

Copper Fox Metals Inc.

# Schaft Creek Project: Bird Baseline Studies, 2008 Addendum



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May 2010

# SCHAFT CREEK PROJECT: Bird Baseline Studies, 2008 Addendum

**May 2010**  
Project #1039-001-07

**Prepared for:**



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**Citation:** Rescan™ Tahltan Environmental Consultants (RTEC). 2010. *Schaft Creek Project: Bird Baseline Studies, 2008 Addendum*. Prepared for Copper Fox Metals Inc. May 2010.

# Executive Summary

## Executive Summary

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Bird baseline studies were conducted in 2006 for the Schaft Creek Project (the Project) proposed by Copper Fox Metals Incorporated (Copper Fox). Copper Fox is a Canadian mineral exploration and development company focused on developing the Schaft Creek deposit located in northwestern British Columbia. The deposit is situated within the upper source regions of Schaft Creek, which drains northerly into Mess Creek and onwards into the Stikine River. The Project is located within the traditional territory of the Tahltan Nation. The Project entered the British Columbia Environmental Assessment (EA) process in August 2006.

Review of the 2006 baseline suggested that the results obtained may have been influenced by seasonal abnormalities or survey methodology. Specifically, the level of productivity recorded for harlequin duck (*Histrionicus histrionicus*) in 2006 was lower than expected and it was suggested that a late spring may have influenced results. Additionally, targeted surveys for northern goshawk (*Accipiter gentilis*) utilized a call playback methodology in 2006; however, inter-station distance for call playback surveys may have been too large to effectively document breeding and nesting activity of the species.

Additional surveys were conducted in 2008 to supplement previous efforts. Specifically, a harlequin duck brood survey was completed to address whether the level of productivity recorded in 2006 was a seasonal abnormality caused by a late spring or was typical for the area. A summer northern goshawk survey was completed using the call playback methodology at standardized and provincially approved inter-station distance.

No harlequin ducks or harlequin duck broods were observed during the brood survey on August 1, 2008. In general, very few waterfowl species were observed: a total of 12 individuals representing five species were recorded. Evidence collected in the region suggested that 2008 was an early spring. Given that climatic conditions differed between years, 2008 results cannot be used to infer whether 2006 was an anomalous year. However, the apparent lack of productivity observed in 2006 and 2008 may be explained by factors other than climatic conditions. Aerial surveys are the recommended method for inventorying harlequin duck surveys in BC; yet, terrain, vegetation and tree cover, water hydraulics, and harlequin duck behaviour (avoidance of noise) can reduce visibility of harlequin ducks along breeding streams. Thus, it is possible that harlequin ducks were successfully raising broods in the Schaft Creek study area in 2006 and 2008 but were not observed during aerial surveys. The areas where harlequin duck pairs were seen in 2006 is indicative of where suitable breeding habitat for this species occurs along the Schaft and Mess Creek watersheds.

Between five and seven juvenile goshawks (fledglings) were detected to the north of the proposed development during call playback surveys in early July, 2008. There were likely three active nest sites in the study area in 2008, although the location of these nest sites was not confirmed. Detections of fledglings are indicative of a nearby nest site, as the call playbacks were conducted during the post-fledgling period when the young are usually found near or within 800 m of a nest site. As northern goshawks exhibit fidelity to nesting areas, the areas where fledglings were seen and/or heard in 2008 are indicative of areas that may be occupied on an annual basis.

# Acknowledgements



## Acknowledgements

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This report was prepared for Copper Fox Metals Inc. by Rescan Tahltan Environmental Consultants. The report was written by Julia Shewan (B.Sc.) with writing and editing support from Brandie Harding (B.Sc., M.Sc. Candidate). Fieldwork was conducted in 2008 by Julia Shewan, Alyson McHugh (B.Sc, M.Sc.), Shaun Freeman (B.Sc., Dipl T., R.P.Bio), Samantha Louie (RTEC), and Kristen Etzerza (RTEC), Kyle Quock (RTEC), and Natasha Seymour (RTEC).

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# 1. Bird Baseline Studies, 2008 Addendum

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## 1.1 INTRODUCTION

The following report details the results of the supplemental harlequin duck and northern goshawk surveys conducted in 2008, and is intended as an addendum to the bird baseline study program completed in 2006. For full details of the 2006 baselines studies, please see the *Schaft Creek Bird Studies Baseline Report 2006* (RTEC 2007).

Bird baseline studies for the Copper Fox Metals Inc. (Copper Fox) Schaft Creek Project (the Project) were initiated in 2006. Baseline studies were conducted on three focal groups: waterfowl and riverine birds, raptors, and breeding songbirds. All these aforementioned studies were conducted within the boundaries of the Wildlife Study Area (study area; see Figure 1.2-1 in RTEC 2007). During these studies, survey effort was directed on one riverine bird, harlequin duck (*Histrionicus histrionicus*), and one raptor, northern goshawk (*Accipiter gentilis*). These two species have received concern from biologists and regional BC Ministry of Environment (MoE) staff in the past due to apparent population declines (harlequin duck [Robertson and Goudie 1999]) and subspecies rarity (northern goshawk [Northern Goshawk *Accipiter gentilis laingi* Recovery Team 2008]).

Spring waterfowl and riverine bird surveys in early May 2006 identified a total of 28 harlequin ducks comprised of 13 male-female pairs (i.e., only two individuals did not appear to have a mate). Subsequent brood surveys conducted in summer (mid July and August) recorded a paucity of breeding activity for harlequin ducks: only one pair was observed and no young were detected. Call playback surveys (CPS) for northern goshawks were conducted in the late spring (June) of 2006. These surveys recorded one northern goshawk adult.

Review of the 2006 baseline suggested that the results, i.e., the level of harlequin duck productivity and northern goshawk breeding activity, may have been influenced by several factors. The apparent lack of harlequin duck productivity may have resulted from either the local climate conditions (late spring), the cryptic nature of harlequin ducks as the breeding season progresses, or a lack of suitable breeding habitat (RTEC 2007). Concerns raised by Skeena Region biologists in 2007 identified a potential gap in the methodology utilized during northern goshawk CPS: inter-station distance between CPS may have been too large to effectively record breeding and nesting activity. As such, follow-up surveys were proposed for 2008 to: a) investigate whether local climate conditions observed in 2006 influenced harlequin duck productivity or whether observed productivity was typical for the area; and b) identify northern goshawks and associated breeding activity using standardized and provincially approved methodology.

## 1.2 OBJECTIVES

The scope of supplemental bird baselines studies conducted in 2008 was to address concerns over the results obtained from the 2006 baseline program. Specifically, the objectives of the studies were to:

1. conduct brood surveys for harlequin ducks along Mess and Schaft creeks and associated tributaries to document the level of productivity; and

2. conduct call playback surveys for northern goshawks using Resource Information Standards Committee (RISC) standardized methodologies to document breeding and nesting activity.

### **1.3 METHODS**

#### **1.3.1 Harlequin Duck**

An aerial brood survey for harlequin duck was conducted over 4.5 hours on August 1, 2008. Consistent with RISC protocols (RIC 1998b, 1999), the survey included the use of a Bell 206 helicopter occupied by a pilot, navigator, and observer. The helicopter flew at speeds of 40 to 100 km/hour depending on weather conditions, and at height of approximately 30 to 50 m above the water.

