Productivity and Monitoring of Red-shouldered Hawk Nests
Final Progress Report 2005

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MICHIGAN STATE UNIVERSITY EXTENSION

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).

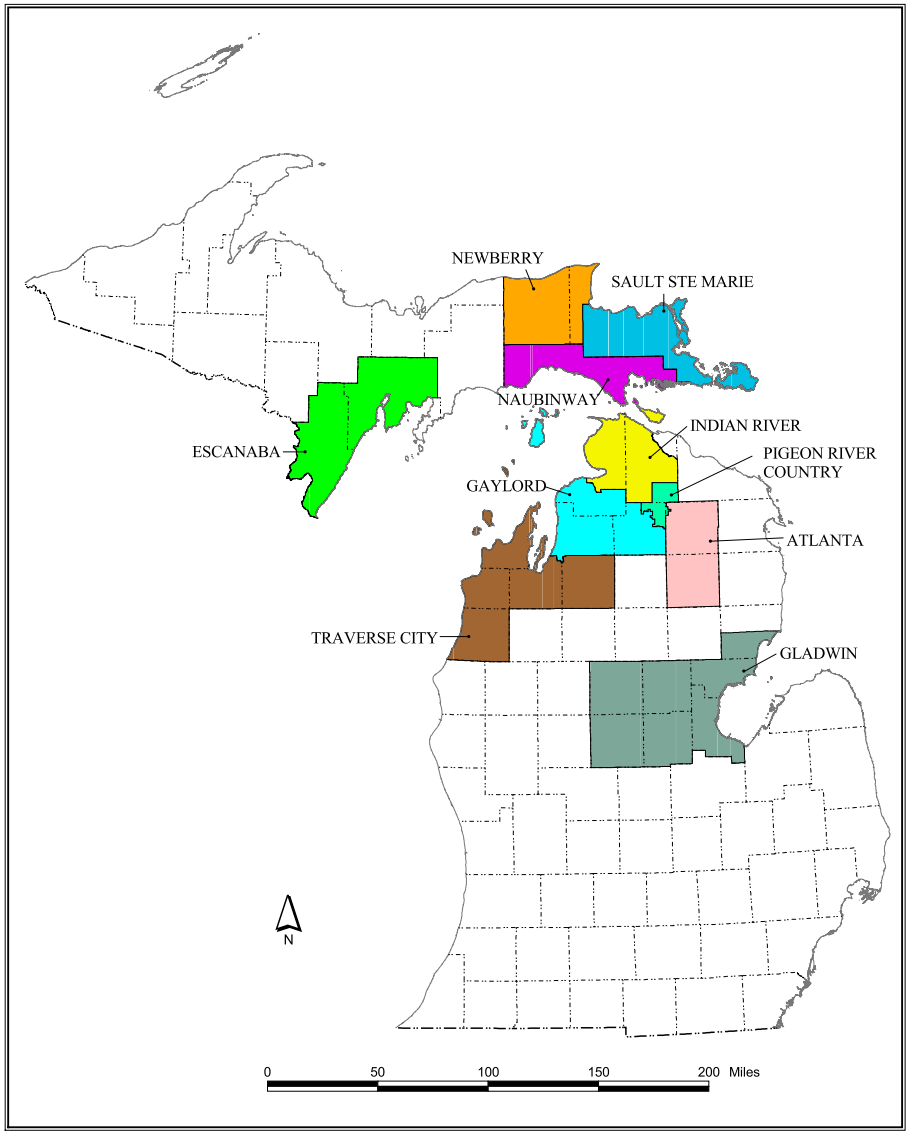
Our earlier data indicate that nest trees tend to be deciduous, primarily American beech (*Fagus grandifolia*), however any tree with adequate structure (i.e., a multi-pronged crotch) could be suitable. Nests tend to be placed in large, mature, super-canopy trees and the nest itself is placed on average 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 2005 study had three main objectives: (1) to continue the monitoring of RSH nests on state forest lands for territorial activity, nest success rates, and productivity; (2) to continue checking nests as requested by forest technicians and biologists to help facilitate sound management decisions in relation to proposed activities; and (3) to distribute information to the bird technical committee to help determine the appropriate state-listing status for this woodland raptor.

