

Wind Energy Bird and Bat Monitoring Database

Summary of the findings from post-construction monitoring reports

Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources

November 2011

INTRODUCTION

This database is a joint initiative of Environment Canada, the Canadian Wind Energy Association, Bird Studies Canada and the Ontario Ministry of Natural Resources. The goals of this project are to facilitate improved understanding of the impacts of wind turbines on birds and bats, allow for greater consistency in assessment of wind power impacts across the country, and lead to future improvements in the Environmental Assessment and approval processes.

The database is intended to be a living tool that summarizes Canadian wind farm data collected and submitted to date, demonstrating our growth in understanding the effects of wind power on birds and bats, and evaluating survey methods and environmental effects assessment. The data summaries presented here represent our current state of knowledge based on Canadian data. This report presents uncorrected results from available studies, primarily conducted between 2006 and 2009.

This report represents the findings of approximately 152 months of post-construction monitoring activity around 638 turbines (7820 turbine-months) at 16 different sites in Alberta, Ontario, British Columbia, Saskatchewan, Newfoundland, Nova Scotia and Prince Edward Island. The majority of the monitoring occurred between the months of April and October, which cover the main periods of activity of birds and bats, particularly during migration. The table below lists the projects included in the database.

Name of project	Prov.	Number of turbines	Capacity per turbine (MW)
Magrath	AB	20	1.5
Soderglen	AB	47	1.5
Taber	AB	37	2.2
Bear Mountain	BC	34	3
St. Lawrence	NL	9	3
Lingan III	NS	5	2
Norway	PE	3	3
Cypress I	SK	9	0.66
Erie Shores	ON	66	1.5
Ferndale	ON	1	1.8
Ferndale	ON	2	1.65
Kingsbridge	ON	22	1.8

Melancthon I	ON	45	1.5
Melancthon II	ON	88	1.5
Prince	ON	126	1.5
Ripley	ON	38	2
Wolfe island	ON	86	2.3
Total =		638	

METHODS

Species composition of casualties can be used to identify which species have been the most frequently observed as casualties at Canadian wind farms. To draw patterns of species composition of casualties, we compared species ranks among sites. Within sites, species ranks are largely unaffected by the amount of effort devoted to monitoring. If a particular species was consistently found to be most prevalent in mortality reports at a majority of sites, this species would obtain the highest rank. This method allows a comparison of sites with different levels of monitoring effort, as each site is given an equal weight when calculating average ranks for each species.

It is important to realize that ranks within each site will be affected by other factors, such as the time of year when the monitoring occurred, or the type of turbines (height, capacity, blade area, etc.). It is hoped the database will provide the means to identify and understand casualty patterns linked to these other variables.

Ranks for birds and bats within each site were determined using fractional ranking, based on the total number of carcasses found for each species. With fractional ranking, items with equal numbers of carcasses receive the same ranking number, which corresponds to the minimum value of what they would have under ordinal rankings. In cases where the number of carcasses is zero for a given species within a project, we assigned the maximum rank possible across all sites. The total number of species reported across all sites was 11 for bats and 129 for birds. Therefore all species that were not found at a given site were either given a fractional rank of 11 (for bats) and 129 (for bird). Without this correction, the rank assigned to species that had not been found at a specific site would be biased by the number of species found at that site.

RESULTS:

A. Species composition (fatalities):

1. Bird and bat fatalities:

Across Canada, bat casualties were reported more often than birds at almost all sites monitored, accounting for 64% of all carcasses found (1423 bats and 794 birds). This pattern was consistent in Ontario, where 66% of the casualties found were bats (1133 bats; 593 birds).

2. Species composition: Birds (Canada)

Across Canada, a total of 794 bird casualties were found representing 115 different species. Passerines were most commonly found, representing 67% of all bird fatalities. The most prevalent species were: Horned Lark (average rank = 54.46), European Starling (average rank = 62.77) and American Robin (average rank = 63.85). Raptors represented 5% of all birds found, with Red-tailed Hawk (average rank = 83.31) and Turkey Vulture (average rank = 83.92) found most commonly. Waterfowl represented 3% of all bird fatalities, with Mallard and Northern Shoveler the most often reported waterfowl species. The following table lists the bird species found during post construction monitoring at wind turbines across Canada, listed from lowest rank (most prevalent across sites) to highest rank (least commonly found).

