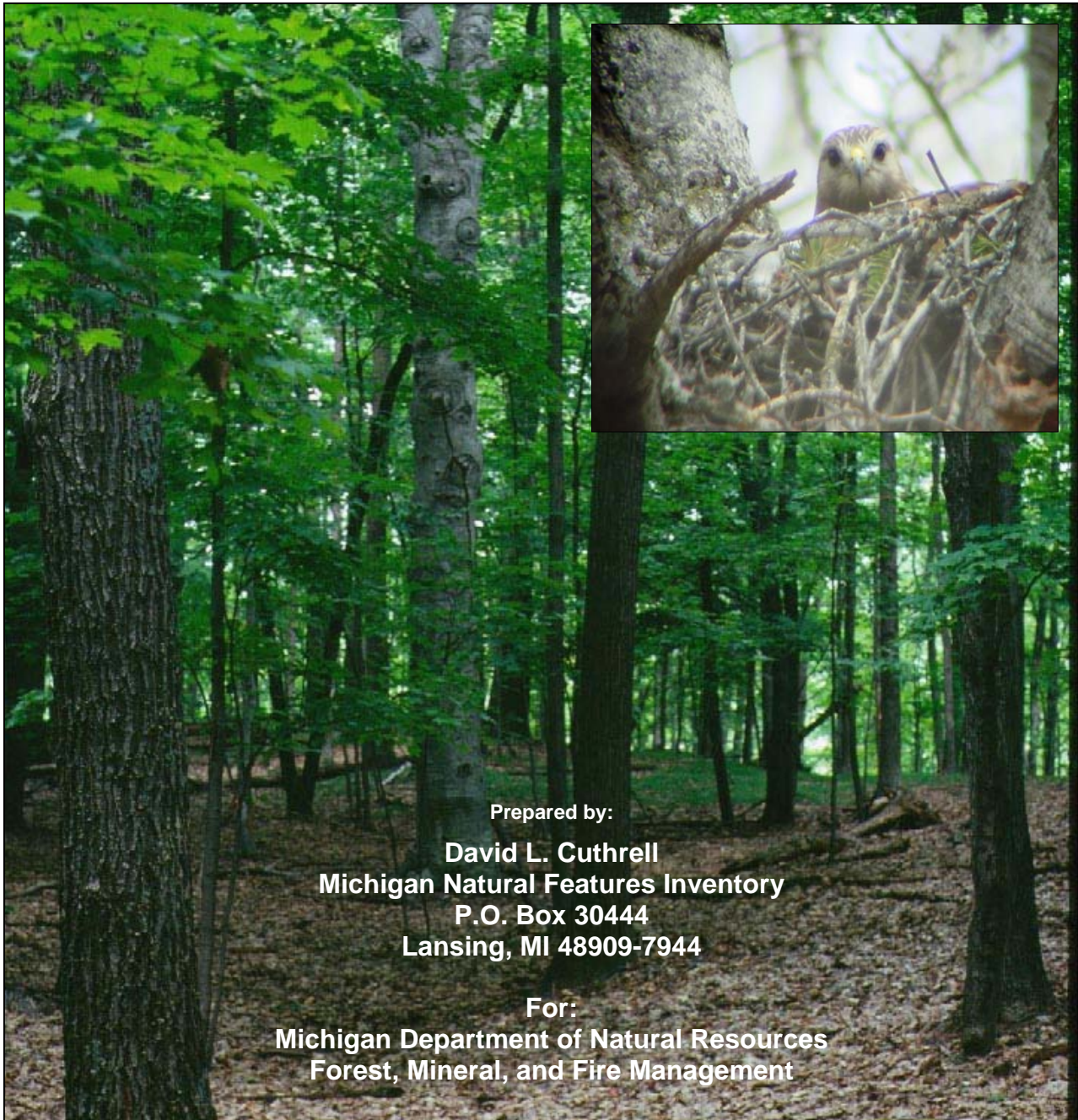


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**Productivity and Monitoring of Red-shouldered Hawk Nests  
Final Progress Report 2006**



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For:

**Michigan Department of Natural Resources  
Forest, Mineral, and Fire Management**

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**Cover Photos by David L. Cuthrell**

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## Introduction

The Red-shouldered Hawk (*Buteo lineatus lineatus*) is currently listed as a state threatened species in Michigan. Historically it was considered one of the most common diurnal raptors in the Southern Lower Peninsula (SLP) (Barrows 1912). However, by the mid-1900's this species had become uncommon in southern Michigan. Population declines have been primarily attributed to loss of forest and wetland habitats. Presumably, as a result of habitat loss, populations shifted their breeding range from southern Michigan to the more forested portions of the state in the Northern Lower Peninsula (NLP) (Brewer et al. 1991).

