

MINASKUAT PROJECT NO. M1

FINAL REPORT

NESTING BEHAVIOR OF GRAY JAYS
(Perisoreus canadensis) **DURING**
MILITARY AIRCRAFT NOISE EVENTS

NOVEMBER 2003



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FINAL REPORT ON

**NESTING BEHAVIOR OF GRAY JAYS
(*PERISOREUS CANADENSIS*) DURING
MILITARY AIRCRAFT NOISE EVENTS**

PREPARED FOR

**INSTITUTE FOR ENVIRONMENTAL MONITORING AND RESEARCH
P.O. BOX 1859, STN. "B"
114 HAMILTON RIVER RD.
GOOSE BAY, LABRADOR A0P 1E0**

PREPARED BY

**MINASKUAT LIMITED PARTNERSHIP
P.O. BOX 482, STATION "C"
BUILDING 412, LAHR BLVD
GOOSE BAY, LABRADOR A0P 1C0
Tel: (709) 896-5860
Fax: (709) 896-5863**

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1.0 BACKGROUND

In March 2003, the Institute for Environmental Monitoring and Research (IEMR) issued a request for proposals to conduct research on the effects of noise disturbance associated with military aircraft activity on the behavior of nesting Gray Jays (*Perisoreus canadensis*). Originally part of IEMR's River Valley Ecosystem study, a long-term field study of river valley ecosystem components and the impact of low-level military training activities on these components, this project was modified to conduct research in the Happy Valley – Goose Bay area. This study was to focus on nesting Gray and the issue of possible noise disturbance by military aircraft. This location provided several advantages as it encompassed adequate Gray Jay habitat, is subjected to frequent noise disturbance events during take-off and landing of military aircraft, and is readily accessible.

In early April 2003, Minaskuat (a partnership between Innu Environmental and Jacques Whitford) was contracted by IEMR to complete the study.

2.0 INTRODUCTION

Military low-level jet aircraft training at 5-Wing Goose Bay has been ongoing since 1981 with the airport in operation since 1941-42 (Them Days 1987, DND 1994). The potential effect of noise disturbance from military aircraft has been an issue and, as part of its environmental mitigation program, the Department of National Defense (DND) has been conducting monitoring research on an annual basis. Avifauna have often been the subject of such investigations, with disturbance studies completed on raptors (osprey, bald eagle, gryfalcon, peregrine falcon, golden eagle) (LFA 1992, JEW 1992, 1994, 1995, JWEL 1995, 1996, 1997, 1998, 1999, Trimper et al. 1998a and b), waterfowl (harlequin and black ducks) (JWEL 1995, 2003a and b), and forest songbirds (IEMR 2003).

DND's environmental mitigation program uses avoidance of sensitive wildlife areas to minimize potential effects that may result from military low-level flying activities (DND 1994). Disturbance caused by noise during military aircraft training may induce startle responses (such as flushing from the nest or cover, elevated heart rates, escape behavior, and/or other behavioral responses). Noise disturbance also has the potential to mask vocal signals (e.g. mating songs, feeding calls of young, alarm calls) (Bowles 1995) that may affect communication and ultimately reproduction. Given the relatively few studies that have focused on forest songbird species in the low-level training area, the need for an investigation into the potential impacts of aircraft noise disturbance on these birds was identified.

This study focused on Gray Jays, a common, year-round resident of Labrador (Dalzell 2001, IEMR 2003), nesting near the airport at 5-Wing Goose Bay that are therefore subjected to noise disturbances by military and civilian aircraft. Research suggests that the bulk of nesting for this species in the area would occur during April and May (Strickland and Ouellet 1993 and references therein, Dalzell 2001).



Military low-level training activities in Goose Bay begin in April, potentially overlapping with the nesting period of Gray Jays.

2.1 Study Objective

The objective of this research was to determine if noise (and visual stimulus) associated with the take-off and landing of military aircraft presents a disturbance and therefore interferes with the reproductive activities of Gray Jays.

2.2 Study Team

Mr. Perry Trimper was the project manager for this study and was responsible for quality control. Ms. Karen Gosse led the field program, under the advice, direction and logistical control of Ms. Kathy Knox, Ms. Caroline Hong, and Mr. Trimper, serving as data recorder and observer during the surveys and was responsible for data interpretation and report preparation. Ms. Knox and Mr. Trimper also participated in the preparation of this report. Aboriginal and non-aboriginal assistants participated in the field study including Ms. Hong, Ms. Brenda Blake, Ms. Shirley Hill, and Ms. Mary Ann Aylward. Mr. Bruce Rodrigues and Mr. Jens Fiegler also participated in field surveys on several occasions. Appreciation is extended to Dan Strickland for providing information critical to understanding the timing and breeding behavior of Gray Jays.

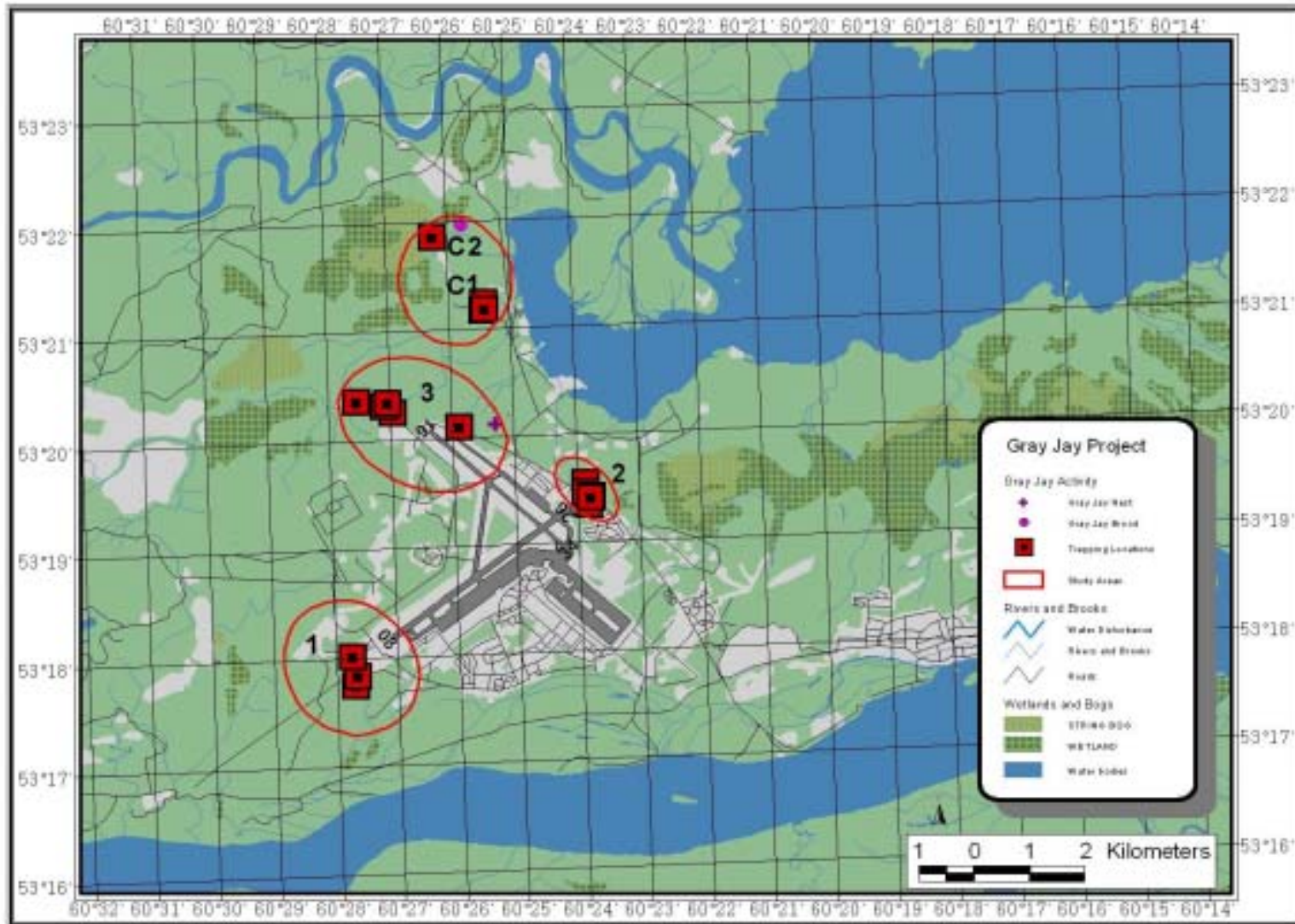
2.3 Study Area

Happy Valley-Goose Bay lies within the Lake Melville ecoregion of Labrador, a sub-arctic area characterized by long, cold winters with heavy snow accumulation and short, warm summers (DND 1994). Snow normally begins in October and may persist into June (DND 1994). Mean daily temperatures range from -18°C in January to 15°C in July (Environment Canada 2003).

The airport at 5-wing Goose Bay services the $130,000\text{km}^2$ military Low Level Training Area (LLTA) within Labrador and northeastern Quebec. Military training activities between April-October typically involve 5000 to 6000 flights per year. Two runways intersect in a triangular configuration and, depending on conditions (e.g. wind direction and speed, temperature, time of day), aircraft take off/land from runways 34, 08, 26 or 16 (Figure 2.1). Attractive Gray Jay habitat (i.e. black spruce dominant forests) within 2 km of the end of the two runways (sites 1-3, Figure 2.1) was selected as the area of focus for nesting pairs. A control area (site C, Figure 2.1) was established 2-3 km from the airport, west along the road leading to the Happy Valley-Goose Bay municipal landfill.



