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Reconciliation of research on forest carbon sequestration and water conservation

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摘要 Carbon sequestration and water conservation are two of the key ecosystem services that forests provide for societal need to address environmental issues. Optimization of the dual services is the ultimate goal in forest management for mitigating global climate change and safeguarding terrestrial water balance. However, there are some tradeoffs between gain in forest productivity and ecosystem water balance. We conducted literature review based on published articles for learned knowledge on forest carbon fixation and hydrological regulations. Some knowledge gaps and research needs are identified by examining the inter-connections between forest carbon sequestration and water conservation. Past researches have helped gain basic understanding of the mechanisms and controls of forest carbon fixation and hydrological regulations as two separate issues. Tools and approaches are well established for quantifying and monitoring forest carbon and hydrological issues, operating at different spatial and temporal scales. There are knowledge gaps on how to design afforestation schemes facilitating enhanced ecosystem services in forest carbon sequestration and water conservation. For the top-down planning of afforestation in regions where water availability is anticipated to be problematic, the questions of how much and where to plant for given land availability, known environmental implications, and sustained regional development and livelihood need to be addressed. For local management considerations, the questions of what and how to plant prevail. Efforts are needed in joint studies of forest carbon sequestration and water conservation functionalities, specifically in relation to establishment and management of planted forests aiming for delivering regulatory ecosystem services in carbon sequestration, water conservation and other social values. We propose an integrated framework with dual consideration of carbon sequestration and water conservation in forest management for future research pursue.

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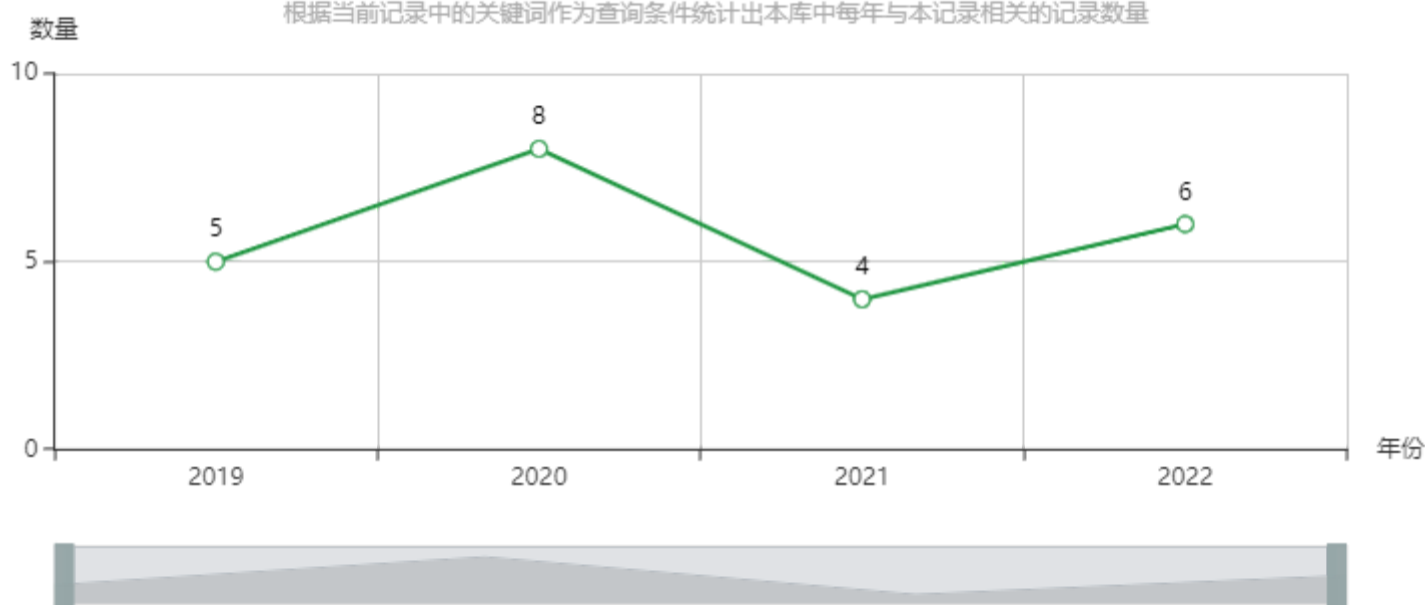
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