Bird species (Canada):

Species name

Horned Lark
European Starling
American Robin
Golden-crowned Kinglet
Ruby-crowned Kinglet
Red-eyed Vireo
Red-tailed Hawk
Turkey Vulture
Yellow-rumped Warbler
Ring-billed Gull
Mourning Dove
Red-breasted Nuthatch
Savannah Sparrow
Eastern Kingbird
Cedar Waxwing
Cliff Swallow
Ruffed Grouse
Brown-headed Cowbird
Killdeer
Magnolia Warbler
Bank Swallow
Canada Warbler
American Redstart
Wilson's Warbler
Cooper's Hawk
Upland Sandpiper
Barn Swallow
Blackburnian Warbler
Chestnut-sided Warbler

Species name

Tree Swallow
Bobolink
American Crow
Gray Partridge
Sora
Vesper Sparrow
Rock Pigeon
Western Grebe
Eared Grebe
Mallard
Northern Shoveler
House Sparrow
American Goldfinch
Common Grackle
Short-eared Owl
Western Meadowlark
Yellow-bellied Flycatcher
Dark-eyed Junco
Gray Catbird
Lapland Longspur
Swainson's Hawk
Philadelphia Vireo
White-throated Sparrow
Herring Gull
Scarlet Tanager
Black-and-white Warbler
Black-billed Cuckoo
Blue-headed Vireo
Brown Creeper

Species name

Northern Flicker
Yellow-bellied Sapsucker
Common Yellowthroat
Yellow Warbler
Least Flycatcher
Merlin
Purple Finch
Ruby-throated Hummingbird
Black Guillemot
Iceland Gull
Leach's Storm-Petrel
Purple Martin
Red-winged Blackbird
Black-throated Green Warbler
Gray-cheeked Thrush
Northern Rough-winged Swallow
Canada Goose
Horned Grebe
House Wren
Ovenbird
Snow Bunting
Swainson's Thrush
American Coot
American Kestrel
Wilson's Snipe
Bald Eagle
Chipping Sparrow
Eastern Meadowlark

Species name

Lincoln's Sparrow
Nashville Warbler
Northern Harrier
Song Sparrow
Swamp Sparrow
Brewer's Blackbird
Blue-winged Teal
Eastern Bluebird
Great Horned Owl
Sandhill Crane
Sharp-tailed Grouse
American Woodcock
Broad-winged Hawk
Chimney Swift
House Finch
Tennessee Warbler
Blue Jay
Warbling Vireo
Evening Grosbeak
Veery
Winter Wren
Brown Thrasher
Downy Woodpecker
Hermit Thrush
Indigo Bunting
Rose-breasted Grosbeak
Sharp-shinned Hawk
Virginia Rail

3. Species composition: Birds (Ontario)

Ontario bird fatality results were generally similar to the rest of Canada. In Ontario, 593 bird casualties were found representing 94 species. Passerines were most common, representing 63% of all bird fatalities in Ontario. The most prevalent passerine species were: Red-eyed Vireo (average rank = 40.7), European Starling (average rank = 42) and Golden Crowned Kinglet (average rank = 43). Raptors represented 7% of all bird fatalities, with Turkey Vulture (average rank = 45.29) and Red-tailed Hawk (average rank = 60.57) found most commonly. Waterfowl represented 3% of all bird fatalities, with Canada Goose and Mallard the most often reported waterfowl species. The following table lists the bird species found during post construction monitoring at wind turbines in Ontario, listed from lowest rank (most prevalent across sites) to highest rank (least commonly found).

Bird species (Ontario)

