Changes in Vegetation Carbon

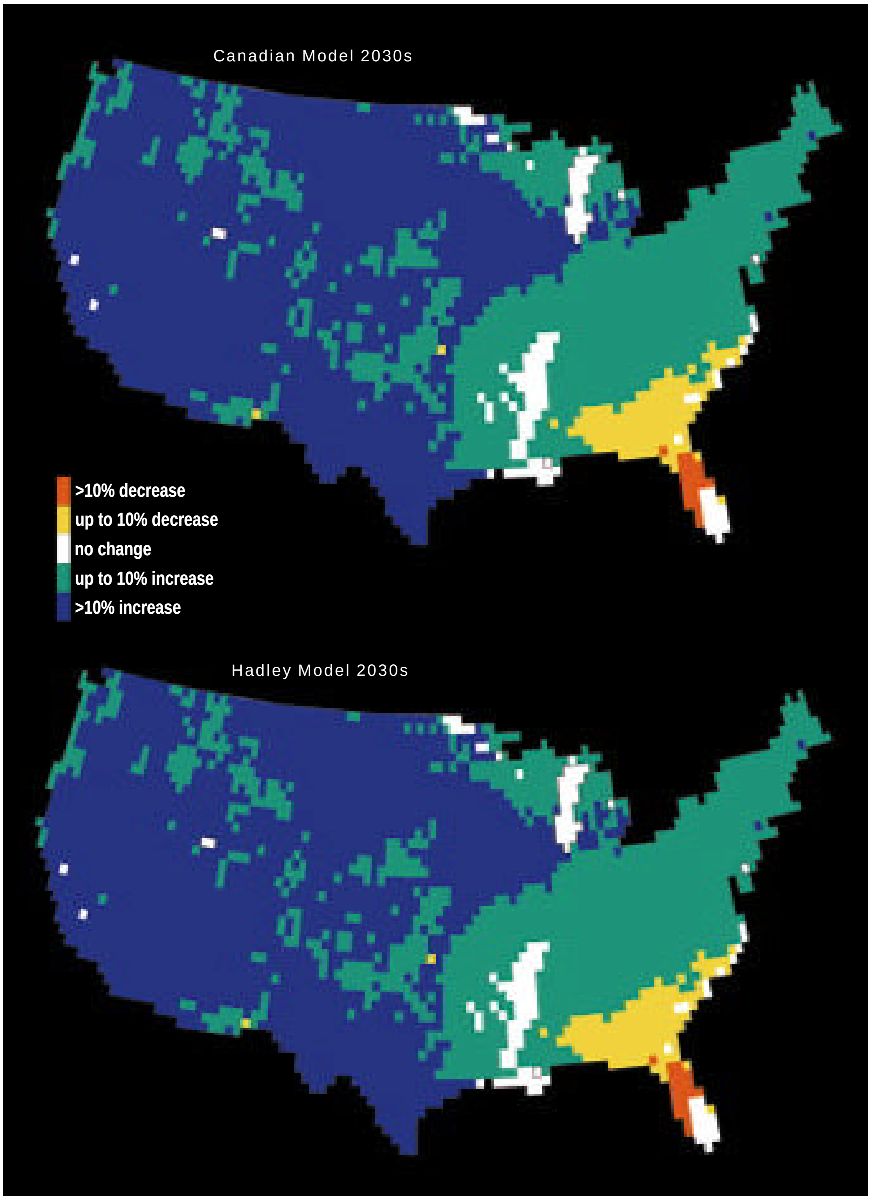
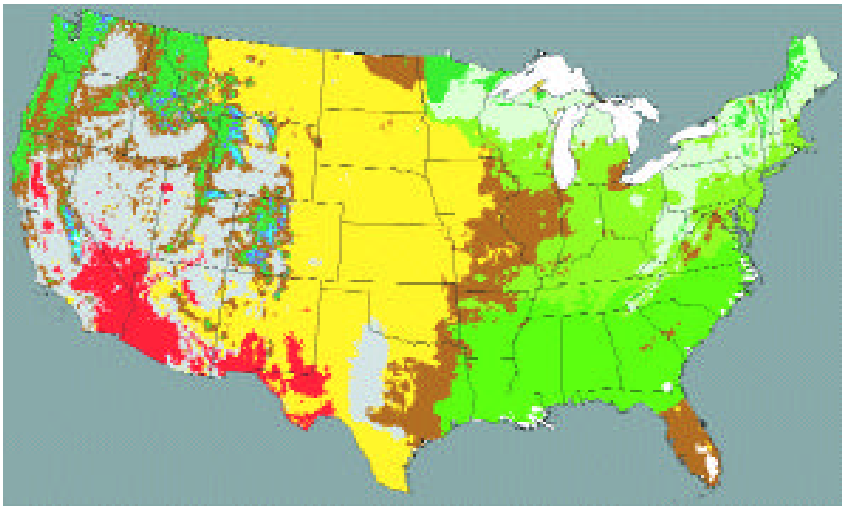