All bird species encountered on the aerial survey were recorded. A handheld Garmin GPS 76 equipped with a remote antenna was used to record survey routes (i.e., flightline) and bird observation waypoints. Waypoint, group number, species, numbers of individuals, and sex (wherever possible) was recorded for each observation during the survey. Brood class (Table 1.3-1) and number of young were also recorded wherever young were observed.

**Table 1.3-1. Plumage Development in Young Waterfowl**

<b>Brood Class</b>	<b>Description</b>
IA	Young are covered in bright down, neck and tail not prominent; 1 to 7 days of age
IB	Young are covered in fading down, neck and tail not prominent; 8 to 13 days of age
IC	Young are downed-covered, but colour faded, body elongated; 14 to 18 days of age
IIA	First feathers appear, replacing down on sides and tail; 19 to 27 days of age
IIB	Over half of body covered with feathers; 28 to 42 days of age
IIC	Small amount of down remains, among feathers of back; 28 to 42 days of age
III	Fully feathered but incapable of flight; 43 to 55 days of age, flying at 56 to 60 days of age

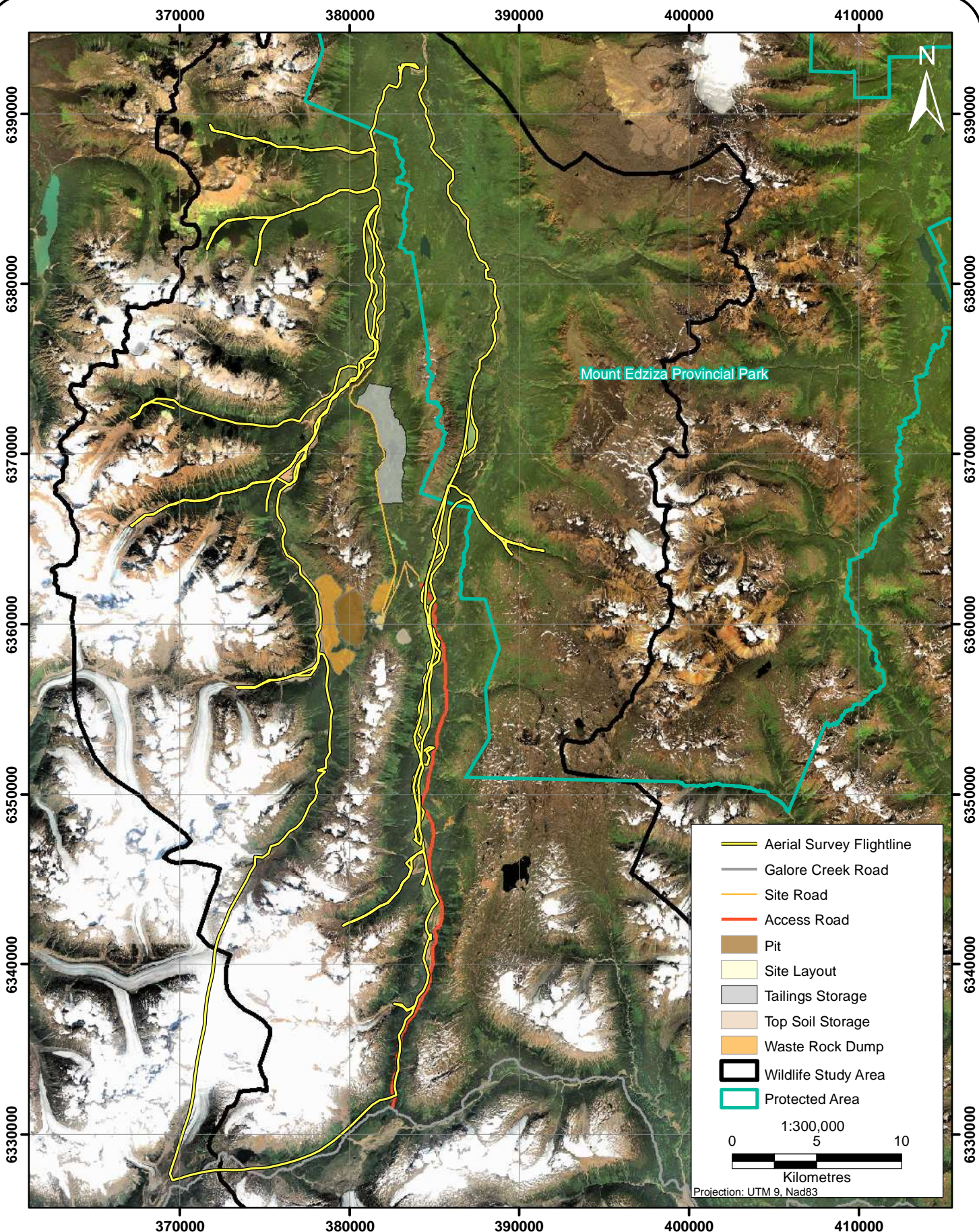
*References: Bellrose (1980) and Gollop & Marshall (1954).*

Flightlines were used to identify survey effort. During the August brood survey, effort was directed along the entire length of Mess and Schaft creeks and associated tributaries within the study area (Figure 1.3-1).

#### **1.3.2 Northern Goshawk**

Call playback surveys for northern goshawk were conducted over a four day period from July 3 to 6, 2008. Surveys were conducted by two separate field crews; each field crew consisted of two observers (biologist and assistant). Field teams used a modified Animal Observation Form – Raptor Call Playback (B) during CPS surveys (RIC 1998a). Northern goshawk surveys were conducted using a minimum inter-station distance (distance between consecutive CPS broadcasts) of 200 m to a maximum of no more than 400 m, based on standardized methods outlined in RIC (1999). Survey effort was also directed toward mature forests within the study area wherever possible, as these areas are more likely to support adequate nesting habitat for goshawks (Squires and Reynolds 1997).

In relation to proposed Project development, there were some areas within the proposed mine site area including the Skeeter Tailings Storage Facility that contained mature forests and were surveyed. However, the majority of the mine site area, including the proposed pit and waste rock dumps, was dominated by early seral stage vegetation and younger forests and was not surveyed in 2008. Call playback surveys were conducted within the proposed pit and waste rock dumps in 2006 (see RTEC 2007).



Mount Edziza Provincial Park

- Aerial Survey Flightline
- Galore Creek Road
- Site Road
- Access Road
- Pit
- Site Layout
- Tailings Storage
- Top Soil Storage
- Waste Rock Dump
- Wildlife Study Area
- Protected Area

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The CPS methodology adhered to RIC standards in terms of the standards for call broadcast and equipment (RIC 2001). Broadcast equipment used included a megaphone (RadioShack©) linked to a digital voice recorder via a mono cable and a digital game caller (FOXPRO Inc. NX3). Each piece of equipment was tested and had approximately a broadcast range of at least 200 m (a power output of greater than 1.2 W at 1 kHz and a known volume output of 100 to 110 dB at 1 m from the broadcast equipment [RIC 2001]). When batteries were fully charged, the equipment was loud enough to elicit responses from goshawks in the desired vicinity of the playback.

Recordings of fledgling food begging calls were used for surveys (RIC 1999). An audio track of goshawk begging calls was engineered that had three rounds of 20-second calls broadcast followed by 30 seconds of silence (total 2.5 minutes per audio track). During surveys, one observer would play the goshawk broadcast while the other observer would listen for a response during the interval of silence between each broadcast. As each round of calls was played, the direction of the loudspeaker was rotated such that the entire range around the focal playback location was included (120° after each call). Additionally, observers waited five and a half minutes after the broadcast period had concluded to record any potential response before moving on (for a total of eight minutes per CPS).

