

INVESTIGATIONS FOR RED-SHOULDERED HAWK FORAGING OR NESTING IN
OR NEAR THE RECENT TIMBER HARVEST WITHIN THE MILAN BOTTOMS

submitted to

ILLINOIS DEPARTMENT OF CONSERVATION
NATURAL HERITAGE DIVISION/ILLINOIS WILDLIFE PRESERVATION FUND

U.S. ARMY CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
NATURAL RESOURCES DIVISION/MISSISSIPPI RIVER PROJECT

U.S. FISH & WILDLIFE SERVICE, MARK TWAIN NATIONAL WILDLIFE REFUGE
WAPELLO DISTRICT

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January 1996

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ACKNOWLEDGEMENTS

Funding for this project was provided by the Illinois Wildlife Preservation Fund, the U.S. Army Corps of Engineers Natural Resources Division Rock Island District, and the Midwest Raptor Research Fund. The Odessa Wildlife Unit of the Iowa Department of Natural Resources provided a boat for field observations. Field observations were conducted by Jon Stravers, Kelly McKay, Ben Conklin, Sarah Hartung, and Shawn Hawks.

This project would not have been possible without the patience, cooperation, and professionalism of Roger Bollman and Gary Swenson of USCOE Mississippi River Project Natural Resources Division, or without the support in previous years by the U.S. Fish & Wildlife Service Regional Nongame Bird Fund.

INTRODUCTION

Although there has been much speculation concerning the effect of various types of timber harvests on red-shouldered hawk (Buteo lineatus) nesting, very little data has been collected on specific responses in the vicinity of recent forest cuts, especially in areas of red-shoulder nesting in forest tracts along the Mississippi River.

Red-shouldered hawks generally require fairly large unfragmented tracts (500 acres or more) of mature bottomland forest (Bednarz & Dinsmoore 1981; Stravers & McKay 1994); they are one of the rarest nesting raptors in Iowa and Illinois, and they are considered endangered in both states. Most of the documented nesting sites for this species in Iowa and Illinois are near or along the Mississippi River (Roosa & Stravers 1989). In some districts, such as the Wapello District (Pools 16-19) they are particularly rare; we know of only three areas that support active red-shoulder nests sites within a 150 mile stretch of the Mississippi from Savanna, Illinois, to Fort Madison, Iowa (Stravers 1992; Stravers & McKay 1994).

During the spring and summer of 1993, personal from the U.S. Army Corps of Engineers Natural Resources Division and the Midwest Raptor Research Fund both observed red-shouldered hawk territorial behavior within one of the proposed timber harvests within the Milan Bottoms. Subsequently, the planned timber harvest within the Mill Creek/Milan Bottoms was delayed, and eventually, the U.S.C.O.E. Natural Resources Division altered their original harvest plan of three areas for a total of 28 acres due to the potential negative effect on red-shouldered hawks nesting. Instead, an eleven acre harvest (proposed cut #3) was completed during the winter of 1994-1995.

In order to understand the potential impact of the accomplished timber harvest, we conducted regular investigations from five observation sites points within the study area during the months following the cut. We conducted searches for and initiated inventory techniques for all raptors nesting within the Mill Creek/Milan Bottoms study area.

This report describes our initial effort to monitor the raptor population within the Milan Bottoms. We intend to continue these investigations over the next several years in order to make a more accurate assessment of red-shoulder response to timber harvest methods within the Milan Bottoms.

RESEARCH OBJECTIVES:

1. To determine the presence or absence of nesting or foraging Red-shouldered hawks during the spring and summer of 1995 within the harvested and unharvested forest tracts in the Milan Bottoms, near the confluence of Mill Creek and the Mississippi River, in Rock Island County, Illinois.
2. To compare reproductive success of red-shouldered hawks, with the reproductive success of red-tailed hawks, great-horned owls, barred owls, and any other raptors nesting within the study area.
3. To compare sightings and use rates for red-shouldered hawks with those of other raptor species within harvested and unharvested forest tracts of the study area.
4. To provide an updated assessment of red-shouldered hawk response to specific forest management techniques within flood plain forests within the Mississippi River Valley.

