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Water management in mediterranean river basins: a comparison of management frameworks, physical impacts, and ecological responses

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Abstract

Rivers in mediterranean climates have been extensively modified by water management infrastructure and practices, yet patterns of development and consequent effects on freshwater ecosystems have not been compared across multiple regions. To evaluate the influence of water management on mediterranean-climate rivers, we compare the historic progression of management policies, institutions, and ecosystem impacts in the Sacramento River (California, USA), Ebro River (Spain), and Biobío River (Chile) basins. There are broad similarities in patterns of ecosystem alterations related to the extensive development of dams and water management infrastructure in the three study basins. Flow regimes have been altered by the reduction of winter peak flows and increased summer baseflows. There are also common patterns of disturbance from sediment transport alteration, water quality degradation, and declines in freshwater biodiversity. Current approaches are inadequate for addressing the formidable water management challenges in California, Spain, and Chile, yet the dramatic evolution of water policies and institutions over the past 150 years suggests that further adaptation is possible. Advances toward integrated and sustainable water management models are likely to occur through incremental change, driven by growing awareness of climate change effects and public demands for water-use efficiency and improved environmental quality.