Materials & Methods

This study, because it was largely funded by the Forest, Mineral, and Fire Management Division, 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 12th to June 6th of 2005 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 2005 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 14 through June 27, all active nests in the NLP 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 mirror attached to a 15 m (50 ft) pole. One person held the mirror pole above the nest while a second individual used binoculars to view and count eggs, chicks, or fledglings. 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 1999-2005 the nesting behavior and productivity of 643 active RSH territories were followed, including 94 active territories in 2005. Among these active territories, 413 active nests were located over the course of this study including 83 active nests in 2005 (Figure 2). Nest success rates among northern Michigan forest areas surveyed was high (67% successful). Nest success rates ranged from a high of 82% in 1999 to a low of 52% in 2004 (Figure 3). After dropping during 2003 and 2004, nest success rebounded to 70% in 2005. Nest success rates for the study period by forest area ranged from a high of 80% for the Eastern UP to a low of 33% for the Western UP (Figure 4), although small sample sizes may explain the variability for these two forest areas.

Reproductive rate from the nest site data combined for all forest areas between the years of 1999 - 2005 was 1.91 young per successful nest and 1.22 young per active nest (Table 1). During our study, reproductive rates fluctuated from year-to-year and by state forest area (Table 1). Nest predation was confirmed (e.g., claw marks on trees, den tree nearby, nests torn apart, remains of adult hawk, etc.) for 11 % of occupied nests between 1999 – 2005 (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*). Predation rates for 2005 were 5%.

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. 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.

Figure 2. Active Red-shouldered Hawk territories, active nests, and successful nests monitored in the northern Michigan study area (1999-2005).

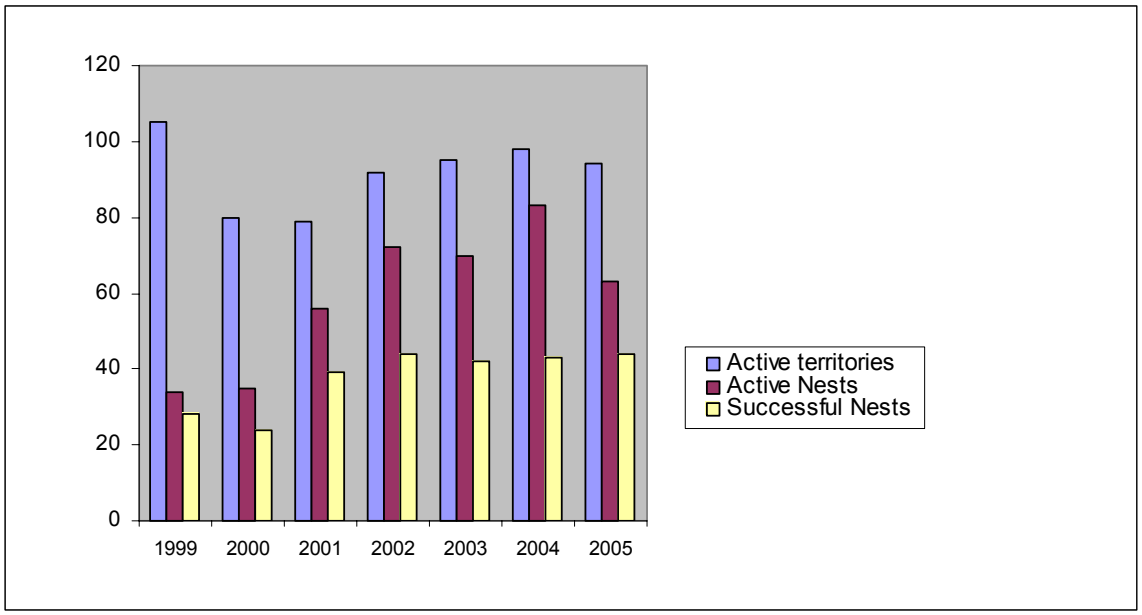


Figure 3. Percent successful Red-shouldered Hawk nests monitored in the northern Michigan study area (1999-2005)

