A scientific review of the Maple Ridge, New York wind turbine mortality studies

MAPLE RIDGE WIND POWER AVIAN AND BAT FATALITY STUDY REPORT

Prepared by: Aaftab Jain Paul Kerlinger Richard Curry Linda Slobodnik
Curry and Kerlinger, LLC

EXECUTIVE SUMMARY

"The Maple Ridge Wind Power Project consists of 195 wind turbines and three permanent meteorology towers on the Tug Hill Plateau of Lewis County, just west of Lowville, New York. In 2005, a total of 120 Vestas wind turbines were constructed within the Phase I project area; the remaining 75 turbines in Phase IA and II of the project were constructed in May to December 2006. **Each 1.65 MW turbine** consists of an 80-meter-(262-foot)- tall tubular steel tower; a maximum 82-meter-(269-foot)-diameter rotor; and a nacelle which houses the generator, transformer, and power train. The towers have a base diameter of approximately 4.5m (15 feet) and a top diameter of 2.5 m (8 feet). The tower is topped by the nacelle, which is approximately 2.8m (9 feet) high and 7.6m (25 feet) long, and connects with the rotor hub. **The rotor consists of three 41-m(134-foot)-long composite blades**. Approximately 30% (38 out of 120) of the nacelles are equipped with L-864 FAA aviation obstruction beacons (lights) consisting of flashing strobes (red at night) and with no beacon illumination during the day. With a rotor blade oriented in the 12 o'clock position, each turbine has a maximum **height of approximately 400 feet** (122meters). All components of the turbine are painted white."

On the surface wind industry mortality research appears very credible, but upon expert scrutiny, there are always study methodologies to be found that hide mortality data. Then along with these studies I discover the obvious omission of facts, a lack of important information and an avoidance of important follow-up studies. With wind energy research, there really is no true science and the industry makes up research methodologies to suit their needs. It has been this way for decades.

While the Maple Ridge 3-year mortality study was not scientific, I will show, it did adhere to the ongoing wind industry pattern of severely flawed, inconsistent and unscientific research. There is a lot I could add about this flawed study, but I will only touch on enough proof needed to illustrate a lack of science a lack of good judgement and to make it clear to all, that most of the mortality went unreported.

The lesson from Maple ridge for everyone, is this, just because data is collected and then used in complex calculations, does make it science or the truth. The study methodologies for this study were flawed those conducting true experts should have known better.

The Maple Ridge wind farm study claimed to use 120 by 130 meter rectangular search plot and then produced calculations for a circular area out to 90 meters from towers. The corners in this imaginary round search plot represented 90 meters. I use the word imaginary because the total average search areas in the study were about 11,300 sq. meters or only 71% of the stated 120 by 130 meters rectangle.

As I will show, this methodology produced severely flawed calculations and left a substantial amount of turbine mortality unreported. I also want to point out that this search area size selected for these large turbines is not much bigger than the search areas used for the thousands of searches used around Altamont's 100kW turbines. The small turbines at Altamont Turbines have a rotor sweep of about 200 sq. meters each. The Maple Ridge turbines, were 26 times larger having 5278 sq. meters of rotor sweep.

Going into this study all the researchers involved should have known better than to restrict the carcass study areas and follow-up calculations, to a 120 by 130-meter area around these very large turbines. The unscientific methodology used for this study also restricted searchers to only look at an average search area size of about 60 meters out from towers leaving 81% of the total study area 60-90 meters, not actually searched. The area beyond 60 meters is very important because for a turbine this size, this is the area where researchers should have expected to find the most carcasses.

If study design allowed for searches out to 150 meters and then added appropriate numbers for carcasses out to 200 meters. I could fully understand. Yet this entire area was avoided in the study. The reality in all this is that is that when considering a minimum search area of 150 meter, that should have used, searches missed over 95% of the areas around these turbines where carcass would have been found.

Is it scientific or credible to expect similar carcass dispersal distances from these wind turbines?

Maple Ridge had search areas of about 60 meters, the small turbines 50m

The Maple Ridge turbines have 26 times the roror sweep and are 300 ft taller.