This species is a woodland raptor that requires forested landscapes composed of deciduous or mixed forests. In Michigan this species has been most frequently documented in hardwood stands composed of well-stocked pole or saw timber, particularly hardwood complexes with associated wetland habitats. Hawks have also been documented in older aspen stands (A6/9), lowland poplar stands (P6), cedar swamps (C6/9), lowland conifers (Q6/9), and occasionally in pine communities (W8/9) (Cooper et al. 1999). RSHs are strongly associated with wetlands and the core of a breeding pair's territory typically encompasses wetland habitat. Wetlands such as beaver ponds, wet meadows, and lowland forests are utilized primarily for foraging purposes (Howell and Chapman 1997). Small upland openings are also used to some extent for foraging habitat (Evers 1994).

The MNFI has conducted systematic surveys for the RSH in ten state forest areas (Atlanta, Escanaba, Gaylord, Gladwin, Indian River, Naubinway, Newberry, Pigeon River, Sault Ste Marie, and Traverse City). Our earlier habitat analysis (1999-2001) indicated that nests typically were located within a heavily forested landscape (71% forest cover  $\pm$  3%), primarily composed of

upland deciduous forests (53% upland deciduous forest cover  $\pm$  6%). Nests were typically located in northern hardwood stands with well-stocked pole or saw timber (90.2% of all nests documented). Nests also tended to be located near wetlands (80% within 0.4 km) and upland openings (mean distance to upland opening 181 m  $\pm$  46 m).

Our earlier data indicate that nest trees tend to be deciduous, primarily American beech (*Fagus grandifolia*), however any tree with adequate structure (i.e., a multi-pronged crotch) could be suitable. Nests tend to be placed in large, mature, super-canopy trees and the nest itself is placed on average 14.1 m  $\pm$  0.37 m above the ground. At the local site level, canopy height, basal area, tree density, canopy closure, and average tree diameter at breast height (dbh) appear important in nest selection. By utilizing both a landscape and nest site approach, insight on distribution and habitat use can be gained which will facilitate sound management of this species. Information from this study is also being used to assess abundance and distribution, which will help determine the appropriate state listing status for this raptor species.

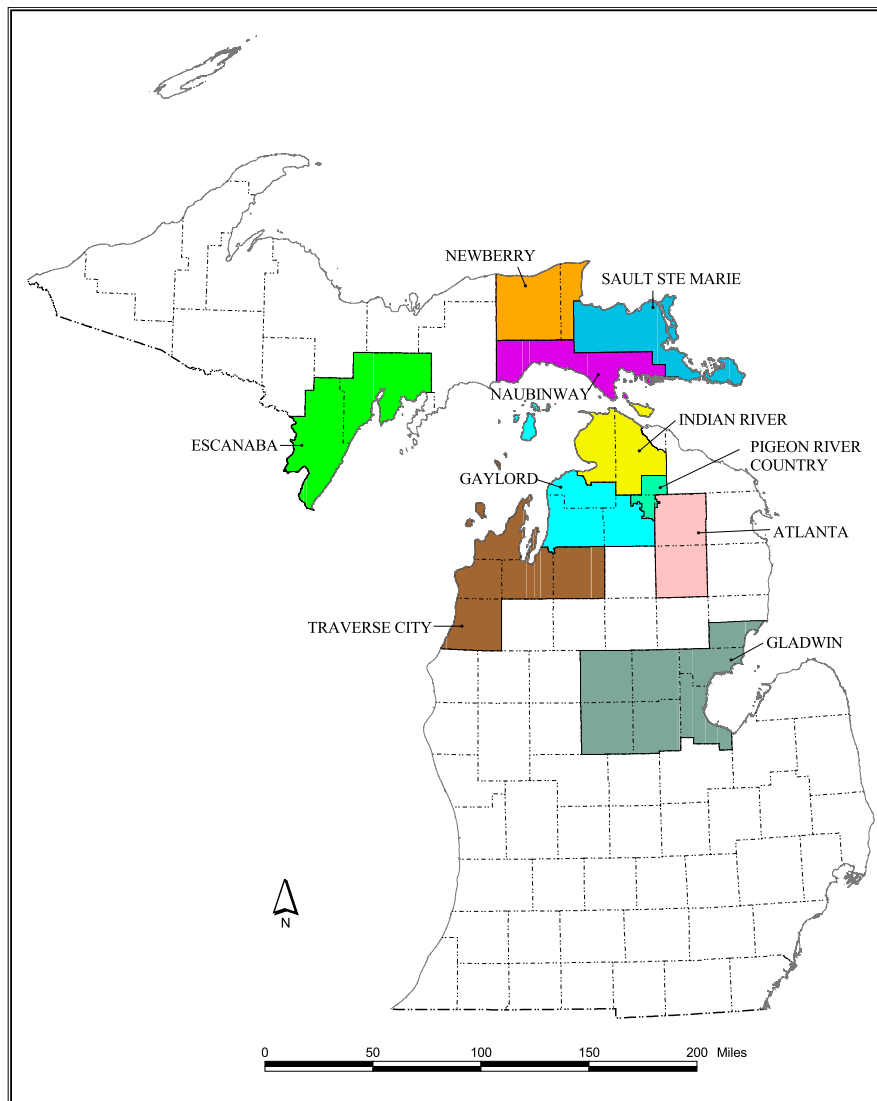
Our 2006 study objectives were to: (1) continue the monitoring of RSH nests on state forest lands for territorial activity, nest success rates, and productivity; (2) continue checking nests as requested by forest technicians and biologists to help facilitate sound management decisions in relation to proposed activities, (3) test the feasibility of a diet study in which we use remote cameras to identify prey items delivered to a nest, (4) begin characterizing northern hardwoods utilized by nesting hawks and evaluating the usefulness of management buffer (separate report), and 5) distribute information to the bird technical committee to help determine the appropriate state-listing status for this woodland raptor.