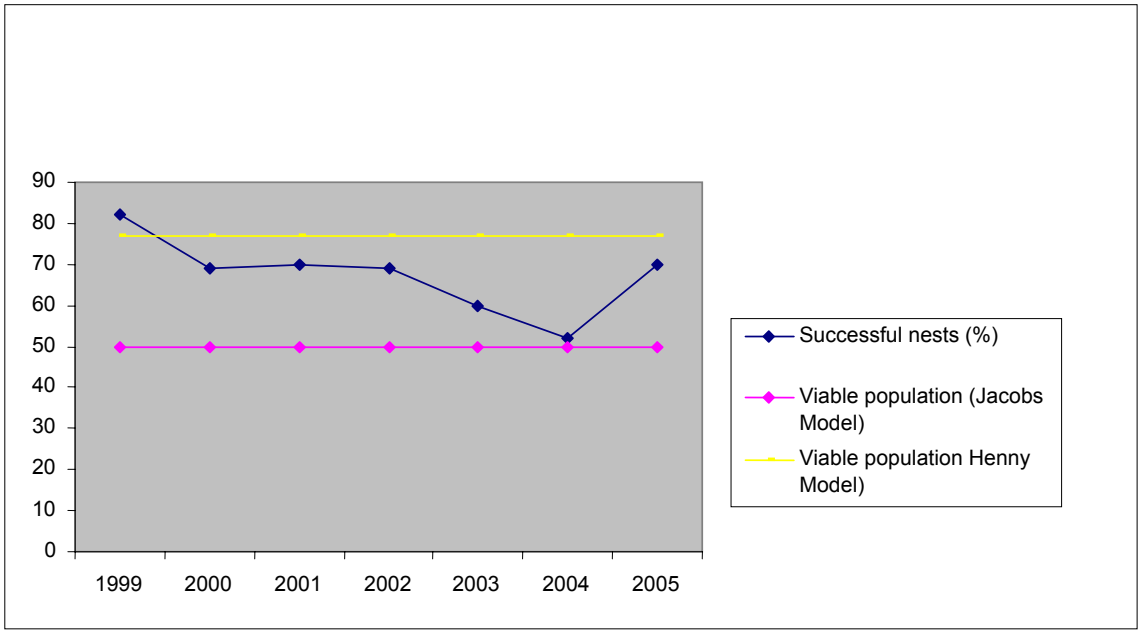


Figure 4. Percent nest success by forest management unit (1999-2005) in the northern Michigan study area.