Figure 1. The maps above show projections of relative changes in vegetation carbon between 1990 and the 2030s for two climate scenarios. Under the Canadian model scenario, vegetation carbon losses of up to 20% are projected in some forested areas of the Southeast in response to warming and drying of the region by the 2030s. A carbon loss by forests is treated as an indication that they are in decline. Under the same scenario, vegetation carbon increases of up to 20% are projected in the forested areas in the West that receive substantial increases in precipitation. Output from TEM (Terrestrial Ecosystem Model) as part of the VEMAP II (Vegetation Ecosystem Modeling and Analysis Project) study.

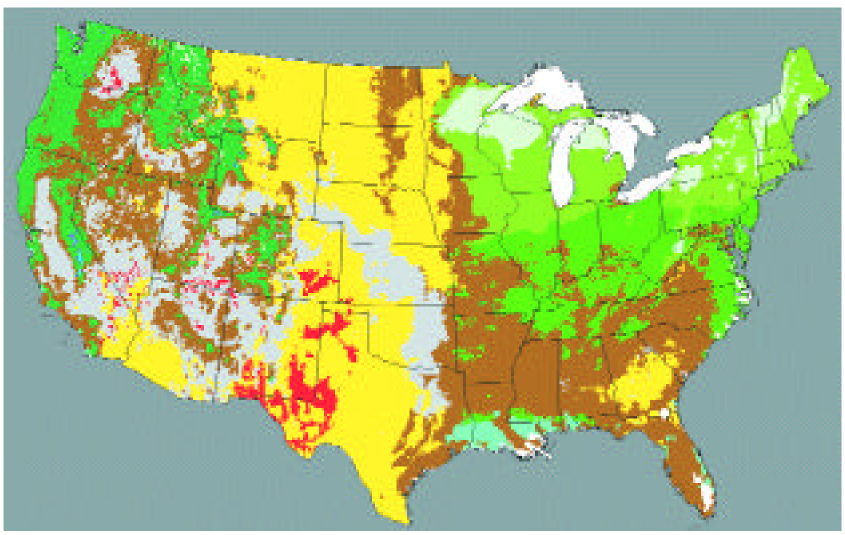
Vegetation and Biogeochemical Scenarios

Ecosystem Models

Current Ecosystems



Canadian Model



Hadley Model

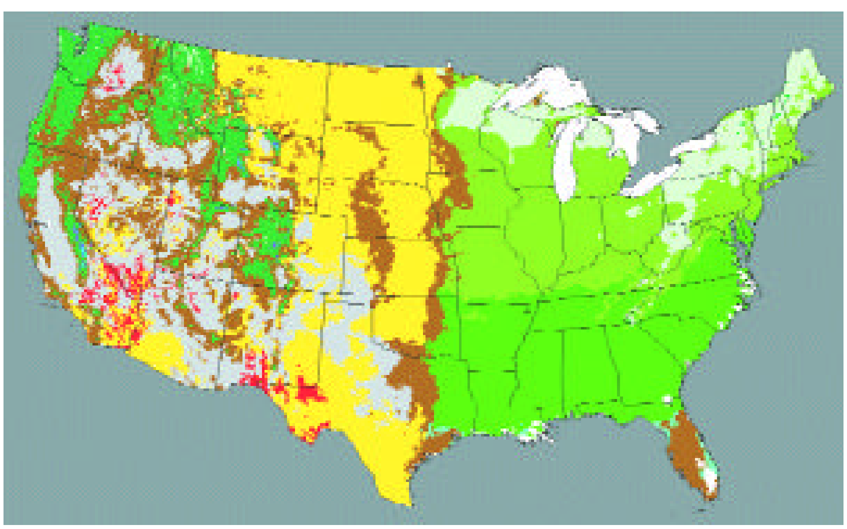


Figure 2. The models used to estimate biogeographic responses to climate change in VEMAP II include LPJ, MAPSS, and MC1. These three models predict the local dominance of various terrestrial vegetation forms based on: (1) ecophysiological constraints, which determine the broad distribution of major