## Materials & Methods

This study took place in several state forest management units throughout the Northern Lower (NLP) and Upper Peninsulas (UP) of Michigan (Figure 1). The study area is within the Northern Lacustrine-influenced Lower Michigan and the Northern Lacustrine-influenced Upper Michigan and Wisconsin sections as described in great detail in (Albert 1995). RSH surveys targeted large deciduous or mixed forest complexes composed of medium to well stocked (> than 40 sq. ft. basal area) pole (5-9" dbh) or saw (10" and >) timber with wetland habitats juxtaposed

or interspersed along them. Select coniferous forest communities (both wetland and upland) that had a deciduous component and associated wetland habitat were surveyed as well. These types of forest/wetland complexes were delineated by analyzing forest operational inventory (OI) maps, USGS topographical maps, 1978 current land cover maps, 1998 air photos, and by consulting with Michigan Department of Natural Resources (MDNR) Forest, Mineral, and Fire Management (FMFM) and Wildlife personnel.

**Figure 1.** Michigan study area and location of state forest management units.



Nests were located from April 10<sup>th</sup> to June 22<sup>th</sup> of 2006 using a variety of techniques. State forests were intensively surveyed for RSHs during earlier studies (Cooper and Cuthrell 2000, Cuthrell and Cooper 2001). During these earlier studies, transects were placed every ¼ mile through forest habitats within compartments selected for surveys. Along each respective transect, calling stations were placed every ¼ mile. At each calling station a taped conspecific RSH call was broadcast with an electronic predator caller three times: at 60 degrees for 10 seconds, 180 degrees for 10 seconds, and 300 degrees for 10 seconds. This was followed by 30 seconds of listening. This calling sequence was repeated three times at each calling station. When hawks responded to the taped calls, we intensively searched for birds and/or a nest in the direction the call was initially heard (Kennedy and Stahlecker 1993, Bowerman pers. comm.).

The vast majority of nests followed during 2006 were discovered during the earlier work, although we sighted some additional nests from vehicles while driving in the study area, and interested foresters and biologists reported new nests or RSH territories. Raptor nest reporting forms (Appendix I) were filled out at each active nest. Confirmed nest locations were recorded using Garmin 12XL GPS units. Nest locations were then loaded into Arc View and records were transcribed and