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Years of research around small turbines at Altamont, using complete searches of a 50 meter distance out from towers, showed that even this search area size still missed many turbine fatalities. For turbines, the size of the Maple ridge turbines and from the research conducted up to 2007, most of the carcass dispersal for the Maple Ridge study should have expected to found beyond 60 meters from towers. The data shown below proves this point.

Below is carcass distribution data collected from Altamont turbines with approximately 9 meter blades and maximum heights of about 100 feet. Today's turbines are 400-500 feet tall and average carcass distribution is reported to be about 20-25 meters from around turbines with 50-60 meter blade lengths.

Table 2-5. Number and Percentage of Turbine-Related Avian Fatalities within and beyond 125 Meters from Turbines

Bird Year	Within 125 Meters	Beyond 125 Meters	Total
2005	545 (99.6%)	2 (<1%)	547
2006	1,185 (99.5%)	6 (<1%)	1,191
2007	1,338 (98.7%)	18 (2%)	1,356
2008	924 (99.1%)	8 (<1%)	932
2009	815 (99.5%)	4 (<1%)	819
Total	**4,807 (99.3%)**	**38 (<1%)**	**4,845**

ICF International. 2011. Altamont Pass Wind Resource Area Bird Fatality Study, Bird Years 2005–2009. September. (ICF 00904.08.) Sacramento, CA. Prepared for Alameda County Community Development Agency, Hayward, CA.

Carcass distribution for 631 small-bodied birds

Average turbine size 103 kW on 24 meter towers with average blade length of 9.25 meters

Small-bodied Birds

Our search radius included 90.5% of the carcasses of small-bodied bird species (Figure 2-9B), of which 75% were located within 34 m of the tower. The mean and standard deviation of these 631 distances was 23.8 ± 19.4 m. Most carcasses were found northeast of the tower, and a considerable number were located southwest (Figure 2-10B), just as the large-bodied bird carcasses had been distributed.

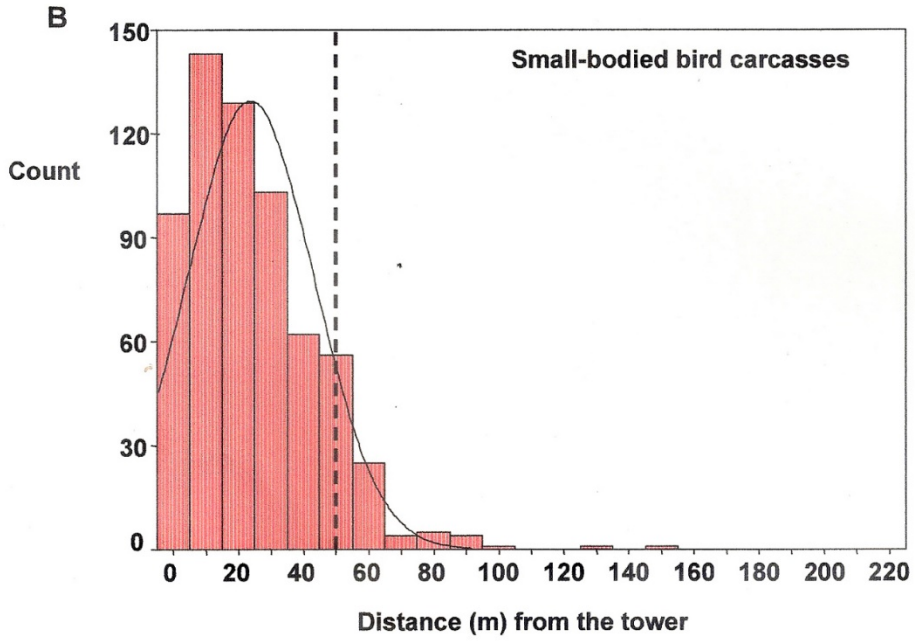


Figure 2-9. Frequency distributions of distance from the wind tower among carcasses of large-bodied (A) and small-bodied (B) bird species

[a] Set 1 includes the 1,526 wind turbines (151.165 MW) in the search rotation through September 2002.
[b] Set 2 includes 2,548 wind turbines (267.090 MW) in the November 2002–May 2003 rotation.
[c] Set 3 includes the 1,326 wind turbines (161.750 MW) not included in any search rotation. Mortality for Set 3 was estimated by taking the weighted average from the two sampled sets of wind turbines ((mortality of Set 1 × 151.165 MW) + (mortality of Set 2 × 267.09 MW)) ÷ 418.255 MW.