If a response from a northern goshawk was elicited, field crews recorded the time, species, sex, age and type of response (visual/aural). As well, the crews estimated the initial distance and compass bearing to the bird from the CPS station, and direction of departure (if a bird was observed), as these provide clues to the proximity and direction of a nest. Where time and safety allowed, crews conducted a search for active nests near the detection. Field crews also recorded any responses to a broadcast including those from other hawks and mimics (e.g., jays).

A total of 88 CPS were conducted along 18 transects during the survey period. Transects were 600 to 800 m long with three to six CPS stations spaced at 200 m apart along the length of the transect (Appendix 1). A unique identifier was assigned to each CPS station, which included a number (referencing the transect on which it was performed) and a letter (referencing the sequence of stations along the transect) (1a, 1b, 1c, etc.).

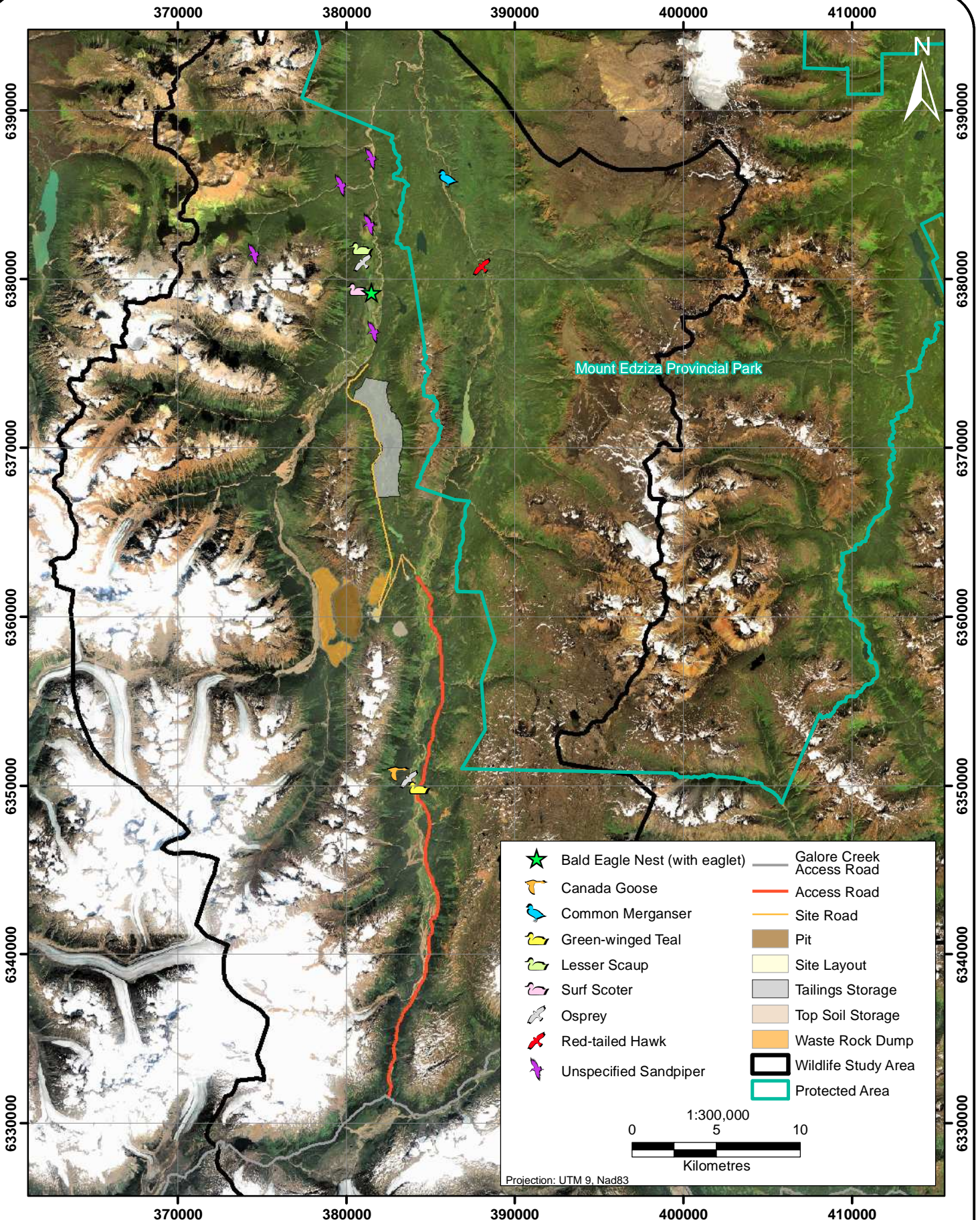
**1.4 RESULTS**

**1.4.1 Harlequin Duck**

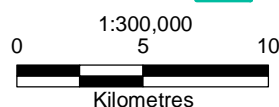
No harlequin ducks were documented during surveys along the Schaft and Mess Creek watersheds in August, 2008. In general, very few birds were observed during this aerial survey. A total of 12 individuals belonging to five species were recorded: five individuals belonging to an unidentified sandpiper species were also detected (Figure 1.4-1; Table 1.4-1; Appendix 3). Additionally, very little breeding activity was recorded for all waterfowl and riverine birds: only two broods belonging to a lesser scaup (*Aythya affinis*) and common merganser (*Mergus merganser*) were observed (Table 1.4-1).

**Table 1.4-1. Summary of Brood Survey Results, August 2008**

<b>Group</b>	<b>Species</b>	<b>No. Adults</b>	<b>No. Broods</b>	<b>No. Young (Brood Class)</b>	<b>Total</b>
Dabbler	Green-winged teal	1	-	-	1
Diver	Lesser scaup	1	1	5 (IB)	6
	Common merganser	1	1	1 (IIA)	2
	Surf scoter	2	-	-	2
Goose	Canada goose	1	-	-	1
Shorebird	Unidentified sandpiper	5	-	-	5



- Bald Eagle Nest (with eaglet)
- Canada Goose
- Common Merganser
- Green-winged Teal
- Lesser Scaup
- Surf Scoter
- Osprey
- Red-tailed Hawk
- Unspecified Sandpiper
- Galore Creek Access Road
- Access Road
- Site Road
- Pit
- Site Layout
- Tailings Storage
- Top Soil Storage
- Waste Rock Dump
- Wildlife Study Area
- Protected Area



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Several raptor species were recorded during the aerial survey, including one observation of a bald eagle (*Haliaeetus leucocephalus*) eaglet in a nest, two osprey (*Pandion haliaetus*), and a red-tailed hawk (*Buteo jamaicensis*). There were also two observations of large raptor that were likely northern goshawks. These two observations are included in following section.

## 1.4.2 Northern Goshawk

### 1.4.2.1 Call Playback Detections

There were six locations (CPS stations) where northern goshawks were detected at during call playback surveys from July 3 to 6, 2008 (Figure 1.4-2; Appendix 1). These detections occurred to the north of the proposed mine site along Transects 3 (one detection), 4 (two detections), 16 (two detections), and 18 (one detection) (Figure 1.4-2). All goshawk detections on call playback surveys were recorded in intermediate to mature successional stage forests within two Biogeoclimatic (BEC) Zones: Engelmann Spruce Subalpine Fir (ESSF) and Birch Willow Spruce (BWS) (Plate 1.4-1; Appendix 2). The dominant tree species were subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) and a minor component of lodgepole pine (*Pinus contorta*) was recorded on Transect 3 (Appendix 2). There were also incidental observations of northern goshawks in the vicinity of Transects 2 and 3 in August, 2008 (Figure 1.4-2).