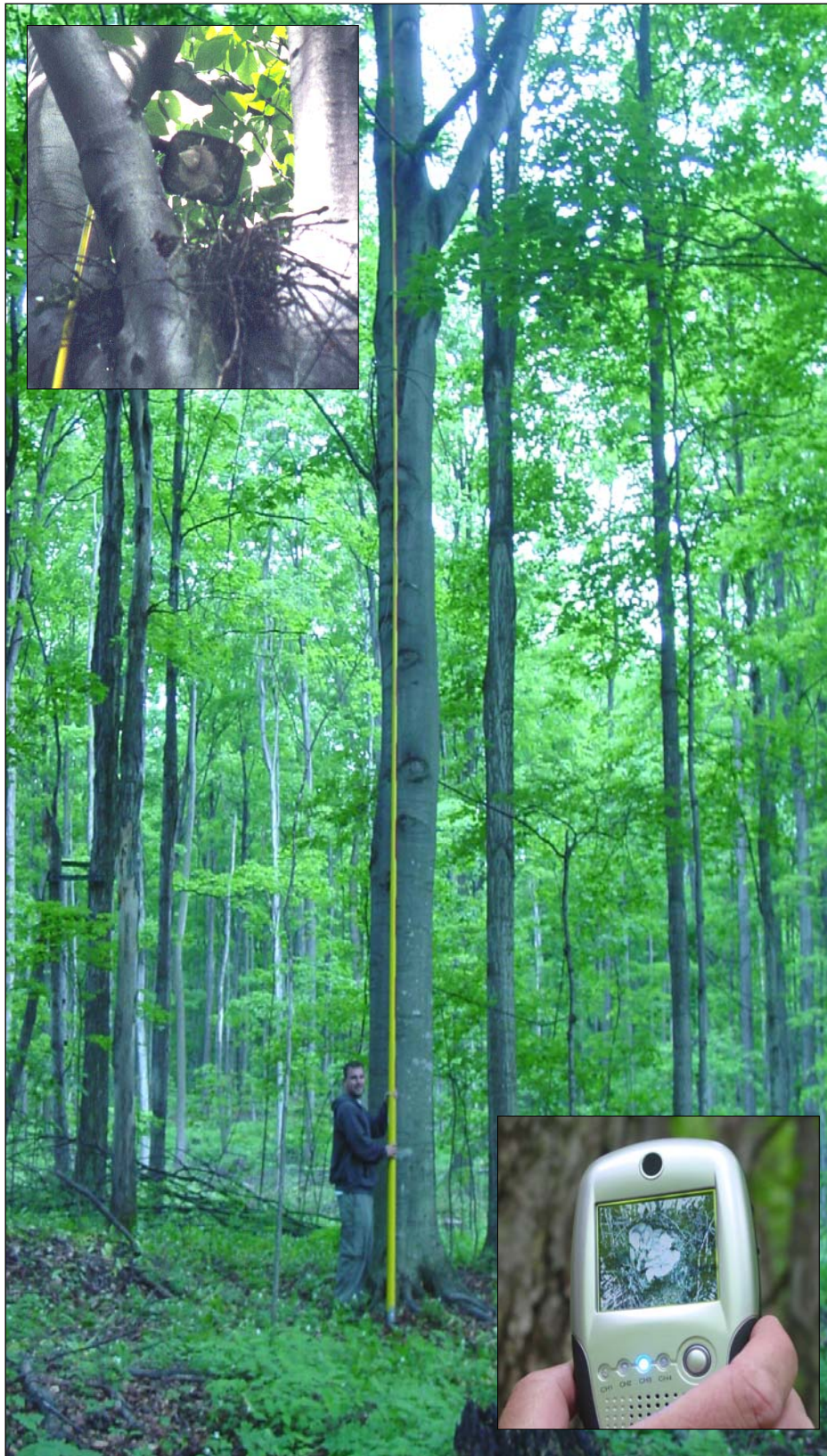
entered into the Michigan Natural Features Inventory's Biological Conservation Database. Territories were considered active if new sticks had been added to the nest, green sprigs were lining the nest, birds responded to conspecific broadcast calls, or if hawks were perched in the nest or nest tree. Nests were considered active if a bird was on the nest, birds were flushed off the nest, if there were down feathers on the edges of the nest, or if there were broken egg fragments at the base of the nest tree.

From June 5 through June 22, all active nests were re-visited at least once to assess productivity. Surveys were timed during the later part of the nestling stage, usually within a couple weeks of fledging, because young birds are more conspicuous at this time. We utilized two methods to assess productivity. These included on-the-ground surveys where the nest was observed from a vantage point or the base of the nest tree is inspected for whitewash. A second and more definitive method was looking into the nest with a camera attached to a 15 m (50 ft) pole. One person held the pole above the nest while a second individual viewed a handheld monitor and counted eggs, chicks, or fledglings (Figure 2). This technique was less disruptive to the hawks (both adults and nestlings) and faster than tree climbing and it also allowed us to visit many more nests per day. A nest was considered successful if at least one young reached 80% of the fledgling age (Kochert 1986).

## Results and Discussion

From 1999-2006 the nesting behavior and productivity of 755 active RSH territories were followed, including 112 active territories in 2006. Among these active territories, 505 active nests were located over the course of this study including 92 active nests in 2006 (Figure 3). Nest success rates among northern Michigan forest areas surveyed was high (65% successful). Nest success rates ranged from

a high of 82% in 1999 to a low of 52% in 2004 (Figure 4). After dropping during 2003 and 2004, nest success rebounded to 70% in 2005 and 2006. Nest success rates for the study period by forest area ranged from a high of 74% for the Eastern UP to a low of 44% for Escanaba FMU (Figure 5), although small sample sizes may explain the variability for these two forest areas.