Smallwood, K. S., and C. G. Thelander, Developing Methods to Reduce Bird Fatalities in the Altamont Wind Resource Area, Final Report by BioResource Consultants to the California Energy Commission, Public Interest Energy Research – Environmenta Contract No. 500-01-019 (L. Spiegel, Project Manager), 2004.
http://altamontsrc.org/alt_doc/cec_final_report_08_11_04.pdf

Carcass distribution for 468 large bodied birds

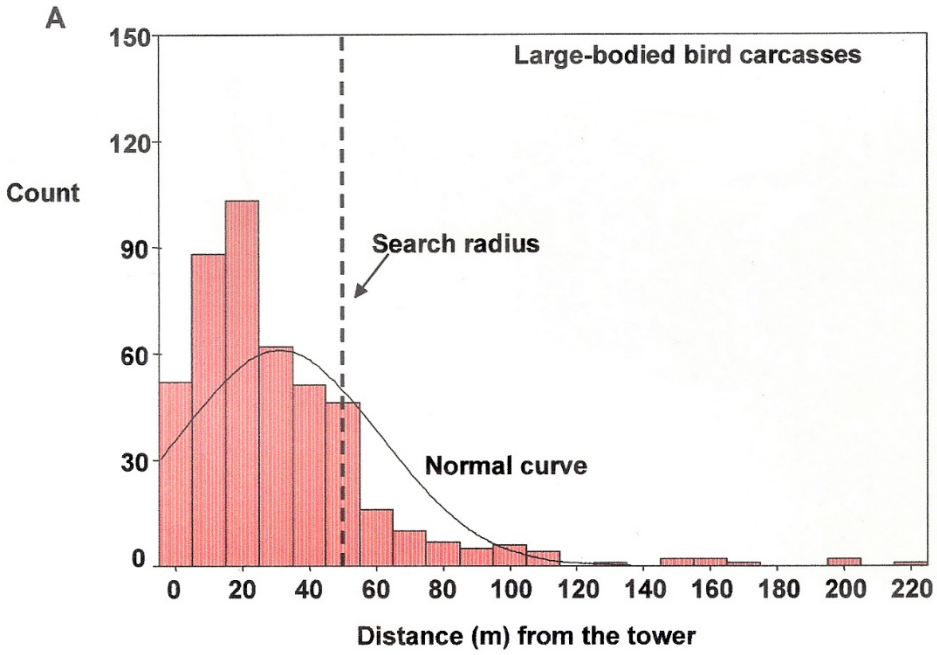
Average turbine size 103 kW on 24 meter towers with average blade length of 9.25 meters

2.3.2 Distances of Bird Carcasses from Wind Turbines

Large-bodied Birds

Our search radius included 84.7% of the carcasses of large-bodied bird species determined to be killed by wind turbines or unknown causes (Figure 2-9A). Of these, 75% were located within 42 m of the tower. The mean and standard deviation of these 468 distances was 31.1 ± 30.0 m. Most carcasses were found northeast of the tower, and a considerable number were located southwest of the tower (Figure 2-10A).

Carcass locations of large-bodied bird species differed significantly by distance from wind turbines according to five ranges of tower heights (ANOVA F = 3.66; df = 4, 456; P = 0.006), and post-hoc LSD tests revealed that fatalities were located farther from 25-m and 32-m towers (means = 33 m and 57 m) than shorter towers (mean = 28 m for 14-m towers, and 26 m for 18.5-m towers) or 43-m towers (mean = 28 m). Distance from tower increased with tower height, according to linear regression analysis, although the precision of the model was poor (Figure 2-11A).