<u>Species name</u>	<u>Species name</u>
Red-eyed Vireo	Black-and-white Warbler
European Starling	Northern Flicker
Golden-crowned Kinglet	Upland Sandpiper
Turkey Vulture	Black-billed Cuckoo
Red-tailed Hawk	Brown Creeper
American Robin	Blue-headed Vireo
Eastern Kingbird	Yellow-bellied Sapsucker
Cedar Waxwing	American Redstart
Horned Lark	Canada Warbler
Ring-billed Gull	Wilson's Warbler
Mourning Dove	Least Flycatcher
Ruby-crowned Kinglet	Purple Finch
Ruffed Grouse	Merlin
Magnolia Warbler	Ruby-throated Hummingbird
Bank Swallow	Wild Turkey
Savannah Sparrow	Mallard
Cooper's Hawk	American Crow
Barn Swallow	Purple Martin
Yellow-rumped Warbler	Red-winged Blackbird
Blackburnian Warbler	Black-throated Green Warbler
Chestnut-sided Warbler	Gray-cheeked Thrush
Tree Swallow	Northern Rough-winged Swallow
Bobolink	Canada Goose
Sora	Red-breasted Nuthatch
Rock Pigeon	Gray Catbird
Cliff Swallow	Swainson's Thrush
American Goldfinch	Wilson's Snipe
Common Grackle	American Kestrel
Brown-headed Cowbird	Chipping Sparrow
Yellow-bellied Flycatcher	House Sparrow
Killdeer	Swamp Sparrow
Philadelphia Vireo	Lincoln's Sparrow
Scarlet Tanager	

Species name

Nashville Warbler
Song Sparrow
Eastern Meadowlark
Bald Eagle
Northern Harrier
Great Horned Owl
Eastern Bluebird
American Woodcock
Chimney Swift
Broad-winged Hawk
Yellow Warbler
Tennessee Warbler
Common Yellowthroat
House Finch
Warbling Vireo
Blue Jay
Herring Gull
White-throated Sparrow
Winter Wren
Veery
Evening Grosbeak
Downy Woodpecker
Virginia Rail
Hermit Thrush
Indigo Bunting
Rose-breasted Grosbeak
Brown Thrasher
Sharp-shinned Hawk

4. Species composition: Bats (Canada)

Across Canada, a total of 1423 bat casualties were found representing 9 different species. Hoary Bat was the species most often found (30% of all bat fatalities; average rank of 2.6). Silver-haired Bat was the second most commonly found species (25% of all bat fatalities; average rank 3.5). Other species commonly found included Little Brown Bat (21%, rank = 4.9), Big Brown Bat (6%, rank = 6.1) and Eastern Red Bat (8%, rank = 7.1). The following table lists the bat species found during post construction monitoring at wind turbines across Canada, listed from lowest rank (most prevalent across sites) to highest rank (least commonly found).

Bat species (Canada):

Species name
Hoary Bat
Silver-haired Bat
Little Brown Bat
Big Brown Bat
Eastern Red Bat
Eastern Pipistrelle
Long-legged Bat
Northern Long-eared Bat
Eastern Small-footed Bat

5. Species composition: Bats (Ontario)

In Ontario, bat casualties numbered 1133, representing 8 species. The most common bat species found were: Hoary Bat (26% of Ontario bat fatalities; average rank = 1.9), Little Brown Bat (27%, rank= 2.9) and Silver-haired Bat (18%, rank = 3.3). Migratory bats in Ontario (Eastern red Bat, Hoary Bat and Silver-haired Bat) represented 55% of the total bat fatalities. The following table lists the bat species found during post construction monitoring at wind turbines in Ontario, listed from lowest rank (most prevalent across sites) to highest rank (least commonly found).

Bat species (Ontario):

<u>Species name</u>
Hoary Bat
Little Brown Bat
Silver-haired Bat
Eastern Red Bat
Big Brown Bat
Eastern Pipistrelle
Northern Long-eared Bat
<u>Eastern Small-footed Bat</u>