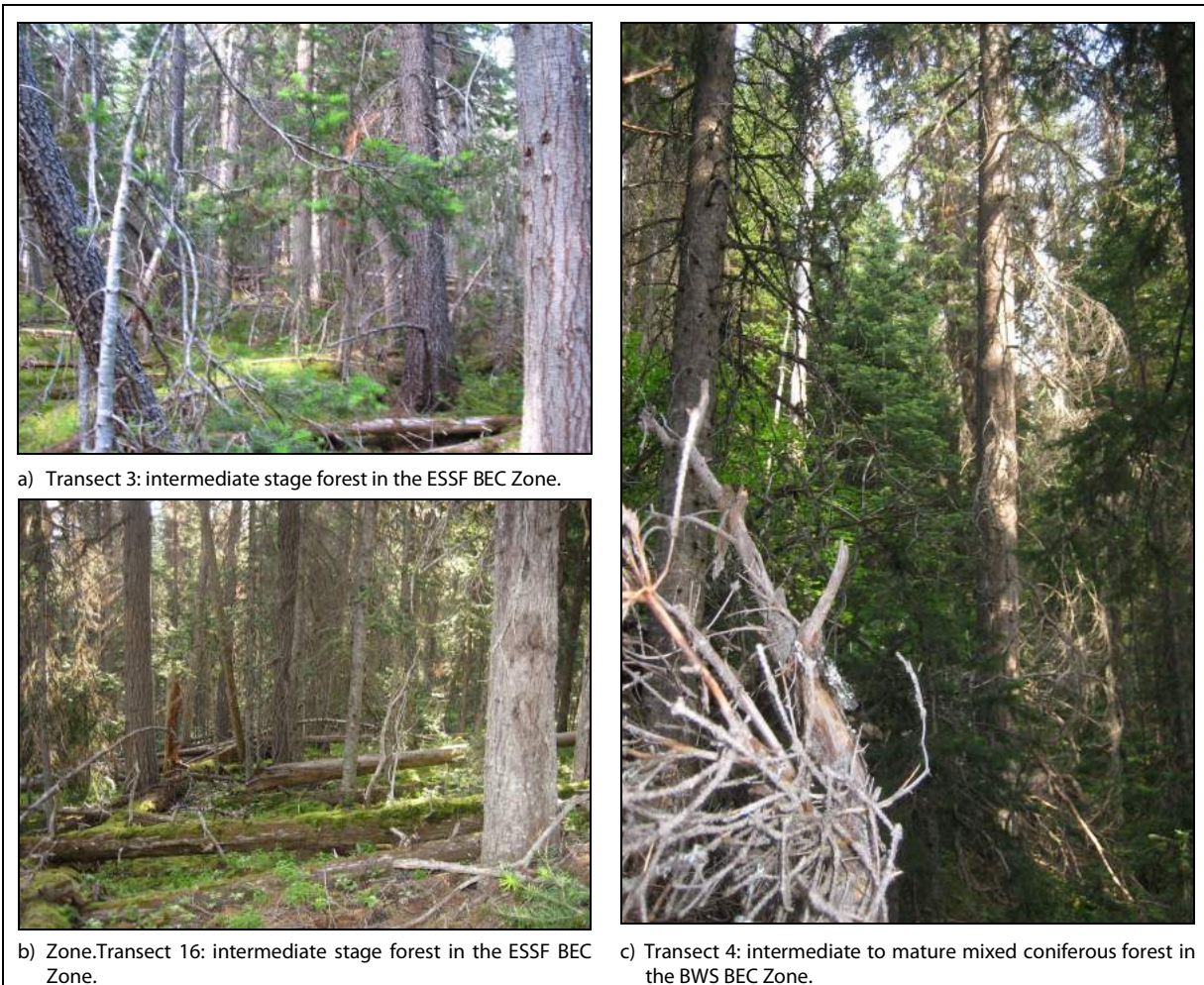
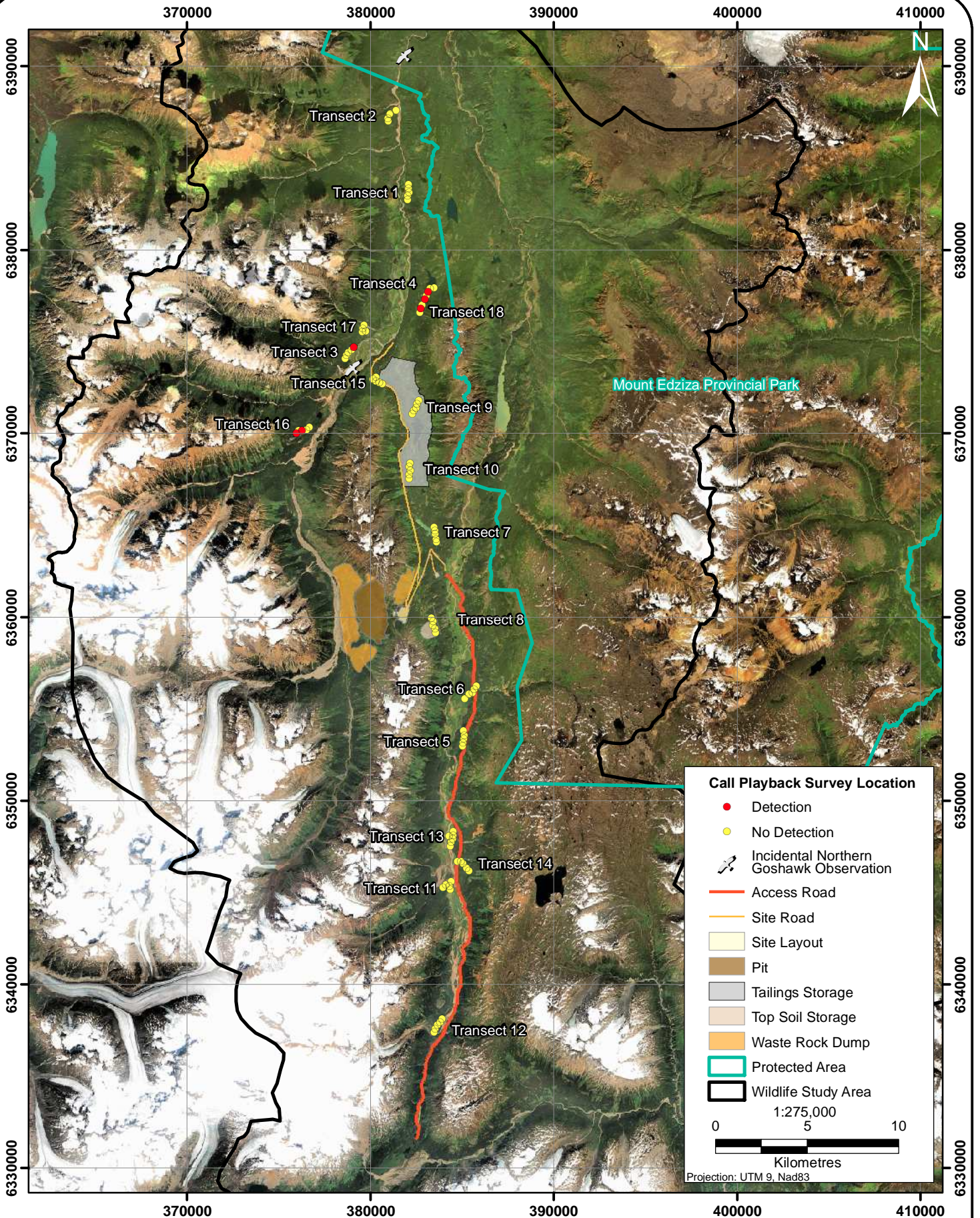


Plate 1.4-1. Examples of habitat where northern goshawks were detected on call playback surveys.





