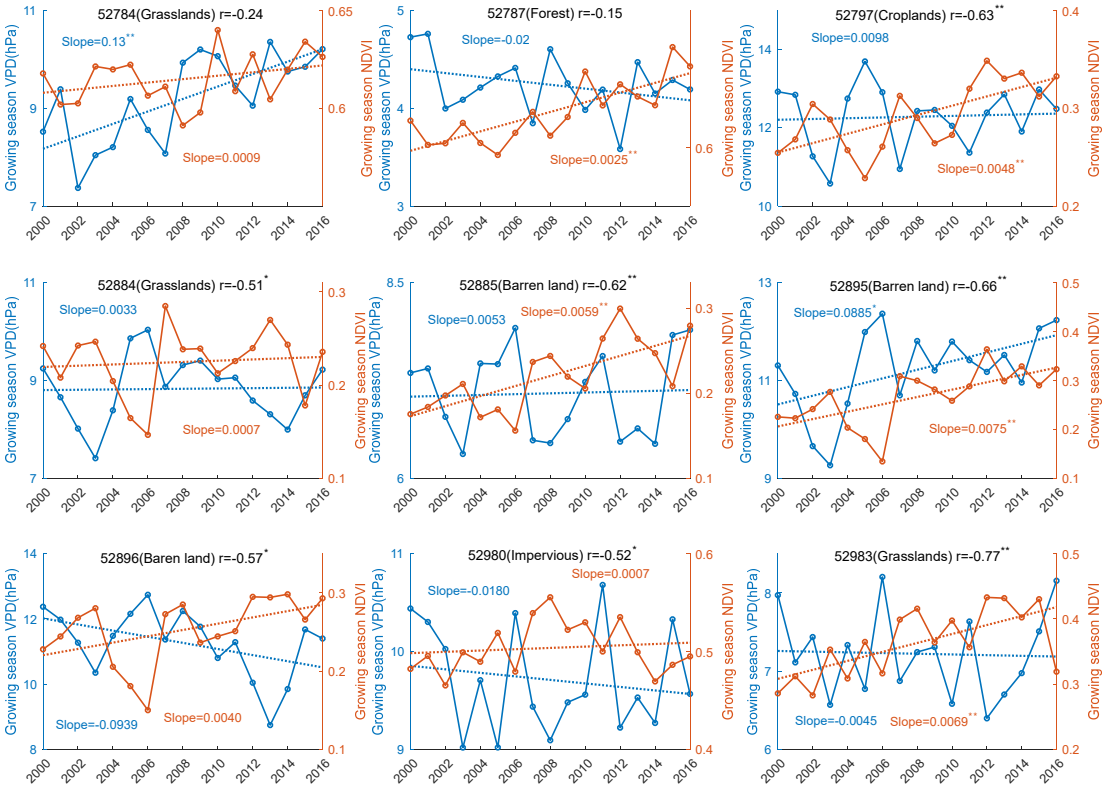

Figure S4. Inter-annual covariation of growing season NDVI and Vapor Pressure Deficit (VPD) at the nine meteorological stations for the years from 2000 to 2016. NDVI for a meteorological station is the average of NDVI values in the 3 by 3 kilometers square collocated with the meteorological station. One asterisk indicates the coefficient is at the 0.05 level of statistical significance, and two asterisks at the 0.01 level of statistical significance. NDVI for the nine stations all experienced positive trends, five of which were statistically significant. In contrast, VPD at the nine stations experienced large inter-annual variations, and VPD at only two stations experienced statistically significant trends, both of which are positive. The detrended NDVI and VPD are negatively correlated at the nine stations, and seven of the correlation coefficients are less than -0.5 and statistically significant. In addition, the magnitudes of these correlation coefficients are generally smaller than those between NDVI and precipitation. This suggests that precipitation affected vegetation inter-annual variations more than VPD did in this semi-arid region.