categories of woody plants; and (2) response limitations, which determine specific aspects of community composition, such as the competitive balance of trees and grasses. Though similar in some respects, these models simulate potential evapotranspiration and direct CO_2 effects differently, and as a result they show varying sensitivities to temperature, CO_2 levels, and other factors. Two of the model models, LPJ and MC1 have biogeochemistry modules, while the third, MAPPS, does not. For both the Hadley and Canadian climate scenarios, the biogeography models project shifts in the distribution of major vegetation types as plant species move in response to climate change. The projected changes in vegetation distribution with climate change vary from region to region. (Source: VEMAP, 1998).

LPJ, MC1 and MAPSS Estimates

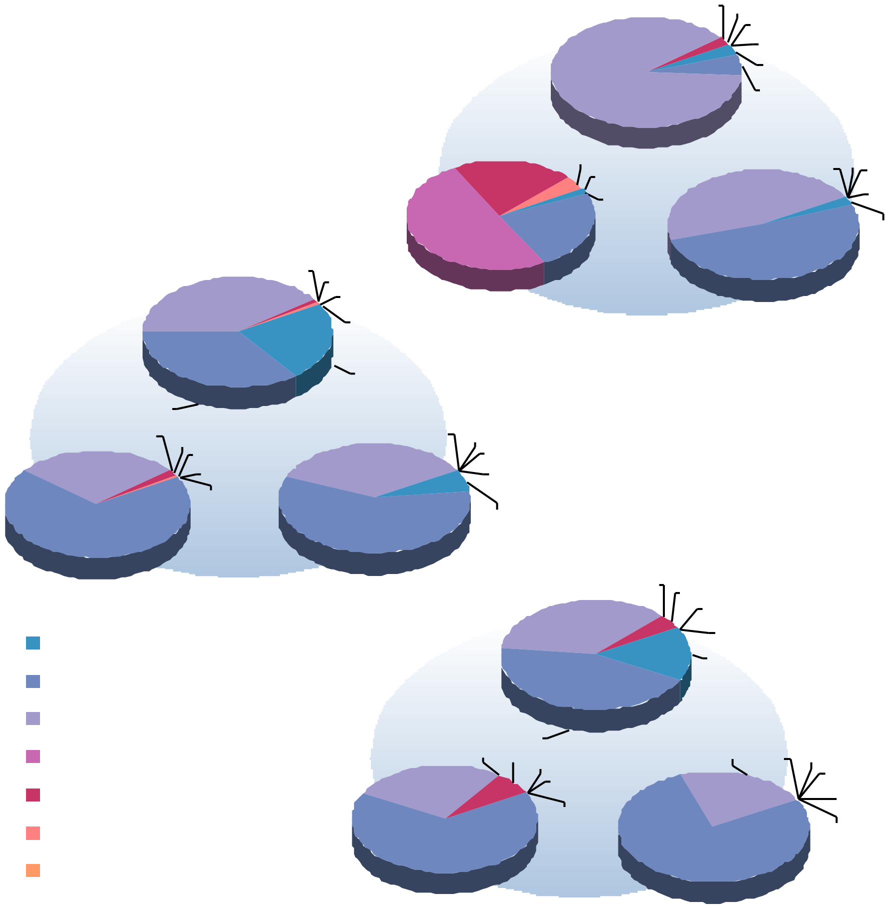


Figure 3(a) Under both simulated climates, forests remain the dominant natural vegetation, but the mix of forest types changes. For example, winter-deciduous forests expand at the expense of mixed conifer-broad-leaved forests. Under the climate simulated by the Canadian model, there is a modest increase in savannas and woodlands.