METHODS

All potential red-shouldered hawk nesting habitat within the Milan Bottoms/Mill Creek area was systematically searched for raptor nests between October 1994 and February 1995; these searches were repeated between March and May of 1995 (Craighead & Craighead 1956). Nest searches were conducted for a total of eleven days (28 person days) between October 1994 and May of 1995. To assist in locating active nesting territories, taped calls of red-shouldered hawks were played in order to elicit a territorial response (Fuller & Mosher 1987). All active raptor nests were plotted on topographic maps or aerial photos and were visited periodically throughout the nesting cycle in order to determine reproductive success.

Observations for raptor activity within and adjacent to the 11 acre timber harvest (cut #3, observation site #3) were conducted for 52 hours on 21 days between February 17 and September 15. We also conducted similar observations at four other sites within the Milan Bottoms/Mill Creek study area. Observation times were rotated so that they included various times of the day and various weather conditions throughout the study period.

We recorded measurements on height of canopy, percent of canopy cover in the immediate nest area, and nest tree size. We measured distances between active raptor nests and we also recorded distances to nearest marsh or canopy clearing, nearest stream, nearest regular boat traffic, and other human disturbance.

Because of the low topography within the study area, high water levels during the spring months reduced the efficiency of nest searches within some sections. We were able to search all of the habitat we considered high potential. However, our coverage of some of the fringe and low potential habitat was not as complete, especially in some areas where the water was deep and the trees were young creating a "crowded" situation that made searches ineffective.

DESCRIPTION OF THE STUDY SITE

The Milan Bottoms/Mill Creek complex study area includes over 1000 acres in Rock Island County, Illinois near the confluence of Mill Creek and the Mississippi River. The study area is bounded on the east by Interstate Highway 280, on the north by the Mississippi River, on the south by highway 92, and by a line approximately 3/8 mile west of the cut #3 on the west.

Most of the study area is owned by U.S. Army Corps of Engineers and managed as part of the Mark Twain National Wildlife Refuge; however, some sections of the study are privately owned. The study area is dissected by an Iowa/Illinois powerline.

Several small streams flow into each other and into the Mississippi River within the study area. These include Mill Creek, Kickapoo Slough, Turkey Hollow Creek and several smaller unnamed temporary streams. The elevation of the study area is low enough that during typical spring flood levels much of the study area is under water. Depth of flood waters may be anywhere between two inches and twelve feet and the duration of the flooding during some years may be as brief as a few days or as long as 6 months. There are several ridges within the study area that are elevated enough to remain exposed during most flooding.

Although there has been some selective timber harvests within the study area at various times in the past, there has been no large scale timber production from this area. Tree species and age diversity within the study area is perhaps one of the highest of flood-plain forests along the Mississippi River.

OBSERVATION SITES

- #1 - 100 meters southwest of cut #1 and 100 meters northwest of the northwest edge of Long Pond.
- #2 - just east of the confluence of Kickapoo Slough and Mill Creek, about 150 meters east of the southeast corner of cut #2.
- #3 - Cut # 3 - eleven acre clear cut finished in the winter 94-95.
- #4 - along the Iowa/Illinois Powerline.
- #5 - Cormorant Pond

RESULTS AND DISCUSSION

RED-SHOULDERED HAWK NESTING SITES & PRODUCTIVITY

During this study, three red-shouldered hawk (RSH) nests were located within the Milan Bottoms/Mill Creek complex. One RSH nest was situated along Mill Creek near the outflow from Gun Pond, about 100 yards south of the confluence of Mill Creek and Kickapoo Slough (Map 1, Figure 1). This nest was within 100 yards of proposed cut #1. Three young RSH fledged from this nest.

