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Land Cover and Land-Use Change



Key Message 1

Agricultural fields near the Ririe Reservoir, Bonneville, Idaho

Land-Cover Changes Influence Weather and Climate

Changes in land cover continue to impact local- to global-scale weather and climate by altering the flow of energy, water, and greenhouse gases between the land and the atmosphere. Reforestation can foster localized cooling, while in urban areas, continued warming is expected to exacerbate urban heat island effects.

Key Message 2

Climate Impacts on Land and Ecosystems

Climate change affects land use and ecosystems. Climate change is expected to directly and indirectly impact land use and cover by altering disturbance patterns, species distributions, and the suitability of land for specific uses. The composition of the natural and human landscapes, and how society uses the land, affects the ability of the Nation's ecosystems to provide essential goods and services.

Executive Summary

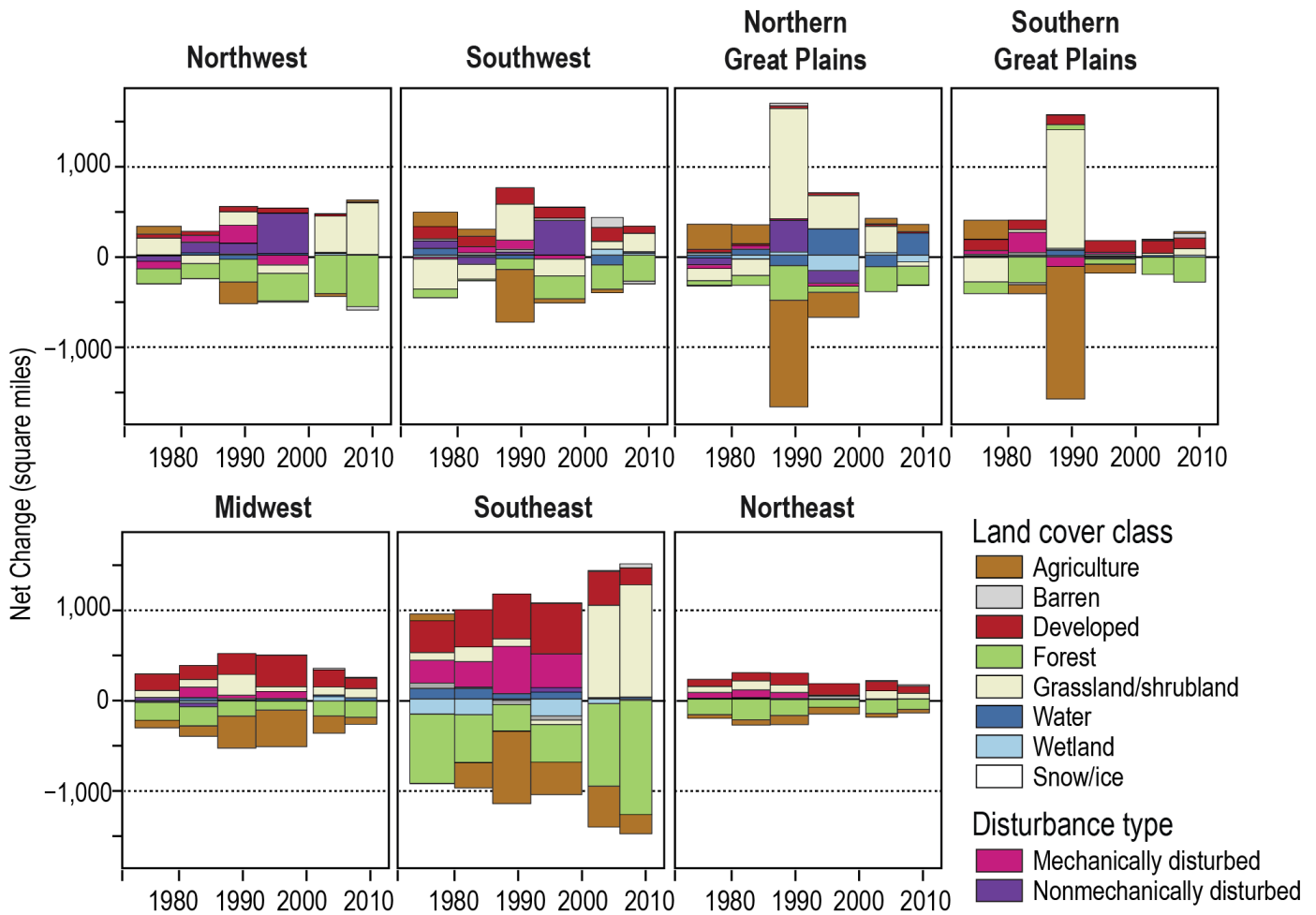
Climate can affect and be affected by changes in land cover (the physical features that cover the land such as trees or pavement) and land use (human management and activities on land, such as mining or recreation). A forest, for instance, would likely include tree cover but could also include areas of recent tree removals currently covered by open grass areas. Land cover and use are inherently coupled: changes in land-use practices can change land cover, and land cover enables specific land uses. Understanding how land cover, use, condition, and management vary in space and time is challenging.

Changes in land cover can occur in response to both human and climate drivers. For example, demand for new settlements often results in the permanent loss of natural and working lands, which can result in localized changes in weather patterns, temperature, and precipitation. Aggregated over large areas, these changes have the potential to influence Earth's climate by altering regional and global circulation patterns, changing the albedo (reflectivity) of Earth's surface, and changing the amount of carbon dioxide (CO₂) in the atmosphere. Conversely, climate change can also influence land cover, resulting in a loss of forest cover from climate-related increases in disturbances, the expansion of woody vegetation into grasslands, and the loss of beaches due to coastal erosion amplified by rises in sea level.

Land use is also changed by both human and climate drivers. Land-use decisions are traditionally based on short-term economic factors. Land-use changes are increasingly being influenced by distant forces due to the globalization of many markets. Land use can also change due to local, state, and national policies, such as programs designed to remove cultivation from highly erodible land to mitigate degradation,¹ legislation to address sea level rise in local comprehensive plans, or policies that reduce the rate of timber harvest on federal lands. Technological innovation has also influenced land-use change, with the expansion of cultivated lands from the development of irrigation technologies and, more recently, decreases in demand for agricultural land due to increases in crop productivity. The recent expansion of oil and gas extraction activities throughout large areas of the United States demonstrates how policy, economics, and technology can collectively influence and change land use and land cover.

Decisions about land use, cover, and management can help determine society's ability to mitigate and adapt to climate change.

Changes in Land Cover by Region



The figure shows the net change in land cover by class in square miles, from 1973 to 2011. Land-cover change has been highly dynamic over space, time, and sector, in response to a range of driving forces. Net change in land cover reveals the trajectory of a class over time. A dramatic example illustrated here is the large decline in agricultural lands in the two Great Plains regions beginning in the mid-1980s, which resulted in large part from the establishment of the Conservation Reserve Program. Over the same period, agriculture also declined in the Southwest region; however, the net decline was largely attributable to prolonged drought conditions, as opposed to changes in federal policy. Data for the period 1973–2000 are from Sleeter et al. (2013)² while data from 2001–2011 are from the National Land Cover Database (NLCD).³ Note: the two disturbance categories used for the 1973–2000 data were not included in the NLCD data for 2001–2011 and largely represent conversions associated with harvest activities (mechanical disturbance) and wildfire (nonmechanical disturbance). Comparable data are unavailable for the U.S. Caribbean, Alaska, and Hawaii & U.S.-Affiliated Pacific Islands regions, precluding their representation in this figure. *From Figure 5.2 (Source: USGS).*