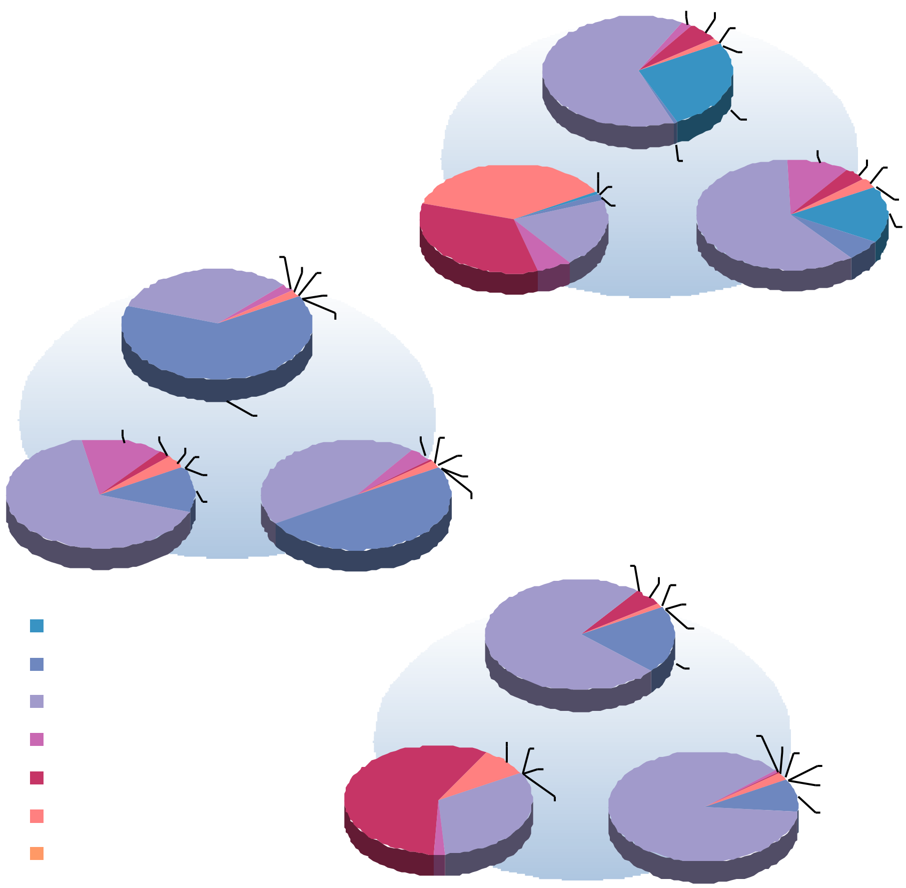


Figure 3(b) Under the climate simulated by the Hadley model, forest remains the dominant natural vegetation, but once again the mix of forest types changes. Under the climate simulated by the Canadian model, all three biogeography models show an expansion of savannas and grasslands at the expense of forests. For two of biogeography models, LPJ and MAPSS, the expansion of these non-forest ecosystems is dramatic by the end of the 21st century. Both drought and fire play an important role in the forest breakup.