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http://altamontsrc.org/alt_doc/cec_final_report_08_11_04.pdf

The graphic below should be noted by all. It was produced from Altamont decades ago. It shows the carcass dispersal recorded in relation to the small turbines in use at Altamont at that time. These were turbines 60-100 feet tall and had blades about 8 meters long.

The search area size of 120 by 130 meters, which was selected for the Maple Ridge Studies, has been superimposed in blue on the carcass dispersal graphic from 1992. As anyone can see, the search plots used for Maple ridge probably would not have even found or reported all these Altamont carcasses.

Wind turbine carcasses distribution from Altamont pass around small turbines. Most of the carcasses found were reported far beyond turbine blade lengths.

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Wind Turbine Effects on Avian Activity, Habitat Use, and Mortality in Altamont Pass and Solano County Wind Resource Areas

1989-1991

Final Report
March 1992

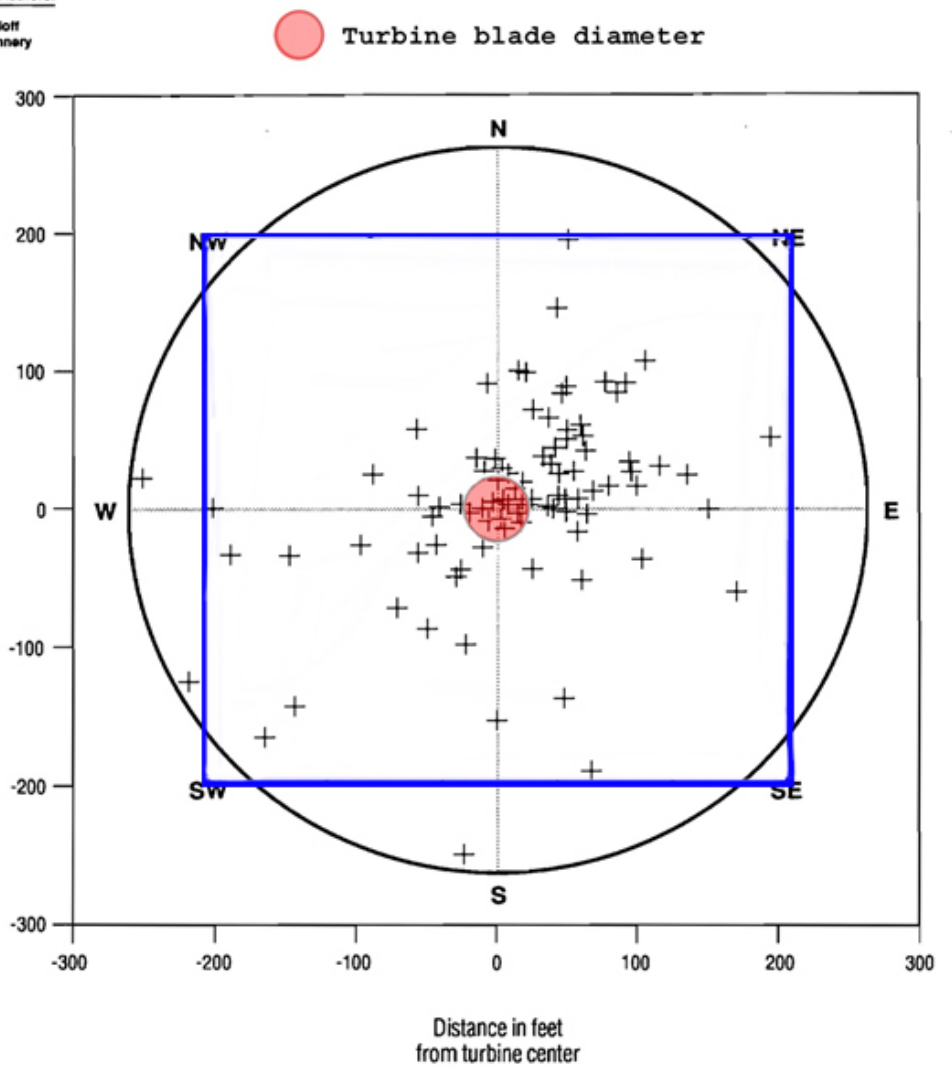

Figure 3-22. Locations of mortalities in relation to turbine centers.

