

Learning from episodes of degradation and recovery in variable Australian rangelands

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Land-change science emphasizes the intimate linkages between the human and environmental components of land management systems. Recent theoretical developments in drylands identify a small set of key principles that can guide the understanding of these linkages. Using these principles, a detailed study of seven major degradation episodes over the past century in Australian grazed rangelands was reanalyzed to show a common set of events: (i) good climatic and economic conditions for a period, leading to local and regional social responses of increasing stocking rates, setting the preconditions for rapid environmental collapse, followed by (ii) a major drought coupled with a fall in the market making destocking financially unattractive, further exacerbating the pressure on the environment; then (iii) permanent or temporary declines in grazing productivity, depending on follow-up seasons coupled again with market and social conditions. The analysis supports recent theoretical developments but shows that the establishment of environmental knowledge that is strictly local may be insufficient on its own for sustainable management. Learning systems based in a wider community are needed that combine local knowledge, formal research, and institutional support. It also illustrates how natural variability in the state of both ecological and social systems can interact to precipitate nonequilibrium change in each other, so that planning cannot be based only on average conditions. Indeed, it is this variability in both environment and social subsystems that hinders the local learning required to prevent collapse.

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