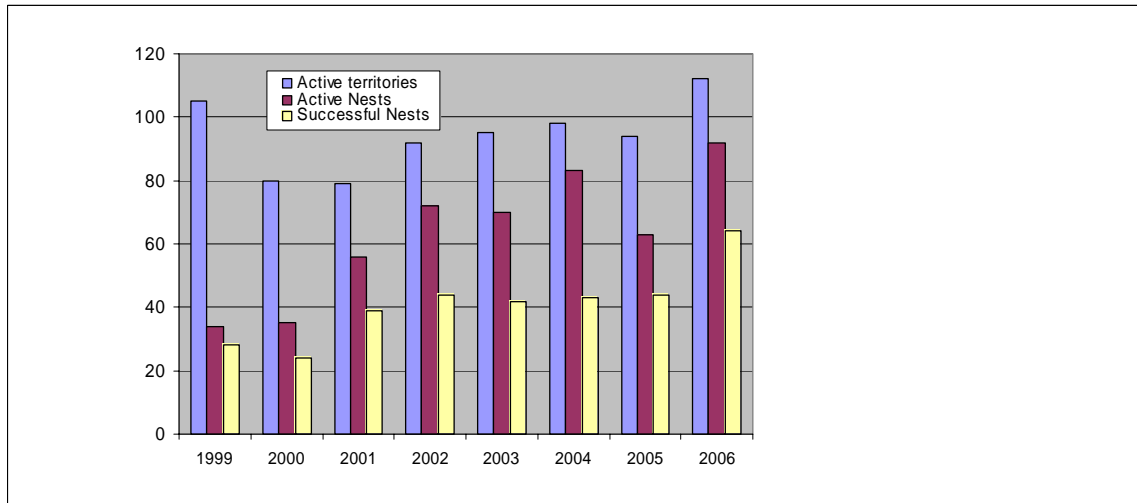


**Figure 2.** Mirror pole used to count number of chicks in the nests. 2a. Close-up of mirror over nest with chicks visible. 2b. Hand-held camera receiver used in 2006.

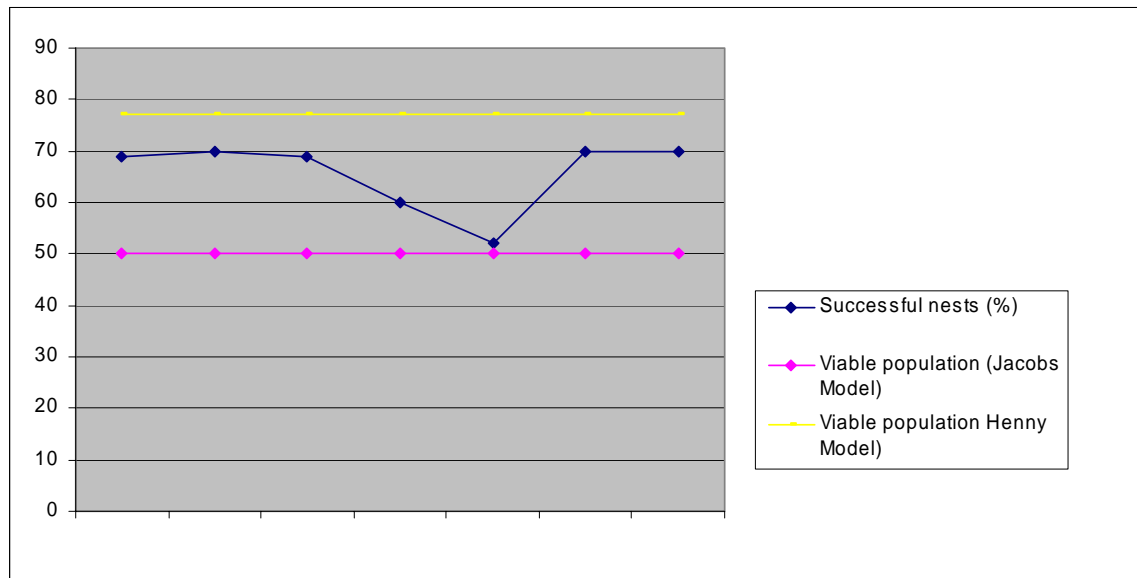
Reproductive rate from the nest site data combined for all forest areas between the years of 1999 - 2006 was 2.05 young per successful nest and 1.33 young per active nest (Table 1). **During 2006 reproductive rates were the highest recorded over the course of this study with 2.51 young per successful nest and 1.72 young per active nest** (Figure 6). During our study, reproductive rates fluctuated from year-to-

year and by state forest area (Figure 5). Nest predation was confirmed (e.g., claw marks on trees, den tree nearby, nests torn apart, remains of adult hawk, etc.) for 6 % of occupied nests between 1999 – 2006 (Table 1). The most frequent predator implicated in the predation of RSH adults and young during our study was the Great Horned Owl (*Bubo virginianus*).

