Title: Future scenarios of land change based on empirical data and demographic trends

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ABSTRACT (300 words max)

Changes in land use and land cover (LULC) have important and fundamental interactions with the global climate system. Top-down global scale projections of land use change have been an important component of climate change research, however, their utility at local to regional scales is often limited. The goal of this study was to develop an approach for projecting changes in LULC based on land use histories and demographic trends. We developed a set of stochastic, empirically-based projections of LULC change for the state of California, USA, for the period 2001-2100. Land-use histories and demographic trends were used to project a "business-as-usual" (BAU) scenario and three population growth scenarios. For the BAU scenario, we projected developed lands would more than double by 2100. When combined with cultivated areas, we projected a 28% increase in anthropogenic land use by 2100. As a result, natural lands were projected to decline at a rate of 139 km2 yr-1; grasslands experienced the largest net decline, followed by shrublands and forests. The amount of cultivated land was projected to decline by approximately 10%, however the relatively modest change masked large shifts between annual and perennial crop types. Under the three population scenarios, developed lands were projected to increase 40-90% by 2100. Our results suggest that when compared to the BAU projection, scenarios based on demographic trends may underestimate future changes in LULC. Furthermore, regardless of scenario, the spatial pattern of LULC change was likely to have the greatest negative impacts on rangeland ecosystems.

Keywords: land use, urbanization, California, projections, LUCAS model

HIGHLIGHTS

- We developed a spatially explicit empirical model of land use and cover change based on land use histories and demographic trends.
- Population growth scenarios result in an increase of 40-90% in developed lands by 2100, but less than the BAU projection.
- Under all scenarios, natural lands were projected to decline in response to increased urbanization and agricultural expansion.

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