A *Superior* Research Reader

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Photo Credit: Katie Frerker and Pooja Kanwar

Greetings and welcome to A *Superio*r Research Reader, a monthly reader on what we believe is current and relevant research to science and resource management on the Superior.

This Month's Edition:

With all of the diverse perspectives of employees on our forest we thought it would be interesting to show-case some of Superior National Forest's very own researchers! So many of us come from a wide array of back-grounds and interests, sharing one another's research is a great way to learn about our fellow colleagues on the Forest. That being said, we are asking all of our readers to please send us any research that you would like to share so we can highlight it in upcoming issues. This does not have to be recent nor specific to work conducted on Superior National Forest, we are just eager to learn more about your research interests! The four articles below are authored by some of the newest employees on the Forest (including yours truly!)...Enjoy!

1. [Frerker et al.](#) find that white-tailed deer herbivory accounts for almost half of long-term forest change in our region.

2. [Barrier (now Anderson) and Johnson](#) study how fire history can affect selection of feeding sites by large ungulates.

3. [Malick et al.](#) relate small mammal composition to forest patch characteristics in Michigan's U.P.

4. [Kanwar et al.](#) conduct a regional ecological risk assessment to prioritize management efforts in the Kaipara Harbour catchment in New Zealand.

Thanks again for reading. Please continue to email us your feedback and research interests, we value your comments and will definitely be incorporating them into future editions.

Happy reading,
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[Long-Term Regional Shifts in Plant Community Composition Are Largely Explained by Local Deer Impact Experiments](#)
Frerker et al. 2014. PLoS ONE.

ABSTRACT: The fact that herbivores and predators exert top-down effects to alter community composition and dynamics at lower trophic levels is no longer controversial, yet we still lack evidence of the full nature, extent, and longer-term effects of these impacts. Here, we use results from a set of replicated experiments on the local impacts of white-tailed deer to evaluate the extent to which such impacts could account for half-century shifts in forest plant communities across the upper Midwest, USA. We measured species' responses to deer at four sites using 10–20 year-old deer exclosures. Among common species, eight were more abundant outside the exclosures, seven were commoner inside, and 16 had similar abundances in- and outside. Deer herbivory greatly increased the abundance of ferns and graminoids and doubled the abundance of exotic plants. In contrast, deer greatly reduced tree regeneration, shrub cover (100–200 fold in two species), plant height, plant reproduction, and the abundance of forbs. None of 36 focal species increased in reproduction or grew taller in the presence of deer, contrary to expectations. We compared these results to data on 50-year regional shifts in species abundances across 62 sites. The effects of herbivory by white-tailed deer accurately account for many of the long-term regional shifts observed in species' abundances ($R^2 = 0.41$). These results support the conjecture that deer impacts have driven many of the regional shifts in forest understory cover and composition observed in recent decades. Our ability to link results from shorter-term, local experiments to regional long-term studies of ecological change strengthens the inferences we can draw from both approaches.

[The Influence of Fire History on Selection of Foraging Sites by Barren-Ground Caribou](#)
Barrier and Johnson 2012. Ecoscience.

ABSTRACT: We used an information-theoretic model comparison approach to investigate the influence of forest stand attributes resulting from wildfire on the occupancy of winter habitats by barren-ground caribou (*Rangifer tarandus groenlandicus*) in the Northwest Territories, Canada. We used field data describing forest stand and understory attributes to develop multinomial regression models. These analyses identified a combination of ground cover type and tree volume (*i.e.*, stand basal area) as best able to describe the observed selection of feeding sites. An observed increase in the percent ground cover of lichen had a positive influence on site selection, while an increase in the percent rock cover and basal area of conifer trees had a negative influence on selection of feeding sites by caribou. The most parsimonious regression model predicted site use with an accuracy of 87%. Lastly, we used published equations to determine the biomass of fruticose lichens on experimental and control sites classified as unburned. Our data indicated that fruticose lichen biomass on the winter range of the Bathurst herd of barren-ground caribou was high compared to winter habitats of caribou in Alaska and the Yukon Territory, and falls in the general range of lichen values reported for winter habitats of the more easterly Beverly herd, as well as portions of Saskatchewan, Manitoba, and Ungava. Overall, the analyses of feeding-site selection suggest that Bathurst caribou forage in areas with a high percentage cover and biomass of lichen, and that future increased incidence and severity of forest fires could cause a temporary decrease in the quality of winter habitat available to the Bathurst herd.

[Effects of Forest Patch Characteristics on Small Mammal Species Composition, Grand Sable Dunes, Michigan](#)
Malick et al. 2012. Natural Areas Journal

ABSTRACT: Species inventory is considered an important component of natural resource management in National Park System units. We trapped small mammals in forested patches in the Grand Sable Dunes, Pictured Rocks National Lakeshore, Michigan, during 2007 and 2009 to inventory species occurrences and test predictions of island biogeography theory in a terrestrial landscape. We captured 538 individuals representing nine small mammal species. Fewer species were present in isolated patches than those closer to the mainland or another patch ($F_{1, 11} = 5.752$, $P = 0.035$), as predicted. Contrary to predictions, there was no relationship between species richness and patch area, proportion of patch edge, or other isolation metrics. We documented range expansion of a southern species, the white-footed mouse (*Peromyscus leucopus* Rafinesque), into the Grand Sable Dunes. White-footed mice were more likely to be captured in less isolated patches (Omnibus $\chi^2_1 = 9.684$, Nagelkerke $R2 = 0.605$, $P = 0.002$). Our results provide the first small mammal inventory for the Grand Sable Dunes and will serve as a baseline for future monitoring of small mammal species in this perched-dune system.

[A Regional Ecological Risk Assessment of the Kaipara Harbour, New Zealand, Using a Relative Risk Model](#)
Kanwar et al. 2015. Human and Ecological Risk Assessment: An International Journal

ABSTRACT: A regional ecological risk assessment was conducted for the Kaipara Harbour catchment in New Zealand. The Relative Risk Model was used to prioritize management of the sources of stress and habitats of concern in the basin. Semi-structured interviews with 25 representative stakeholders were conducted to obtain the resource-users' perspectives and to identify the regional stressor sources and receptor habitat data for the model. For this risk analysis we divided the catchment into nine ecological districts. Mixed-methodological approaches including content analysis, geospatial analysis, and source documentation were used to categorize source and habitat rankings, based on the relative abundance of each in the nine ecological districts. Risk characterization revealed that fishing pressure and tidal energy pose the largest sources of perceived risk to the catchment; shellfish and Maui dolphin habitats are the receptors estimated to be at greatest risk; and the Kaipara and Rodney ecological districts are the sub-regions estimated with the greatest combined risk. A Monte Carlo analysis confirmed the source inputs and revealed greater uncertainty than the estimated habitat input results. The results of this assessment can be used by policy-makers, conservation groups, and municipalities to inform the future management efforts in the harbor and catchment.