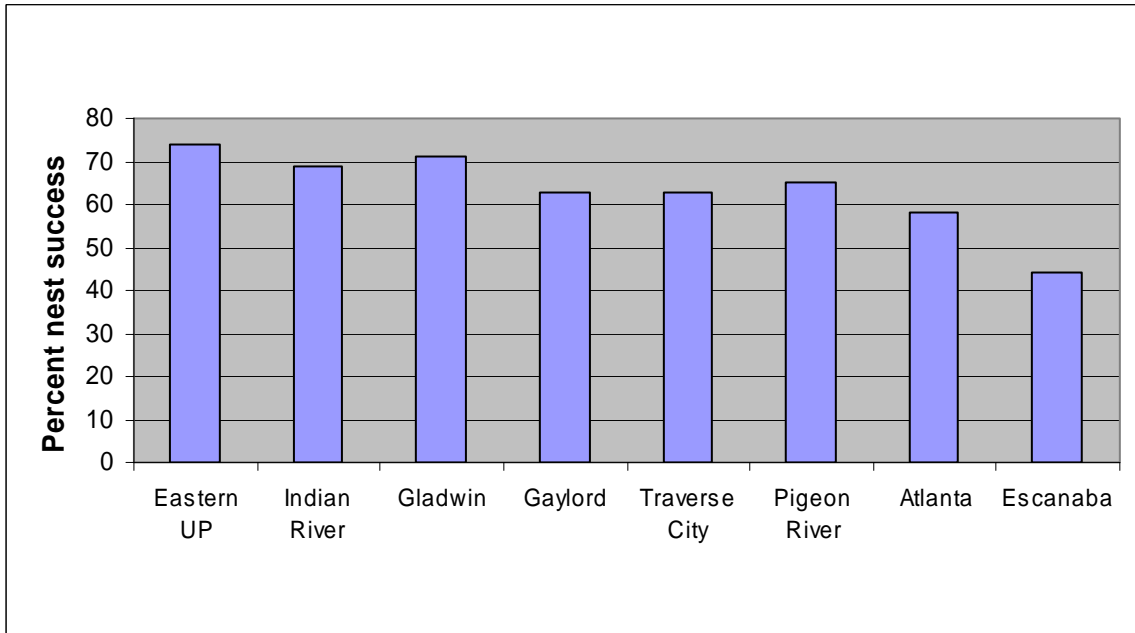
**Figure 3.** Active Red-shouldered Hawk territories, active nests, and successful nests monitored in the northern Michigan study area (1999-2006).



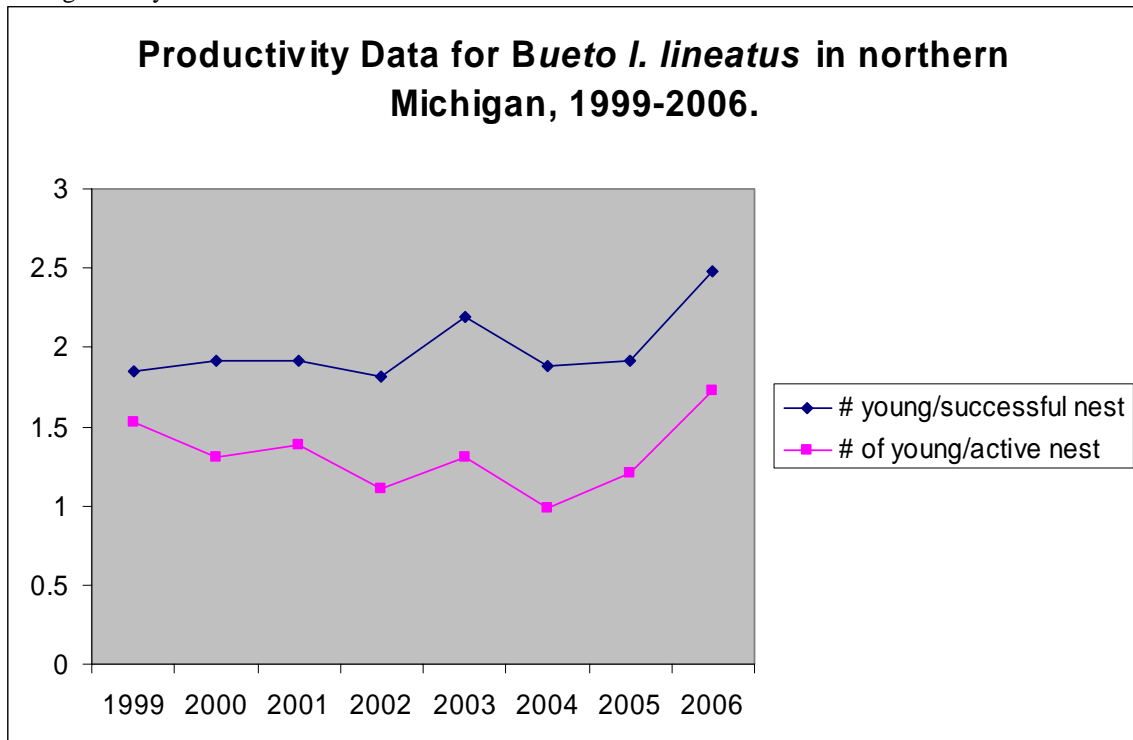
**Figure 4.** Percent successful Red-shouldered Hawk nests monitored in the northern Michigan study area (1999-2006)



**Figure 5.** Percent nest success by forest management unit (1999-2006) in the northern Michigan study area.



**Figure 6.** Productivity of Red-shouldered Hawk nests monitored during 1999-2006 in the northern Michigan study area.





## Future Work

Over the next two years (contingent upon funding) several RSH nests will be monitored for territorial re-occupancy, nest site fidelity, nest success, brood size, and prey utilization. Habitat parameters (landscape and micro-habitat scales) will continue to be quantified and summarized for all nest locations documented to date (separate report forthcoming). We hope to compare RSH nesting success, productivity, and prey utilization between recently harvested (0-4 yrs. post harvest), harvested

(5-10 yrs. p.h.), and unharvested (>11 yrs.). By the end of this multi-year project, we hope to compare attributes around successful nests and unsuccessful nests to better evaluate efforts to enhance reproductive success. We also hope to determine the appropriate state-listing status for woodland raptors in Michigan and work cooperatively with the Wildlife Division and Forest, Mineral, and Fire Management Division to refine and finalize Management Guidelines for the RSH

**Table 1.** Reproductive outcomes of Red-shouldered Hawks nesting in northern Michigan by state forest management areas 1999-2006.