B. Seasonal fatality patterns:

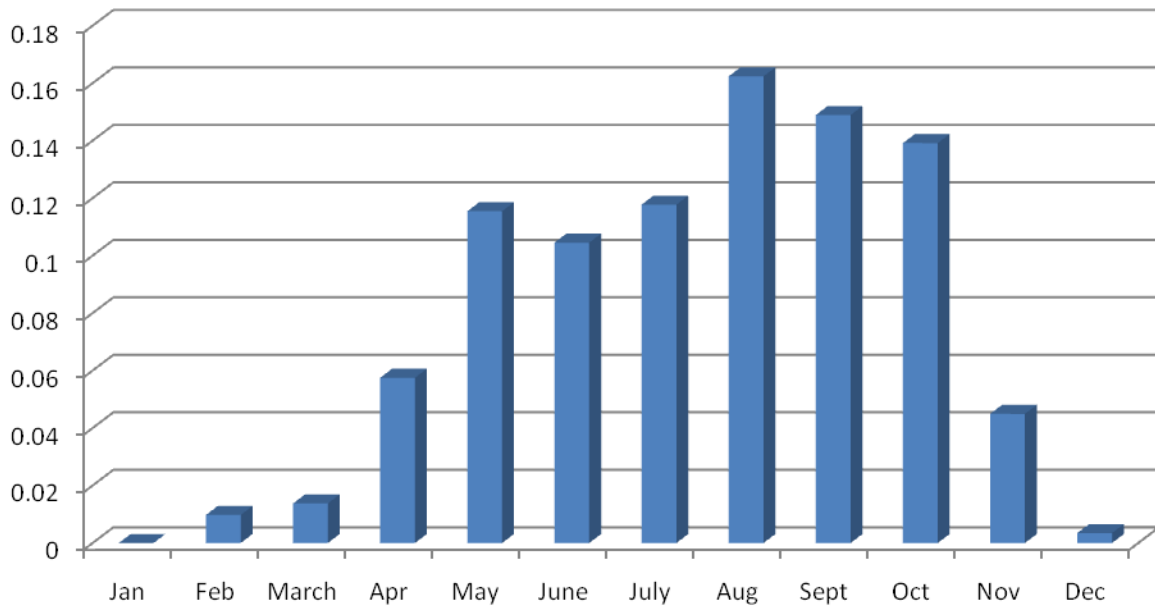
Seasonal fatality results in the following sections are reported in number of casualties (birds or bats) found per turbine, for each month. This summarizes the numbers of animals found during post-construction monitoring surveys across all sites, and allows for comparison among months/ across seasons. Actual numbers of turbine mortalities, which require correction for variation in sampling effort and scavenger take, could not be calculated from the data set.

6: Seasonal fatality patterns: Birds (Canada)

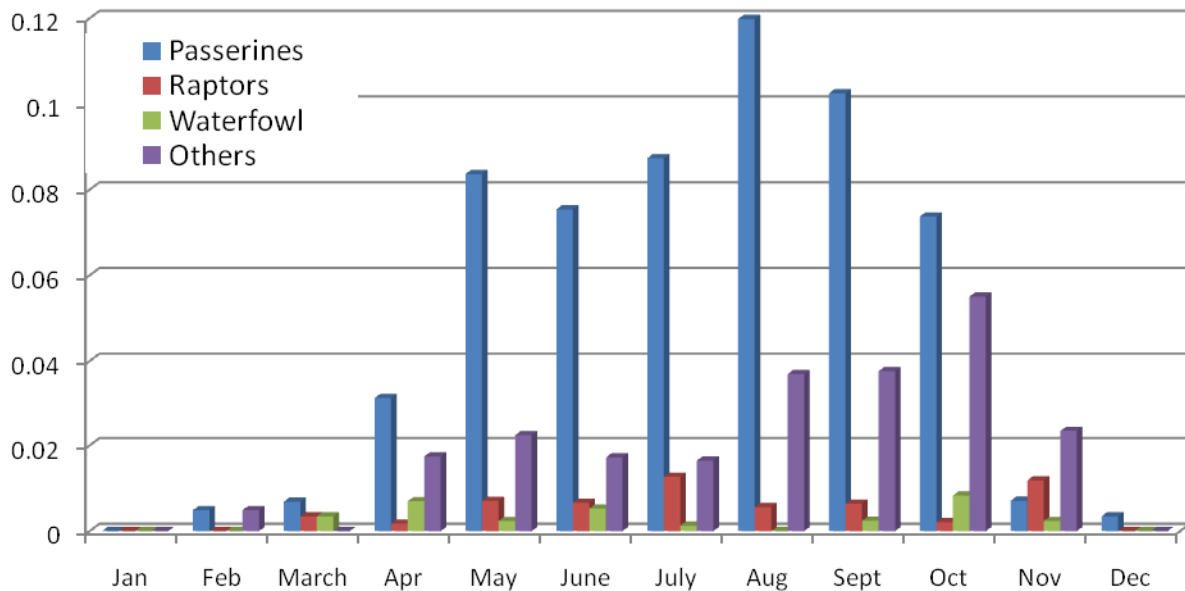
At wind farms in Canada, most of the bird carcasses were found from May through October. Bird fatalities were slightly higher in the late summer- early fall period, with 61% of all casualties reported between the months of August and October. There were very few fatalities reported in winter and early spring (between November and March). This is also a period when relatively few birds are present.