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For the Maple Ridge mortality studies, a search area size of 120 meters by 130 meters may have been acceptable for Small turbines at Altamont, but it was many times too small. Then with this study methodology researchers had the nerve to calculate carcass totals out to 90 meters when 81 % of the

outer reaches of their declared study area (beyond 60 meters) were not even looked during this study. It is also no surprise that the Maple Ridge Study reported no birds or bats carcasses in the search area annulus of 80-90 meters because searchers during this study, only looked at about 1.5% of this total area or just 90 square feet, 80-90 meters out per turbine. This study by design, missed most of the carcasses.

Figure 12. Examples of searched towers showing searchable area divided into concentric annuli.

Table 13. Area Adjustment Factor (bird and bat incidents from standardized surveys conducted from April 30 to November 9, 2008 (not including 'added incidentals').

Below are the totals given for the areas searched at different distances for all 64 turbines.

Table 9. Number of incidents (Birds) versus total area searched per 10m distance annulus at 64 searched sites, April 30 to November 14, 2007.

Buffer	Area Searched	Bird Incidents	Bird Incident Density
0-10	20004	9	0.00045
10-20	60010	9	0.00015
20-30	98736	5	0.00005
30-40	132303	6	0.00005
40-50	144686	10	0.00007
50-60	153565	6	0.00004
60-70	123132	4	0.00003
70-80	52701	2	0.00004
80-90	5771	0	0.00000

60-90 meter annulus
Total area for 64 turbines
approx. 940480 sq meters

Total area searched - 181604
Total of area not searched - 81%

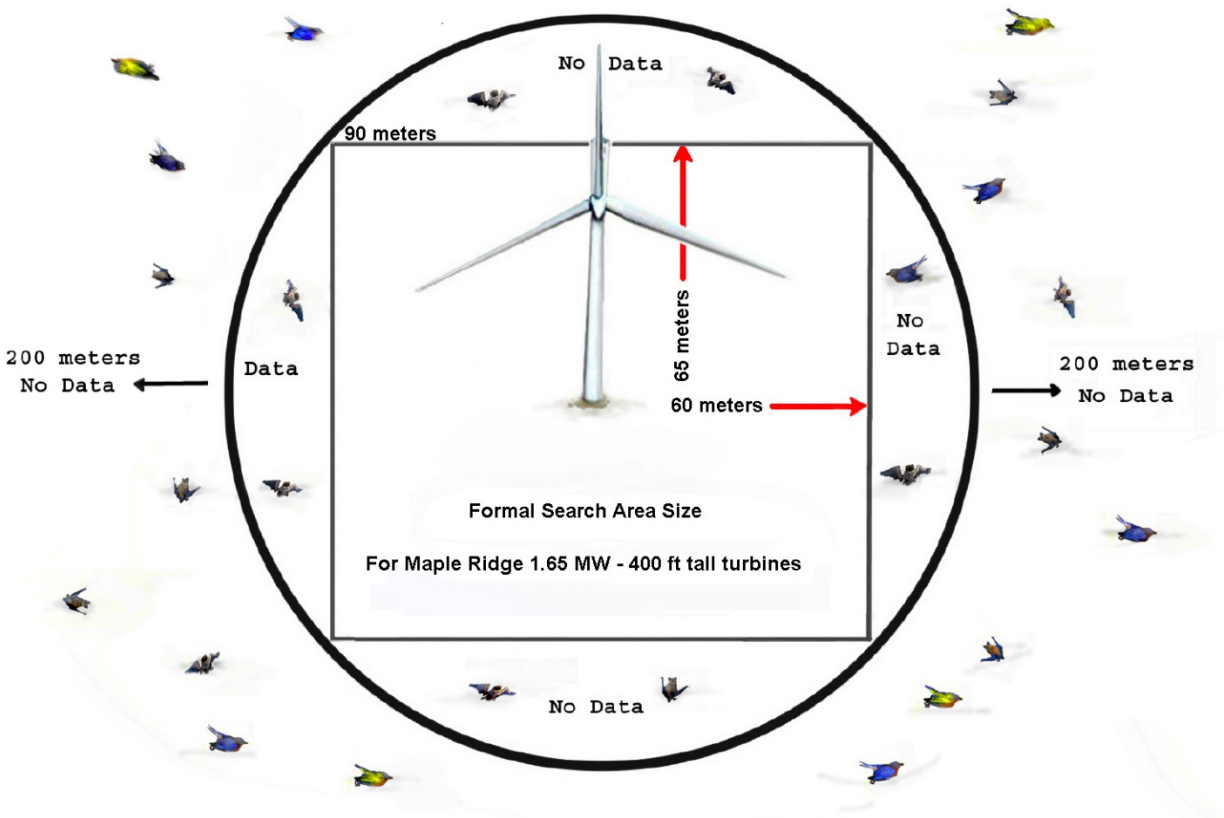
Table 10. Number of incidents (Bats) versus total area searched per 10m distance annulus at 64 searched sites, April 30 to November 14, 2007.

