

Will land-use change erode our conservation gains?

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Picture a preserve – a “last great place” (the marketing label of The Nature Conservancy), or even just a pretty good place. Conservationists identify these places and prioritize them through rigorous planning protocols¹. But how can we ensure that these places will retain their conservation value over the long haul, or even that they will continue to be the right places? The world, after all, is dynamic.

Climate change and its ecological and societal impacts are (finally!) receiving widespread attention. I’d like to focus instead on a related and arguably more urgent issue: land use and land-use change. Human land uses are the major agents of habitat loss throughout the world, and rates of land-use change are accelerating. Examples are legion. Some 4.5 million ha of wetlands disappeared in the United States between the 1950s and the 1970s, chiefly through conversion to agriculture. Urban land cover increased 348% in the Greater Yellowstone Ecosystem between 1975 and 1995. In Western Australia, some 93% of the native vegetation had been converted to agriculture by the early 1960s, leaving only scattered woodland remnants. In semiarid regions of New Mexico and Idaho, grazing and fire have passed thresholds and produced essentially irreversible changes in land cover from grassland to shrubland (or vice versa). The list goes on.

It is naïve, of course, to think that only recent land uses affect the integrity of the habitats we strive to conserve. Seemingly “natural” tropical forest in Puerto Rico bears the imprints of agricultural land uses centuries ago, and the species richness of plant communities in some French forests still reflects the effects of a brief period of agricultural land use during the Roman occupation in AD 50-250. The widespread dominance of oak and hickory in forests of the Midwestern United States likely had its origins in the activities of Native Americans, and Aborigines have used fire to shape Australian landscapes for many millennia. What we see today contains the legacies of past land uses. “Natural” is a relative term.

Understanding the effects of past land uses on natural habitats and biodiversity is useful only insofar as it helps us select the places we wish to protect and manage the places we don’t protect. What is really needed is knowledge that can help us anticipate and adjust for future land-use changes. This requires an understanding of the underlying socioeconomic and political forces that contribute to land-use change. In Eastern Europe, for example, the breakup of the former Soviet Union led almost immediately to the replacement of the extensive monocultures of collective farms by smaller, more diverse single-family farms, enhancing the heterogeneity and wildlife value of local landscapes. The recent expansion of soybean agriculture in parts of Brazil was fostered in large part by global economics and advances in agricultural technology. The current rush to embrace biofuels as energy sources is causing massive cropland conversions in the central United States and a cascading array of ripple effects as corn prices escalate. And we are now seeing shifts in the forest industry from traditional timber harvesting to the development of forest farming for fiber production using exotic or engineered tree species, accompanied by a

¹ See, for example, Groves, C. R. 2003. Drafting a conservation blueprint: A practitioner’s guide to planning for biodiversity. Island Press, Washington D. C.

movement into areas in the southern hemisphere previously used for agriculture or grazing. In the future, demographic changes such as the retirement of the baby-boom generation, technological advances such as telecommuting, and economic expansion in developing countries (witness China!) will all contribute to major shifts in land uses. Globalization means that land uses in one part of the world are increasingly influenced by factors elsewhere in the world, and those pesky thresholds in ecological responses to land-use change portend that we are likely in for some rude surprises.

My emphasis here on land-use changes is not intended to leave climate change out in the cold (so to speak). Climate change undoubtedly will influence land-cover patterns at a variety of scales. But the reverse may also be true. A “top story” on the NASA website, for example, was headlined “landcover changes may rival greenhouse gases as cause of climate change”². Clearly, consideration of either climate change or land-use change in isolation from the other provides only a partial picture of the changing context of our conservation actions. How we deal with the two, however, is likely to be quite different. Whereas considerations of climate change tend to start at the global level and work down, land use is essentially local, and the effects of land use and land-use change amplify upwards to broader scales. Consequently, while there may be some hope of dealing with climate change through broad multinational policy accords, land use is likely to remain immersed in a morass of local and idiosyncratic policies and politics, particularly in the United States.

So, will land-use change compromise conservation planning efforts if we ignore it or just pay it lip service? You bet! Think of what the surroundings of protected places will look like in 10 or 20 or 50 years. Think of what the effectiveness of conservation will be *within* those places if we ignore the surroundings. Think of the multiple ways in which conservation progress may be thwarted by the accelerating pace of economic globalization and changing land values and land uses in many of the biodiversity “hotspots,” or even the “coldspots,” of the world.

What can we do? Actually, quite a lot. Many conservation strategies are aimed at influencing land uses or lessening their impacts on biodiversity, so there is a strong foundation of experience on which to build. We could bolster some of this experience by using imagery to assess the form and magnitude of land-use changes surrounding protected areas since they were placed under conservation protection. Have they become islands? Have the connections across the landscape disappeared? But we need also to couple such assessments with analyses of the potential consequences of different scenarios of future land-use changes. We need to develop ways of assessing “conservation futures.”

So what’s the bottom line of this ranting and raving?

- If we don’t look to the future, we probably won’t be very effective in protecting our present conservation investments or investing wisely.
- Climate change and land-use change will affect these investments, at multiple scales.
- We are moving to consider climate-change impacts much more aggressively; unless we do the same for land-use change, success at dealing with climate change will be illusory.

² www.gsfc.nasa.gov/topstory/2002/20020926landcover.html

- Most of our attention is being given to “protected lands”; we must also recognize that the matrix of unprotected lands – the places where people live and work – can contribute to the goal of preserving biodiversity.