USGS science for a changing world
Western Ecological Research Center http://www.werc.usgs.gov
Publication Brief

| Release: | Contacts: | Email: | Phone: |
| --- | --- | --- | --- |
| June 2012 | Josh Ackerman | jackermen@usgs.gov | 530-752-0485 |

USGS Western Ecological Research Center | Davis Field Station | One Shields Avenue, University of California, Davis, CA 95616

# Density-Dependent Nest Survival and the Benefits of Having Neighbors

Nest predation levels are a key part of waterfowl demography studies, but considerable uncertainty remains as to whether nest predation is density-dependent — whether the predation rate changes with the spatial pattern and density of nests.

A key question is whether density-dependent nest predation is only observable during seasons with moderate predation, given the difficultly in analyzing patterns under very high predation rates (most nests are depredated) or with very low predation rates (most nests are not found by predators). University of California-Davis and USGS researchers conducted experiments examining this question and have reported the findings in *Oecologia*.

The researchers replicated a study 10 years after their original study, using both natural and artificial nests, comparing a year when overall rates of nest predation were high (2000) to a year with moderate nest predation (2010). Researchers found no evidence for density-dependent predation on artificial nests in either year, indicating that nest predation is not density-dependent at the spatial scale of the experimental replicates (1-ha patches). Using nearest neighbor distances as a measure of nest dispersion, they also found little evidence for "dispersion-dependent" predation on artificial nests.

However, when they tested for dispersion-dependent predation using natural nests, they found that nest survival increased with shorter nearest neighbor distances, and that neighboring nests were more likely to share the same nest fate than non-adjacent nests. Thus, at small spatial scales, density-dependence appears to operate in the opposite direction as predicted: closer neighbors are more likely to be successful. The findings suggest that local nest dispersion — rather than larger-scale measures of nest density — may play a more important role in density-dependent nest predation.

## Management Implications

- There is strong evidence that density dependence is an important regulator of waterfowl populations at the continental scale across years, and nest predation has long been implicated as a likely source of this pattern.
- However, at small spatial and temporal scales, density-dependence appears to operate in the opposite direction as predicted — closer neighboring nests are more likely to be successful.
- These results highlight the importance of scale in understanding the population demography of waterfowl.

THIS BRIEF REFERS TO:
Ringelman, KM, JM Eadie, JT Ackerman. 2012. Density-dependent nest predation in waterfowl: the relative importance of nest density versus nest dispersion. Oecologia. doi: 10.1007/s00442-011-2228-1

THIS STUDY REFERS TO:
Ackerman, JT, AL Blackmer, JM Eadie. 2004. Is predation on waterfowl nests density dependent? - Tests at three spatial scales. Oikos 107: 128-140.

http://www.werc.usgs.gov/ProductDetails.aspx?ID=4732
http://www.werc.usgs.gov/ackerman

Local nest dispersion may play a more important role in nest predation.