The Role of Local Knowledge in State-and-Transition Model Development

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People who interact with rangelands on a regular basis gain practical insights about how rangelands work by living on and working with them. This local knowledge is refined over time as individuals see the way the land responds to weather, management, and disturbances. Local knowledge (LK) is a type of knowledge “integrally linked with the lives of people, always produced in dynamic interactions among humans and between humans and nature, and constantly changing.”1 LK could inform rangeland science and management to a much larger degree, but it often contributes little because the people who gain it are scattered across the landscape and there have been few attempts to systematically document and incorporate their knowledge into research or broad-scale management plans. State-and-transition models (STMs) developed for ecological sites (see Bestelmeyer et al., this issue) offer an ideal opportunity to integrate LK into durable and adaptive management tools.

STMs require information about how vegetation has changed over time in response to management and environment; however, long-term monitoring data for each ecological site are rarely available. Many recently developed STMs rely on the LK of natural resource professionals and are supported by monitoring data and research when available.2 Other long-term residents and land users often have valuable insights about rangeland dynamics and their knowledge sometimes provides the only information available. For this paper, we focus on the LK of ranchers, because they are the primary group with whom we have worked; however, we realize that other long-term residents and land users (e.g., hunters, hikers) also might hold valuable LK about rangelands.

Benefits of Using LK to Develop STMs

LK has been used in a wide range of natural resource fields from fisheries3 to nontimber forest products.4 The process of integrating LK into STMs can provide important insights about the ecosystem, engage ranchers in the process of model creation, identify critical knowledge gaps, and increase communication between ranchers, agency employees, and scientists. Despite these potential benefits, very few published studies document the incorporation of ranchers’ LK into STMs.5,6

In comparison to ecological data collection and analysis, documenting LK can be relatively fast and provide information on a range of spatial and temporal scales. A recent STM workshop suggested that although ecological field data provide site-specific information on plant communities and the ecological attributes of existing states, LK can provide valuable information about management history and environmental context, historical or uncommon states, and vegetation dynamics at different scales.7 The types of information that LK provides would be difficult to acquire without the participation of long-term managers. For instance, it would be difficult to know the management histories of particular places, information about uncommon states and states that are no longer in existence, or how historical events influenced plant communities. Ranchers also might be able to identify practical indicators of thresholds and provide information about the interactions among ecological sites. Ecological data-driven models often rely on a process of qualitative synthesis to define states and transitions suggested by quantitative analysis of field data. LK can help to interpret field data and refine the resulting states and transitions.

The process of integrating LK into STMs helps ranchers become familiar with STMs. Participating in model development can also lead ranchers to think about landscapes in new ways (e.g., applying ecological site concepts) and incorporate these insights into their management. Ranchers often are skeptical about management practices and tools developed far from their ranch, so including LK can lend credibility and relevance to the resulting STMs. Engaging ranchers in model development allows them to participate...