# A synthesis of bat and bird fatalities in Québec wind facilities between 2007 and 2011

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#### Introduction

- Wind power is expanding all around the world and Québec plans to increase its production to more than 1000 MW in 2012 in order to reach 1700 MW in 2013.
- To ensure the protection of biodiversity, especially bats and birds, Québec requires, since 2008, post-construction mortality surveys during the first 3 operational years.
- These surveys follow the same methodology and are thus adequately comparable.
- I present a **synthesis of bat and bird fatalities** reported during post-construction mortality surveys of **4 wind facilities** during the **2007-2011 period**.

# Study area

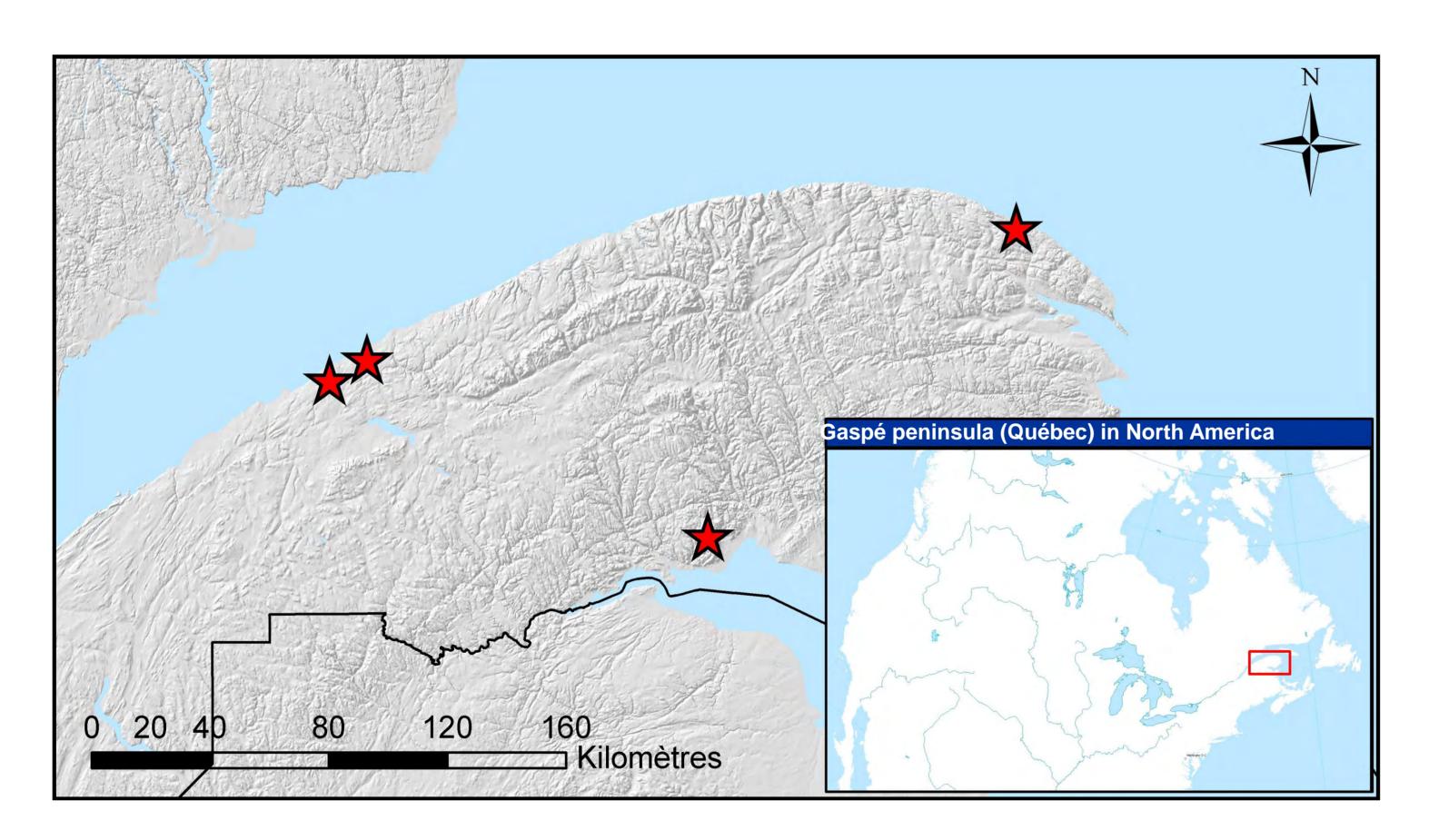


Figure 1. Localisation of wind facilities with post-construction mortality surveys (red stars) between 2007 and 2011 in Québec (Gaspé peninsula), Canada.