**Call Playback Survey Location**

- Detection
- No Detection
- Incidental Northern Goshawk Observation
- Access Road
- Site Road
- Site Layout
- Pit
- Tailings Storage
- Top Soil Storage
- Waste Rock Dump
- Protected Area
- Wildlife Study Area

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# Northern Goshawk Call Playback Survey Results, July 2008

FIGURE 1.4-2



Observers recorded seven individuals responding to broadcasted calls during the July survey (Table 1.4-2). Detections on Transects 3 and 4 involved an aural and close proximity (< 50 m) visual encounter of the responding individual at the CPS station. One individual was heard and seen at the fifth CPS station of Transect 3 (CPS 3e), one individual at the first CPS station of Transect 4 (CPS 4a), and two individuals at the third CPS station of Transect 4 (CPS 4c) (Table 1.4-2; Appendix 1).

**Table 1.4-2. Northern Goshawk Call Playback Survey Detections, July 2008**

Date	CPS Station	No. Detected	Distance and Direction of Goshawk Detection <sup>1</sup>			Goshawk Characteristics	
			ID Method <sup>2</sup>	Distance (m)	Bearing (°)	Sex	Age Class
03-Jul-08	3e	1	V & A	40	220	Unknown	Juvenile
03-Jul-08	4a	1	V & A	30	90	Unknown	Juvenile
03-Jul-08	4c	2	V & A	20	270	Unknown	Juvenile
06-Jul-08	16a	1	A	400	240	Unknown	Juvenile
06-Jul-08	16c	1	A	200	340	Unknown	Juvenile
06-Jul-08	18b	1	A	300	250	Unknown	Juvenile

Notes:

<sup>1</sup> distance and direction relative to the CPS station.

<sup>2</sup> V: Visual, A: Aural (e.g., call)

Visual encounters of goshawks were brief (often lasting for less than a minute), and as such, the sex of the birds observed could not be determined. On the remaining three detections (Transects 16 and 18), observers only recorded an aural response and the responding individual was estimated to be quite far (> 200 m) from the CPS station (Table 1.4-2). One individual each was heard at the first and third CPS station along Transect 16 (CPS 16a and 16c, respectively), and one was heard at the second CPS station of Transect 18 (CPS 18b) (Table 1.4-2, Appendix 1).

The response at CPS 18b could have been a gray jay mimicking a goshawk fledgling call, as a jay approached to investigate the field crew during the period following the call broadcasts. However, Transect 18 was located downslope in proximity to Transect 4, along which three goshawk fledglings were seen and heard (Table 1.4-2). Both transects were within a mixed subalpine fir and Engelmann spruce forest. Studies have shown that fledglings often stay within the same forest cover type as the nesting site, and those individuals making exploratory trips away from the nest were recorded at the same elevation as the nest site or below it (Doyle and Mahon 2000). Thus, it is still possible that the detection at CPS 18b was a goshawk fledgling, as the detection was located downslope and within the same habitat type from Transect 4.

Although northern goshawks were detected on six occasions, the number of individuals recorded (i.e., heard and/or seen) is possibly less as some individuals could have responded more than once. Doyle and Mahon (2000) reported that goshawk fledglings in the Kispiox Forest District, located just north of Kitwanga, BC, often stay within 400 m of the nest site during the post-fledgling period in June and July, which is referred to as the post-fledgling area (PFA), and only permanently move away (disperse) from the nest in late July to early August. Similarly, other studies across the range of northern goshawks have documented fledgling movements within 200 to 800 m of the nest site during the post-fledgling period (Kenward, Marcstrom and Karlbom 1993; Kennedy et al. 1994; Shipman 1998; Mahon and Doyle 2001). Since each transect on which detections occurred were greater than 800 m apart, this suggests that detections between transects represent individual birds. However, within transects, specifically Transects 4 and 16 where two detections occurred along the length of the transect, responding individuals may

have been recorded twice. Goshawk detections were spaced at approximately 450 m from one another on Transect 4 (distance between CPS 4a and 4c) and approximately 720 m apart on Transect 16 (distance between the locations where goshawks were estimated to be calling from, based on distance and directional estimates recorded at CPS 16a and 16c). Given that the distances between goshawk detections on Transects 4 and 16 were within 800 m of one another, a fledgling in the area could have heard each broadcast and responded at both stations. Thus, there may have been five goshawk fledglings detected during the July surveys across all transects.

A mobbing response from a several other bird species was observed during call playback surveys, including greater yellowlegs (*Tringa melanoleuca*), American robin (*Turdus migratorius*), steller's jay (*Cyanocitta stelleri*), pine siskin (*Spinus pinus*), and chestnut-backed chickadee (*Poecile rufescens*). "Mobbing" responses are when smaller bird species congregate in groups at the location of perceived predator. If the threat is real (a potentially dangerous predator such as a hawk or owl), these groups of birds will attack (i.e., mob) the predator to drive it away.

#### 1.4.2.2 Nesting Activity

Locating the nest site also helps confirm the numbers of birds in the area. A fledgling response is indicative of a nearby nest, as their movements are restricted to around the nest site for the majority of the post-fledgling period. No nests were documented in 2008, although nest searches were conducted wherever possible.

A search for a nest site was conducted along Transect 3. Transect 3 was located near the toe of a mountain slope on the west side of Schaft Creek (Figure 1.4-2; Plate 1.4-1a). The goshawk that responded at CPS 3e approached from the southwest (220°), circled several times near the CPS station, and then flew off in a southerly direction. The field crew attempted to follow the fledgling to locate the nest and searched the area for 30 minutes; however, the fledgling was not seen again, nor was a nest site observed. Given the original direction of approach, a nest site could have been located upslope to the southwest.

A detailed nest site search could not be conducted along Transect 4 due to safety concerns: a black bear was encountered and the field team left the area. Transect 4 was conducted on a narrow bench east of Schaft Creek, with a sharp drop to the river valley bottom and an incline above the bench (Figure 1.4-2; Plate 1.4-1c). The encounter at the CPS 4a station involved a bird flying downslope from the east (90°). The next visual encounter at CPS 4c involved two birds flying in from the west (270°) and perching on a tree near the CPS station. The direction that goshawks approached from at CPS 4a and CPS 4c suggests that a nest site could have been located upslope in close vicinity of the transect line.