Figure 2.1 Study Area



3.0 METHODOLOGY

3.1 Survey and Capture

Following the terms of reference issued by the IEMR, the project began on 8 April 2003 with a survey of the study area for the presence of nesting pairs (Figure 2.1). At prospective trapping locations, suet was placed in trees along two or three line transects, each approximately 100m apart, to attract jays. Trapping occurred between 14-30 April. Potter Traps[®] (Boreal King Supply Co. Ltd.) baited with suet and/or bread were set in areas where baiting had been successful or where birds had been observed directly (Figures 3.1 and 3.2). Six traps were used and rotated between 17 trapping sites within the study area (Appendix A). Traps were placed in trees (usually black spruce) approximately 1-2 m above the snow, and positioned so that food in either end was easily accessible. For four days the traps were tied open so birds were able to enter and leave the cages unrestricted. With the arrival of transmitters on the 14 April (pre-ordered by the IEMR), trapping and the attachment of transmitters began in earnest. Traps were set in the morning and checked late afternoon. When weather was suitable (i.e. no precipitation and moderate temperatures) traps were reset, left overnight, and checked early the next morning. On occasion, the study team was able to observe traps from a distance and capture birds within a few minutes (Appendix A).

3.2 Handling and Marking of Gray Jays

Captured birds were removed from the trap and placed in cloth handling bags for processing. All birds were color banded for identification in the field. Due to a delay in the arrival of celluloid leg bands (Size X3, Avinet Inc.) bands were fashioned from colored electrical tape during 8-21 April. Birds captured/recaptured after 21 April were banded/re-banded with the celluloid bands. Weights of birds were recorded and a determination of reproductive status was often attempted, whereby researchers would examine individuals for the presence of a brood patch, most pronounced on females, or of a cloacal proturbance, indicating a male. Unlike in the fall when males and females can easily be distinguished by a 10g difference in weight, sexing of Gray Jays during the spring is difficult and not dependable. Individuals believed to be adult breeders were fitted with an external VHF transmitter (Model BD-2) manufactured by Holohil Systems Ltd. The unit consisted of a 1.88 g transmitter with a battery life of approximately 10 to 20 weeks. Transmitters were attached to the base of one or two central tail rectrices using a 2cm x 6cm piece of duct tape. Any feathers that had fallen off in the trap or during handling were retained. All aspects (measurements, weather, other parameters) of the 5-10 minute handling time were recorded (Appendix B).



Figure 3.1 Potter Trap with a captured Gray Jay



3.3 Telemetry Tracking and Nest Searching

Telemetry tracking and nest searching began on 15 April (Appendix C). Individual Gray Jays were located using a hand-held antenna (Model RA-2A, manufactured by Telonics) and receiver (Model SRX 400, manufactured by Lotek). The objective was to find a nest by either flushing an individual from the nest (female), or by following an adult to the nest when delivering food (male). Dan Strickland, a research biologist at Algonquin Park in Ontario, who has been studying Gray Jays for over 30 years, was contacted for his advice on several occasions throughout this phase of the field study, beginning 28 April (Appendix D). As nesting had likely already begun in Labrador at the start of the contract in early April, he suggested the possibility of locating a nest through observations of male feeding behavior. Males gather and hold large amounts of food in their throats prior to delivering food to the female. He recommended trying to follow the male to the nest during one of these deliveries. The study team increased their search effort with this direction.



Tracking of individuals continued until 30 May, beyond the nesting period (i.e. after fledging of young), in order to determine the fate of all deployed transmitters (Appendix C). Throughout all tracking periods, researchers would record general biological information, such as the number of adults present at a site, agonistic interactions between individuals (e.g. aerial pursuits, bill snapping), feeding behavior (selection and storage), and any indications of breeding activity (e.g. gathering of nest material, territorial defense).

3.4 Nest Monitoring

A 20x digital video camera was established within 15m of the nest and used in combination with 8x binoculars to monitor the behavior of the birds during military aircraft events (take-off and landings). The study team contacted Hans Lindner at the 5-Wing Goose Bay Military Coordination Centre (MCC) or Jens Fiegler of the German Air Force (the only active airforce at this time) on a daily basis to obtain information on sortie times, as well as the number and type of aircraft. Monitoring would generally last 15 minutes before and after scheduled sorties. This would include an approximately one-hour period between take-off and landing when noise disturbance levels were considered background or “natural.”

A Larson-Davis hand held sound meter (model DSP80) was used to quantify sound exposure levels of aircraft events. The time and duration of exposure, maximum sound levels (L1, measured in decibels), Leq (the overall noise index which represents an average sound level required to produce the same acoustic energy as the total actual noise average), and type of aircraft were recorded. Frequencies were A-weighted using a fast response. Observers monitored the nest on a daily basis, recording any marked behavioral changes in response to military aircraft noise events (e.g. temporary abandonment of nests or of young, premature fledging of young, fleeing from the area, alarm calls, or other startle responses). Important biological information, during and outside of noise events, such as the identity of individuals entering and leaving the nest (if possible), number and duration of visits to the nest, type of prey brought to the nest, and other relevant information, was also recorded.

To determine when, and for how long, the female was off the nest (i.e. changes in temperature at the nest) (Joyce *et al.* 2001) a temperature sensor (cable model TMC20-HA) was inserted into the bottom of the nest. An external data logger (HOBO[®] H8 series) recorded temperature every 48 seconds.

Monitoring at the nest continued until all young had fledged from the nest. The field team also continued to search for other nests and adult pairs until the end of May.



4.0 RESULTS

4.1 Gray Jay Captures

Eighteen Gray Jays were captured and 17 birds color-banded between 14-29 April over 80 trapping sessions (Table 4.1, Appendices A and B). Three birds (148.390, 148.459, 148.875) were recaptured during this period (Table 4.1). Trapping of Gray Jays after the nesting period had ended took place between 20-28 May. Four additional Gray Jays were captured during this period (Table 4.1). Attempts to capture and band fledglings between 20-29 May were unsuccessful.

Trapping of Gray Jays was limited to black spruce habitats at the ends of the runways and in the control. Based on the number of captured/recaptured and unmarked birds observed these areas, a density of over 10 birds/km² was estimated. This is higher than reported for Gray Jays in Algonquin Park, where a density of one to two non-breeders per territory (i.e. up to four birds/0.69 km²) may be expected (Strickland and Ouellet 1993).

4.2 Telemetry Tracking and Nest Searching

The study team deployed 13 transmitters. Upon release, the transmitter did not appear to have any effect on the flight of the bird as it would fly to a nearby tree, perch for 1-5 minutes, and then return to routine activity.

Telemetry tracking and nest searching were conducted over 27 days between 15 April-29 May. While the transmitter signal was generally strong, at least 4 of the units were discarded within 5 weeks, either through attachment failure and/or by the birds who were able to remove them, in most instances with the tail feathers attached. The study team recovered nine transmitters (Table 4.1). Two transmitters were still active at the end of the field study and two others were never located after release of the birds (Table 4.1).

Nine Gray Jays (69%) were re-located on several occasions throughout the study period (Table 4.2). Telemetered birds were often observed in association with one or more other birds during tracking and would generally remain within sight, flying from tree to tree (Table 4.2). Indications of flushing from a nest or of food deliveries to a nest were not evident.

On 6 May, one nest was located when researchers were following a radio-tagged bird. The nest was located in a 4.5m black spruce, approximately 2m above the snow, on the south facing side of a small bog off runway 34 (Figures 3.2 and 4.1). The adult female was sitting at the nest when discovered with the male observed bringing food to the nest. Neither the male nor female had been previously captured during the main trapping period. Visual observations from approximately 10m determined that four young were present in the nest. Nestlings were down covered, had their eyes closed, and were incapable



of any significant movements, indicating that they were likely five days old or younger at the time of their discovery.

Researchers were able to locate one other brood of Gray Jays (i.e. an adult pair with 4 young) on 16 May while tracking a radio-tagged bird (believed to be the adult male), but the young had already fledged.

Table 4.1 Gray Jays Captured/Recaptured at 5-Wing Goose Bay, April-May 2003

Transmitter Frequency	Study Area	Habitat	Coordinates	Capture/Recapture Date(s)	Weight (g)	Band Color (leg)	Fate of Transmitter	Comments
148.630	3	Open bS1 along roadside	53°20.180 -60°25.891	14/04/03	-	White (L)	Uncertain	Searched without success
148.857	3	Open bS along roadside	53°20.180 -60°25.891	14/04/03	-	Red (L)	Recovered 16/04/03	
148.875	3	Open bS/lichen, some large trees	53°20.340 -60°26.960	14/04/03 17/04/03 18/04/03 26/04/03	60	White (R) ²	Recovered 19/05/03	Recaptured in same study area
148.785	1	Mature open bS, some regen	53°.2945 -60°.4618	15/04/03	-	Red (L)	Recovered 02/05/03	Tail feathers in poor condition
148.459	1	Mature open bS, some regen	53°.2945 -60°.4618	16/04/03 24/04/03 30/04/03	61	Blue (L) ²	Recovered 28/05/03	Recaptured in same study area
148.900	C1	bS dominant, near roadside	53°19.597 -60°25.420	16/04/03	-	White (L)	Recovered 29/05/03	
No transmitter	C2	bS dominant, near roadside	53°.3673 -60°.4369	16/04/03	-	-		Bird escaped when removing from trap
148.180	C2	bS dominant, near roadside	53°.3673 -60°.4369	16/04/03	-	Red (L)	Last observed 29/05/03	
148.390	1	Mature open bS, some regen	53°.2945 -60°.4618	17/04/03 21/04/03	70	Green (L) ²	Recovered 23/05/03	Recaptured in same study area; transmitter fell off when recaptured
148.857	1	Mature open bS, some regen	53°.2945 -60°.4618	17/04/03	70	Yellow (R)	Recovered 27/05/03	Possible brood patch
148.430	C2	bS dominant, near roadside	53°.3673 -60°.4369	17/04/03	50	Green (L)	Uncertain	Problems with transmitter (background interference)
No transmitter	1	Mature open bS, some regen	53°17.772 -60°27.672	17/04/03	-	White (L)		Bird escaped while processing