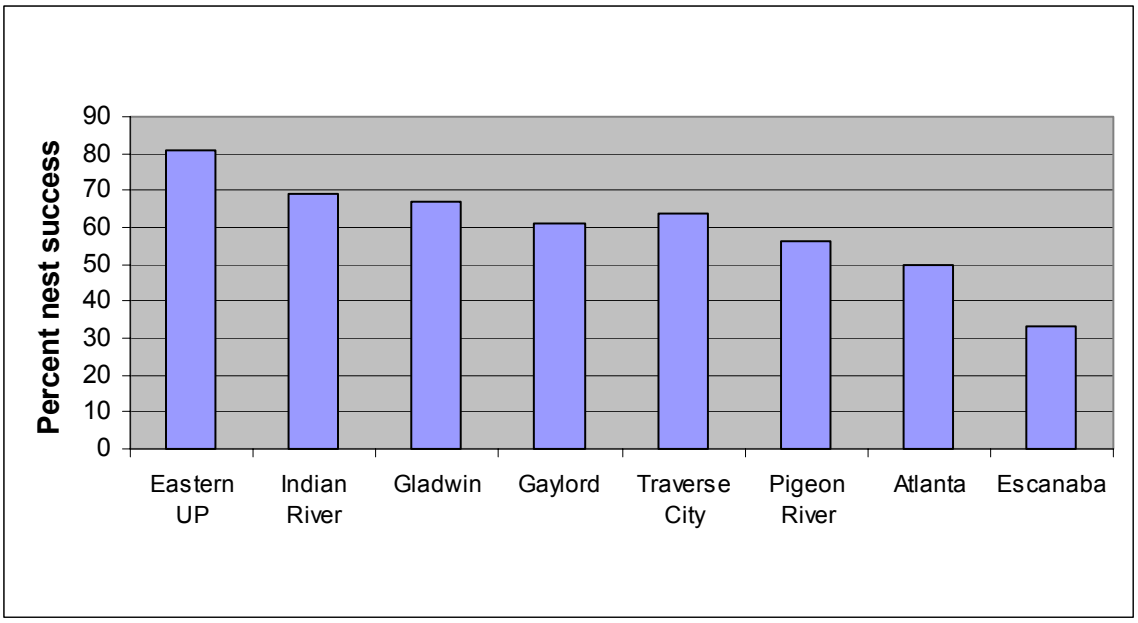


Figure 5. Productivity of Red-shouldered Hawk nests monitored during 1999-2004 in the northern Michigan study area.

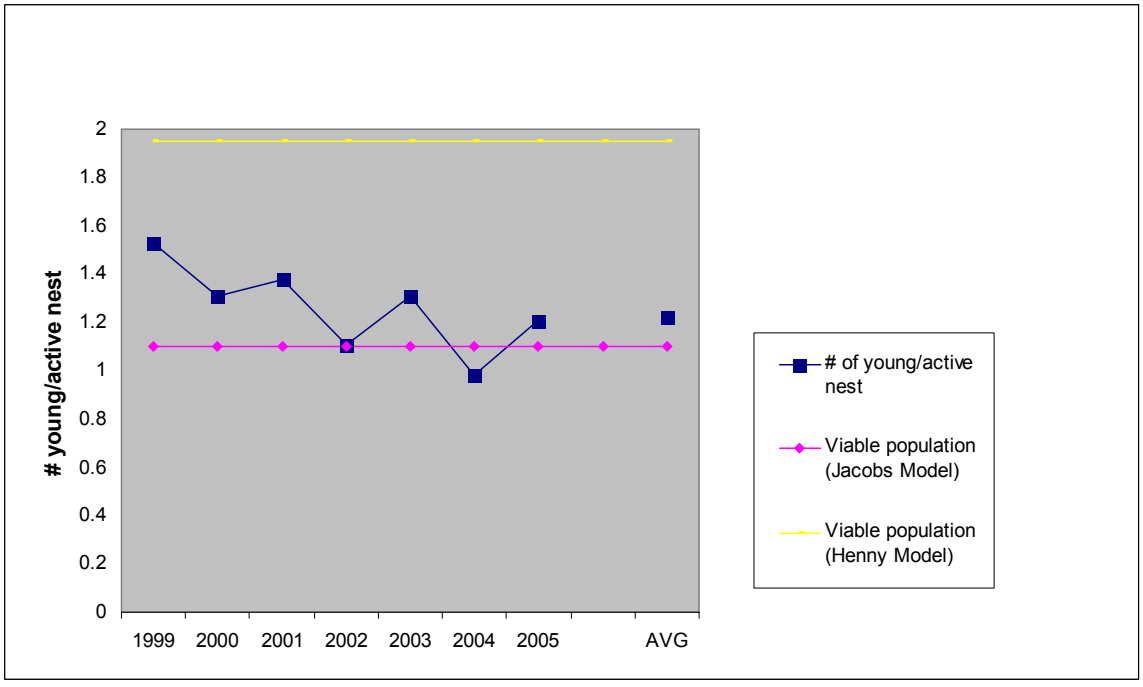


Table 1. Reproductive outcomes of Red-shouldered Hawks nesting in northern Michigan by state forest management areas 1999-2004.

