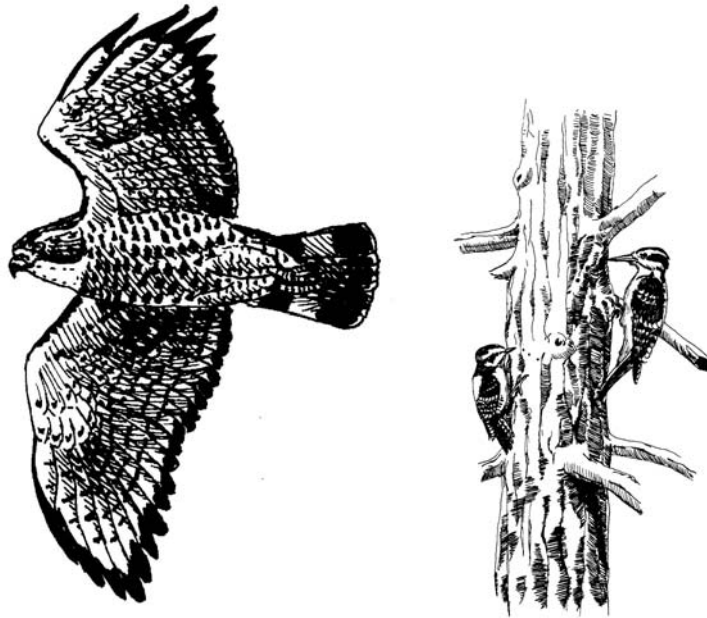


NEW BRUNSWICK FOREST HAWK AND SPRING WOODPECKER SURVEY

*Guide for Volunteers
Revised May 2003*



Illustrations by: Steven D'Amato



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 l'environnement au travail



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New Brunswick Forest Hawk and Spring Woodpecker Survey

Bird Studies Canada and the New Brunswick Department of Natural Resources and Energy (NB-DNRE) welcome you to the second year of the New Brunswick Forest Hawk and Spring Woodpecker Survey!

Thanks for committing your time to the survey.

Why a New Brunswick Forest Hawk and Spring Woodpecker Survey?

This survey has been designed primarily to monitor the population trends of Broad-winged Hawks and Northern Goshawks, and to gather more information on the status of Red-shouldered Hawk and Red-tailed Hawk across the province. Northern Goshawk and Broad-winged Hawk have been identified as indicators of **Old Hardwood Habitat (OHWH)** they are thought to use this habitat type for nesting and hunting, often putting their nest in the first crotch of a large hardwood tree. In NB, objectives for specific amounts of **OHWH** have been put in place for crown land. Monitoring Goshawks and Broad-winged hawk along with the amount of old hardwood forest in the province helps wildlife managers assess management strategies to maintain these species in NB.

Red-shouldered Hawks and Red-tailed Hawks have been identified as species of conservation concern by the DNRE's Species at Risk program. The Red-shouldered Hawk is listed as **May be at risk**, and the Red-tailed Hawk is listed as **Sensitive**. The conservation concern for these species can primarily be attributed to their small population sizes and the fact that not much is known about their population trends or relative abundance in NB. The results of this monitoring program will be used to monitor and evaluate the conservation status of these hawks in New Brunswick.

Presently, forest hawks are not well monitored in New Brunswick. Red-shouldered hawks have never been observed in New Brunswick on any monitoring program such as the Breeding Bird Survey (BBS) or Christmas Bird Count (CBC). Goshawk, Red-tailed Hawk and Broad-winged Hawk are counted on the BBS and the CBC, but are not observed in numbers high enough to be useful in evaluating changes in their abundance. Raptors are wide-ranging and fast moving, and they nest at low densities and are widely dispersed. Therefore, a more hawk-specific survey has been developed to evaluate forest hawk abundance. Playbacks of Red-shouldered Hawk and Northern Goshawk calls will be used to census hawks along 85 randomly-chosen routes passing through areas of extensive forest cover in NB.

