Study Description

As furbearers and ecosystem engineers, predicting beaver densities has important economic and ecological implications. We evaluated whether model selection using information criteria would retain the most parsimonious model with the greatest accuracy to predict beaver colony density fluctuations. Although information criteria favored the performance of complex models, empirical validations of density predictions revealed simple models forecasted densities nearly as well. Our results suggested density-dependent mechanisms were a main driver of beaver colony density fluctuations. Our study demonstrated the importance of validating model predictions and revealed how a limitation of information criteria (over-fitting complex models) can affect interpretations of ecological dynamics.
Photo 1. A beaver entering a beaver pond in Voyageurs National Park in northern Minnesota, USA. Beavers are territorial semi-aquatic mammals that live in family groups called colonies. Our results suggested that density-dependent mechanisms significantly influence landscape-scale beaver colony dynamics. Photo credit: Dan Mallwitz.
Photo 2. A researcher is pictured navigating across the top of a massive beaver dam in northern Minnesota. Beavers are renowned ecosystem engineers that radically transform forest environments through their prolific dam-building activities. Our results suggested that beaver colony densities are relatively unaffected by climatic conditions, likely due to the unique ability of beavers to create and modify their own habitat. Photo credit: Thomas D. Gable.
Photo 3. Aerial photograph of a beaver pond and lodge during fall. Beaver colony densities were estimated using aerial surveys where observers identified active colonies by the presence of food caches (the colony’s winter food source) and/or mud on lodge or dam features. Photo credit: Thomas D. Gable.
Photo 4. A beaver is pictured chewing on a stick from a deciduous tree. In contrast to our expectations, we found forage quality did not have a significant influence on finite rates of change in beaver colony densities, perhaps due to the flexible foraging strategies beavers use. Photo credit: Thomas D. Gable.
Photo 5. A picturesque beaver lodge during summer in northern Minnesota. Photo credit: Kathryn M. Renik.

These photographs illustrate the article “Ecological forecasts reveal limitations of common model selection methods: predicting changes in beaver colony densities” by Sean M. Johnson-Bice, Jake M. Ferguson, John D. Erb, Thomas D. Gable, Steve K. Windels published in *Ecological Applications*. https://doi.org/10.1002/eap.2198