1 Black spruce

2 Celluloid leg band used



Transmitter Frequency	Study Area	Habitat	Coordinates	Capture/Recapture Date(s)	Weight (g)	Band Color (leg)	Fate of Transmitter	Comments
148.520	1	Mature open bS, some regen	53°17.772 -60°27.672	18/04/03	60	Gray (R)	Last observed 23/05/03	
148.585	3	Open bS/lichen, some large trees	53°20.340 -60°26.960	18/04/03	60	Yellow (R)	Located 19/05/03 in bog	
148.745	3	Open bS/lichen, some large trees	53°20.460 -60°27.540	25/04/03	63	Orange (L) ²	Recovered 22/05/03	4 other Gray Jays in area; stored food items offered
No transmitter	3	Open bS/lichen, some large trees	53°20.460 -60°27.540	26/04/03	65	Green (R) ²		Some evidence of a cloacal proturbance (male?)
No transmitter	3	Open bS/lichen, some large trees	53°20.406 -60°27.104	26/04/03	70.5	Red (R) ²		Believed juvenile
No transmitter	1	Mature open bS, some regen	53°17.963 -60°27.745	29/04/03	70+	Orange (R) ² Blue (L)		Believed juvenile
No transmitter	3 (nest area)	bS dominant, near open bog/pond	53°20.270 -60°25.258	20/05/03	-	Red (R) ² Red (L)		Adult female from monitored nest; brood patch evident
No transmitter	3 (nest area)	bS dominant, near open bog/pond	53°20.270 -60°25.258	20/05/03	-	Red (R) ² Blue (L)		Adult male from monitored nest
No transmitter	3 (nest area)	bS dominant, near open bog/pond	53°20.270 -60°25.258	20/05/03	-	Yellow (R) ² Yellow (L)		Breeding status uncertain
No transmitter	3 (nest area)	bS dominant, near open bog/pond	53°20.254 -60°25.307	28/05/03		Yellow (R) ² Orange (L)		Breeding status uncertain



Table 4.2 Gray Jay Telemetry Re-location, 5-Wing Goose Bay, April-May 2003

Date	Study Area	Lat/Long (NAD 27)	Comments
Frequency 148.180			
6 May	C2	53°22.169/-60°25.915	In black spruce tree; left the area
6 May	C2	53°22.113/-60°25.892	
16 May	C2	53°22.171/-60°28.737	Located with mate and five fledglings; feeding young
Frequency 148.459			
21 April	1	53°17.924/-60°27.685	Observed with 148.857 and two other Gray Jays
2-3 May	1	53°17.963/-60°27.745	
28 May	1	53°18.225/-60°28.188	Transmitter recovered
Frequency 148.900			
24 April	C1	53°19.597/-60°25.420	Alone at roadside
1-2 May	C1	53°21.330/-60°25.417	
29 May	C1	53°21.324/-60°25.423	Transmitter recovered
Frequency 148.520			
24 April	3	53°17.853/-60°27.517	Observed with 148.857
23 May	3	53°17.747/-60°27.258	Observed with one other Gray Jay (possible mate)
Frequency 148.585			
24 April	3	53°20.340/-60°27.540	Observed with 148.875 and other Gray Jay
24 April	3	53°20.340/-60°26.960	Observed with 148.875
19 May	3	53°20.499/-60°26.691	Transmitter located in bog; could not be recovered
Frequency 148.745			
26 April	3	53°20.460/-60°27.540	Observed with 148.875
30 April	3	53°20.340/-60°26.960	Observed with 148.875
22 May	3	53°20.449/-60°26.732	Transmitter recovered
Frequency 148.8571			
16 April	3	53°20.180/-60°25.891	Transmitter recovered
Frequency 148.857			
21 April	1	53°17.881/-60°27.764	Observed with one other Gray Jay
21 April	1	53°17.924/-60°27.685	Observed with 148.458 and two other Gray Jays
24 April	1	53°17.853/-60°27.517	Observed with 148.520
2-3 May	1	53°17.963/-60°27.745	Observed with 148.459
5 May	1	53°17.881/-60°27.764	
27 May	1	53°18.084/-60°28.261	Transmitter recovered
Frequency 148.785			
2 May	1	53°17.698/-60°27.757	Transmitter recovered
Frequency 148.875			
15 April	3	53°20.407/-60°26.918	Observed with one Gray Jay
16 April	3	53°20.406/-60°27.104	Observed with two other Gray Jays; left the area
17 April	3	53°20.460/-60°27.054	
18 April	3	53°20.460/-60°27.540	Observed with two other Gray Jays
24 April	3	53°20.460/-60°27.540	Observed with 148.585 and one other Gray Jay
24 April	3	53°20.340/-60°26.960	Observed with 148.585
26 April	3	53°20.460/-60°27.540	Observed with 148.745
30 April	3	53°20.340/-60°26.960	Observed with 148.745

1 Transmitter 148.857 was located on the ground 2 days after the bird was released and was subsequently reused on another bird



Date	Study Area	Lat/Long (NAD 27)	Comments
19 May	3	53°20.230/-60°26.817	Transmitter recovered
Frequency 148.390/371			
21 April	1	53°17.963/-60°27.745	
23 May	1	53°18.073/-60°27.941	Transmitter recovered

Figure 4.1 (above and below) Gray Jay nest discovered on 6 May 2003 near the airport at 5-Wing Goose Bay, Labrador



4.3 Nest Monitoring

The study team was able to position close to the nest (<15m), as the adults quickly adjusted to the presence of observers. Usually one or more adults would approach observers looking for food and occasionally one would land on the researchers when food items were offered.

As the incubation period ended prior to the discovery of the nest, nest attendance by the adults during the monitoring period was low. Brooding by the female declined dramatically by observation day 3, after which time nest visitations usually involved the female sitting alongside the young moving around nesting material (a behavior known as nest jabbing). The male would make short visits (<5minutes) to the nest, sometimes bringing food, approximately every 1-4 hours. Though nest attendance was minimal during the monitoring period, to test the sensitivity and methodology of the temperature sensor, a temperature probe was inserted into the nest on 8 May. Temperatures recorded at the nest ranged from



below 0°C in the early morning to 25-30°C between 1500-1700 hours (Figure 4.2). This pattern was consistent for each day temperatures were recorded.

Low-level flying for the 2003 season started later than in previous years, however, the first day of flying on 6 May coincided with the discovery of the nest. The study team was able to observe 151, and record 115 military aircraft noise events, over 28 hours of observation (Table 4.3, Appendix E). In all cases, aircraft were either Panavia Tornados or F-4F Phantoms (Jens Fiegler, personal communication). Maximum noise exposure levels varied greatly at the nest, from 56.7-111.2 dB, according to whether aircraft were taking off or landing, from which runway, and other conditions such as wind speed and direction. Leq values also varied, from 53.5-88.6 dB. One or more adults were present at the nest for 33 out of the 151 disturbance events monitored. During a noise event, the female would generally remain at the nest and display no overt reaction to the disturbance. On four occasions the adult flew from the nest, and four times one (or both) adults flew to the nest, as a plane was taking off or landing. However, the birds did not appear startled during these noise events and these movements appeared to be natural.

Fledging of young occurred on the morning of 18 May. Back-calculation using data collected for over 30 years on Gray Jays nesting in Ontario (Strickland and Ouellet 1993) reveals that adult female Gray

Jays in Labrador began incubating between 5-8 April, approximately one month before low-level training activities began.

Table 4.3 Nest Observations and Aircraft Movements at 5-Wing Goose Bay, 7-18 May 2003

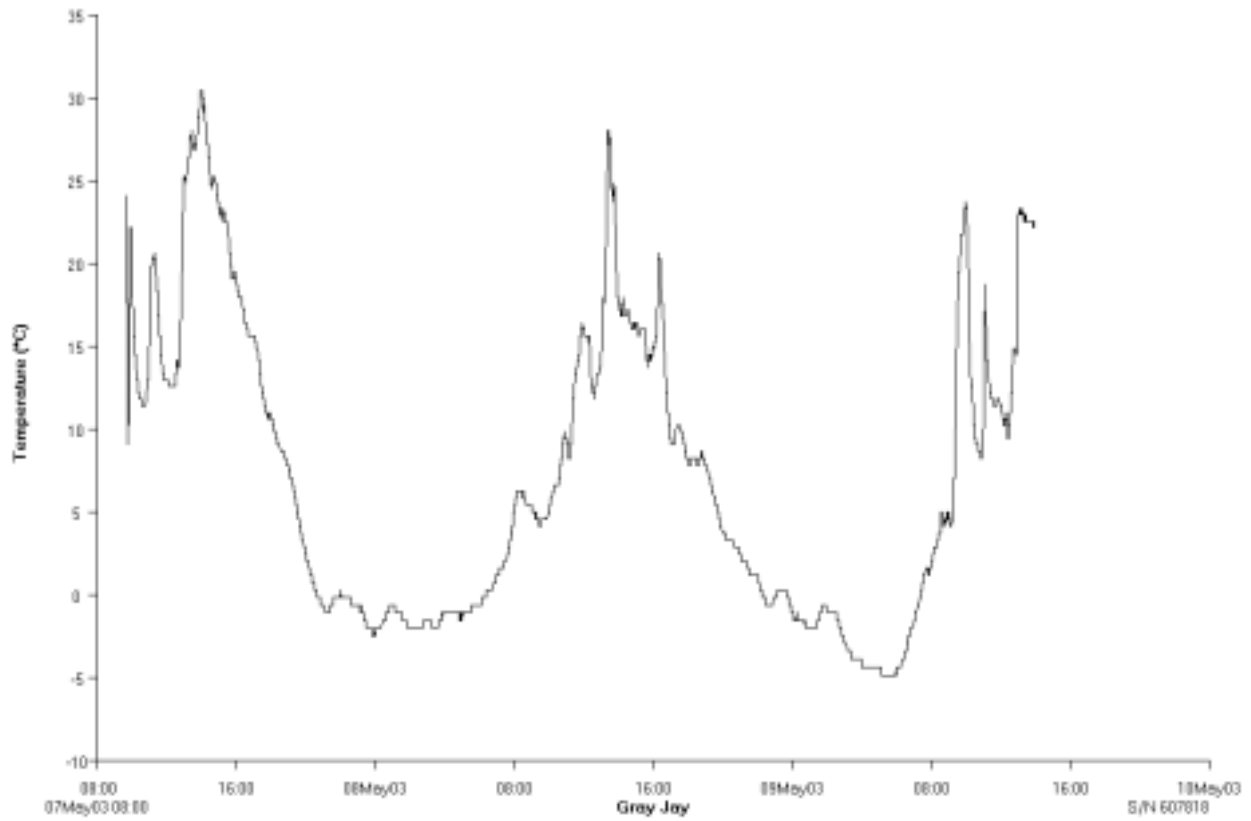
Date	Runway/direction	Total aircraft movements	Noise level range (dB)	# adults present at nest	Reactions	Comments
7 May	34	3	~70-95	0-1	No reaction when present	
	08	1	~60	Unspecified	No reaction	
	26	0	-	-	-	-
	Overhead	1	~60-70	1	No reaction	Female brooding
	Unknown	8	~60-75	1	No reaction	Female brooding during most noise events
8 May	34	2	No data	0	na	Adults feeding near nest
	08	1	No data	0	na	
	26	0	-	-	-	-
	Overhead	7	No data	0-1	No response when present	Adults feeding near nest during one noise event
	Unknown	5	~60-80	0-2	Adults leave nest one after another during one noise event	Adults generally absent from nest
9 May	34	4	90.9-106	0	na	
	08	0	-	-	-	-
	26	0	-	-	-	-
	Overhead	1	90	1	No reaction	Female brooding
9 May cont.	Unknown	8	59.8-97.2	0-1	Female returned to brood during one noise event	Adults generally absent from nest
10 May	34	3	85.6-100.2	0-2	Male flew to nest with brooding female during one noise event	Adults generally absent from nest
	08	0	-	-	-	-
	26	0	-	-	-	-