The NB Forest Hawk and Spring Woodpecker survey playback protocol consists of Red-shouldered Hawk and Northern Goshawk alarm/territorial calls interspersed with silent listening periods. Northern Goshawks are very responsive to the alarm call during the nesting period when they have nestlings or fledglings. Broad-winged Hawks will also respond to Red-shouldered Hawk calls during the nesting period, although research hasn't yet shown at which

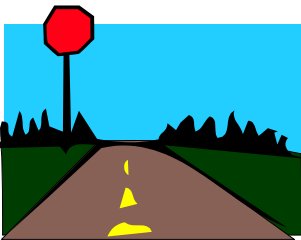
stage they are the most responsive. Other hawk species are also expected to respond to heterospecific calls; it is our hope that the Goshawk and Red-shouldered Hawk broadcasts will illicit responses from Red-tailed and Red-shouldered Hawks also.

What about woodpeckers?

For volunteers who feel confident in their ability to identify woodpeckers by sight and sound, an additional component of the hawk survey is to gather information on the number and species of *woodpeckers* they observe on the survey. Woodpeckers often respond to the calls of hawks and owls by approaching and calling. This behavior may allow some species of woodpeckers to be surveyed during the hawk survey. We'd like to use the survey to monitor these species. So, where volunteers feel that they can identify the species of woodpeckers that occur in NB (see appendix) by **sight and sound**, we would like them to record these species also. Even if you can't identify woodpeckers, we'd like you to note whether or not you saw or heard any during your survey, including when they are not observed as well. Even if an observer cannot identify the species it is important to note their absence or presence. Blue Jays and Gray Jays will also be recorded as part of this year's survey.

The goals of NB Forest Hawk Survey are:

1. To detect changes in the relative abundance of Broad-winged Hawk and Northern Goshawk in New Brunswick, both on crown land and on privately-owned land;
2. To collect data on Red-tailed Hawk and Red-shouldered Hawk in order to monitor and update their conservation status;
3. To use the results of the monitoring program to assess the performance of DNRE's Old Forest Habitat supply strategy for crown lands; and
4. To collect data on woodpecker and jay presence along survey routes, to assess the ability of the survey to monitor woodpecker and jay populations in New Brunswick.



GENERAL SURVEY METHODOLOGY

It's simple and fun! Volunteers drive a 15-km road transect, stopping every 1 km (for a total of 16 stops). At each stop, volunteers complete a 7-minute point count using a broadcast CD that alternates between hawk calls and silent listening periods. The first 4 minutes of the playback protocol involve Red-shouldered Hawk calls, while the last 3 minutes involves Northern Goshawk calls. During the 7 minutes, volunteers record all forest hawks and jays (and, if they are confident, woodpeckers) seen or heard during each playback or listening period.

Surveys start one half-hour before sunrise and take approximately 3 hours to complete (not including travel time to and from the survey route). **Surveyors are asked to conduct the survey between May 18 and June 16.**

It is important that the same volunteer survey the same route each year.

GETTING READY

Before you start your survey, you need to:

1. Read these instructions and become familiar with the methods and data forms.
2. Learn your hawks, jays and woodpeckers! Listen to the training CD to be sure you can identify any hawk, jay or woodpecker calls you might hear. Travel around your community to listen and look for hawks and practice your ID skills. Go out with someone who has experience with hawk calls and who can teach you the different calls you may hear along your route. Try to be as familiar as possible with the calls of the four target hawk species: Northern Goshawk, Broad-winged Hawk, Red-shouldered Hawk and Red-tailed Hawk. Remember, some bird species, like Blue Jays and European Starlings, can mimic the calls of hawks – and they do a pretty good job of it! Try to recognize the difference between the real thing and the mimic (study the training CD!).
3. If possible, scout your assigned route before running your survey. This is particularly important if you did not receive a completed stop description form (see below).
4. If you are using your own CD player, check to be sure that it is working and is loud enough. Complete the test on page 6 to make sure your equipment is loud enough for the survey. If you do not have your own CD player, check the list of locations (DNRE offices) included in your kit to see where you can pick up a CD player. Reserve the CD player for 1-3 days during the time period when you think you'll be surveying your route.



Your assigned route

Your kit includes a map of your survey route, and (potentially, see below) a description of each stop along the route. All survey routes were chosen randomly using secondary roads located through forested habitats, including some pretty rough forestry roads. Sections of road that pass through non-forest habitat (i.e. agricultural areas, residential areas) are not included as part of the route. Each route was mapped out to fall entirely on either crown, federal or private land, allowing us to examine hawk population trends on each landbase separately.

We have made an attempt to scout all routes on private land before assigning them to volunteers. During our scouting expeditions, we chose stop locations based on suitability of habitat (see below for details). We were not, however, able to scout all routes. If you did not receive a **completed** stop description form, please attempt to scout your route, noting each stop location as described below.

