Brief for Resource Managers

Synthesis

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Each of these fact sheets provides a different approach for evaluating the vulnerability of sagebrush ecosystems to climate change. These approaches did not always agree in their predictions for the future of sagebrush. Species distribution models (SDMs) predicted large decreases in the extent of sagebrush ecosystems, while analyses of longitudinal data, carbon cycling and fire histories indicated more modest impacts. Currently, we do not know which approach is closer to the truth. SDMs might do a better job of capturing long-term and regional-scale patterns, or they might be biased by a number of problematic assumptions. We recently began a new project to rigorously compare the results of different modeling frameworks. If we find that predictions are qualitatively consistent across the models, we would have much greater confidence using model output to guide management decisions. For now, we caution that managers should not rely solely on SDMs to guide decisions.

Despite the contrasting results from the models, we can draw some conclusions about climate change in sagebrush steppe based on ecological principles, natural history, and historical trends. First, it is likely that increasing temperatures will stress native sagebrush steppe species in the lowest, hottest basins more than in cooler and wetter upland habitats. Second, the effect of climate change on cheatgrass and fire is critical but uncertain. Regional warming will increase the frequency of hot, dry conditions that promote fire, but droughts could dampen the fire cycle by limiting the production of fine fuels. Third, the adaptive capacity of sagebrush is unknown and research on the potential for sagebrush to adapt to climate change should be a high priority. Finally, the greatest uncertainty for any decision-making is the rate of future greenhouse gas emissions, a factor over which local land managers and regional policy-makers have little control.

Management Implications

- Increasing temperatures will stress native sagebrush steppe species in the lowest, hottest basins.
- Greatest near-term uncertainty is the influence of climate change on cheatgrass and fire.
- Greatest long-term uncertainty is the adaptive capacity of sagebrush.
- Decision-makers should not rely only on projections from species distribution models.