THE HARDWOOD ECOSYSTEM EXPERIMENT

SUMMARY OF OUTPUTS

FOR THE CONTRACT PERIOD
MAY 1, 2012 – APRIL 30, 2014
AND PRECEDING CONTRACTS

COMPiled by:
ANDY MEIER, PROJECT COORDINATOR
PHONE: (765) 494-4472    EMAIL: MEIERA@PURDUE.EDU
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Introduction
The Hardwood Ecosystem Experiment (HEE) is a collaborative project between the Indiana Department of Natural Resources, Division of Forestry (DoF) and researchers from Purdue University, Indiana State University, Ball State University, Drake University (Iowa) and Indiana University.

The main goal of HEE is to understand the ecological and social impacts of long-term forest management on public and private lands in Indiana and the Central Hardwoods Region. Our primary objectives include:

1. Develop even-aged and uneven-aged silvicultural systems that maintain oak-dominated forest communities and landscapes;
2. Determine both the positive and negative impacts of these systems on communities of herbaceous, avian and terrestrial amphibian species groups;
3. Determine the social and economic ramifications of these systems in both the local and regional communities; and
4. Provide demonstration sites and develop novel educational materials and techniques to engage the public concerning forest management.

The HEE is designed as a long-term field experiment to study forest management and its impacts. In collaboration with DoF, we created a replicated series of study areas at Morgan-Monroe and Yellowwood State Forests, on which the most common approaches to forest management will be implemented and monitored. This framework of study sites will be used to study the long-term response of selected species both in the treated areas themselves and the surrounding forest. Simultaneously, we will conduct surveys of the landowners and general public in the immediate vicinity of the study areas to assess their attitudes towards active land management.

The purpose of this document is to provide a quick summary of HEE research products from project initiation to the present. It provides metrics of total project productivity as well as a comprehensive listing of research, technical and extension publications by author, year and title.
HEE Summary through August 2013

The HEE has completed nearly eight years of data collection, analysis and dissemination related to the impacts of forest management on forest ecosystems and human communities in southern Indiana. The project to date has involved nearly 20 principle investigators from 7 different universities and state agencies (Table 1). The project has trained more than 130 undergraduate and post-baccalaureate students as field technicians and undergraduate researchers. A total of 22 graduate students have conducted graduate research on the HEE; the large majority of these have been focused entirely on the HEE (Table 1).

Table 1. Principle investigators and university participation on the HEE from 2006-13.

<table>
<thead>
<tr>
<th>Principle Investigator</th>
<th>Project(s)</th>
<th>Institution</th>
<th>Start date</th>
<th>Finish date</th>
<th>Grad students¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-14</td>
<td></td>
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<td></td>
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<td>Carter, Tim</td>
<td>Bats, fawn dispersal</td>
<td>Ball State University</td>
<td>5/1/12</td>
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<td>DuChamp, Joe</td>
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<td>2/28/13</td>
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<td>Institution</td>
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<td>Finish date</td>
<td>Grad students</td>
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<td>5/1/06</td>
<td>4/30/11</td>
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<td>Purdue University</td>
<td>5/1/07</td>
<td>4/30/11</td>
<td>3</td>
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</tbody>
</table>

1 This column includes current graduate students who have not completed their projects. Therefore, the total number of students in this column is greater than the number of theses/dissertations listed below.

2 This value includes one graduate student who completed an M.S. degree and continued on to a Ph.D. degree on the same project.

This research effort has led to a large body of publication (Figure 1) and has been presented to a wide array of audiences (Figure 2). HEE researchers have begun to accumulate sufficient data to describe responses of various ecosystem components to forest management, while numerous graduate students have completed their projects and data analysis; this research is now beginning to be published in peer-reviewed academic journals. Figure 1a shows a breakdown of publications by individual HEE inventory. Figure 1b shows the breakdown by year. A major accomplishment of the 2012-14 contract cycle was the completion of USDA-Forest Service General Technical Report NRS-P-108, a 350 page document cataloguing characteristics of the research sites prior to timber harvesting (see Swihart et al. 2013 below for titles). This document is the most comprehensive assessment of landscape-level ecosystem conditions in Indiana and is one of only a handful of similar documents available for the entire eastern United States. The investment of time and energy in this document will be invaluable to future researchers as they continue to follow these species groups for the remainder of the project.

Further, data from the Hardwood Ecosystem Experiment has been presented at numerous venues, both scientific and non-scientific (Figure 2a). Substantial effort was made early in the project to provide numerous extension opportunities to the general public and to natural resources professionals in the state of Indiana (Figure 2a). As more years of data have become available, there has been a large increase in the number of presentations to scientific audiences, with a particular increase in presentations at venues with regional, national and international impact (Figure 2b).
Figure 1. Hardwood Ecosystem Experiment publications by publication type for a) individual inventories and b) year. GTR refers to the HEE General Technical Report

*Eight of the publications listed for 2013 are either in press or in review and have not yet been published. Additionally, this Figure 2b does not include the 22 articles that were published by the USDA-Forest Service as part of the HEE General Technical Report (see Swihart et al. 2013 below).
Figure 2. Hardwood Ecosystem Experiment presentations by a) presentation type and by b) presentation scope. Extension presentations are not included in 2b resulting in lower total numbers.
**2012-14 HEE Publications**

**Journal articles**


Summerville, K.S. 2013. Forest lepidopteran communities are more resilient to shelterwood harvest compared to more intensive logging regimes. *Ecological Applications*. [http://dx.doi.org/10.1890/12-0639.1]


**General Technical Report NRS-P-108**


**GTR-NRS-P-108 Contents:**

**Historical and Current Perspectives on Forest Management**


**Introduction to the Hardwood Ecosystem Experiment**

Targeted Wildlife Species


Targeted Wildlife and Plant Communities


**Socio-economic Implications of Forest Management**


**Concluding Synthesis and Looking Forward**


**Extension publications**


**Graduate student dissertations and theses**


Malloy, M.C. 2012. Effects of forest management on breeding bird populations on mixed deciduous forests of southern Indiana. Master of Science Thesis. Purdue University, West Lafayette, Indiana.


2006-12 HEE Publications

Journal articles


Graduate student dissertations and theses

Caylor, M.K. 2011. Impacts of different forest tree-harvest methods on diets and populations of insectivorous forest bats. Master of Science Thesis. Indiana State University, Terre Haute, IN.


Sheets, J.J. 2010. Impact of forest management techniques on bats with a focus on the endangered Indiana myotis (*Myotis sodalis*). Master of Science Thesis. Indiana State University, Terre Haute, Indiana.