Date	Runway/direction	Total aircraft movements	Noise level range (dB)	# adults present at nest	Reactions	Comments
	Overhead	0	-	-	-	-
	Unknown	6	75-100.2	0-2	One adult leaves and second flew to nest during one noise event	Adults generally absent from nest
12 May	34	7	71.5-103.1	0-1	Adult flew from nest towards observers during one noise event	Adults generally absent from nest
	08	10	69.7-90.5	0-1	No reaction	Adults generally absent from nest
	26	0	-	-	-	-
	Overhead	1	60	0	na	
	Unknown	12	62.3-93.8	0	na	
13 May	34	1	95.6	0	na	
	08	3	71.4-81.3	0-1	No reaction when present	Adult jabbing at nest during one noise event
	26	0	-	-	-	-
	Overhead	4	79.6-84.6	0	na	
	Unknown	10	66.6-84.3	0-1	Adult flew from nest during one noise event	Adults generally absent from nest
14 May	34	2	84-93.3	0	na	
	08	10	67.5-91	0	na	
	26	0	-	-	-	-
	Overhead	0	-	-	-	-
	Unknown	2	56.7-60	0	na	
15 May	34	5	88.4-100.6	0-1	One adult left and second remained at nest during one noise event	Female generally present on nest with no reaction
	08	3	74.2-90.1	0	na	
	26	0	-	-	-	-
	Overhead	2	87-100.7	0	na	
	Unknown	1	68.2	0	na	
16 May	34	2	78.6-87.5	1	No reaction	
	08	4	72.5-111	0	na	
	26	0	-	-	-	-
	Overhead	3	70.5-80.2	0-1	No reaction when present	Adults generally absent from nest
	Unknown	7	73.1-102.3	0-1	No reaction when present	Adults generally absent from nest
17 May	34	0	-	-	-	-
	08	0	-	-	-	-
	26	7	67.8-75.9	0-2	2 adults flew to nest during one noise event	Adults generally absent from nest
	Overhead	3	72.8-84.5	1	No reaction	Adult sitting on nest edge or jabbing at nest
	Unknown	5	68.3-92.2	0-1	No reaction when present	Adult sitting on nest edge during 2 noise events
18 May	No aircraft activity					Young fledged



Figure 4.2 Sample Temperature Data Collected at the Monitored Gray Jay Nest Near the Airport at 5-Wing Goose Bay, Labrador, 7-10 May 2003. Temperature was Recorded every 48s.



5.0 DISCUSSION

5.1 Gray Jay Nesting and Response to Military Aircraft Activity

In 2003, nest building by Gray Jays in the Happy Valley-Goose Bay area commenced mid to late March, with incubation initiated between 5-8 April. The female Gray Jay spends up to 98% of the time at the nest during incubation, after which nest attendance drops off dramatically (Strickland and Ouellet 1993). The 2003 low-level flying season commenced later than in previous years and did not coincide with the incubation period of Gray Jays nesting in the study area. Nonetheless, one nest was located early during the nestling period and was able to be monitored over an 11-day period until the young had fledged. Throughout the observation period, the study team was able to observe the nest during 151 and record 115 aircraft noise events. During a noise event, the adult(s), if present, would generally remain at or near the nest and display no overt reaction to the disturbance. Any observed change in behavior appeared to be natural.

Habituation to noise disturbances would depend on the duration, predictability, and frequency of the noise. Studies on Osprey have shown that birds nesting near areas of regular disturbance (e.g. humans, highways, and aircraft approach corridors) were able to habituate to those activities, but those nesting further away were less tolerant (Mullen 1985). Noise events near the runway at 5-Wing Goose Bay are regular and ongoing. Since Gray Jays occupy and defend permanent territories (up to 10+ years) with successive nests placed within 100-200m of each other (Strickland and Ouellet 1993), birds nesting in the vicinity of the airport may have habituated to disturbances resulting from military and civilian aircraft events.

5.2 Research Methodology

Nesting dates observed during this study fall within the range of 26 February-17 April reported for the first egg laid in 244 Algonquin, Ontario nests between 1964-1992 (Strickland and Ouellet 1993) but are almost one week earlier than nesting dates reported for Anticosti Island in the Gulf of St. Lawrence (Dan Strickland, personal communication). Observations from Algonquin suggest that breeding is earlier following warm, later winter weather, and postponed if the weather is cold and stormy (Dan Strickland, personal communication). Thus, future studies on Gray Jays should start early in the season (i.e. early March) as to ensure trapping coincides with the pre-nesting period.

As incubation began in early April and trapping commenced on 14 April, the majority, if not all, birds fitted with a transmitter were males or non-breeders. Males travel up to two territories (approximately 1.5 km) away and return to the nest to feed the female as infrequently as once per day (Strickland and Ouellet 1993). Thus, given the late start date of the field season, transmitters were not an effective means of locating a nest. However, even if the transmitters had arrived in March, prior to the nesting period, the difficulty of distinguishing males from females during the spring season existed. To



counteract this problem, Gray Jays can be captured and banded in the fall when a 10g difference in weight can be used to distinguish males from females (Dan Strickland, personal communication). The mortality rate for territory-holding adults is estimated between 10-18.2% (Strickland and Ouellet 1993). Thus, males and females banded in the fall would likely survive to the start of the following breeding season.

While able to fly with the transmitters, the majority of the recovered transmitters had been removed by the birds themselves, indicating that the birds had been stressed. Discussions with Dan Strickland (April 2003) revealed that by offering nesting material (cotton batting) to adult pairs prior to the start of nesting in late winter/early spring (i.e. mid to late March), nests can be located when the birds fly to the nest with the cotton. Following Mr. Stricklands methodology, the need for transmitters is no longer evident.

The temperature sensor and data logger used to record information on nest attendance during this study provided information only on the methodology and sensitivity of the equipment, as the incubation period had ended prior to the start of nest monitoring. Changes in temperatures recorded at the nest were believed to reflect changes in external air temperatures resulting from changes in the amount of direct sunlight reaching the nest (i.e. the nest was located on the north side of an open bog, angled slightly to the south, and maximum sun exposure occurred mid to late afternoon). Temperature sensors would likely provide information on nest attendance if employed early during the incubation stage and if care is taken to insure probes are properly inserted (as to remain covered by the incubating female) into the cup of the nest. Difficulties can be expected with the insertion of the probe in future studies, however, as nests can be found up to heights of 26m (Bent 1946, as cited in Strickland and Ouellet 1993).



6.0 CONCLUSIONS

Nest building and incubation by Gray Jays during the 2003 field season was initiated in late March/early April, approximately 2 weeks prior to the start of the field program. In addition, military aircraft activities for the 2003 flying season began 3-4 weeks later than normal and did not overlap with the incubation period. Despite this off timing, one nest was located early in the nesting stage and monitored over a period of 11 days during take-off and landing of military aircraft. No adverse reactions to military aircraft noise events were identified with the single nest monitored. When present during take-off and landing of military aircraft, adults would generally remain at the nest and continue to brood or feed the nestlings. Changes in behavior that might have occurred during a noise event appeared to be natural.

7.0 RECOMMENDATIONS

The study team recommends that surveys for territory-holding adult Gray Jays begin in Fall 2003 with the capture, identification (using differences in weight), and banding of males and females. Prior to the start of nest building of the following year, the study team will return to areas where trapping was successful, offer nesting material (i.e. cotton batting) to breeding pairs, and attempt to follow the birds to the nest. Nest building generally begins 3-4 weeks prior to, and is complete several days before the laying of the first egg (Strickland and Ouellet 1993). Field studies in 2003 suggest that egg laying began between 6-8 April in Labrador and, consequently, nest building had ended by late March-early April. Given the influence of winter weather conditions, and the 2-week range of nesting dates observed yearly in Algonquin Park (Dan Strickland, personal communication), the study team recommends returning to the study area by mid-late March 2004. If nest location using the methodology employed by Dan Strickland is difficult or unsuccessful, returning at this conservative date will allow sufficient time before incubation commences to re-capture Gray Jays and deploy transmitters on known females. Once nest are located, a temperature probe should be inserted carefully into the nest and monitoring commence immediately. Monitoring should continue until all young have fledged from the nest. A proposed time frame and cost estimate required to continue this field program in 2003-2004 are provided in Appendix F.