If you received a blank stop description form:

Unfortunately, this means that we were not able to scout your route and choose stop locations. We are hoping you may be able to do this for us. We realize that some routes are remote and a scouting expedition prior to the survey morning may not be possible. However, if you cannot scout your route, the following information still applies, as you will be required to fill out the stop description form the same morning as you conduct the survey.

Please drive the route and map out your stops by filling out the stop description form. Each route consists of 16 stops spaced 1 km apart. At each stop, note the odometer reading (measured from the starting point of your route) and a general description of the stop (e.g. “just after big curve, next to speed limit sign”, or “100 m past driveway of house #365”) and the habitat (e.g. “coniferous forest on left”). Make sure your description of the starting point (Stop #1) is particularly clear. Try and pick a starting location that is easy to re-locate such as a road junction or bridge (or note the driving distance from a point that is recognizable). Clearly describe the starting point on your stop description form. It is also a good idea to mark the starting point with flagging tape or a reflector.

If you own or can borrow a Geographic Positioning System (GPS), we *strongly* recommend that you take it with you on your scouting expedition or actual survey. At a minimum, we would like to know the position (UTM or latitude/longitude) of the first and last stops on your route. We would prefer that all positions are reported using the NAD83 reference system; please indicate if your GPS uses a different system (e.g. NAD27). In future years, we hope to have GPS units available for volunteers to borrow in order to georeference their stops.

Along each route, stops should be located every 1km as much as possible. However, stops should be moved if they are dangerous (e.g. on a curve) or too noisy (e.g. near a house with a loud dog, beside a loud river or creek, etc.). Also, if a stop falls in an open area (e.g. an agricultural field, or cluster of houses), please move it to the nearest available forested location. The general rule that we have been using is that each stop should be about 75% forested within about a 500 m radius. If you need to adjust the station spacing, please ensure that the stations are *at least* 1 km apart; you may lengthen the distance between stops, but please do not shorten it.

Also, please keep in mind the following general requirements:

1. The route should pass through mostly-forested habitat. If the route is on a road that is heavily settled with many houses or farms, it may not be suitable. If your route falls on a road that has a lot of homes (e.g. several per kilometre on average), it is probably not suitable.
2. The road(s) followed on the route should be permanent roads which will likely be available for surveying in future years. Roads should be accessible mid-May to mid-June. If you're not sure if a road is accessible (it might be too muddy or wet, and you may require a 4WD vehicle), ask someone who lives nearby!

5. The route should follow secondary roads with little traffic and sufficient safe points for stopping. Generally, a road that has constant traffic is not suitable for the hawk survey, as it is neither safe nor easy to hear hawks when cars and trucks are constantly passing.

If you find that your route does not fit one or more of the above requirements, please contact the survey coordinator who will choose a new route for you. Because we are attempting to randomize the location of routes, please do not attempt to choose your own new route. However, any knowledge you could provide on the suitability of roads in the area would help us to pick a better route.

Survey Materials

Your Survey Kit

In your kit, we provide:

- Instruction Booklet
- Training CD* (for new volunteers, and if requested by returning volunteers)
- Broadcast CD*
- Data form
- Route map and stop description form
- List of locations (DNRE offices) where CD players can be “signed out” for survey use
- Compass direction sheet
- Application for Volunteer support (optional; fill out only if you wish to receive a tax receipt for the amount of your expenses. Follow the instructions carefully.)
- Envelope for returning the completed forms

* CDs will not be replaced annually, so be careful with your CDs and hold on to them for use on future surveys.

You will have to Provide:

- CD player (either your own CD player that passes the test, or one signed out from DNRE)
- Towel (to place underneath the CD player to avoid scratching vehicle)
- Flashlight
- Spare batteries for flashlight and CD player (if you’re using your own)
- Watch
- Pencil/Pen
- Clipboard
- Compass
- Reliable vehicle

Handy but Optional:

- Geographic Position System (GPS)
- Cell Phone (in case of emergency)



Broadcast Equipment

We are providing standardized broadcast equipment to all surveyors by making CD players available for borrowing through local DNRE offices. These are the same CD players that are currently being used for the NB Nocturnal Owl Survey. However, if you own a loud, portable CD player, you may use it for the survey provided it passes the simple test outlined below. We have established **400 metres** as the minimum distance at which you should be able to recognize the Northern Goshawk and Red-shouldered Hawk calls when the broadcast CD is played at maximum volume without causing undue distortion (under ideal conditions: in an open area with no wind or precipitation). If your own equipment does not meet this guideline, please make arrangements to borrow a CD player from one of the locations listed.

