The impact of multiple wildfires on trajectories of change and stable states in sagebrush-steppe ecosystems

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Research has documented how sagebrush-steppe ecosystems recover following single fires, but we have little quantitative knowledge of the impact of repeated disturbances. Changes to fire regimes, such as increased frequency and severity, pose a threat to the composition, structure and environmental services of these communities.

Large wildfires burnt the Arid Lands Ecology Reserve (ALE) of the Hanford Reach National Monument in 2000 and 2007. Permanent vegetation plots on ALE were sampled in 1996, 2001 through 2004, and 2009. Plots were originally selected to represent vegetation types across a range of elevations and soils types. We analysed data from these plots to describe how the fires affected successional pathways in sagebrush-steppe, and to quantify the potential for vegetation recovery.

Cover of all plant functional groups declined immediately following the 2000 fire. Most groups exhibited some post-fire recovery, but the 2007 burn resulted in further reductions. Shrub cover showed a continual decline from 1996 values. Species richness increased slightly from 1996 through 2009, largely due to increases in perennial native forbs. Pre-fire vegetation classifications successfully distinguished between communities in 2009, but pre- and post-fire composition was also strongly influenced by elevation and soil type. Fire effects were scale dependent: repeated fires accentuated differences between broad elevational groups, but plots within these groups became more similar to one another. In 2009, low elevation sites were strongly associated with invasive annuals, though *Bromus tectorum* occurred in nearly all plots. Plot trajectories of change suggest that successive fires moved plots increasingly far from their
state in 1996.

Initial results suggest that repeated fires produce fundamental and cumulative changes in communities. These changes may have resulted in communities crossing thresholds that prevent them from returning to their pre-fire composition without significant restoration efforts. We will return to ALE in 2010 to continue studying post-fire vegetation dynamics.

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