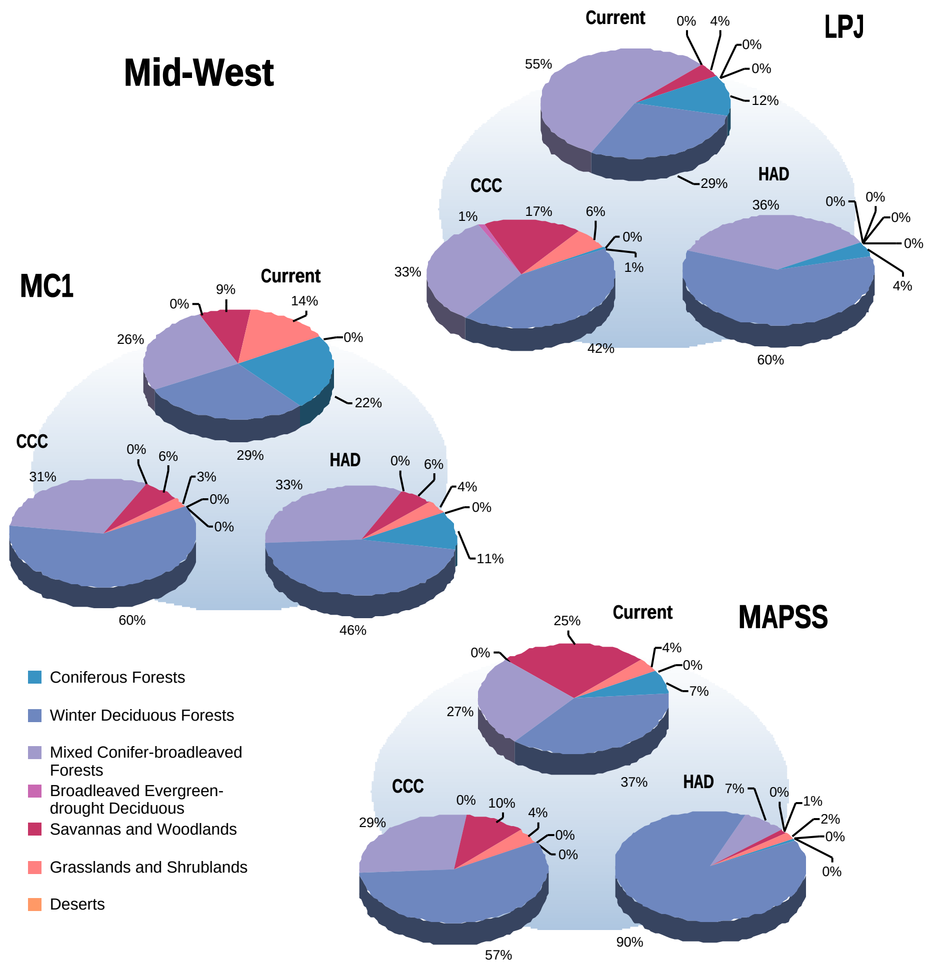


Figure 3(c) Under both simulated climates, forests remain the dominant natural vegetation, but the mix of forest types changes. One biogeography model, LBJ, simulates a modest expansion of savannas and grasslands.