Differences in the volume and sound quality of different CD players will no doubt affect the number of hawks that respond. However, as long as the average volume and quality of the CD player used by an individual volunteer on a specific route does not change over time, the survey should be able to monitor long-term trends in hawk populations. **In other words, please attempt to use the same CD player each year you conduct the survey!**

If you are using your own CD player... INSTRUCTIONS FOR TESTING YOUR BROADCAST EQUIPMENT

This test takes about 20 minutes to complete and can be done anytime before the survey. It should be carried out under weather and noise conditions similar to those which will likely be encountered during the survey (i.e. little or no wind, no precipitation, minor background noise). Use two people for this test: one to listen and one to run the CD player.

Find a quiet, open area where you can measure off distances of approximately 400 and 500 metres either by pacing (100 metres is roughly 120 steps for most people) or driving (use car odometer). One volunteer should stand 400, and then 500 metres away from the CD player while the other volunteer plays the broadcast CD. The CD player should be played at the maximum volume possible without causing distortion. If your CD player has bass and treble settings, make sure they are set to the "normal" setting. Listen to see if the Red-shouldered hawk and Northern Goshawk calls are audible and recognizable at both 400 and 500 m. The results of this test should be entered on the first page of the survey form.

DETAILED INSTRUCTIONS

When to Survey Your Route

Survey Window

Please conduct your survey between **May 18 and June 16**. This will ensure that your route is run during the breeding periods of both the Northern Goshawk and the Broad-winged Hawk.

Timing

The survey should begin just after sunrise, and should take approximately 3 hours to complete.



Weather Conditions

Weather conditions can affect your ability to detect hawks. Wind and precipitation significantly reduce the calling rates and detectability of hawks. Cloud cover is not as important. Try to choose a calm day to conduct your survey when there is little or no wind (3 or less on the Beaufort scale, see data sheet for details). Do not attempt to conduct your survey if there is persistent rain or winds exceed force 3. If conditions get bad throughout the survey it may be necessary to abandon the route and run the route another morning when conditions are better.

How to Survey Your Route

Drive to the starting location. Plan to arrive at sunrise. Reset your odometer. This is Stop 1. Fill out date, time and weather information at the top of the data form. Put the broadcast CD in the CD player. **Make sure you are using the broadcast CD, and not the training CD!**

At each stop push the play button on the CD player and move at least 20 meters away. Only one person should be responsible for identifying and counting hawks and completing the survey forms. **Please use forms provided for recording data in the field.**

The broadcast CD will consist of the following sequence of calls and silent listening periods: First, there will be 4 sets of 20-sec Red-shouldered Hawk calls, each separated by 40 sec of silence (totaling 4 minutes). This will be followed by two sets of 20-sec Northern Goshawk calls separated by a 40-sec listening period. Finally, there will be a 1-min and 40-sec silent listening period; a beep marks the end of the playback protocol. This totals 7-min of survey time per stop.

Estimate the distance and direction to each bird when it first began to call. This can be done using the direction sheet provided in the kit, and a compass to help determine which direction the sound is coming from.

Identify woodpeckers and jays if possible. Please record the species and number of woodpeckers/jays, and when and where they were first detected. Basically, use the same procedure for woodpeckers/jays as you use for hawks. Even if you cannot identify woodpecker species please indicate if they were present or not during the survey by checking the appropriate box on your survey sheet.

Before leaving each stop, make sure you have noted the odometer reading, time of day, traffic count and the background noise levels. It is important to keep track of the noise levels on your route, as noise can affect the detectability of hawks. For example, if the average noise level increases along the route with time (i.e. as traffic increases), then the average number of

hawks detected may decrease. This may not mean that fewer hawks were present, but rather that they were harder to detect because of the noise.

Proceed immediately to the next station, and repeat the above procedure at all 16 stops. At the end of the last stop, record the time and weather conditions. Add up the total number of birds of each species and fill out the comments section while the route is still fresh in your mind.

How to Complete the Survey Form and Data Form

Become familiar with the survey form before going out to the field to ensure the data are being collected accurately. There are a number of instructions and definitions for the various codes to be used in completing this data form, for wind, cloud cover and precipitation. Study the sample form carefully.