The second RSH nest was located along a slightly elevated ridge about half way between Long Pond and Mill Creek, about 400 yards from the Mississippi River, and about 150 yards west of proposed cut # 2. Two young RSH fledged from this nest.

A third RSH nest was located near the intersection of Cormorant Pond and a drainage ditch about 75 yards from the powerline on private property (owned by Charles Brandt); this nest was approximately 500 yards east of the accomplished cut #3. Three eggs were laid and incubated for at least 40 days but none hatched.

In some respects, placement of RSH nests within the study area is somewhat unusual according to our previous findings (Stravers 1992: Stravers & McKay 1994); we typically found RSH nests near the edge of the valley slope. However, the forests within the Milan Bottoms are not contiguous with the valley slope, which is situated one mile south and is separated by open fields, highway 92, and several human dwellings. Also, there is only slight topographic relief within the study area which makes this area different from most RSH nesting sites we know of. However, despite the lack of topographic relief within the study area, it appears that RSH are selecting nesting locations within the driest portions of the study area where they find adequate-sized nesting trees. This is similar to our findings in other areas along the Mississippi River.

We have found that RSH are fairly well adapted to typical flooding cycles along the Mississippi River. However, young fledglings have a poor chance of survival when the nest tree is situated in a low-lying area and the surrounding area is inundated during the fledging period in early June. Because of the lack of topographic relief and the limited availability of suitable nesting sites within the Milan Bottoms, some RSH might be forced to select sites that are less favorable due the potential for flooding and for human disturbance.

COMPARISON OF RED-SHOULDERED AND RED-TAILED HAWKS OBSERVATIONS AT THE VARIOUS OBSERVATION SITES

In addition to our searches for active raptor nests, and our observations on reproductive success, we made observations for presence/absences of RSH and other raptors within the timber harvest and at various locations within the study area. Research from various regions has suggested that fragmentation of large forest tracts and an increase in edge habitat favors red-tailed hawks (RTH) and may discourage RSH nesting (Bednarz & Dinsmore 1981; Hands et al 1989; Jacobs & Jacobs 1993; Stravers & McKay 1993).

Per hour observations for these two species were similar at the timber harvest observation site #3 (0.50 for RSH and 0.44 for RTH). Per hour observations at site #1 was 1.32 for RSH and 0.49 for RTH, and 1.10 for RSH and 0.55 for RTH at site #2 (Table 2). Both of these sites were within the mature forest where the canopy was well-developed. It appeared that RSH spent more time perched, foraging, or soaring above the mature forest, while RTH were usually observed in flight, but usually only passing over the mature forested areas.

Per hour observations of RSH were 1.16 at site #4 and 0.87 at site #5, while per hour rates for RTH were 1.08 at site #4 and 0.97 at site #5. These observation sites were in relatively open areas near outlying ponds. Many of the raptors observed were in flight.

At all sites RSH were heard more often than seen, and RTH were seen more often than heard. This indicates that RSH were much more defensive and territorial within the Milan Bottoms, while RTH were less territorial of area that is probably only used as an foraging area, mostly for immature RTH.

It should be noted that these comparisons are not based on equal treatment since observation times varied at each site. Also, the field of vision and effectiveness of our observations also differed from site to site because of vegetation, topography, and water levels. Because the timber harvest provided a suitable clearing for observations, RSH were actually more easily observed at site #3 than at sites #2 and #3 where vision was limited by vegetation. However, these differences in visibility from site to site were somewhat minimized by the fact that often times we heard rather than saw RSH.

The 11 acre timber harvest appeared to be a frequent foraging area for several raptor species including red-tailed hawks, barred owls, and great-horned owls. Bald eagles and turkey vultures were also frequently observed, but most often they were flying over the area rather than perched or actively foraging.