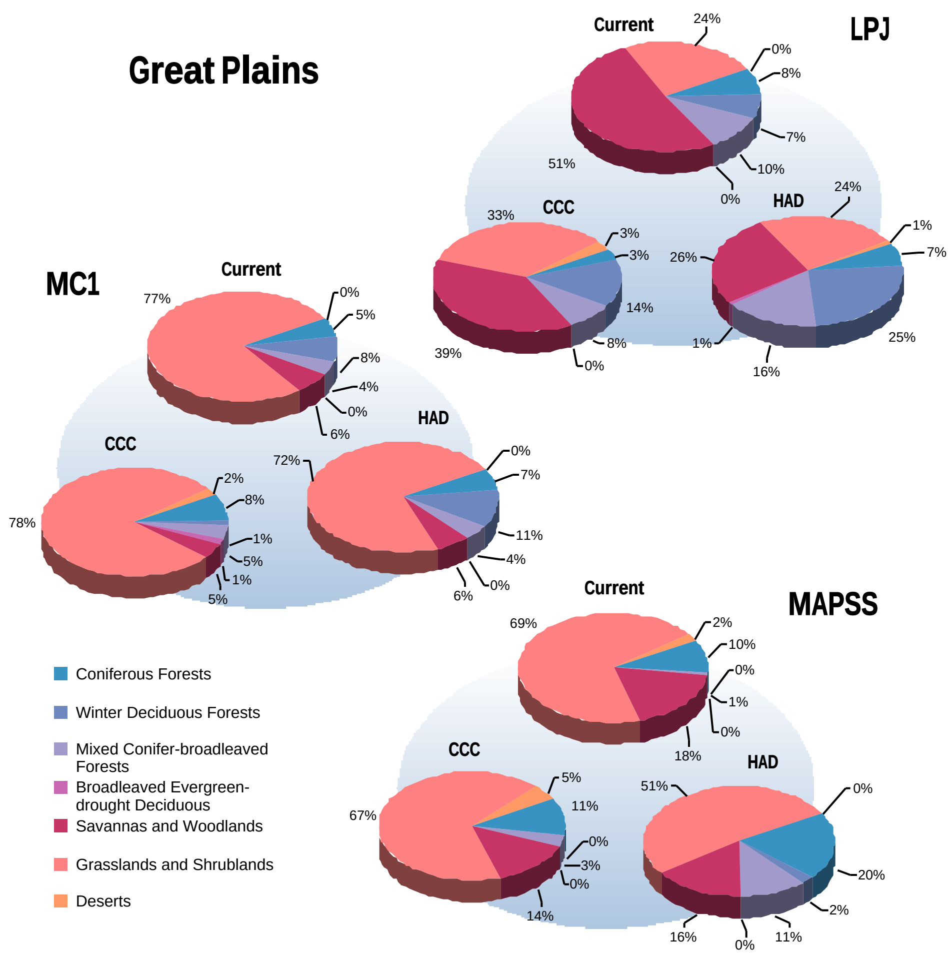


Figure 3(d) Under the climate simulated by the Hadley model, two biogeography models project an increase in woodiness in this region, while the third projects no change in woodiness. Under the climate simulated by the Canadian Model, the biogeography models project either no change in woodiness or a slight decrease.