Broadcast equipment:

If you are using your own CD player, please indicate the type of equipment you are using. If you are using a CD player from DNRE, please indicate the DNRE ID# (if present) given on the unit.



Woodpecker Identification Skills:

Woodpeckers can be quite tricky to identify by calls, drumming and sometimes even by sight. Please indicate which woodpecker species you can positively identify by sight, call, and drumming by placing a check mark in the appropriate box on the second page of the survey form. Although we want to collect information about woodpeckers, hawks remain the primary focus of the survey. Some observers may be uncertain about their ability to identify or fully record woodpeckers. If you decide not to record woodpeckers because your skills are not as great as you would like, please check off “I did see woodpeckers but am not comfortable identifying and recording them”. If you decide to record woodpeckers but don’t actually detect any on your route (which is highly unlikely!), then please check off “I saw/heard no woodpeckers”.

Date:

Please write out the day first and write out the name of the month, i.e. 20 May, 2003.

Start Time:

Record the time you started the broadcast CD at Stop 1.

Weather:

Record the weather conditions at the start and end of the survey. Estimate the air temperature. Circle the appropriate code (as listed on the survey form) to indicate wind, cloud cover and precipitation. Pay particular attention to the codes for cloud cover, as they are not as intuitive as the other codes. For example, a code of “3” means the sky is mostly clear.

DO NOT USE “0” TO INDICATE A CLEAR SKY.

Odometer reading:

This information is particularly important if a stop has to be shifted from the standard station spacing of 1 km due to noise interference (from running water, frogs, hydro generator, barking dogs) or unsuitable habitat (open fields, homes). If you were provided with stop descriptions, please try and follow them as closely as possible. There is likely to be variation between odometers in different vehicles, so you may have to rely on a combination of the odometer reading and the stop description to locate each stop.

Time at each stop:

Record the time of day using the 24-hour clock (i.e. 0600h) at the start of each new stop.

Hawk information:

Follow the sample form carefully! We are primarily interested in knowing how many hawks of each species you see or hear, when they were seen or heard (i.e. during which silent minute, or during which playback call), and whether they continued to call in subsequent listening periods. Also note which hawks were only seen and not heard, individuals believed to be “repeats” (the same bird you heard at previous station) and possible pairs. If you think you are hearing the same bird from the previous station, then record it but mark an asterisk (*) besides the species code and make a note in the remarks section.

At each stop, record each bird detected in the column immediately to the right of the stop number by writing in the appropriate 4-letter species code, as noted on the data form. For each stop, up to 4 different birds can be recorded on the lines provided. If more than four birds are detected at a stop, then record these birds in the spaces provided at the end of the form. Make sure you write the stop number beside them! Record each individual bird in its own column even if birds are of the same species.

The columns to the right of the species code are used to indicate which of the listening periods the hawk/woodpecker/jay were detected in. When the hawk/woodpecker/jay is heard, record the proper species code as noted on the data form, and place an “H” in the column for the listening period or playback period in which the hawk/woodpecker/jay was detected. For example, if the hawk/woodpecker/jay was heard calling in the second silent listening period, place an “H” in the in the column titled, “2nd minute”. If the hawk/woodpecker/jay was heard during every listening period and playback period then place an “H” in every column. Leave columns blank if the bird was not heard during that listening period.

You may be wondering why we require such precise information about when the hawks/woodpeckers/jays are heard during the playback. This information helps us understand the effect of the playback on calling behaviour, as well as analyze the effectiveness of multiple playbacks. For example, we can determine the proportion of Broad-winged Hawks that called after 2 sets of calls, as opposed to 4 sets. If we find that 95% of hawks are detected after only 2 sets of calls, we may decide in future years that the last two sets of calls are unnecessary.

If hawks/woodpeckers/jays are seen and not heard, put an “S” in the appropriate column. If the hawk/woodpecker/jay is seen and heard place an “HS” in the appropriate column. **Please do not use an “HH” to denote two hawks/woodpeckers/jays calling in the same**

listening period! Use a separate line for each bird. Also we are not interested in the number of times a hawk/woodpecker/jay calls during a particular listening period. Use only one “H” to denote that a hawk has called, regardless of whether it called once or 20 times. For those recording woodpecker observations, if a woodpecker is only identified by its drumming put a “D” in the appropriate column. If it is identified by its call, use an “H”. If it is seen use an “S”.