Area/year	Active Nests	Successful nests	Fledged Young	Confirmed Predation %	Young per Successful Nest	Young per Active Nest	Percent Nest Success
Eastern UP	**26**	**21**	**42**	**2**	**2.00**	**1.61**	**81**
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 [a]	1	1	1	0	1.00	1.00	
Indian River	**74**	**51**	**101**	**9**	**1.98**	**1.36**	**69**
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	
Gladwin	**12**	**8**	**16**	**10**	**2.00**	**1.33**	**67**
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	
Gaylord	**59**	**36**	**75**	**16**	**2.08**	**1.27**	**61**
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	
Traverse City	**73**	**47**	**87**	**8**	**1.85**	**1.19**	**64**
2000	6	5	10	17	2.00	1.67	
2001	10	9	18	0	2.00	1.80	
2002	11	8	14	0	1.75	1.27	
2003	16	6	13	25	2.17	0.81	
2004	15	8	14	0	1.75	0.93	
2005	15	11	18	7	1.64	1.20	
Pigeon River	**137**	**86**	**153**	**11**	**1.78**	**1.12**	**56**
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	

Area/year	Active Nests	Successful nests	Fledged Young	Confirmed Predation %	Young per Successful Nest	Young per Active Nest	Percent Nest Success
Atlanta	**26**	**13**	**27**	**2**	**2.08**	**1.04**	**50**
2002	6	4	9	0	2.25	1.50	
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	
Escanaba	**6**	**2**	**3**	**0**	**1.50**	**0.50**	**33**
2002	1	1	2	0	2.00	2.00	
2003	2	0	0	0	0.00	0.00	
2004	3	1	1	0	1.00	0.33	
2005 [a]							
STUDY TOTALS	**413**	**264**	**504**	**11**	**1.91**	**1.22**	**63**

[a] = not all nests in the forest area were checked for productivity in 2005

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APPENDIX I

MNFI Raptor Nest Reporting Form

RAPTOR NEST REPORTING FORM

Michigan Natural Features Inventory

Site Information
Observer(s) Name:_____ **Phone**:_____ **email**:_____
County:_____ **State Forest Area**:_____ **Compartment/stand**:_____
Date of Observation:_____ **Township/Range/Section:**_____
Directions to Site:_____
Survey and Biological Data
Weather (check): sunny ☐ mostly sunny ☐ partly cloudy ☐ mostly cloudy ☐ cloudy ☐
winds: 0-5 ☐ 6-10 ☐ 11-15 ☐ 16-20 ☐ 20+ ☐ **Temperature:** ____
Precipitation: rain ☐ snow ☐
Circumstance of Observation:deliberate search ☐accidental observation ☐ responded to taped call ☐
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 ☐ birds observed but not calling ☐ birds observed & heard ☐
Nest Found (check all that apply): no☐ yes ☐; if yes nest decorated ☐ not decorated ☐ old nest ☐
presence of down ☐ evidence of new construction ☐ bird on nest ☐ birds heard in immediate vicinity of nest ☐
Nest tree species:_____ **Nest height:** 10-20' ☐ 21-30' ☐ 31-40' ☐ 41-50' ☐ 50'+ ☐
Nest tree DBH :_____**Age class**: Even ☐ Uneven ☐ **Presence of flight lane**: yes ☐ no ☐
Landscape Position: Slope ☐ Flat ☐ Upland ☐ Lowland ☐ **Canopy layers**: 1 ☐ 2 ☐ 3 ☐
Proximity to wetland (mi.): < 1/8 ☐ >1/8<1/4 ☐ >1/4<1/2 ☐ >1/2 ☐
Type of wetland habitat nearby: Conifer ☐ Hardwood ☐ Emergent ☐ Vernal Pool ☐ Shrub ☐
Other: _____

Understory density: Dense ☐ Moderate ☐ Sparse ☐ **Cover type**: M☐ A☐ B☐ O☐ Other_____
Stocking density: 5☐ 6☐ 7☐ 8☐ 9☐

Productivity Surveys (if conducted)
Date:_____ **Observer(s):**_____ **Active**: Yes ☐, if yes young in nest ☐ whitewash at base of tree ☐ young of year in nearby trees ☐ No ☐
Number of Young: _____
Was there evidence of predation: no ☐ yes ☐If yes, nest torn apart ☐ claw marks on tree ☐ dead bird in or near nest ☐ other_____
Additional notes: _____
_____

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