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APPENDIX A

Gray Jay Trapping Effort

Appendix A

Start Date	Start Time	End Date	End Time	Compartment 1	Compartment 2
Trap Site 1					
14-Apr-03	1100	14-Apr-03	1600	squirrel	empty, door closed
14-Apr-03	1600	15-Apr-03	1700	Gray Jay (148.785)	empty
16-Apr-03	Early afternoon	16-Apr-03	Late afternoon	Gray Jay	empty
16-Apr-03	Late afternoon	17-Apr-03	930	empty, door closed	empty, door closed
17-Apr-03	930	17-Apr-03	1800	empty, door closed	empty, door closed
17-Apr-03	1800	17-Apr-03	1810	Gray Jay (148.390)	empty
17-Apr-03	1805	17-Apr-03	1845	Gray Jay (148.857)	empty
17-Apr-03	1845	18-Apr-03	1150	Gray Jay (148.520)	empty, door closed, bait gone
21-Apr-03	1200	21-Apr-03	1600	empty, door closed, bait gone	empty, door closed, bait gone
24-Apr-03	1030	24-Apr-03	1710	empty, door closed, bait gone	empty, door closed, bait gone
Trap Site 1a					
16-Apr-03	Late afternoon	17-Apr-03	935	empty, door open	empty, door partially closed
17-Apr-03	935	17-Apr-03	1600	empty, door open	empty, door open
17-Apr-03	1600	17-Apr-03	1630	Gray Jay	empty, door open
17-Apr-03	1630	18-Apr-03	1200	empty, door closed	empty, door closed, bait gone
Trap Site 1b					
21-Apr-03	1145	21-Apr-03	1635	empty, door open	Gray Jay recapture(148.390/148.371)
24-Apr-03	1045	24-Apr-03	1730	empty, door open	Gray Jay recapture (148.459)
29-Apr-03	1200	29-Apr-03	1710	empty, door open	Gray Jay (no transmitter)

Appendix A (continued)

Start Date	Start Time	End Date	End Time	Compartment 1	Compartment 2
Trap Site 1b (continued)					
29-Apr-03	1710	30-Apr-03	1000	empty, door open	Gray Jay recapture (148.459)
30-Apr-03	1000	30-Apr-03	1450	empty, door open	empty, door open
Trap Site 2					
14-Apr-03	Late morning	14-Apr-03	Late afternoon	empty, door closed	empty, door open
14-Apr-03	Early evening	15-Apr-03	Early afternoon	squirrel	squirrel
15-Apr-03	Late afternoon	16-Apr-03	Early morning	empty, door closed	empty, door closed
16-Apr-03	Late morning	16-Apr-03	1600	empty, door closed	squirrel, caught in door
16-Apr-03	1600	17-Apr-03	1050	empty, door closed	empty, door closed
Trap Site 2a					
15-Apr-03	Early afternoon	16-Apr-03	Early morning	empty, door open	empty, door open
16-Apr-03	Early morning	16-Apr-03	Late afternoon	empty, door closed	empty, door closed
16-Apr-03	Late afternoon	17-Apr-03	Early morning	empty, door open	chickadee
Trap Site 2b					
17-Apr-03	1050	17-Apr-03	1720	empty, door open	empty, door open
17-Apr-03	1720	18-Apr-03	1100	empty, door open	empty, door open
18-Apr-03	1100	18-Apr-03	1820	empty, door open	squirrel
21-Apr-03	1100	21-Apr-03	1710	empty, door open	squirrel
24-Apr-03	1130	24-Apr-03	1420	chickadee	chickadee
24-Apr-03	1420	25-Apr-03	940	empty, door open	empty, door closed
Trap Site 2c					
17-Apr-03	1100	17-Apr-03	1725	empty, door open	empty, door open

Appendix A (continued)

Start Date	Start Time	End Date	End Time	Compartment 1	Compartment 2
Trap Site 2c (continued)					
17-Apr-03	1725	18-Apr-03	1110	empty, door open	empty, door open
18-Apr-03	1110	18-Apr-03	1820	empty, door open	empty, door open
21-Apr-03	1100	21-Apr-03	1715	empty, door open	empty, door open
24-Apr-03	1130	24-Apr-03	1425	empty, door open	empty, door open
24-Apr-03	1425	25-Apr-03	940	empty, door open	empty, door open
Trap Site 2d					
30-Apr-03	1030	30-Apr-03	1340	empty, door open	empty, door open
Trap Site 3a					
14-Apr-03	Late morning	14-Apr-03	1720	Gray Jay (148.630)	Gray Jay (148.857) Note: transmitter later fell off
26-Apr-03	1400	26-Apr-03	1715	empty, door open	empty, door open
29-Apr-03	1040	29-Apr-03	1505	empty, door open	empty, door open
30-Apr-03	1155	30-Apr-03	1250	empty, door open	empty, door open
Trap Site 3b					
14-Apr-03	Late morning	14-Apr-03	1800	Gray Jay (148.875)	empty
25-Apr-03	1800	26-Apr-03	1100	empty, door open	squirrel
26-Apr-03	1100	26-Apr-03	1430	empty, door open	empty, door open
26-Apr-03	1430	26-Apr-03	1700	empty, door open	empty, door open
29-Apr-03	1015	29-Apr-03	1435	empty, door open	empty, door open
Trap Site 3c					
17-Apr-03	Late morning	17-Apr-03	1630	Gray Jay recapture (148.875), bait gone	empty, door open

Appendix A (continued)

Start Date	Start Time	End Date	End Time	Compartment 1	Compartment 2
Trap Site 3c (continued)					
17-Apr-03	1630	18-Apr-03	940	Gray Jay (148.585)	empty, door open
18-Apr-03	940	18-Apr-03	1740	Gray Jay recapture (148.875)	empty, door open
24-Apr-03	1500	25-Apr-03	1510	Gray Jay (148.745)	empty, door open
25-Apr-03	1510	26-Apr-03	1115	Gray Jay (no transmitter)	empty, door open
26-Apr-03	1115	26-Apr-03	1635	empty, door open	empty, door open
Trap Site 3d					
25-Apr-03	1500	26-Apr-03	1110	empty, door open	empty, door open
16-Apr-03	1110	26-Apr-03	1610	empty, door open	Gray Jay (juvenile?)
Trap Site 3e					
25-Apr-03	1550	26-Apr-03	1125	dead chickadee	Gray Jay recapture (148.875)
26-Apr-03	1125	26-Apr-03	1640	empty, door open	empty, door partially closed
Trap Site c1					
14-Apr-03	Late morning	14-Apr-03	1640	empty, door open	empty, door closed
14-Apr-03	1640	15-Apr-03	Early afternoon	empty, door closed	empty, door closed
15-Apr-03	Early afternoon	16-Apr-03	Early morning	Gray Jay (148.900)	empty
21-Apr-03	1020	21-Apr-03	1645	empty, door closed, bait gone	chickadee
24-Apr-03	1130	24-Apr-03	1355	empty, door closed	empty, door open
24-Apr-03	1355	25-Apr-03	955	empty, door closed	empty, door open
25-Apr-03	955	25-Apr-03	1330	empty, door closed	empty, door open
25-Apr-03	1330	26-Apr-03	930	empty, door open	squirrel

Appendix A (continued)

Start Date	Start Time	End Date	End Time	Compartment 1	Compartment 2
Trap Site c1a					
29-Apr-03	1115	29-Apr-03	1544	empty, door open	empty, door open
29-Apr-03	1544	30-Apr-03	1105	empty, door closed	empty, door closed
30-Apr-03	1105	30-Apr-03	1345	empty, door closed	empty, door closed
Trap Site c1b					
29-Apr-03	1115	29-Apr-03	1546	empty, door open	empty, door closed
29-Apr-03	1546	30-Apr-03	1110	empty, door closed	empty, door closed
30-Apr-03	1110	30-Apr-03	1347	empty, door closed	empty, door open
Trap Site c2					
14-Apr-03	Early morning	14-Apr-03	1650	squirrel	empty, door open
14-Apr-03	1650	15-Apr-03	Early afternoon	empty, door closed	empty, door closed
15-Apr-03	Early afternoon	16-Apr-03	Early morning	Gray Jay (escaped while processing)	empty, door closed
16-Apr-03	Late morning	16-Apr-03	1635	Gray Jay (148.180)	squirrel
16-Apr-03	1635	17-Apr-03	Early morning	squirrel	empty, door open
17-Apr-03	Early morning	17-Apr-03	Late afternoon	Gray Jay (148.430)	empty, door closed
17-Apr-03	Late afternoon	18-Apr-03	1035	empty, door partially closed	squirrel

APPENDIX B

Gray Jay Bird Capture/Handling Data Sheets

JACQUES WHITFORD ENVIRONMENT LTD.

Bird Capture/Handling Data Sheet

Date: 29 Apr 03 Time: 1710 Project #: NFS09202Capture/Handling Team: KG, BBCapture Location (river): site 1bLatitude: 53°19.963 Waypoint # _____Longitude: -60.27.745Species: Gray Jay Bird #: 18 Sex: ? Weight (g): 70⁺gReproductive Condition: small protuberance; maybe naturalMouthing Condition: appear to be juvenile, but uncertainPlastic Band: orange ~~blue~~ Metal Band #: _____Transmitter Frequency: no transmitterFecal Sample Collected? Yes No Blood Sample Collected? Yes NoPreviously handled? Yes No Handling Time (min): < 7 minutesTransmitter Check: Yes No

Comments: wings indicated it was a 2nd yr
(juvenile) and thus not likely to mate.
Thus, we did not put on a transmitter.