Area/year	Active Nests	Successful nests	Fledged Young	Confirmed Predation %	Young per Successful Nest	Young per Active Nest	Percent Nest Success
<b>Eastern UP</b>	<b>34</b>	<b>25</b>	<b>50</b>	<b>2</b>	<b>2.00</b>	<b>1.47</b>	<b>74</b>
2001	4	2	4	0	2.00	1.00	
2002	7	7	12	0	1.70	1.70	
2003	5	3	8	0	2.67	1.60	
2004	9	8	17	11	2.12	1.89	
2005 <sup>a</sup>	1	1	1	0	1.00	1.00	
2006	8	4	8	0	2.00	1.00	
<b>Indian River</b>	<b>87</b>	<b>60</b>	<b>124</b>	<b>8</b>	<b>2.07</b>	<b>1.42</b>	<b>69</b>
1999	9	9	16	0	1.78	1.78	
2000	9	7	15	22	2.14	1.67	
2001	12	7	15	9	2.40	1.25	
2002	12	4	6	33	1.50	0.50	
2003	8	8	19	0	2.40	2.40	
2004	12	8	17	0	2.12	1.42	
2005	12	8	13	0	1.63	1.08	
2006	13	9	23	0	2.55	1.77	
<b>Gladwin</b>	<b>14</b>	<b>10</b>	<b>20</b>	<b>8</b>	<b>2.00</b>	<b>1.43</b>	<b>71</b>
2001	3	2	4	0	2.00	1.33	
2002	4	2	4	0	2.00	1.00	
2003	2	2	4	0	2.00	1.00	
2004	1	1	2	0	2.00	2.00	
2005	2	1	2	50	2.00	1.00	
2006	2	2	4	0	2.00	2.00	

Area/year	Active Nests	Successful nests	Fledged Young	Confirmed Predation %	Young per Successful Nest	Young per Active Nest	Percent Nest Success
<b>Gaylord</b>	<b>70</b>	<b>44</b>	<b>92</b>	<b>14</b>	<b>2.09</b>	<b>1.31</b>	<b>63</b>
1999	4	3	6	25	2.00	1.50	
2000	4	2	4	50	2.00	1.00	
2001	10	7	13	20	1.86	1.30	
2002	9	5	9	0	1.80	1.00	
2003	11	9	22	0	2.44	2.00	
2004	13	5	10	8	2.00	0.77	
2005	8	5	11	12	2.20	1.38	
2006	11	7	17	0	2.43	1.54	
<b>Traverse City</b>	<b>88</b>	<b>57</b>	<b>118</b>	<b>7</b>	<b>2.07</b>	<b>1.34</b>	<b>65</b>
2000	8	6	12	17	2.00	1.50	
2001	10	9	18	0	2.00	1.80	
2002	11	8	16	0	2.00	1.45	
2003	16	6	13	25	2.17	0.81	
2004	11	8	17	0	2.12	1.54	
2005	15	11	18	7	1.64	1.20	
2006	17	10	24	0	2.40	1.40	
<b>Pigeon River</b>	<b>168</b>	<b>109</b>	<b>212</b>	<b>10</b>	<b>11.94</b>	<b>1.26</b>	<b>65</b>
1999	21	16	30	14	1.88	1.43	
2000	16	10	17	31	1.70	1.06	
2001	17	12	23	18	2.10	1.35	
2002	22	13	24	4.5	1.85	1.09	
2003	18	11	21	11	1.90	1.16	
2004	23	10	15	4.3	1.50	0.65	
2005	20	14	23	0	1.64	1.15	
2006	31	23	59	0	2.56	1.90	
<b>Atlanta</b>	<b>36</b>	<b>20</b>	<b>48</b>	<b>2</b>	<b>2.40</b>	<b>1.33</b>	<b>56</b>
2002	9	5	13	0	2.60	1.44	
2003	8	3	5	13	1.67	0.63	
2004	7	2	5	0	2.50	0.71	
2005	5	4	8	0	2.00	1.60	
2006	7	6	17	0	2.83	2.43	
<b>Escanaba</b>	<b>8</b>	<b>4</b>	<b>9</b>	<b>0</b>	<b>2.25</b>	<b>1.12</b>	<b>50</b>
2002	1	1	2	0	2.00	2.00	
2003	2	0	0	0	0.00	0.00	
2004	2	1	1	0	1.00	0.50	
2005 <sup>a</sup>							
2006	3	2	6	0	3.00	2.00	
<b>STUDY TOTALS</b>	<b>505</b>	<b>329</b>	<b>673</b>	<b>6</b>	<b>2.05</b>	<b>1.33</b>	<b>65</b>