Only hawks, woodpeckers and jays heard during the broadcast CD should tallied. If you detect a bird before or after this period, then make a note in the “remarks” column, but do not include the individual when you add the total number of birds on the route.

Distance:

For each bird heard calling, estimate its distance from you at the point when it first began calling. Use the appropriate distance categories as noted on the data sheet (<200m, 200m-400m, 400m-600m, >600m).

Direction:

For each bird heard calling, estimate its direction from the point when it first began to call using a compass and, if you wish, the “compass direction sheet” provided in your kit. Stand on the road facing forward (i.e. the direction you are travelling in). Use the compass to determine which way is North. Then align the compass direction sheet with the direction you just determined to be North, and use it to estimate which compass direction most closely matches the direction the hawk is calling from (N, NE, E, SE, S, SW, W, NW).

Noise Level:

Rate the background noise level at each stop using the four-point scale described on the data form. **Please give only one code per stop, not a range (i.e. Noise level = 1).** Describe the source of noise if above noise level 1, in the remarks section (i.e. frogs, traffic, airplane, running water.)

Comments:

Note other interesting observations made during that stop. If you had any interesting experiences on your survey route, please let us know. We love to hear your stories! Also, if you take any photographs while on your survey, please send us a copy. You may be featured in one of our newsletters (with your permission of course!).

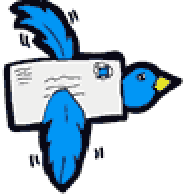
**At the end of the 16th stop, record the time and weather conditions. Congratulations!
You’re done!**

Species Totals:

After you have completed your survey, add up the total number of hawks, woodpeckers and jays of each species that you detected. This helps us to interpret your data forms.

Additional Comments:

Please complete this section immediately following the survey while the experience is still fresh in your mind. Your comments are very important. We want to ensure we design this volunteer survey is feasible, enjoyable and productive.

**Returning the Data Form**

After you've finished your survey, please return your completed data sheets using the return envelope provided to:

NB Forest Hawk Survey

Bird Studies Canada

P.O. Box 6227

Sackville, NB E4L 1G6

Fax (506) 364-5062

Phone (506) 364-5025

Email: becky.whittam@ec.gc.ca, or ramsey.hart@ec.gc.ca

Thanks, and enjoy the survey!

Appendix A

Track Listing of the NB Forest Hawk Survey Training CD **(included in your survey kit)**

Included in your kit is a training CD with vocalizations and/or drumming sounds of the hawk and woodpecker species you might encounter on your survey. We encourage you to listen to this CD to familiarize yourself with these vocalizations. Use this CD as a reference only. Do not use this CD for broadcasting during your survey. The following list describes the sounds you will hear on the training CD. Because it was originally created in Ontario, some of the sounds (e.g. Red-headed and Red-bellied woodpecker) are unlikely to be encountered in NB.

HAWKS

Red-shouldered Hawk

The common call is a loud, rapidly repeated, 'kee-you, kee-you, kee-you' or 'kee-yah, kee-yah, kee-yah'. Sometimes the call is a drawn out 'keee-yah' similar to that of a Red-tailed Hawk but it is not as raspy or drawn out and is usually followed by more typical rapidly repeated 'kee-yah' calls.

Blue Jay imitating Red-shouldered Hawk

The next four sets of calls demonstrate the resemblance of a Blue Jay imitating the call of a red-shouldered Hawk. Sets one and three are Blue Jay vocalizations and sets two and four are those of an actual Red-shouldered Hawk. The difference may be remarkably slight; listen for the characteristic interspersed "jay" call that Blue Jays often give.

Red-tailed Hawk

The common call of the Red-tailed Hawk is a hoarse, rasping scream 'keyarrh' with a hissing quality in the voice likened to escaping steam. The call starts high and slurs downward.

Comparison of Red-shouldered and Red-tailed Hawks

The next three sets of vocalizations compare the Red-shouldered Hawk and the Red-tailed Hawk. Calls one and three belong to the Red-shouldered Hawk while the second is of a Red-tailed Hawk. Note that the Red-shouldered can give a similar 'keyar' call but it is not as raspy or drawn out as that of the Red-tailed Hawk and is usually followed with a rapid succession of the more typical 'keeyah' calls.