APPENDIX C

Telemetry Tracking and Nest Search Effort

Appendix C

Date	Sites Visited	Search Effort (Approx. hours)	Active Transmitters (possible)	Comments
15-Apr-03	3	3	3	Three Gray Jays observed together
16-Apr-03	3	3	6	Three Gray Jays observed Transmitter 148.630 located on ground
17-Apr-03	1, c1, c2, 3	4	9	Three Gray Jays observed together One capture (c2) One recapture (3)
18-Apr-03	3, c2, c1, 1	2	11	Three Gray Jays observed together One capture
21-Apr-03	c1, c2, 1	3	11	One recapture
24-Apr-03	c1, 1, 3	3	11	
25-Apr-03	c1, 3	2	12	
26-Apr-03	3	6	12	Two captures, One recapture
29-Apr-03	c1, c2	0.5	12	
30-Apr-03	1, 3, c2, c1	2	12	One recapture
1-May-03	c1, c2, 1	4	12	Three Gray Jays observed together – aggressive behavior
2-May-03	1	3	11	Two Gray Jays observed showing aggressive behavior towards a squirrel Located transmitter 148.785 on ground
3-May-03	1, c1	2.5	11	Two Gray Jays observed together
5-May-03	1	2	11	Two Gray Jays observed together; offered nesting material but birds not interested
6-May-03	c2, 3	5	11	Located nest near site 3a
9-May-03	c2	1	11	No Gray Jays observed
15-May-03	c2	2	11	
16-May-03	c2	2	11	Located 148.180 with mate and five fledglings; could not locate nest
19-May-03	3	4	9	Transmitters 148.875 and 148.585 located on ground
21-May-03	c2, 1	2	9	Attempted to catch adults and fledglings at c2
22-May-03	3	1	8	Located transmitter 148.745 on ground
23-May-03	1	2	7	Two Gray Jays observed together Located transmitter for 148.390 on ground
26-May-03	1	1.5	7	
27-May-03	1	2	6	No Gray Jays observed in area Located transmitter for 148.857 on ground
28-May-03	1	2	5	No Gray Jays observed in area Located transmitter 148.459 on ground
29-May-03	c1, c2	4	4	No Gray Jays observed in area Located transmitter 148.900 on ground (c1)
Total		68.5		

APPENDIX D

**Record of E-mail Communications with Mr. Dan Strickland,
Research Biologist, Algonquin Park, Ontario**

Appendix D

From: "Karen Gosse" <kgosse@jacqueswhitford.com>
Date: Mon, 28 Apr 2003 11:13:02 -0300
To: <strick@vianet.on.ca>
Subject: gray jays

Hi Dave,

I got your name from Bruce Rodrigues here in Goose Bay. I understand that he spoke with you in the past about the Gray Jay research project currently ongoing by Jacques Whitford/Minaskuat. Bruce mentioned your expertise in the area, and I was wondering if I could contact you by phone to ask a few questions about Gray jays and discuss their breeding behavior? Bruce and myself were out in the field this past Saturday to try and get a feel as to whether or not the birds have begun incubating, but were only able to capture 3 birds and come up with inconclusive information.

Thanks in advance,
Sincerely,
Karen Gosse

From: Strickland <strick@vianet.on.ca>
Date: 04/28/03 02:07PM
To: <kgosse@jacqueswhitford.com>

Hello Karen,

Sure, call me (evenings are best) at 705 635 2761.

Dan (not Dave) Strickland

From: "Karen Gosse" <kgosse@jacqueswhitford.com>
Date: Fri, 02 May 2003 14:05:09 -0300
To: <strick@vianet.on.ca>
Cc: "Karen Gosse" <kgosse@jacqueswhitford.com>
Subject: Re: gray jays

Hi Dan,

Thank-you very much for chatting with me on the phone on Wednesday night. The information you provided on Gray jay behavior was immediately put to use in the field. I have been able to locate (on the net) the papers you mentioned and have ordered some relevant books for my library collection that are of great use for our research.

Today we watched 2 jays in an area together chase, harass, and swoop down at a squirrel in a tree. I was hoping that this aggressive behavior was stimulated by a nest nearby... however, I am wondering whether the jays would be this aggressive over cached food. Any thoughts?

Thanks again,
Have a great day,
Karen

Appendix D (continued)

From: Strickland <strick@vianet.on.ca>
Date: 05/02/03 08:26PM
To: <kgosse@jacqueswhitford.com>

Hello Karen,

No problem ** glad to be of some small help. The harassing of the squirrel by the jays does indeed sound suspicious, especially the fact that it was two jays that were mobbing the squirrel. If it had been a question of the squirrel robbing one of the jay's food caches (possible) only one jay would be bothered** and even then it probably wouldn't be THAT excited. Worth pursuing I would say,

Best,
Dan

From: "Karen Gosse" <kgosse@jacqueswhitford.com>
Date: Fri, 09 May 2003 15:16:13 -0300
To: <strick@vianet.on.ca>
Subject: Re: gray jays

Hi Dan,

We finally found our first Gray Jay nest on Tuesday, May 6. There were 4 nestlings and the adult (female?) was brooding the chicks. Their skin was pinkish and very little down was present, indicating that the chicks were still very young, maybe at most 5 days. Observations from Wednesday-Friday have revealed a noticeable increase in feathers and an increase in the time that the female spends away from the nest (1.5 2 hours). How do these findings relate to your research on Anticosti Island, with respect to incubation/hatch dates? Are incubation dates in Goose Bay later? It has been suggested that there is a 2-week delay period in activity (for all/most species) in Labrador when compared to Newfoundland.

Hope all is going well,
Cheers,
Karen

From: Strickland <strick@vianet.on.ca>
Date: 05/12/03 11:18AM
To: <kgosse@jacqueswhitford.com>

Hi Karen,

Congratulations! Yes, the bird brooding the chicks is always the female, never the male. As far as Anticosti dates are concerned, the 13 nests I found there last year had dates for the laying of the first egg ranging from April 12 to April 27, mean April 17.5. Assuming 4-egg clutches and therefore 21 days from the laying of the first egg to the (more or less simultaneous) hatching of all the eggs, the earliest hatching date would have been May 3rd, the latest May 18th, and the mean would have been May 8.5. Assuming a 23 day nestling period, the earliest fledging date would have been May 26th, the latest would have been June 10, and the mean would have been May 31.5. (I say "would have been" because I did not take into account the fact that some nests failed and therefore affected the actual earliest, mean, and latest hatching and fledging dates).

In any case, the fact that you found approximately 5 day old nestlings on May 6th suggests that nesting near Goose Bay is, if anything, earlier than it was (last year at least) on Anticosti. Good luck with your observations and don't hesitate to ask if you think I can be of further help.

Dan

Appendix D (continued)

From: "Karen Gosse" <kgosse@jacqueswhitford.com>
Date: Tue, 27 May 2003 09:01:26 -0300
To: <strick@vianet.on.ca>
Subject: Re: gray jays

Hi Dan,

To confirm your thoughts, Gray Jay nesting near Goose Bay was likely earlier than on Anticosti. Chicks fledged from the one nest we monitored on 18 May - over a week earlier than the earliest date on Anticosti! On the 15 May, as well, fledglings were observed at a second study site. Given the large variation that you observed on Anticosti (over 2 weeks difference between the earliest and latest fledgling dates), fledgling jays have occurred even earlier than 15 May. Would nesting times be shorter in northern environments, such as in Goose Bay, due to the shorter spring/summer season?

Over the past week we have been attempting to catch and band the fledglings, but have met with little success. As the adults feed the young for 2-3 weeks after fledgling, I would guess that the young would be unresponsive to food (though when baiting the adults we did try to attract the young). Also, we've found that the fledglings remain quite high in the trees and are increasingly difficult to locate as the days go on. Have you any suggestions or any of your own observations on fledgling behavior that might help?

Thanks once again Dan,

Cheers,

Karen

From: Strickland <strick@vianet.on.ca>
Date: 5/28/03 10:08AM
To: Karen Gosse <kgosse@jacqueswhitford.com>
Subject: Re: gray jays

Hi Karen,

Thanks for keeping me posted on your jay observations. Regarding the timing of breeding, my Algonquin observations over the years suggest that breeding is earlier following warm later winter weather and postponed if the weather is cold and stormy. My Anticosti observations seemed to fit in because nesting was much later there and winter lasted much longer too. It would be interesting to compare this year's Goose Bay weather with last year's Anticosti weather, although, through no fault of yours, the Goose Bay sample is not very big. With regard to finding fledglings, you will find that they become more and more active as the days go by. That is, instead of mostly sitting and waiting for their parents to come and feed them, more and more often they will try to intercept their parents as they arrive with food and/or follow them after a feeding has occurred. The trick, of course is finding the fledglings and for that I can suggest only patience and listening very carefully plus scanning tree tops (to see adults resting after having fed their juvies hidden in the trees below). Good luck. I will be out west from May 30 to June 20 but will look forward to more news when I get back.

Best,
Dan

Appendix D (continued)

From: "Karen Gosse" <kgosse@jacqueswhitford.com>
Date: Tue, 04 August 2003 10:11:26
To: <strick@vianet.on.ca>
Subject: Re: Labrador Gray Jays

Hi Dan,

The Gray Jay project here in Goose Bay has come to an end since we last had contact and I am currently in the stages of finishing up the report. We never were able to capture and band the fledglings, though we certainly tried hard on several occasions. The young tended to remain very high in the trees and were not responsive to offered food items. As you mentioned, they were increasingly active as the days went on, but we found them to be very apprehensive (compared to the adults) towards approaching us.