# Methodology

- Here are the main requirements of the post-construction survey:
  - Duration of 3 years (the 3 three years of operation);
  - Monitor a minimum of 50% of the turbines for the first year;
  - Visit to turbines every 7 days;
  - From end of March to mid-November;
  - Carcass removal trials;
  - Searcher efficiency trials.
- Fatality estimations were made with Huso's equation.
- Wind facility names are not presented here because mortality reports are confidential. We have randomly attributed a letter to each wind facility.

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#### Results

- Estimates of bat mortality during this period ranged from 0 to 0.015 fatalities/turbine/day, or 0 to 5.546 fatalities/turbine/year (Table 1).
- Estimates of bird mortality during this period ranged from 0 to 0.019 fatalities/turbine/day, or 0 to 6.801 fatalities/turbine/year (Table 1).
- Overall, it is estimated that 1034 bats and 1801 birds were killed during the four-year period, which is relatively low for birds but a high rate for bats.

Table 1. Fatality estimations (daily, annual and annual mortality) for bats and birds in four wind facilities in Gaspé peninsula (Québec) between 2007 and 2011.

Wind		Daily fat	ality rate	Annual fa	tality rate	Annual mortality estimate			
facility	Year	(Fatalities/turbine/day)		(Fatalities/t	urbine/year)	(Fatalities)			
		Bats	Birds	Bats	Birds	Bats	Birds		
Α	2008	0	0.003	0	0.922	0	62		
	2009	0.003	0.006	1.045	2.134	70	143		
	2010	0	0.005	0	1.692	0	113		
В	2009	0	0.004	0	1.603	0	117		
	2010	0	0.001	0	0.536	0	39		
	2011	0	0	0	0	0	0		
С	2007	0.007	0.009	2.620	3.265	191	238		
	2008	0.002	0.007	0.693	2.649	51	193		
	2009	0.002	0.019	0.581	6.801	42	496		
D	2010	0.007	0.003	2.720	1.010	209	91		
	2011	0.015	0.010	5.546	3.640	471	309		

- Bat fatalities affected mainly *Lasiurus cinereus*, with **67.8** % (38/56) of all fatalities reported (Table 2).
- Wind facility D had more than 87 % of all bat fatalities reported
- More than 87.7 % of bat fatalities have been reported during the breeding season (June July) which 40.8 % in a short period of 10 days, from July 20 to 29 (2010 and 2011).
- However, it is important to note that the wind facility presenting high bat fatalities is the only facility to have carried out surveys between July 16 and 30.
- Several bat fatalities have been reported for the only facility where surveys were done late in July. This could suggest that the **estimated mortality of bats could be underestimated in the other three wind facilities** (i.e. visits every 7 days).

Table 2. Bat species fatalities within four wind facilities in Gaspé peninsula (Québec) between 2007 and 2011.

Wind facility / year	Α		В		С		D		TOTAL		
Species	2008 2009	2010	2009	2010	2011	2007	2008	2009	2010	2011	IOIAL
Eptesicus fuscus								1			1
Lasiurus borealis										1	1
Lasiurus cinereus						1	1		23	13	38
Lasionycteris noctivagans									1	1	2
Myotis lucifugus						1					1
Myotis septentrionalis	1					1	1			3	6
Myotis sp.									7		7
Perimyotis subflavus											0
TOTAL	1			0			6		4	9	56

# Management Implications

- Relatively **high fatality rates for bats** in Québec wind facilities between 2007 and 2011.
- An **update of the protocol** for monitoring bird and bat fatalities in wind facilities is **in progress** to adapt the methodology and be able to adequately document the mortality of bats in wind facilities,.
- The main changes concern the interval between visits (3-days) and periods of inventories (continuous from June to end of September).