Broad-winged Hawk

The territorial call is a high-pitched, thin whistle given in two notes `pi-tee' or `pee-eeee'. The first note is generally quite short while the second is drawn out.

Blue Jay imitating Broad-winged Hawk

The next two sets of vocalizations give examples of a Blue Jay imitating a Broad-winged Hawk followed by an actual Broad-winged Hawk. When mimicking the Broad-winged Hawk, the call of the Blue Jay is not as high or drawn out as that of the Broad-winged Hawk. Again, listen for the interspersed "jay" calls.

Cooper's Hawk

The alarm call of a Cooper's Hawk can be heard when approaching the nest. It is a rapidly repeated, even-paced series of `cac-cac-cac' or `cuck-cuck-cuck' notes somewhat reminiscent of a Northern Flicker.

Northern Goshawk

The call of the female Goshawk can include a high plaintive `kee-ah'. The alarm call is similar to a Cooper's Hawk but is a harsher and more spaced-out series of `cac-cac-cac' notes.

American Kestrel

The common call when alarmed is a loud, shrill, rapid `klee-klee-klee' or `killy-killy-killy'. A variation also included on the tape sounds like a continuous whirring chatter.

Merlin

The alarm call of the Merlin is a harsh, cackling and accelerating series of `ki-ki-ki-kee' notes.

Peregrine Falcon

The common alarm call given at an intruder at the nest is a series of loud, harsh `cack-cack-cack' notes with an intense angry quality.

Northern Harrier

The alarm call of the male harrier is a rapid series of nasally sounding `kek-kek-kek' notes and that of the female is a higher `kee-kee-kee' delivered with the similar nasal quality. Also heard on the tape are vocalizations of a pair during courtship. These calls sound like a thin, wheezy `whee-a'.

Osprey

The alarm call of the osprey is a thin, high-pitched series of `kyew-kyew-kyew-kyew' notes.

Bald Eagle

The common call of the Bald Eagle is a harsh creaking cackle `kleek-kik-ik-ik-ik' or a lower `kak kak kak'.

WOODPECKERS

Yellow-bellied Sapsucker

Typical calls made by the Yellow-bellied Sapsucker are short, sharp, nasal mewling notes or a slurring, downward `cheeerr'. Territorial drumming has an erratic "morse code" quality.

Pileated Woodpecker

The call is a loud, high, accelerating `kik-kikkik-kik-kik' with pitch rising and falling. Several examples of the loud resonating drumming are provided on the tape.

Northern Flicker

The common vocalization is a loud series of `wick-wick-wick' notes similar to the Pileated Woodpecker but lower in pitch and more even in cadence and pitch. Often, a perched pair will duet with softer, slower `wicka-wicka-wicka' notes. The call note is an emphatic `Kleeyer!'.

Downy Woodpecker

The call of the Downy Woodpecker is a high-pitched, harsh whinny accelerating at the end. The call note is a `pick' which is generally softer and higher pitched than that of the Hairy Woodpecker.

Hairy Woodpecker

The call of the Hairy Woodpecker is a slurred whinny usually even-pitched. This whinny can be drawn out to a long high-pitched rattle. The call note is a loud, sharp `peek'.

Comparison of Belted Kingfisher and Hairy Woodpecker calls

The first call is the `rattle' of the Belted Kingfisher followed by the `rattle' of the Hairy Woodpecker. Notice that the woodpecker call is higher-pitched and not as "dry" sounding as that of the kingfisher.

Red-headed Woodpecker

The call of the Red-headed Woodpecker is a series of raspy `queer' notes.

Red-bellied Woodpecker

The common call of the Red-bellied Woodpecker is a rolling series of nasal `chur, chur, chur' notes with a distinct trilled quality. Also heard is a barking `chiv-chiv' or `chaw-chaw' call.

Comparison of Yellow-bellied Sapsucker and Red-bellied Woodpecker calls and drumming

The down-slurred, nasal `cheerr' note of the sapsucker is clear and well spaced out. Its drumming is erratic in cadence, often likened to "morse code". The Red-bellied Woodpecker delivers a rapid series of short raspy `queer' notes which are slightly trilled. The drumming is a short, rapid, even-cadenced rap.

Black-backed Woodpecker

The call note of the Black-backed Woodpecker is a quiet `pic' or `krick' given singly or well spaced out.

Three-toed Woodpecker

Although unlikely to be encountered during this survey, this species is included for completeness.