The overall pattern of fatalities was largely driven by passerines, which represented the majority of casualties. No pattern was detected in raptor or waterfowl fatalities across the year. The numbers of reported raptor and waterfowl casualties were relatively low at all sites.

**Number of bird carcasses per turbine-month
Canada**

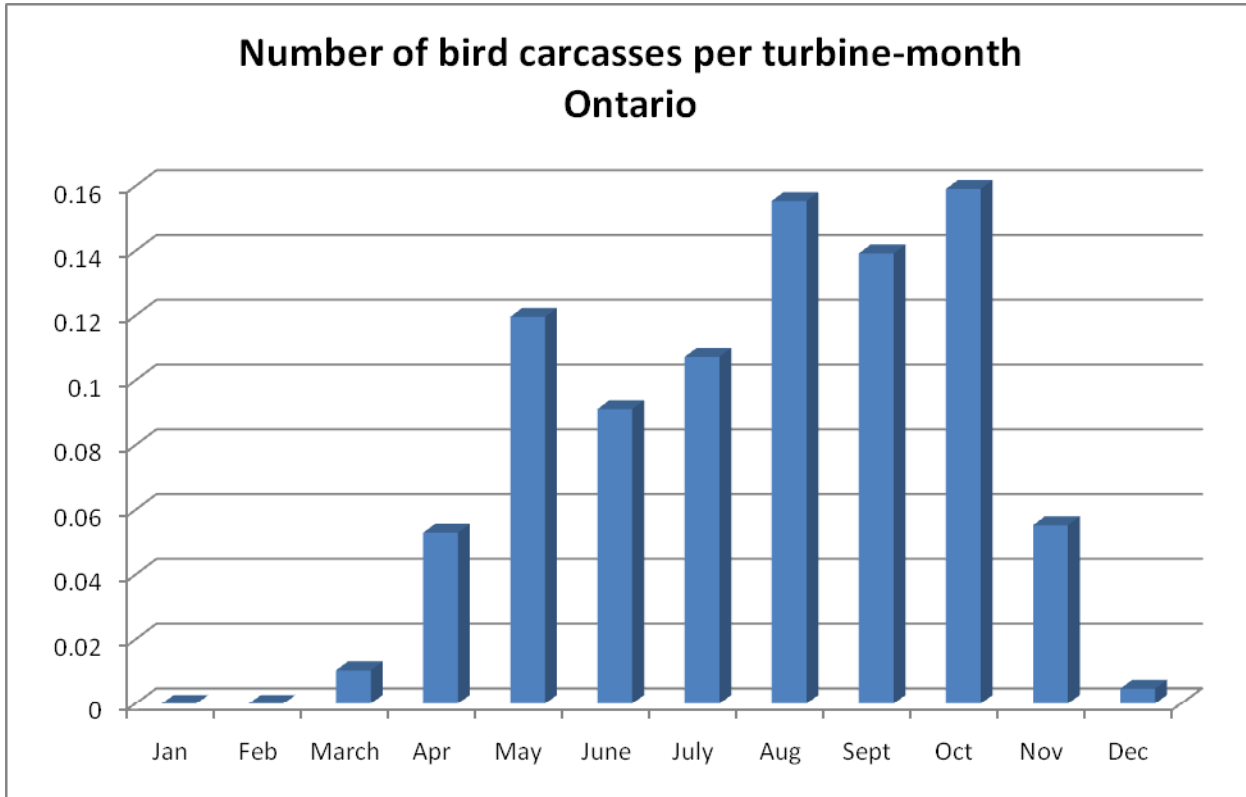


**Number of bird carcasses per turbine-month
Canada**