These observations in the Milan Bottoms confirm that RSH forage throughout the entire study area during the nesting season. RSH do indeed incorporate foraging in edge habitat, and we did observe them near the timber harvest on several occasions. However, our findings in the Milan Bottoms is similar to our previous findings that RSH spend most of their time foraging along wooded sloughs, small back water pools and waterways or wetland pools, especially where these habitats occur within mature forest. RSH probably find less competition within these mature forested habitats, and probably face increased competition from various other raptor species such as red-tailed hawks and great-horned owls at edge habitats.

RECOMMENDATIONS

We are somewhat hesitant to draw any significant conclusions about red-shouldered hawk response to specific forest harvests from only one season of observations following the eleven-acre timber harvest. However, we feel there are both benefits and drawbacks associated with a timber harvest or with allowing timber to become over-mature.

RSH appear to select stable trees within the driest and oldest portions of large forest tracts. This puts them in direct conflict with the most valuable timber within the study area. Cuts within or near prime nesting sites may cause RSH to abandon specific areas as nesting habitat, but most likely will force them to choose another site somewhere within the study area which may in fact be less favorable. This is typified by the fact that the RSH nest which was situated on the edge of what we consider favorable habitat (near a clearing, a powerline, and an agricultural field), was unsuccessful. This may support our theory that some sites are naturally less favorable for RSH than others.

However, timber harvests may be necessary in some areas in order to stimulate new growth since regeneration of canopy tree species is often poor in areas of mature flood plain forests. Canopy species such as cottonwood and silver maple are typically shade intolerant and most seedlings don't survive well underneath a well-developed canopy. Consequently, some kind of concessions may be necessary in order to provide suitable age trees and suitable nest-site habitat for RSH in 40-60 years.

Although some research has suggested that RSH will abandon territories that are near timber harvests, recent observations in Wisconsin, Minnesota, and other areas along the Mississippi River suggest that RSH continue to nest in some sites where the timber harvests have been conducted on a small scale (Jacobs & Jacobs 1993; Dr. David Anderson, University of Minnesota, in press; Stravers 1996).

According to these observations, it appears that the USCOE's methods of timber management, which incorporates a series of small clear cuts within a given area, may cause a minimum of disturbance to nesting RSH and may also provide for needed regeneration. We agree with this approach of timber management as long as the overall plans provide for a protected core area, and as long as nest sites that have a history of good reproductive success are also protected.

We feel the proposed cuts at sites # 1 & 2 should not be completed as yet since these cuts might cause RSH to abandon nearby nesting sites. While we feel it is important to provide protection for RSH nesting sites, we also feel that the overall health of the forest within the study site may be more important than the protection of a few nesting sites within the study area.

Because the species diversity within the Milan Bottoms is particularly rich in comparison with many other areas along the Mississippi River, we feel that the promotion of forest diversity should be an important factor in any forest harvests conducted in the study area. We also feel that any estimate of RSH response to timber harvest within the study should be based on long term data rather than on any findings from a single season. We feel these observations should be continued during the next few years.

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KEY FOR ABBREVIATIONS USED IN FIGURES

SPECIES

TV = Turkey Vulture
SS = Sharp-shinned Hawk
CH = Cooper's Hawk
UA = Unidentified Accipiter
RTH = Red-tailed Hawk
BW = Broad-winged Hawk
RSH = Red-shouldered Hawk
UB = Unidentified Buteo
OS = Osprey
BE = Bald Eagle
AK = American Kestrel
PG = Peregrine Falcon
UR = Unidentified Raptor

RAPTOR ACTIVITY

P = PERCHED F = FORAGING C = CALLING
SF = SOARING FLIGHT DF = DIRECT FLIGHT CF = COURTSHIP FLIGHT
TF = TERRITORIAL FLIGHT

TABLE 1. OBSERVATIONS ON RED-SHOULDERED HAWK AND OTHER RAPTOR ACTIVITY
WITHIN THE MILAN BOTTOMS/MILL CREEK COMPLEX DURING 1995

