Journal Publications

LEROUX S.J., F. K. A. SCHMIEGELOW, S.G. CUMMING, R. B. LESSARD, AND J. NAGY. 2007. **ACCOUNTING FOR SYSTEM DYNAMICS IN RESERVE DESIGN**. Ecological Applications, pp. 1954–1966

Abstract.

Systematic conservation plans have only recently considered the dynamic nature of ecosystems. Methods have been developed to incorporate climate change, population dynamics, and uncertainty in reserve design, but few studies have examined how to account for natural disturbance. Considering natural disturbance in reserve design may be especially important for the world's remaining intact areas, which still experience active natural disturbance regimes. We developed a spatially explicit, dynamic simulation model, CONSERV, which simulates patch dynamics and fire, and used it to evaluate the efficacy of hypothetical reserve networks in northern Canada. We designed six networks based on conventional reserve design methods, with different conservation targets for woodland caribou habitat, high-quality wetlands, vegetation, water bodies, and relative connectedness. We input the six reserve networks into CONSERV and tracked the ability of each to maintain initial conservation targets through time under an active natural disturbance regime. None of the reserve networks maintained all initial targets, and some over-represented certain features, suggesting that both effectiveness and efficiency of reserve design could be improved through use of spatially explicit dynamic simulation during the planning process. Spatial simulation models of landscape dynamics are commonly used in natural resource management, but we provide the first illustration of their potential use for reserve design. Spatial simulation models could be used iteratively to evaluate competing reserve designs and select targets that have a higher likelihood of being maintained through time. Such models could be combined with dynamic planning techniques to develop a general theory for reserve design in an uncertain world.