A detailed nest search was not performed along Transect 16, which was conducted along a ridge near the toe of a mountain slope on the west side of Schaft Creek (Figure 1.4-2; Plate 1.4-1b). The aural response at the CPS 16a station involved a goshawk that called twice from a westerly direction (240°) at approximately 400 m. The next aural response at CPS 16c involved a bird calling from a closer distance of approximately 200 m to the north (340°). The distance between the estimated positions of goshawks was approximately 720 m. The detection at CPS 16c was closer than that recorded at CPS 16a. Thus, the distance and directional estimates recorded at CPS 16c are likely more accurate, which would suggest that a nest may have been upslope of CPS 16c to the northwest.

A search along Transect 18 was not attempted due to the possibility that the aural response at CPS 18b was a gray jay mimicking a fledgling. However, given that Transects 4 and 18 were close to one

another, the visual observations of fledglings on Transect 4 provide better indication of where a potential nest site was in the general area around Transects 4 and 18.

## **1.5 DISCUSSION**

### **1.5.1 Harlequin Duck**

The follow-up surveys for harlequin duck provided some useful clarification on results obtained in 2006. The follow-up survey was required to answer the question of what level of productivity can be expected under normal climate conditions. The level of productivity recorded on harlequin duck surveys in 2006 suggested that none of the 13 pairs of harlequin ducks were successful in raising any broods, with a similar expectation based on the 2008 result. The level of effort between 2006 and 2008 was similar (4.46 hrs in 2006 vs. 4.5 hours in 2008) and the overall level of productivity for waterfowl and riverine bird species was much lower in 2008 (2 broods) than in 2006 (22 broods). Thus, neither 2006 nor 2008 appear to be a "normal" year. Evidence collected elsewhere in the region suggested that 2008 was an early spring (S. Freeman, pers. obs). Given that climatic conditions differed between years, 2008 results cannot be used to infer whether 2006 was an anomalous year.

Excluding the differing climate conditions, other factors could have influenced results. Aerial surveys, particularly helicopter surveys, are the recommended method for inventorying harlequin ducks in BC (RIC 1998b). However, the method has acknowledged drawbacks. On breeding streams, aerial surveys can be hampered by tree cover, terrain, vegetation, observer bias, and water hydraulics, which all can reduce visibility of harlequin ducks (RIC 1998b). Additionally, noise disturbance from aerial surveys is also known to cause avoidance behaviour in harlequin ducks (Goudie 2006), and these effects may be exacerbated when adults have young to protect, or if young react more strongly to overhead noise. Coordinated ground based studies on breeding streams indicate that between 30% and 50% of birds can be missed during aerial surveys (Freeman and Goudie 1996; RIC 1998b).

These arguments are supported by results of other harlequin duck studies near the Project. Aerial surveys were conducted for the Galore Creek Project in 2005 and 2006 along several major watersheds that supported harlequin duck breeding habitat (fast-flowing mountainous rivers and streams with riffle habitat), including the Iskut and Stikine rivers and More, Sphaler, Porcupine and Scotsimpson creeks (RTEC 2006). Four pairs of harlequin ducks were observed, and no broods were documented. Only on the ground incidental observations confirmed breeding attempts and success: one depredated harlequin duck nest and one female with four ducklings were seen on More Creek (RTEC 2006).

Thus, the apparent lack of harlequin duck productivity observed during baseline studies in 2006 and 2008 may not be a result of study area containing unsuitable harlequin duck breeding habitat. It is possible that harlequin ducks were successful in raising broods in the study area but were not observed during aerial surveys. RIC (1998b) states that all harlequin pairs detected on surveys should be considered to be potential breeding pairs. Studies have shown that harlequin ducks nest within the same watersheds occupied by pairs and females exhibit some fidelity to nesting areas over the years (Freeman and Goudie 1996, 2001). Thus, major and minor tributaries along the Schaft and Mess Creek watersheds where harlequin duck pairs were seen in 2006 (refer to Figure 2.2-1 in RTEC 2007) possibly support a breeding population of harlequin ducks.

The results of harlequin duck studies across the Pacific Northwest provides some information on what level of productivity could be observed in the study area. Studies of harlequin ducks in southern BC

have shown that females have a high breeding propensity (the proportion of sexually mature females that initiate egg production) of around 92% (Bond, Esler, and Williams 2008). The survivorship of young varies across studies, from 43% of ducklings surviving to the fledging stage in northeast Alaska (Crowley 1999) to 60% in Oregon (Bruner 1997). The mean fledging brood size (fledgling per female) recorded in these studies was 2.4 (Crowley 1999) and 3.7 (Bruner 1997). It is likely that similar levels of reproductive output could be expected for harlequin ducks in the Schaft Creek area.

### **1.5.2 Northern Goshawk**

Northern goshawk call playback surveys in 2008 were more successful in recording the presence of goshawks than those in 2006: there were between five and seven juvenile goshawks recorded in an area to the north of the proposed development in July 2008. There were also two observations of adults recorded incidentally during harlequin duck surveys in August, 2008.

There were likely three active nesting sites in the study area, although the location of these nest sites was not confirmed in 2008. This study in particular increases the knowledge of goshawk breeding in the ESSF BEC zone of northern BC. Northern goshawks typically nest in mature and old growth forests with an open understory and closed canopy (Doyle and Mahon 2000; RIC 2001; BC ILMB 2009). Open understory is a requirement for accipiters as these species actively hunt within the forest and need to be able to maneuver and see their prey. For the most part, the habitat in the vicinity of goshawk detections was similar to that selected by nesting goshawks. Surveys were conducted in intermediate to mature successional stage forests, which generally had semi-open to closed canopy closure and an open understory: the most common understory was coarse woody debris. The distances between potential nesting areas in the study area (inferred from goshawk fledgling detections) were on the order of 5 km or more, which is consistent with what has been observed in other studies. The spacing between nests of adjacent goshawk pairs was 5 km in Oregon (Reynolds and Wight 1978) and up to 20 km in the Kispiox Forest District (Doyle and Mahon 2000). Goshawks also exhibit fidelity to nesting areas within their home range. Studies in the Kispiox Forest District showed that some nesting goshawks reused the same nesting areas over multiple years, and that alternate nests within the nesting area were on average 200 m from one another (Doyle and Mahon 2000). Thus, the areas where goshawk fledglings were seen and/or heard in 2008 are indicative of areas that may be occupied and productive on an annual basis.