SITE: OBSERVATION SITE # 3 (11 ACRE CUT)

DATE	TIME	HOURS	#RSH	ACTIVITY/DURATION	OTHER RAPTORS OBSERVED
02/17	1430-1650	2.3	1	C	BE (5), RTH, BO, GHO
02/24	1310-1640	2.3	-	-	BE (12), RTH (2), GHO, BO (3)
03/19	0815-1205	3.8	5	C, CF, DF, SF	BE (9), RTH (5), BO, CH, SS
03/30	1430-1600	1.5	2	C, SF	RTH (3), GHO (3), BE, BO
04/14	0745-1145	4.0	3	C, SF	RTH(4), GHO(2), BO(2), OS TV(12), CH(2), PF, AK, SS
04/19	0756-1056	3.0	-	-	RTH (2), TV (15)
05/04	1500-1830	2.5	?		
05/11	0830-1030	2.0	-	-	RTH (2), TV (7)
05/11	1420-1620	2.0	2	C, DF, TF	BO (2), TV (4)
05/11	1715-1915	2.0	1	C,	BO (2)
05/12	0708-0838	1.5	-	-	-
06/03	1600-1930	3.5	2	C, SF, DF	GHO (2), BO (3), TV (4)
06/07	1100-1400	3.0	-	-	RTH (1), TV (3)
06/16	1445-1645	2.0	1	P, F, DF	TV (4), GHO (2)
06/23	1320-1550	2.5	1	C	TV (12), GHO (1)

TABLE 1. (continued) OBSERVATIONS ON RED-SHOULDERED HAWK AND OTHER RAPTOR ACTIVITY WITHIN THE MILAN BOTTOMS/MILL CREEK COMPLEX DURING 1995

DATE	TIME	HOURS	#RSH	ACTIVITY/DURATION	OTHER RAPTORS OBSERVED
06/24	0540-0840	3.0	2	C, DF	RTH (2), GHO (1)
06/24	1030-1230	2.0	-	-	-
07/07	1502-1702	2.0	4	SF, C	RTH (1), GHO (2), TV (17)
07/08	0632-0932	3.0	2	C, C	GHO (1), TV (4)
07/08	1110-1210	1.0	-	-	-
09/15	1645-1851	2.1	-	-	TV (13)

TOTALS FOR OBSERVATION SITE # 3 (11 ACRE CUT)

RSH-26, BE-27, RTH-23, GHO-16, BO-15, TV-91

TOTAL OBSERVATION PERIODS: 21
 TOTAL RSH OBSERVATIONS: 26
 OTHER RAPTOR OBSERVATIONS: 192

TOTAL HOURS: 52.0
 RSH PER HOUR: 0.50
 TV PER HOUR: 1.75
 RTH PER HOUR: 0.44
 GHO PER HOUR: 0.31
 BO PER HOUR: 0.28
 BE PER HOUR: 0.52

SITE: OBSERVATION SITE # 1

DATE	TIME	HOURS	#RSH	ACTIVITY/DURATION	OTHER RAPTORS OBSERVED
02/18	0830-1030	2.0	2	C	BE(9), RTH(2), BO(2)
03/19	1335-1505	1.5	3	C, DF, SF, TF	BE(12), RTH, GHO, BO, CH
04/05	1345-1745	4.0	4	C, SF,	TV(8), OS
04/14	1045-1345	3.0	3	C, SF	TV(6), RTH, CH, SS, AK
04/18	1430-1530	3.0	1	C, DF	TV(2), RTH, GHO
04/19	0945-1145	2.0	3	C, DF	TV(6), RTH
05/05	0630-0850 1010-1110	3.3	4	C, SF, DF, TF	TV(4), RTH, GHO
05/06	0710-0840	1.5	4	C, DF	RTH, GHO
05/11	0830-1030	2.0	3	C, TF	TV(11), RTH(3), AK
05/12	0820-1020	2.0	5	C	TV(4), RTH, BO, CH

