

Spatial-temporal changes in the distribution of *Populus euphratica* forests in the Tarim Basin and analysis of influencing factors from 1990-2020

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Abstract:

Understanding the spatiotemporal evolution patterns of *Populus euphratica* (*P. euphratica*) forests in the Tarim Basin (TB) and their influencing factors is crucial for regional ecological security and high-quality development. However, there is currently a lack of large-scale, long-term systematic monitoring. This study utilized multi-source medium and high-resolution remote sensing images Landsat series and Sentinel-2 to obtain distribution data of *P. euphratica* forests and shrublands in 14 distribution areas of the TB at five-year intervals. We monitored the spatiotemporal changes of *P. euphratica* forests and shrublands in the TB from 1990 to 2020 and analyzed the human activities and natural conditions influencing their mutual conversion. 1990–2020, *P. euphratica* forests and shrublands decreased in the first 20 years and increased in the last 10 years. *P. euphratica* forests were primarily distributed within 1.5 km (27.53%) and beyond 3 km (53.60%) of rivers, while shrublands were mainly distributed 8-10 km (34.84%) from rivers. Water and farmland significantly influenced the conversion between *P. euphratica* forests and shrublands. *P. euphratica* forests converted to shrublands more frequently within 2 km of rivers, whereas shrublands converted to *P. euphratica* forests more frequently beyond 4 km. Additionally, from 1990 to 2020, the farmland area in the *P. euphratica* distribution areas of the TB nearly tripled, with 19.79% of *P. euphratica* forests and 10.61% of shrublands converted to farmland, mainly beyond 3 km from rivers. In areas with low water conveyance frequency beyond 4 km from rivers, shrublands converted to *P. euphratica* forests more extensively. In contrast, within 1.5 km of rivers in areas with high water transfer frequency, *P. euphratica* forests converted to shrublands more extensively. Therefore, the rational utilization and allocation of water resources between trees and shrubs, as well as the reduction of farmland area, are crucial for the protection of *P. euphratica* forests.

Keywords: *Populus euphratica* forest; Spatial and temporal distribution; shrubland; farmland; water resources.