Conservation implications of active forest management

Barny Dunning, Project Leader

Patrick Ruhl (right) with coworker Jameson Pierce

Diane Packett, Forestry & Natural Resources, MS.

Cooperators:
Packett, Diane, Forestry & Natural Resources, MS.
Ruhl, Dr. Patrick, Harding University, Searcy, AR. Website: http://ruhlresearch.wix.com/patrickjruhl

Goals:
This study examines the ecological impacts of active timber management on native wildlife of Indiana. Active timber management includes economic harvest of trees and management of woodlands for personal and public use. In addition, the nation's forests are being looked at as a source of renewable energy, with wood biofuel being suggested as a replacement for fossil fuels. We investigate these issues in collaboration with other Purdue researchers through the Hardwood Ecosystem Experiment, a 100-year study of the impacts of forest management in southern Indiana. In addition, we studied the use of small upland woodlots in northwest Indiana as stopover habitat by migratory landbirds. The research will help elucidate the mechanisms of habitat selection for breeding or migration stopover, and will identify important land management practices that will help conserve native wildlife on public and private lands.

Recent Publications:
Ruhl, P. J., C. D. Delancey, and J. B. Dunning. 2018. Roost preference, postfledgling habitat use, and breeding phenology of adult female Worm-eating Warblers (*Helmitheros vermivorum*) on the breeding grounds. Wilson Journal of

Statement of Problem:
People own and manage forest habitat for many reasons, including economic, ecological and personal interest. Forests provide breeding habitat for many species of native wildlife, including birds, mammals and amphibians. In addition, woodland patches can be suitable stopover habitat for migratory birds. Migrants require stopover habitat for resting and refueling, and because migration progress is subject to unpredictable weather events. It is therefore important to maintain quality forest habitat throughout species' breeding and wintering ranges as well as along migration routes. The landscapes of the Midwestern United States have undergone extensive fragmentation for agriculture and development. In many areas forest land has been reduced to riparian corridors along rivers and isolated woodland patches. Large forest regions, such as found in southern Indiana, are managed for timber production and outdoor recreation. Small forest patches are common across the Midwest but are often considered of low importance by conservation groups (largely because they are often unsuitable habitat for breeding birds). Small patches may provide a critical resource as stopover habitat, however.

As part of the Hardwood Ecosystem Experiment (HEE), we are studying how native wildlife and plants respond to changes associated with active land management. The HEE project uses 1000-acre sections of state forest land in southern Indiana to examine how species and ecosystems change with forest management. The project looks at both short-term responses (within a few years) as well longer-term changes. In addition, we have conducted our research in areas managed for biomass harvest and in small, privately owned woodlots in agricultural landscapes. Recent summaries of national research needs have emphasized the importance of long-term, large-scale field research on these issues; while a recent report of The Nature Conservancy identified a need for research on how migrant birds use isolated habitat patches, and the importance of patch density and connectivity on migratory species in general.

Current Activities:
We have studied the response of forest salamanders, breeding birds and migratory species to active forest management at a number of spatial scales. Many species respond to habitat change in relatively unique manners, which means that no single management practice will conserve all species. A variety of land use practices, forest age and condition classes are necessary to support the entire range of native species found in our forests. Some of the specific responses include: A. We found that few species of Neotropical migrant birds were present in small woodlots during the breeding season, but that these patches were heavily used during migration. We suggest that isolated forest patches may be important conservation targets in the fragmented landscapes common in agricultural districts. B. Forest

Ornithology 130:397-409.

Kellner, K. F., P. J. Ruhl, J. B. Dunning, J. K. Riegel, and R. K. Swihart. 2016. Multi-scale responses of breeding birds to experimental forest management in Indiana, USA. Forest Ecology and Management 382:64-75.

Ruhl, P.J., K. F. Kellner, J. M. Pierce, J. K. Riegel, R. K. Swihart, M. R. Saunders, and J. B. Dunning. 2018. Characterization of Worm-eating Warbler (*Helmitheros vermivorum*) breeding habitat at the landscape level and nest scale. Avian Conservation and Ecology 13(1):11.

Ruhl, P.J., R.N. Chapman, and J.B. Dunning. 2016. Field-testing a standard metabolic rate estimation technique for eastern red-backed salamanders. *Journal of Herpetology* 50:138-144.

Leonard, O. D., J. W. Moore, J. K. Riegel, A. R. Meier, J. B. Dunning, K. F. Kellner, and R. K. Swihart. 2015. Effect of forest-management practices on winter occupancy of Barred Owls and Eastern Screech-Owls in deciduous forests in the east-central United States. *Journal of Field Ornithology* 86:115-129.

Packett, D.L., and J.B. Dunning. 2009. Stopover habitat selection by migrant landbirds in a fragmented forest-agricultural landscape. Auk 126:579-589.

salamanders, one of the dominant vertebrate groups found in forest soil layers, decreased when forests are harvested with techniques that remove the forest canopy. Additional harvest of downed woody debris (usually left in the stands after timber harvest) for bioenergy purposes did not cause an additional threshold drop in salamander numbers, but salamanders were more common in areas where some woody debris was retained. Our results suggest that caution should be taken in approving the removal of woody debris from our forests until the ecological impacts are fully understood. C. We examined the breeding success of birds that occupy the young forest now growing in the clearcuts that were created 10 years ago as the first HEE treatments. An interesting pattern seen here and elsewhere is that birds normally associated with mature forest (such as Scarlet Tanagers) will move their newly fledged young into the clearcuts after the chicks have left the nest. We documented that very large numbers of Worm-eating Warblers, an Indiana species of special concern, use the young habitat for foraging, roosting and potentially breeding. In addition we observed the breeding of Chestnut-sided Warblers, a first in over 20 years for southern Indiana.

Extension and outreach publications:

Kellner, K. F., P. J. Ruhl, J. B. Dunning, and R. K. Swihart. 2017. Managing forests for birds in Indiana. Indiana Woodland Steward 25(3): 7-8.

Meier, A. R., A. Pizzo, M. Malloy, J. K. Riegel, and J. B. Dunning. 2015. Breeding birds and forest management in the Hardwood Ecosystem Experiment and the Central Hardwoods Region.
Purdue University Cooperative Extension Publication FNR-500- W.

Packett, D.L., and J.B. Dunning. 2009. Small woodlots: rest stops on the migration highway. Ohio Woodland Journal 16(4):17-19.