TOTALS:

RSH-32, BE-12, RTH-12, TV-35, BO-4, GHO-4, CH-2, AK-2, SS-1, OS-1

TOTAL OBSERVATION PERIODS:	10	TOTAL HOURS:	24.3
TOTAL RSH OBSERVATIONS:	32	RSH OBSERVATIONS PER HOUR:	1.32
OTHER RAPTOR OBSERVATIONS:	73	TV PER HOUR:	1.44
		RTH PER HOUR:	0.49
		GHO PER HOUR:	0.16
		BO PER HOUR:	0.16

SITE: OBSERVATION SITE # 2

<u>DATE</u>	<u>TIME</u>	<u>HOURS</u>	<u>#RSH</u>	<u>ACTIVITY/DURATION</u>	<u>OTHER RAPTORS OBSERVED</u>
02/18	1110-1310	2.0	2	C	BE (5), RTH (2), CH (2)
03/31	1030-1345	3.25	5	C, DF, SF, TF	BE(3), BO, OS
04/14	1503-1603	1.0	1	C	RTH, BO(2), TV(4)
04/18	1608-1708	1.0	-	-	TV(4), BO(2)
05/05	0830-1230	4.0	3	C, DF, SF, TF	RTH (2), TV (17)
05/06	0805-0925	1.25	3	C, DF	RTH
05/11	1115-1315	2.0	2	C, DF, SF	RTH (2), TV (7)

TOTALS: TV-32, BE-8, RTH-8, BO-5, CH-2, OS-1

TOTAL OBSERVATION PERIODS: 7
TOTAL RSH OBSERVATIONS: 16
OTHER RAPTOR OBSERVATIONS: 56

TOTAL HOURS: 14.5
RSH OBSERVATIONS PER HOUR: 1.10
TV PER HOUR: 2.20
RTH PER HOUR: 0.55
GHO PER HOUR: -
BO PER HOUR: 0.34

SITE: OBSERVATION SITE # 4

<u>DATE</u>	<u>TIME</u>	<u>HOURS</u>	<u>#RSH</u>	<u>ACTIVITY/DURATION</u>	<u>OTHER RAPTORS OBSERVED</u>
02/19	1305-1505	2.0	3	C, CF, P	RTH (3), BE (6), CH
03/18	1410-1540	1.5	4	C, SF, DF	BE(4)
03/30	1100-1400	3.0	2	C, SF, CF, DF	RTH (3), CH (1),
04/19	1118-1148	0.5	1	INCUBATING	-
07/07	1430-1630	2.0	-	-	RTH (5), TV (39)
05/12	1130-1230	1.0	2	C, INCUBATING	RTH, TV (5)
05/18	1540-1740	2.0	2	C	TV(10), BO(2), RTH

TOTALS: RSH-14, TV-49, RTH-13, BE-10, BO-2, CH-2

TOTAL OBSERVATION PERIODS:	7	TOTAL HOURS:	12.0
TOTAL RSH OBSERVATIONS:	14	RSH OBSERVATIONS PER HOUR:	1.16
OTHER RAPTOR OBSERVATIONS:	76	TV PER HOUR:	4.08
		RTH PER HOUR:	1.08
		GHO PER HOUR:	-
		BO PER HOUR:	0.17

SITE: OBSERVATION SITE # 5

<u>DATE</u>	<u>TIME</u>	<u>HOURS</u>	<u>#RSH</u>	<u>ACTIVITY/DURATION</u>	<u>OTHER RAPTORS OBSERVED</u>
02/19	1030-1250	2.3	2	C, SF	RTH (4), BE (4), BO (2), CH
04/18	1230-1330	1.0	1	C	TV(12), RTH(2)
04/19	1302-1502	3.0	4	C, SF, DF	RTH(3), TV(16), BO(3) AK(2), OS, CH
05/06	1003-1203	2.0	2	C	TV (18)
05/11	1600-1800	2.0	-	-	RTH, GHO, TV (7)