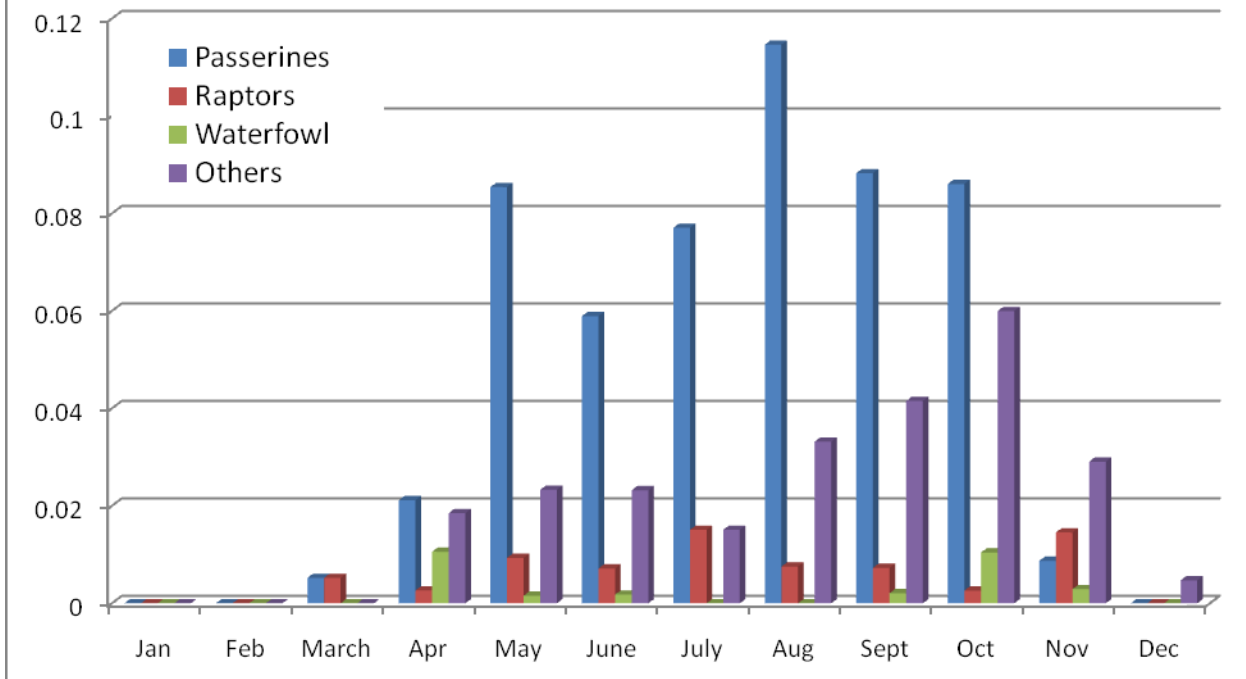


7: Seasonal patterns of fatalities: Birds (Ontario)

The seasonal pattern of bird fatalities was largely the same in Ontario, with highest fatalities reported between May and October. As with the Canadian results, Ontario fatality results are dominated by passerines, with relatively low numbers of raptors and waterfowl species reported across all sites.