In our last correspondence in late May you suggested comparing this past winters weather data in Goose Bay with that of Anticosti Island. I, myself, wasn't living here at the time, however my co-workers agree that conditions were "average" this past winter, but the season was longer (began early, "before Halloween", extended later into Spring, and then changed rather quickly from winter to summer conditions). I am sure I could locate a detailed weather description if you would like to pursue this further. Also, I will mentioned that we have recommended extending the Gray Jay project into next year - commencing this fall with capturing and banding of adults with subsequent nest searching/monitoring beginning mid-late March 2004 (I am eager to try out your methodology of offering nesting material to pairs to locate nests!). Perhaps a more detailed weather description can be obtained in the upcoming year and used for comparison.

Dan, I just wanted to extend my sincere appreciation for your helpful advice and genuine interest in our project. I have learned a lot on the biology and on field techniques for studying Gray Jays from our conversations that will certainly be used in the field this upcoming season.

Thanks again for all you help,

Karen

From: Strickland <strick@vianet.on.ca>
To: Karen Gosse <kgosse@jacqueswhitford.com>
Date: 8/4/03 2:11PM
Subject: Re: Labrador Gray Jays

Hi Karen,

Thanks for the update on your jay activities. Good luck with being able to continue with the project. I'd be happy to help any way that I can.

Best,

Dan

APPENDIX E

Military Aircraft Noise Data

Appendix E

Date: 7 May, 2003

Start time: 09:45

End Time: 12:06

Approx. Air Temperature (°C): 10

Cloud Cover: 1

Wind: calm

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
10:06	2 phantom	take off		~80-95		M/F remained away
Runway 08						
-	-	-	-	-	-	-
Runway 26						
-	-	-	-	-	-	-
Overhead						
-	-	-	-	-	-	-
Unknown						
1019	2 unknown	pass by		~75	~60	F remained at nest
11:26:19	3 unknown	landing			118	no response
11:28:55	2 unknown	landing		~70	56	adult remained at nest
11:32:04	2 unknown	landing		~60?	58	adult remained at nest
11:37:56	2 unknown	landing		~60?	205	F remained brooding

Appendix E (continued)

Date: 7 May, 2003

Start time: 14:08:30

End Time: 16:20:00

Approx. Air Temperature (°C): 10

Cloud Cover: 1

Wind: calm

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
14:12:10	unknown	takeoff		~70		adult remained @ nest
14:21:54	unknown	takeoff		~70	74	F stands in nest - jabbing
Runway 08						
15:36:34	1 unknown	takeoff		~60		no response
Runway 26						
-	-	-	-	-	-	-
Overhead						
15:29:13	unknown	flew over		~60-70	47	F remained brooding
Unknown						
14:15:30	1 unknown			~70	55	adult remained brooding
14:32:32	2 unknown	flies by? Heading N		~60		no response?
15:14:19	1 unknown				56	adult remained sitting on side of nest

Appendix E (continued)

Date: 8 May, 2003

Start time: 09:30

End Time: 12:12:15

Approx. Air Temperature (°C): 2

Cloud Cover: 10

Wind:

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
9:57:07	3 unknown	takeoff one after the other				adult remains in area storing food
10:58:28	2 phantom	takeoff one after the other			32 +	adults absent
Runway 08						
10:32:06	phantoms	takeoff			66	adults absent
Runway 26						
-	-	-	-	-	-	-
Overhead						
9:58:45	phantoms					no adults present
10:18:09	2 tornado	flew overhead one after another			81	Adult perched on tree flew off
10:35:57	2 tornado	flew over nest			83	adults absent; chicks quiet
11:14:50	unknown				80	adults remain nest near researchers feeding
11:23:15	2 phantom	landing				F remains at nest
11:25:39	2 phantom	landing			45	adult remains at nest jabbing
12:08:14	1 tornado	landing			~40-50	adults absent; no response @ nest
Unknown						
9:50:36	2 phantom	takeoff				both adult leave nest (one after the other)
10:08:36	1 phantom	takeoff			56	adult remains brooding
10:16:23	2 phantom	takeoff		~70-80	69	adults absent
11:08:10	1 phantom	fly by		~60-70	55	adults absent
12:03:09	1 tornado	circle around for landing		~60-70	41	adults absent; no response @ nest

Appendix E (continued)

Date: 9 May, 2003

Start time: 09:20

End Time: 12:20:05

Approx. Air Temperature (°C): 0

Cloud Cover: 1

Wind:

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
9:41:32	2 phantom	takeoff		90.9	48	adults absent
9:55:36	2 phantom	takeoff	82.2	92.5	49	adults absent
10:04:55	2 phantom	takeoff	86.5	106	64	adults absent
10:31:17	2 tornado	takeoff	80	91.8	60	adults absent
Runway 08						
-	-	-	-	-	-	-
Runway 26						
-	-	-	-	-	-	-
Overhead						
12:04:39	1 tornado	flew over	81	90		adult remains at nest brooding
Unknown						
10:40:55	1 phantom	circle around (landing?)	55.5	63.9		adults absent
10:43:51	2 tornado	takeoff	73.3	88.1		adults absent
10:47:54	4 phantoms	takeoff and fly overhead	74.3	111	65	adults absent
10:51:45	1 tornado	flew by	76.6	90.1		adults absent
10:53:47	1 tornado	flew near area	79.2	97.2		adults absent; one returns at 10:54:30
11:54:48	tornados	circled around	56.4	59.8	43	F to nest brooding
12:02:06	unknown	circled around to land	53.4	61.7		adult remains brooding
12:02:48	2 tornado	circled around to land	63	72.5	54	adult remains brooding

Appendix E (continued)

Date: 10 May, 2003

Start time: 09:32

End Time: 11:55:16

Approx. Air Temperature (°C): 10

Cloud Cover: 2-3

Wind: mild

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
9:42:04	2 phantom	takeoff	76.7	85.6	56	adults absent
9:52:09	2 phantom	takeoff	84.3	99.3	82	F remained at nest; M flew to nest and left again
9:59:48	2 phantom	takeoff	85.9	100.2	68	adults absent
Runway 08						
-	-	-	-	-	-	-
Runway 26						
-	-	-	-	-	-	-
Overhead						
-	-	-	-	-	-	-
Unknown						
10:01:25	2 tornado	takeoff	85.7	100.2	99	adults absent; no respons @ nest
10:05:19	2 tornado	takeoff			84	adults absent; no respons @ nest
10:07:40	1 tornado	takeoff	69.6	75	71	adults absent; no respons @ nest
10:17:30	1 tornado	takeoff	75.8	91.1	80	one adult leaves nest, second goes to nest and moves below nest in same tree 32s later
10:28:55	2 tornado	takeoff	76.3	88.5	96	adult flew from ground to treetop with mate
10:35:06	2 phantom	flew by	63.7	78.3	51	adults remain feeding in area

Appendix E (continued)

Date: 12 May, 2003

Start time: 09:35

End Time: ~11:35

Approx. Air Temperature (°C): 10

Cloud Cover: 1-2

Wind: calm

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
10:01:02	2 phantom	takeoff	74.1	83.8	91	adults absent; no response @ nest
10:05:14	1 tornado	takeoff	86.4	100.6	72	adults absent; no response @ nest
10:10:00	2 phantom	takeoff	84.6	96.1	70	adult leaves nest & flew towards/landed near researchers
10:14:05	1 tornado	takeoff			45	adult remained perched @ top of tree; other remained in area
10:26:04	1 phantom	takeoff	89.8	103.1	61	adults absent; no response @ nest
10:33:58	1 tornado	takeoff	83.6	94.6	41	adults absent; no response @ nest
Runway 08						
10:17:40	2 phantom	takeoff	79.6	90.5	30	adults absent; no response @ nest
Runway 26						
-	-	-	-	-	-	-
Overhead						
-	-	-	-	-	-	-
Unknown						
10:11:50	1 tornado	takeoff	79.6	88	58	adult remained perched @ top of tree; other remained in area
10:20:16	1 tornado	takeoff	72.8	82	94	adults absent; no response @ nest
10:57:50	1 phantom	circled in to land			11	adults absent; no response @ nest
11:11:28	Unknown	landing	69.5	77.8	30	adults absent; no response @ nest
11:16:15	Unknown	landing	54.9	64.6	5	adults absent; no response @ nest
11:16:41	unknown	landing	61.1	67.3	21	adults absent; no response @ nest
11:31:08	unknown	landing	54.5	63.2	32	adults absent; no response @ nest

Appendix E (continued)

Date: 12 May, 2003

Start time: 15:06

End Time: 17:25:22

Approx. Air Temperature (°C): 10

Cloud Cover: 2

Wind: slight breeze

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
16:33:20	unknown	circled in for landing	58.9	71.5	24	adults absent; no response @ nest
Runway 08						
15:12:20	2 tornado	takeoff	69.2	80.9	97	adults absent; no response @ nest
15:15:31	unknown	takeoff	63.9	71.2	49	adults absent; no response @ nest
15:21:29	unknown	takeoff	71.5	78.8	41	adults absent; no response @ nest
15:23:12	unknown	takeoff	69.8	76.4	78	adults absent; no response @ nest
15:26:22	unknown	takeoff	64.4	71.7	38	adult remained at nest
15:31:08	unknown	takeoff	62.6	68.6	27	adult remained at nest
15:46:15	unknown	takeoff	62.7	79.2	18	adult remained at nest
16:00:14	unknown	takeoff	74.7	86.2	59	both adults remain in area feeding
16:55:11	unknown	landing	65.4	69.7	19	F remained @ nest; M remained perched in tree
Runway 26						
-	-	-	-	-	-	-
Overhead						
15:36:55	2 phantom	circled over nest	79.4	91.6	60	adults absent; no response @ nest
Unknown						
16:37:08	unknown	landing	54.3	62.3	18	adults absent; no response @ nest
16:40:30	1 tornado	circled in for landing	82.7	93.8	54	adults absent; no response @ nest
16:44:41	2 tornado	circled in for landing	74.6	83	44	adults absent; no response @ nest
16:47:07	1 tornado	circled in for landing	76.4	86.9	38	adults absent; no response @ nest
16:49:31	unknown	landing	57.3	63.2	24	adults absent; no response @ nest