<sup>a</sup> = not all nests in the forest area were checked for productivity during 2005

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Thanks to Seth Gallagher, graduate student at Central Michigan University, for his collection of data on the productivity and micro-habitat analysis from the Pigeon

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## **APPENDIX I**

### **MNFI Raptor Nest Reporting Form**

## RAPTOR NEST REPORTING FORM

Michigan Natural Features Inventory

<p><b>Site Information</b> Observer(s) Name: _____ Phone: _____ email: _____ County: _____ State Forest Area: _____ Compartment/stand: _____ Date of Observation: _____ Township/Range/Section: _____ Directions to Site: _____</p> <p><b>Survey and Biological Data</b> Weather (check): sunny <input type="checkbox"/> mostly sunny <input type="checkbox"/> partly cloudy <input type="checkbox"/> mostly cloudy <input type="checkbox"/> cloudy <input type="checkbox"/> winds: 0-5 <input type="checkbox"/> 6-10 <input type="checkbox"/> 11-15 <input type="checkbox"/> 16-20 <input type="checkbox"/> 20+ <input type="checkbox"/> Temperature: _____ Precipitation: rain <input type="checkbox"/> snow <input type="checkbox"/> Circumstance of Observation: deliberate search <input type="checkbox"/> accidental observation <input type="checkbox"/> responded to taped call <input type="checkbox"/> Raptor Species Observed: red-shouldered hawk red-tailed hawk broadwing hawk northern goshawk Cooper's hawk northern harrier bald eagle osprey peregrine falcon merlin kestrel short-eared owl long-eared owl great horned owl other _____ Rank your identification: extremely confident confident some reservation not sure no clue Describe individuals observed: # of adults _____ # of juveniles _____ (check all that apply) birds heard calling <input type="checkbox"/> birds observed but not calling <input type="checkbox"/> birds observed &amp; heard <input type="checkbox"/> Nest Found (check all that apply): no <input type="checkbox"/> yes <input type="checkbox"/>; if yes nest decorated <input type="checkbox"/> not decorated <input type="checkbox"/> old nest <input type="checkbox"/> presence of down <input type="checkbox"/> evidence of new construction <input type="checkbox"/> bird on nest <input type="checkbox"/> birds heard in immediate vicinity of nest <input type="checkbox"/> Nest tree species: _____ Nest height: 10-20' <input type="checkbox"/> 21-30' <input type="checkbox"/> 31-40' <input type="checkbox"/> 41-50' <input type="checkbox"/> 50'+ <input type="checkbox"/> Nest tree DBH : _____ Age class: Even <input type="checkbox"/> Uneven <input type="checkbox"/> Presence of flight lane: yes <input type="checkbox"/> no <input type="checkbox"/> Landscape Position: Slope <input type="checkbox"/> Flat <input type="checkbox"/> Upland <input type="checkbox"/> Lowland <input type="checkbox"/> Canopy layers: 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> Proximity to wetland (mi.): &lt; 1/8 <input type="checkbox"/> &gt;1/8&lt;1/4 <input type="checkbox"/> &gt;1/4&lt;1/2 <input type="checkbox"/> &gt;1/2 <input type="checkbox"/> Type of wetland habitat nearby: Conifer <input type="checkbox"/> Hardwood <input type="checkbox"/> Emergent <input type="checkbox"/> Vernal Pool <input type="checkbox"/> Shrub <input type="checkbox"/> Other: _____</p>
<p>Understory density: Dense <input type="checkbox"/> Moderate <input type="checkbox"/> Sparse <input type="checkbox"/> Cover type: M <input type="checkbox"/> A <input type="checkbox"/> B <input type="checkbox"/> O <input type="checkbox"/> Other _____ Stocking density: 5 <input type="checkbox"/> 6 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 9 <input type="checkbox"/></p>
<p><b>Productivity Surveys (if conducted)</b> Date: _____ Observer(s): _____ Active: Yes <input type="checkbox"/>, if yes young in nest <input type="checkbox"/> whitewash at base of tree <input type="checkbox"/> young of year in nearby trees <input type="checkbox"/> No <input type="checkbox"/> Number of Young: _____ Was there evidence of predation: no <input type="checkbox"/> yes <input type="checkbox"/> If yes, nest torn apart <input type="checkbox"/> claw marks on tree <input type="checkbox"/> dead bird in or near nest <input type="checkbox"/> other _____ Additional notes: _____</p>

Please draw a map of nest site on back of form or attach compartment map or topographic map

Send completed form to:

Dave Cuthrell, Michigan Natural Features Inventory, P.O. Box 30444, Lansing, Michigan 48909  
For additional information: Dave Cuthrell, zoologist (517) 335-6627 Email: cuthreld@state.mi.us