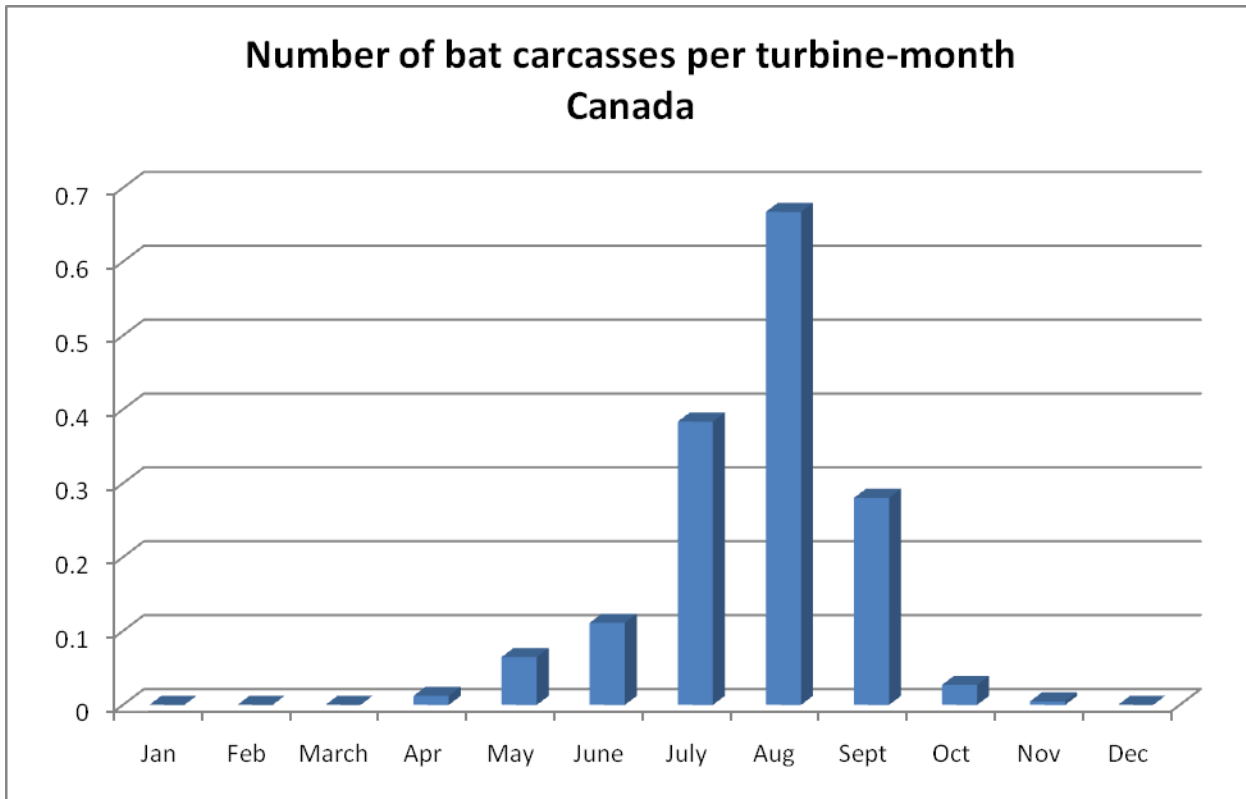


Number of bird carcasses per turbine-month Ontario

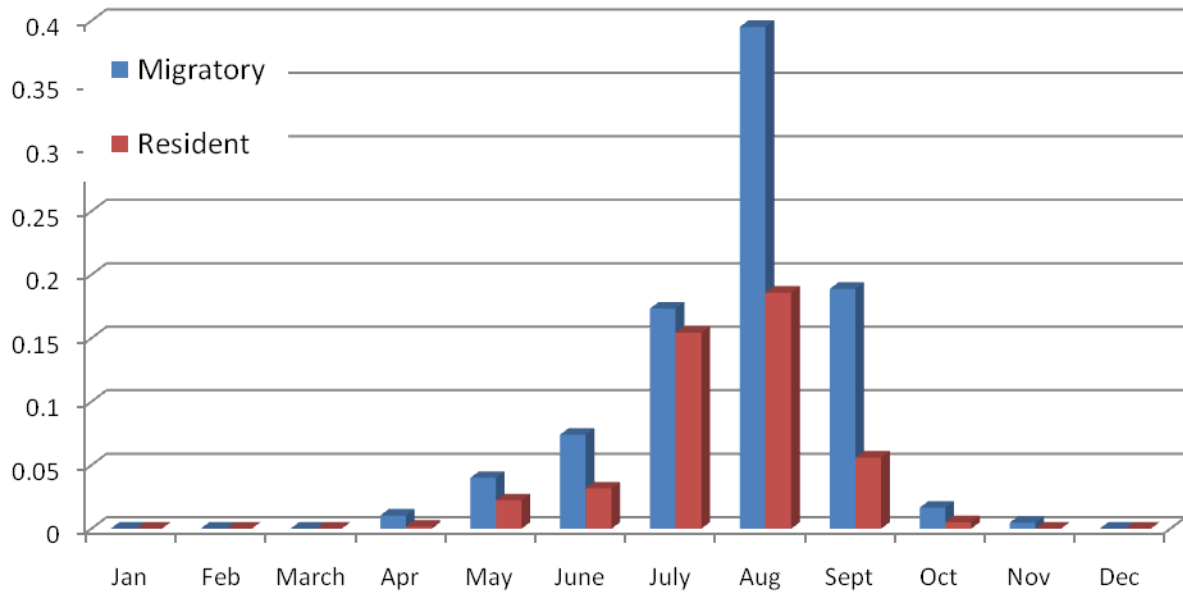


8: Seasonal fatality patterns: Bats (Canada)

In Canada, most bat casualties at wind power projects were found in July, August and September (88% of bat carcasses). Peak numbers of carcasses were found in August (42% of all bat carcasses). Migratory species were found more than resident species in August and September.