LPJ, MC1 and MAPSS Estimates

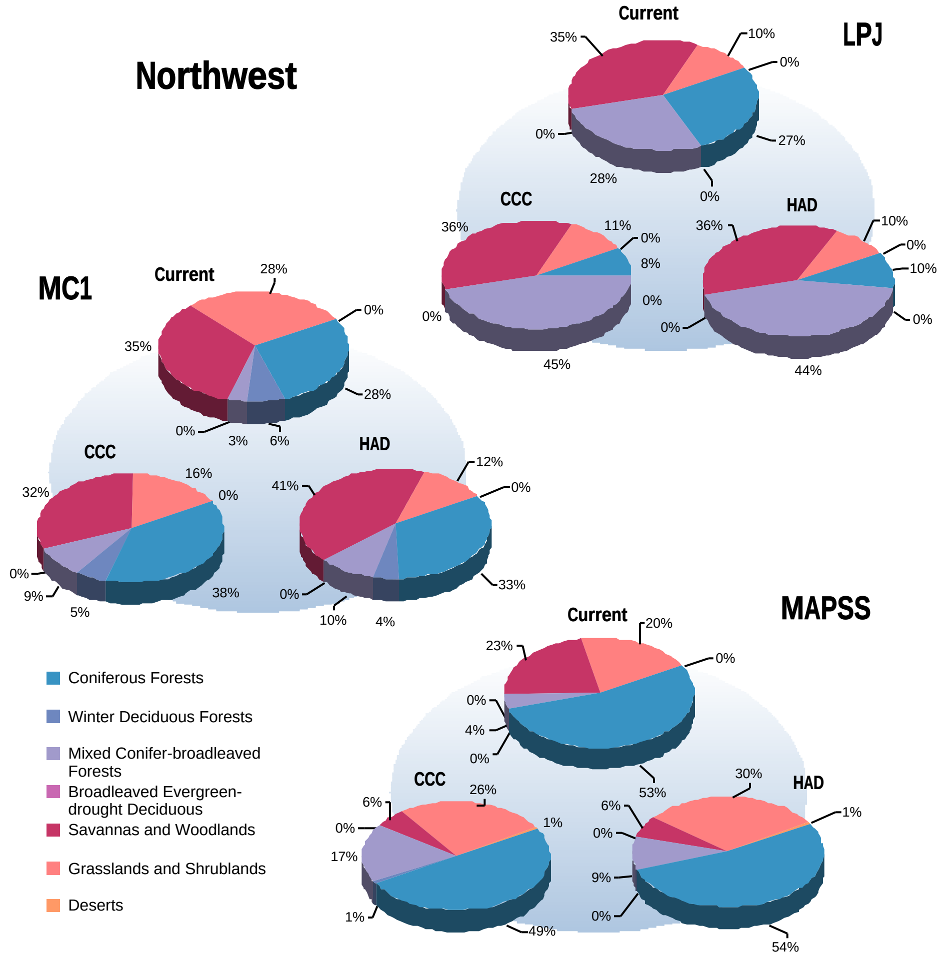


Figure 3(e): Under both simulated climates, the forest area grows slightly.

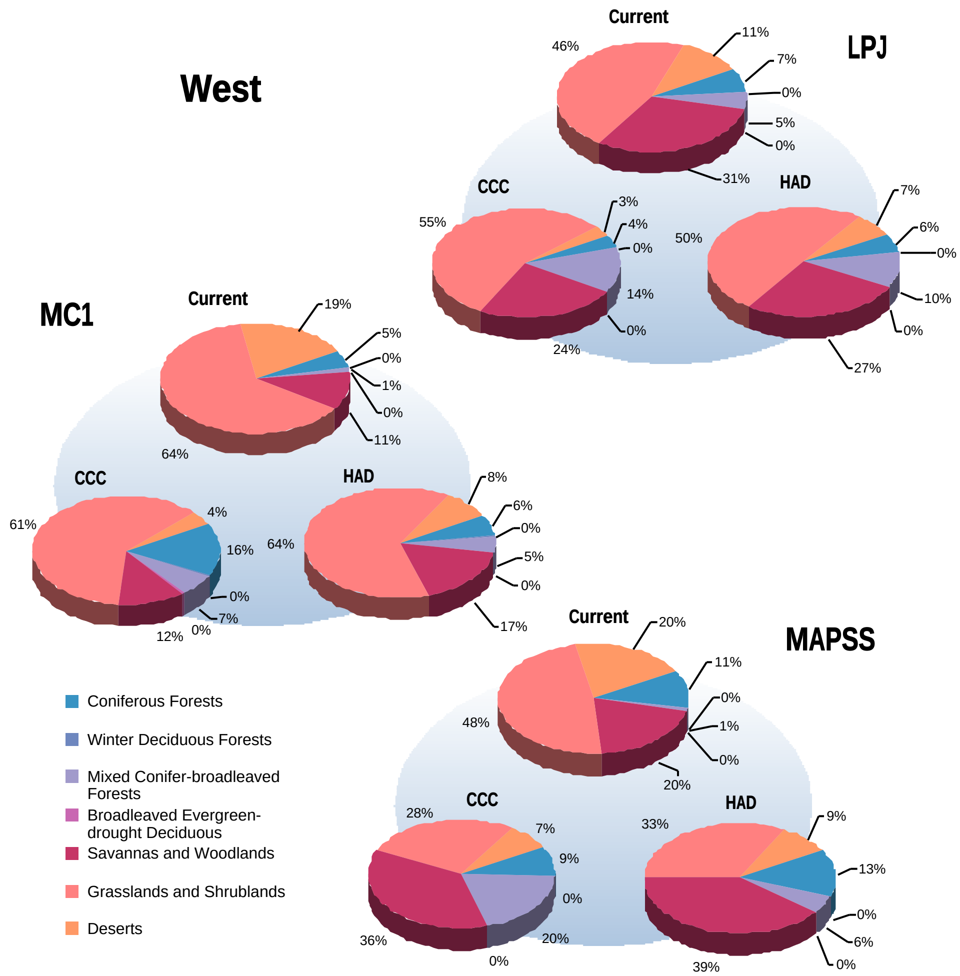


Figure 3(f). Under the climate simulated by both the Hadley and Canadian models, the area of desert ecosystems shrinks and the area of forest ecosystems grows.