TOTALS: RSH-9, TV-53, RTH-10, GHO-1, BO-5

TOTAL OBSERVATION PERIODS: 5	TOTAL HOURS: 10.3
TOTAL RSH OBSERVATIONS: 9	RSH OBSERVATIONS PER HOUR: 0.87
OTHER RAPTOR OBSERVATIONS: 78	TV PER HOUR: 5.15
	RTH PER HOUR: 0.97
	GHO PER HOUR: 0.10
	BO PER HOUR: 0.49

TABLE 2. COMPARISON OF TOTALS AND PER HOUR OBSERVATIONS OF RAPTORS AT EACH OF THE FIVE OBSERVATION SITES WITHIN THE MILAN BOTTOMS DURING 1995.

TOTALS FOR OBSERVATION SITE # 3 (11 ACRE CUT)
RSH-26, BE-27, RTH-23, GHO-16, BO-15, TV-91

TOTAL OBSERVATION PERIODS:	21	TOTAL HOURS:	52.0
TOTAL RSH OBSERVATIONS:	26	RSH PER HOUR:	0.50
OTHER RAPTOR OBSERVATIONS:	192	TV PER HOUR:	1.75
		RTH PER HOUR:	0.44
		GHO PER HOUR:	0.31
		BO PER HOUR:	0.28
		BE PER HOUR:	0.52

TOTALS FOR OBSERVATION SITE #1:

RSH-32, BE-12, RTH-12, TV-35, BO-4, GHO-4, CH-2, AK-2, SS-1, OS-1

TOTAL OBSERVATION PERIODS:	10	TOTAL HOURS:	24.3
TOTAL RSH OBSERVATIONS:	32	RSH OBSERVATIONS PER HOUR:	1.32
OTHER RAPTOR OBSERVATIONS:	73	TV PER HOUR:	1.44
		RTH PER HOUR:	0.49
		GHO PER HOUR:	0.16
		BO PER HOUR:	0.16

TOTALS FOR OBSERVATION SITE #2: TV-32, BE-8, RTH-8, BO-5, CH-2, OS-1

TOTAL OBSERVATION PERIODS:	7	TOTAL HOURS:	14.5
TOTAL RSH OBSERVATIONS:	16	RSH OBSERVATIONS PER HOUR:	1.10
OTHER RAPTOR OBSERVATIONS:	56	TV PER HOUR:	2.20
		RTH PER HOUR:	0.55
		GHO PER HOUR:	-
		BO PER HOUR:	0.34

TOTALS FOR OBSERVATION SITE #4: RSH-14, TV-49, RTH-13, BE-10, BO-2, CH-2

TOTAL OBSERVATION PERIODS:	7	TOTAL HOURS:	12.0
TOTAL RSH OBSERVATIONS:	14	RSH OBSERVATIONS PER HOUR:	1.16
OTHER RAPTOR OBSERVATIONS:	76	TV PER HOUR:	4.08
		RTH PER HOUR:	1.08
		GHO PER HOUR:	-
		BO PER HOUR:	0.17

TOTALS FOR OBSERVATION SITE #5: RSH-9, TV-53, RTH-10, GHO-1, BO-5

TOTAL OBSERVATION PERIODS:	5	TOTAL HOURS:	10.3
TOTAL RSH OBSERVATIONS:	9	RSH OBSERVATIONS PER HOUR:	0.87
OTHER RAPTOR OBSERVATIONS:	78	TV PER HOUR:	5.15
		RTH PER HOUR:	0.97
		GHO PER HOUR:	0.10
		BO PER HOUR:	0.49



LEGEND

① OBSERVATION SITE

⊗ RSH NEST

Figure 1 shows the three red-shouldered hawk nests and the five observation sites within the Milan Bottoms