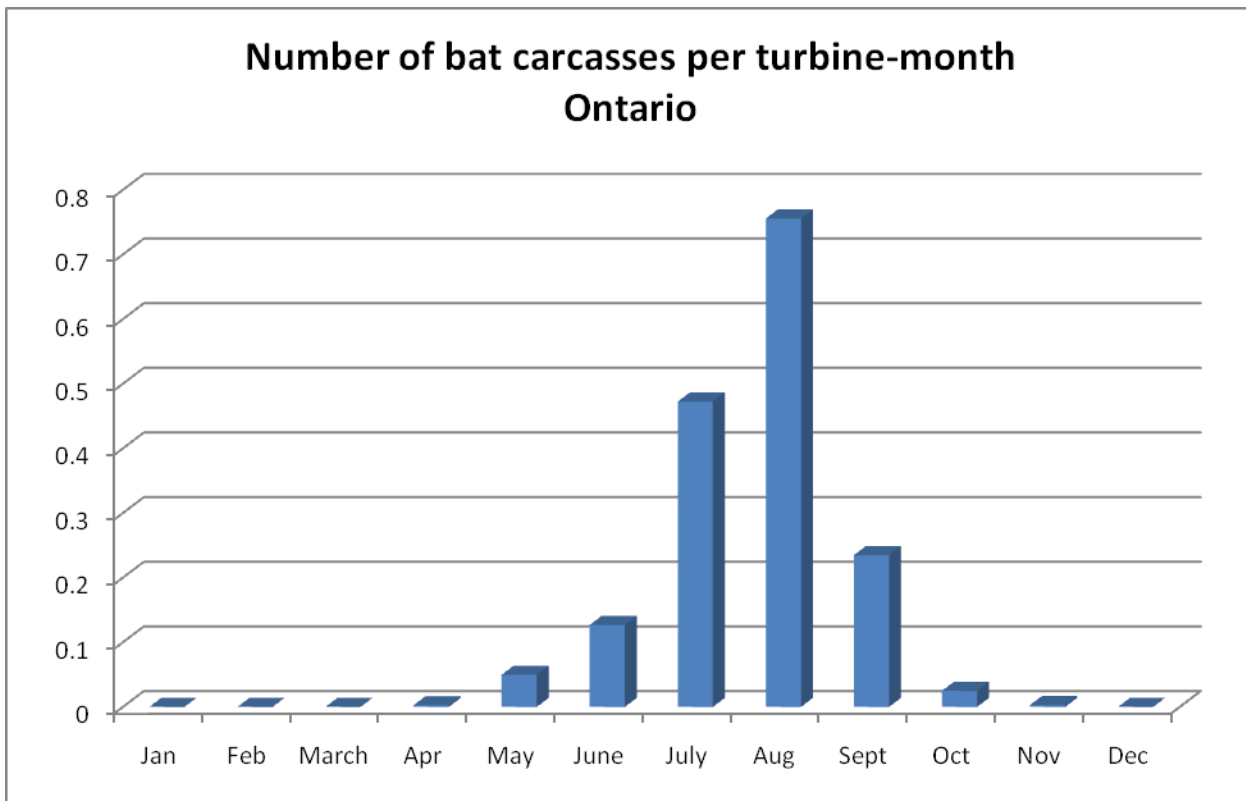
Number of bat carcasses per turbine-month Canada



9: Seasonal patterns of fatalities: Bats (Ontario)

The seasonal pattern of reported bat fatalities at wind power projects in Ontario was largely the same as in the rest of Canada. In Ontario, most of the bat casualties were found in July, August and September (89% of all bat carcasses), with peak numbers occurring in August (44%).

Migratory (Hoary Bat, Silver-haired Bat, and Eastern Red Bat) and resident (Little Brown Bat, Big Brown Bat, Eastern Pipistrelle, Northern Long-eared Bat and Eastern Small-footed Bat) species generally followed the same seasonal pattern. August was the month of highest reported carcasses for both migratory species (48% of all migratory bat casualties) and resident species (40% of all resident casualties).



Number of bat carcasses per turbine-month Ontario