Appendix E (continued)

Date: 13 May, 2003

Start time: 14:23

End Time: 17:07:43

Approx. Air Temperature (°C):

Cloud Cover: 10

Wind: Light

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
14:40:22	2 phantom	takeoff	83.6	95.6	53	adults absent; chicks almost popped out of nest
Runway 08						
14:31:17	2 phantom	takeoff			92	adults absent; chick pops head out of nest
14:50:47	2 tornado	takeoff		81.3		adults absent; no response @ nest
15:01:16	1 tornado	takeoff	65.7	71.4	64	adult remains @ nest jabbing; other remains in area
Runway 26						
-	-	-	-	-	-	-
Overhead						
15:11:47	2 phantom	circled overhead for landing	77.6	84.6	46	adults absent; no response @ nest
15:59:37	1 tornado	circled overhead for landing	72.6	79.6	72	adults absent; no response @ nest
16:23:41	unknown	circled overhead for landing			49	adults absent; no response @ nest
16:37:50	unknown	circled overhead for landing			31	adults absent; 3 chicks popped heads out of nest
Unknown						
14:26:21	phantom(s?)	takeoff	76	84.3	74	adults absent; no response @ nest
15:06:19	1 tornado	takeoff	70.2	82.2	74	adult flew from nest
15:10:38	1 tornado	takeoff	65.9	72.9	68	adults absent; no response @ nest
15:14:40	unknown	landing	55.4	66.6	19	adults absent; no response @ nest
15:17:59	1 tornado	takeoff	70.2	82.4	75	adults absent; no response @ nest
15:23:12	2 tornado	takeoff	71.9	80.8	38	one chick pops up head; adult in area making chattering noises @ crows
15:28:50	1 tornado	takeoff	69.4	70.4	60	adults absent; no response @ nest
16:10:00	unknown	takeoff	60	67	110	adults absent; no response @ nest
16:15:35	1 tornado	circled around to land			65	adults absent; no response @ nest
16:22:19	unknown	takeoff			55	adults absent; no response @ nest

Appendix E (continued)

Date: 14 May, 2003

Start time: 14:49:20

End Time: 16:27:25

Approx. Air Temperature (°C): 3

Cloud Cover: 10

Wind: Light

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
16:10:24	1 phantom	takeoff	74.1	84	36	adults absent; no response @ nest
16:12:38	2 phantom	takeoff	82.1	93.3	77	adults absent; no response @ nest
Runway 08						
15:01:50	1 tornado	takeoff	65.3	71.4	55	adults absent; no response @ nest
15:05:02	1 tornado	takeoff	69.8	78.8	25	adults absent; no response @ nest
15:08:43	1 tornado	takeoff	64.2	77.3	57	adults absent; chicks looking around
15:14:43	1 tornado	takeoff	65.4	73.4	60	adults absent; no response @ nest
15:18:25	1 tornado	takeoff	73.6	81	32	adults absent; no response @ nest
15:26:10	1 tornado	takeoff	61.7	77.3	42	adults absent; no response @ nest
16:11:42	unknown	takeoff	71	78.1	21	adults absent; no response @ nest
16:18:50	1 phantom	takeoff	60.6	67.5	44	adults absent; no response @ nest
16:21:45	2 phantom	takeoff	81.8	91	40	adults absent; no response @ nest
16:23:24	1 unknown	takeoff	68.4	71.9		adults absent; no response @ nest
Runway 26						
-	-	-	-	-	-	-
Overhead						
-	-	-	-	-	-	-
Unknown						
16:17:03	1 tornado	landing	53.5	56.7	7	adults absent; no response @ nest
16:26:27	1 tornado	landing	54.6	60	21	adults absent; no response @ nest

Appendix E (continued)

Date: 15 May, 2003

Start time: 09:43:50

End Time: 11:02

Approx. Air Temperature (°C): 9

Cloud Cover: 1

Wind: calm

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
10:03:50	2 phantom	takeoff	87.6	99.2	30	adults absent; one chicked looked up at jet
10:10:50	2 tornado, 1 phantom	takeoff one after another	88.6	100.6	110	one adult flew to nest and left after 19s
10:13:44	2 phantom	takeoff	83.6	96.7	55	one adult remains in nest feeding, other adult leaves
10:19:55	2 phantom	takeoff	78.6	88.4		adult remains in nest jabbing, other remains perched on treetop singing
10:21:49	3 tornado	takeoff one after another	87.6	100.2	100	one adult remained at nest jabbing; adult perched on treetop flew off
Runway 08						
10:01:55	2 tornado, 1 phantom	takeoff - one after another	68.6	74.2	115	adults absent; no response @ nest
10:51:05	1 unknown	takeoff - one after another	66.6	74.7	50	adults absent; no response @ nest
10:53:04	2 tornado	takeoff	78.9	90.1		adults absent; no response @ nest
Runway 26						
-	-	-	-	-	-	-
Overhead						
10:46:05	2 phantom	flew over to land	76.9	87	52	adults absent; one chick flaps wings
10:48:44	1 tornado	flew over to land	88	100.7	28	adults absent; no response @ nest
Unknown						
10:58:05	unknown	circled around to land	60.8	68.2	25	adults absent; no response @ nest

Appendix E (continued)

Date: 16 May, 2003

Start time: 09:46

End Time: 12:06

Approx. Air Temperature (°C): 10-12

Cloud Cover: overcast

Wind: 23-30

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
11:45:06	1 tornado	takeoff?	78.4	87.5		adult remained at nest looking around
11:47:03	1 tornado	landing	73	78.6		adult remained at nest
Runway 08						
10:03:40	2 unknown	takeoff	71.4	76.5		adults absent; no response @ nest
10:04:32	unknown	takeoff	63	72.5	20	adults absent; no response @ nest
10:08:00	unknown	takeoff	61.6	72.5		adults absent; no response @ nest
10:23:35	2 unknown	takeoff	92.6	111	50	adults absent; no response @ nest
Runway 26						
-	-	-	-	-	-	-
Overhead						
11:03:03	1 tornado	flew over nest to land	73.3	82.2		adults absent; no response @ nest
11:15:00	1 tornado	flew over nest to land	64.1	70.5		adults absent; no response @ nest
11:44:16	1 tornado	flew over nest to land				adult remained at nest
Unknown						
10:00:00	unknown	takeoff	70.8	78.9	59	adults absent; no response @ nest
10:16:11	unknown	takeoff	84.8	102.3	36	adults absent; no response @ nest
10:26:15	unknown	takeoff	69.5	76.3	90	adults absent; no response @ nest
11:04:55	1 phantom	circled around to land	69	73.1		adults absent; no response @ nest
11:05:50	1 phantom	circled around to land	64.1	87.1		adults absent; no response @ nest
11:20:02	3 phantom	circled around to land	83.3	98		adults absent; no response @ nest
11:27:14	1 tornado	circled around to land	77.3	85.5		adult remains @ nest jabbing; chicks flapping wings

Appendix E (continued)

Date: 17 May, 2003

Start time: 09:50

End Time: 12:00

Approx. Air Temperature (°C): 16-18

Cloud Cover: 2-3

Wind: 20-30

Comments:

1st sound	aircraft	activity	Leq	L1	Dur. (s)	Effect
Runway 34						
-	-	-	-	-	-	-
Runway 08						
-	-	-	-	-	-	-
Runway 26						
9:58:10	unknown	takeoff	69.1	72.1	70	2 adults flew to the nest from nearby trees
10:00:48	unknown	takeoff	69	75.9	48	adults absent; no response @ nest
10:05:30	unknown	takeoff	64.2	71.1	65	adults absent; no response @ nest
10:08:45	unknown	takeoff	65.3	70.8	59	adults absent; no response @ nest
10:14:16	unknown	takeoff	63	67.8	44+	adults absent; no response @ nest
10:22:10	unknown	takeoff	64.7	69.8	45	adults absent; no response @ nest
10:23:21	unknown	takeoff	66	70.7	78	adults absent; no response @ nest
Overhead						
11:07:05	4 phantoms	circled over nest to land	72.2	80.8	104	adult remains at nest jabbing
11:15:28	2 phantoms	circled over nest to land	76.2	84.5	68	adult remains at nest sitting on side
11:18:14	1 phantom	circled over nest to land	66.2	72.8	47	adult remains at nest sitting on side
Unknown						
11:19:50	1 torando	circled to land	63.4	68.3	18	adult remains sitting at nest
11:24:14	1 phantom	circled to land	73.7	73.9	34	adult remains sitting at nest
11:29:55	1 torando	circled to land	82.4	92.2	32	adult remains sitting at nest, lifts head and looks @ peak noise
11:42:42	1 torando	circled to land	60.6	72.2		adults absent; no response @ nest
11:47:30	1 torando	circled to land	71.8	78.6	20	adults absent; no response @ nest (went to nest 24 s after noise subsided)

APPENDIX F

Proposed Field Schedule 2003-2004

Appendix F

Potential Time Frame

Main study periods: October to November, March to May

October-November:

- survey of study area
- identification and capture of territory-holding Gray Jays
- weigh, sex and band adult pairs

15 March-7 April (nest construction/pre-incubation stages):

- return to capture locations and locate pairs
- offer nesting material (cotton batting) and attempt to follow birds to nest, or if this method is unsuccessful, re-capture birds and mount telemetry equipment
- monitor nests to determine when incubation begins

early April-late May (incubation, nestling and fledging stages):

- set up temperature probes and video camera at nest
- monitor nest/record observations during nesting stages and military aircraft events