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# Appendix 1

Raw Northern Goshawk Call Playback Survey Results, July 2008

**Appendix 1. Raw Northern Goshawk Call Playback Survey Results, July 2008**

Date	Transect	Point	Easting	Northing	Start	End	Target Species	Distance (m)	Bearing (°)	Visual / Call (V/C)	Activity	Sex	Age Class	Detection Comment(s)	Incidentals / Mobbing Responses
03-Jul-08	1	a	382051	6383390	7:55	8:03	-	-	-	-	-	-	-		3 GRJA called in
03-Jul-08	1	b	382099	6383173	8:13	8:21	-	-	-	-	-	-	-		
03-Jul-08	1	c	382005	6382985	8:30	8:38	-	-	-	-	-	-	-		DEJU chipping
03-Jul-08	1	d	382011	6382776	8:46	8:54	-	-	-	-	-	-	-		
03-Jul-08	1	e	382066	6383600	9:29	9:37	-	-	-	-	-	-	-		
03-Jul-08	2	a	381376	6387627	8:06	8:16	-	-	-	-	-	-	-		GRJA mimic
03-Jul-08	2	b	381060	6387469	8:28	8:37	-	-	-	-	-	-	-		GRJA fly in
03-Jul-08	2	c	381038	6387406	8:56	9:05	-	-	-	-	-	-	-		
03-Jul-08	2	d	380942	6387210	9:16	9:24	-	-	-	-	-	-	-		
03-Jul-08	2	e	380964	6387029	9:34	9:42	-	-	-	-	-	-	-		GRJA mimic
03-Jul-08	3	a	378600	6374106	10:33	10:41	-	-	-	-	-	-	-		6 GRJA mimicking
03-Jul-08	3	b	378673	6374304	10:55	11:03	-	-	-	-	-	-	-		GRJA mimic at beginning
03-Jul-08	3	c	378759	6374471	11:14	11:22	-	-	-	-	-	-	-		
03-Jul-08	3	d	378961	6374588	11:33	11:41	-	-	-	-	-	-	-		GRJA juvenile came in after 6 min
03-Jul-08	3	e	379078	6374748	11:51	11:59	NOGO	40	220	V/C	flying	U	J	Weak begging call response after 1st round of playback then individual flew in. Flew couple times around then took off S.	
03-Jul-08	4	a	382973	6377360	10:33	10:41	NOGO	30	90	V/C	flying	U	J	Flyover at swamp, weak call	
03-Jul-08	4	b	383036	6377544	10:53	11:01	-	-	-	-	-	-	-		
03-Jul-08	4	c	383136	6377736	11:08	11:17	NOGO	20	270	V/C	mobbing	U	J	2x juveniles flew in for a look, weak response call	
03-Jul-08	4	d	383240	6377915	11:29	11:38	-	-	-	-	-	-	-		
03-Jul-08	4	e	383446	6377956	11:54	12:02	-	-	-	-	-	-	-		
04-Jul-08	5	a	385081	6353399	5:52	6:00	-	-	-	-	-	-	-		
04-Jul-08	5	b	385043	6353204	6:11	6:19	-	-	-	-	-	-	-		
04-Jul-08	5	c	385013	6353004	6:27	6:35	-	-	-	-	-	-	-		
04-Jul-08	5	d	385099	6353592	7:00	7:08	-	-	-	-	-	-	-		GRJA mimic
04-Jul-08	5	e	385059	6353824	7:24	7:32	-	-	-	-	-	-	-		possible MERL
04-Jul-08	6	a	385137	6355578	5:58	6:06	-	-	-	-	-	-	-		
04-Jul-08	6	b	385352	6355850	6:46	6:54	-	-	-	-	-	-	-		
04-Jul-08	6	c	385547	6355904	7:00	7:08	-	-	-	-	-	-	-		
04-Jul-08	6	d	385650	6356078	7:15	7:23	-	-	-	-	-	-	-		
04-Jul-08	6	e	385754	6356261	7:39	7:47	-	-	-	-	-	-	-		
04-Jul-08	7	a	383594	6364129	8:22	8:30	-	-	-	-	-	-	-		
04-Jul-08	7	b	383574	6364250	8:43	8:51	-	-	-	-	-	-	-		
04-Jul-08	7	c	383518	6364548	9:10	9:18	-	-	-	-	-	-	-		GRJA mimic
04-Jul-08	7	d	383501	6364719	9:28	9:36	-	-	-	-	-	-	-		
04-Jul-08	7	e	383457	6364918	9:46	9:52	-	-	-	-	-	-	-		
04-Jul-08	8	b	383510	6359414	8:32	8:40	-	-	-	-	-	-	-		
04-Jul-08	8	a	383545	6359217	8:51	8:51	-	-	-	-	-	-	-		GRJA mob and chatter
04-Jul-08	8	c	383385	6359587	9:10	9:18	-	-	-	-	-	-	-		
04-Jul-08	8	d	383411	6359784	9:36	10:34	-	-	-	-	-	-	-		
04-Jul-08	8	e	383317	6359976	9:55	10:03	-	-	-	-	-	-	-		

(continued)

**Appendix 1. Raw Northern Goshawk Call Playback Survey Results, July 2008 (continued)**

Date	Transect	Point	Easting	Northing	Start	End	Target Species	Distance (m)	Bearing (°)	Visual / Call (V/C)	Activity	Sex	Age Class	Detection Comment(s)	Incidentals / Mobbing Responses
04-Jul-08	9	a	382265	6371101	10:47	10:57	-	-	-	-	-	-	-		
04-Jul-08	9	b	382356	6371275	11:08	11:16	-	-	-	-	-	-	-		
04-Jul-08	9	c	382483	6371442	11:27	11:35	-	-	-	-	-	-	-		GRYE flew over and called
04-Jul-08	9	d	382520	6371653	11:40	11:48	-	-	-	-	-	-	-		2 GRYE calling for the entire count, nest or territory must be nearby
04-Jul-08	9	e	382616	6371823	11:55	12:03	-	-	-	-	-	-	-		GRYE still calling
04-Jul-08	10	a	382105	6367579	10:56	11:07	-	-	-	-	-	-	-		GRJA calling/mimic
04-Jul-08	10	b	382108	6367796	11:18	11:26	-	-	-	-	-	-	-		
04-Jul-08	10	c	382162	6368012	11:36	11:45	-	-	-	-	-	-	-		
04-Jul-08	10	d	382105	6368211	12:01	12:10	-	-	-	-	-	-	-		
04-Jul-08	10	e	382146	6368408	12:21	12:29	-	-	-	-	-	-	-		
05-Jul-08	11	a	384329	6345153	6:00	6:08	-	-	-	-	-	-	-		
05-Jul-08	11	b	384302	6345355	6:20	6:28	-	-	-	-	-	-	-		
05-Jul-08	11	c	384373	6345598	6:36	6:42	-	-	-	-	-	-	-		AMRO alarm and mob
05-Jul-08	11	d	384108	6345422	6:51	6:59	-	-	-	-	-	-	-		
05-Jul-08	11	e	383938	6345312	7:09	7:17	-	-	-	-	-	-	-		
05-Jul-08	12	a	383445	6337415	6:02	6:10	-	-	-	-	-	-	-		PISI mob
05-Jul-08	12	b	383520	6337598	6:26	6:35	-	-	-	-	-	-	-		
05-Jul-08	12	c	383637	6337795	6:48	6:56	-	-	-	-	-	-	-		
05-Jul-08	12	d	383785	6337942	7:06	7:14	-	-	-	-	-	-	-		
05-Jul-08	12	e	383905	6338118	7:23	7:31	-	-	-	-	-	-	-		
05-Jul-08	13	a	384510	6348337	8:24	8:32	-	-	-	-	-	-	-		
05-Jul-08	13	b	384497	6348138	8:40	8:48	-	-	-	-	-	-	-		
05-Jul-08	13	c	384278	6348077	9:08	9:16	-	-	-	-	-	-	-		
05-Jul-08	13	d	384482	6347940	9:43	9:51	-	-	-	-	-	-	-		
05-Jul-08	13	e	384390	6347746	10:01	10:09	-	-	-	-	-	-	-		
05-Jul-08	13	f	384334	6347558	10:21	10:30	-	-	-	-	-	-	-		
05-Jul-08	14	a	384727	6346730	8:56	9:04	-	-	-	-	-	-	-		
06-Jul-08	14	b	384908	6346706	9:20	9:28	-	-	-	-	-	-	-		
05-Jul-08	14	c	385040	6346604	9:44	9:52	-	-	-	-	-	-	-		
05-Jul-08	14	d	385215	6346358	10:20	10:28	-	-	-	-	-	-	-		
05-Jul-08	14	e	385363	6346213	10:50	10:58	-	-	-	-	-	-	-		
06-Jul-08	15	a	380285	6373104	5:57	6:05	-	-	-	-	-	-	-		
06-Jul-08	15	b	380118	6372995	6:12	6:20	-	-	-	-	-	-	-		
06-Jul-08	15	c	380280	6372869	6:32	6:40	-	-	-	-	-	-	-		
06-Jul-08	15	d	380472	6372816	6:51	6:59	-	-	-	-	-	-	-		STJA called in
06-Jul-08	15	e	380644	6372728	7:10	7:18	-	-	-	-	-	-	-		GRJA mimic
06-Jul-08	16	a	375946	6370053	6:00	6:08	NOGO	400	240	C	-	-	J	called twice, very far away	
06-Jul-08	16	b	376076	6370210	6:31	6:40	-	-	-	-	-	-	-		
06-Jul-08	16	c	376260	6370192	6:54	7:02	NOGO	200	340	C	-	-	J		
06-Jul-08	16	d	376488	6370257	7:19	7:27	-	-	-	-	-	-	-		
06-Jul-08	16	e	376642	6370384	7:45	7:53	-	-	-	-	-	-	-		

(continued)

**Appendix 1. Raw Northern Goshawk Call Playback Survey Results, July 2008 (completed)**

Date	Transect	Point	Easting	Northing	Start	End	Target Species	Distance (m)	Bearing (°)	Visual / Call (V/C)	Activity	Sex	Age Class	Detection Comment(s)	Incidentals / Mobbing Responses
06-Jul-08	17	a	379623	6375939	8:06	8:14	-	-	-	-	-	-	-		
06-Jul-08	17	b	379552	6375754	8:23	8:31	-	-	-	-	-	-	-		
06-Jul-08	17	c	379539	6375548	8:41	8:49	-	-	-	-	-	-	-		
06-Jul-08	17	d	379733	6375596	8:57	9:05	-	-	-	-	-	-	-		
06-Jul-08	18	a	382794	6376994	8:28	8:36	-	-	-	-	-	-	-		
06-Jul-08	18	b	382739	6376849	8:49	8:58	NOGO	300	250	C			J		
06-Jul-08	18	c	382676	6376598	9:06	9:16	-	-	-	-	-	-	-		

Notes:

U - unspecified

J - juvenile

## Appendix 2

### Call Playback Survey Habitat Information

## Appendix 2. Call Playback Survey Habitat Information

Transect	Tree Species	Site Description
1	mix of lodgepole pine and Engelmann spruce	forest not much bigger than 14 cm dbh, very small trees, some trees have fallen.
2	lodgepole pine/subalpine fir	Just below lodgepole pine forest with quite a bit of older forest 30-40 cm dbh, also plenty of CWD.
3	subalpine fir/ Engelmann spruce	difficult to age stand, mostly ~10 cm dbh spruce/fir, some lodgepole.
4	marshy area adjacent to lake, surrounded by subalpine fir	subalpine fir forest w/ most trees 20-30 cm dbh.
5	subalpine fir/ Engelmann spruce	some good large subalpine fir 20-25 cm dbh, lots of lodgepole pine to S end of transect.
6	black cottonwood grove w/ large trees and Engalmann spruce	floodplain dominated by cottonwood gives way to moist spruce/fir forest at end of transect.
7	mostly subapline fir and mixed Engelmann spruce	lots of deadfall, ~20 dbh trees.
8	subapline fir	in a mountain saddle, some older forest in the area, trees ~30 cm dbh, lots of CWD.
9	subapline fir	majority is small, spindly trees at the north end of Skeeter Lake.
10	marsh area dispersed in subalpine fir/ Engelmann spruce	most trees are spindly, 20-30 cm dbh.
11	mixed black cottonwood/ subalpine fir/ Engelmann spruce	Some good dbh trees (20-40 cm).
12	Engelmann spruce/ subalpine fir	Mostly 10-20 cm dbh subalpine fir, small patches of larger trees, cottonwoods 30-50 cm.
13	mixed dead/coniferous, black cottonwoods and Engelmann spruce	
14	subalpine fir	multistoried canopy, tons of CWD, trees >30 cm dbh
15	subalpine fir	small trees giving way to larger trees upslope (some 30 cm dbh)
16	subalpine fir/ Engelmann spruce	trees from 20 to 40 dbh along transect, trees not very tall.
17	subalpine fir	
18	subalpine fir	most trees 10-15 m tall with occasional 10 m tall tree, middle of transect has lots of 30-40 cm dbh trees.

## Appendix 3

Raw Harlequin Duck Brood Survey Results, August 2008

### Appendix 3. Raw Harlequin Duck Brood Survey Results, August 2008

Date	Time	Easting	Northing	Common Name	Scientific Name	No. Hens	No. Young	Brood Class	No. Drake or Unidentified	Total	Habitat Type	Comment(s)
1-Aug-08	10:11	381863	6390604	Northern Goshawk	<i>Accipiter gentilis</i>	-	-	-	1	1	Large River	
1-Aug-08	10:40	381482	6387161	Unknown Sandpiper	fam. <i>Scolopacidae</i>	-	-	-	1	1	Large River	
1-Aug-08	10:46	379670	6385570	Unknown Sandpiper	fam. <i>Scolopacidae</i>	-	-	-	1	1	Small River	
1-Aug-08	11:04	374515	6381472	Unknown Sandpiper	fam. <i>Scolopacidae</i>	-	-	-	1	1	Medium Creek	
1-Aug-08	11:12	381391	6383253	Unknown Sandpiper	fam. <i>Scolopacidae</i>	-	-	-	1	1	Large River	
1-Aug-08	11:19	381604	6376877	Unknown Sandpiper	fam. <i>Scolopacidae</i>	-	-	-	1	1	Large River	
1-Aug-08	11:27	379042	6373592	Northern Goshawk	<i>Accipiter gentilis</i>	-	-	-	1	1	Large River	
1-Aug-08	13:00	381459	6379231	Bald Eagle	<i>Haliaeetus leucocephalu</i>	-	1	-	-	1	Large Marsh	nest with eaglet
1-Aug-08	13:11	380953	6381838	Lesser Scaup	<i>Aythya affinis</i>	1	5	IB	-	6	Large Marsh	
1-Aug-08	13:13	380952	6381012	Osprey	<i>Pandion haliaetus</i>	-	-	-	1	1	Large Marsh	
1-Aug-08	13:15	381266	6379411	Surf Scoter	<i>Melanitta perspicillata</i>	1	-	-	1	2	Large Lake	
1-Aug-08	15:14	383703	6350386	Osprey	<i>Pandion haliaetus</i>	-	-	-	1	1	Large Lake	
1-Aug-08	15:14	383703	6350386	Canada Goose	<i>Haliaeetus leucocephalu</i>	-	-	-	1	1	Large Lake	
1-Aug-08	15:14	383703	6350386	Green-winged teal	<i>Anas crecca</i>	1	-	-	-	1	Large Lake	
1-Aug-08	16:39	388005	6380761	Red-tailed Hawk	<i>Buteo jamaicensis</i>	-	-	-	1	1	Large River	
1-Aug-08	16:44	386076	6386000	Common Merganser	<i>Mergus merganser</i>	1	1	IIA	-	2	Large River	