Buffer	Area Searched	Bat Incidents	Bat Incident Density
0-10	20004	18	0.00090
10-20	60010	55	0.00092
20-30	98736	45	0.00046
30-40	132303	43	0.00033
40-50	144686	23	0.00016
50-60	153565	13	0.00008
60-70	123132	4	0.00003
70-80	52701	1	0.00002
80-90	5771	0	0.00000

80-90 meter annulus
Total area for 64 turbines
approx. 353800 sq meters

Total area searched - 5771
Total of area not searched -98.5%

How square search plots produce deceptive wind turbine mortality data



For a turbine this size, most carcasses can be expected to fall beyond 60 meters.

The Maple Ridge wind farm study declared 120 by 130 meters rectangular search areas and then produced calculations for a circular area out to 90 meters. But searchers only looked at a total average search area size of about 60 meters out from towers. By no surprise, this study reported no carcasses in the search annulus of 80-90 meters because searchers only looked at about 1.5% of this total area. Missed data leaves nothing to calculate.

The average recorded bird carcass distance for Maple Ridge was 42.5m. The average recorded bat carcass distance was 25.9m. When thousands of turbine carcass have reported distances in the range of 2 times the length of a turbine's blade, these Maple Ridge 400 ft turbines, having 41 meter blades are not possible.

An inconsistent and disturbing revelation

By the time the Maple Ridge study got underway, another mortality study in California was already being conducted in California, by some of the very same people involved with New York's Maple Ridge fatality

Post-Construction Avian Monitoring Study
for the
Shiloh I Wind Power Project
Solano County, California

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Paul Kerlinger, Ph.D.
Richard Curry, Ph.D.

Curry and Kerlinger, L.L.C.

study.

"EXECUTIVE SUMMARY

The Shiloh I Wind Power Project Area is situated on roughly 6,800 acres of agricultural land in the Montezuma Hills, near Rio Vista in Solano County, California. The project consists of 100 wind turbines rated at 1.5 MW each for a total capacity of up to 150 MW. All one hundred turbines went on-line in March 2006."

"The hub height of each wind turbine is 65 meters (213 feet) and the rotor diameter is 77 meters (253 feet), for a total height of approximately 103.5 meters (339.5 feet) above ground level (AGL) when the rotors are in the 12 o'clock position. At the 6 o'clock position the tip of the rotors are approximately 26 meters AGL."

The Maple Ridge turbines at 1.65 MW are 10% larger than the 1.5 MW turbines installed in California. The New York turbines are 60 feet taller and their rotating blades about 3 meters longer. In other words, being taller with longer blades, birds and bats hit by the Maple ridge turbines will be launched from higher elevations and catch more wind as they drift from towers. Bird and bats will sustain impacts sending them from further away from towers,

The Shiloh turbines had search areas that extended 105 meters out from towers and 50 turbines were searched. The Maple Ridge turbines had partial searches of areas around 64 turbines that amounted to a

total area about 60 meters out from towers. Total search area for the Shiloh study allowed for more than three times more search area per turbine area, **34636 square meters vs. 11300 sq meters** for the Maple ridge study.

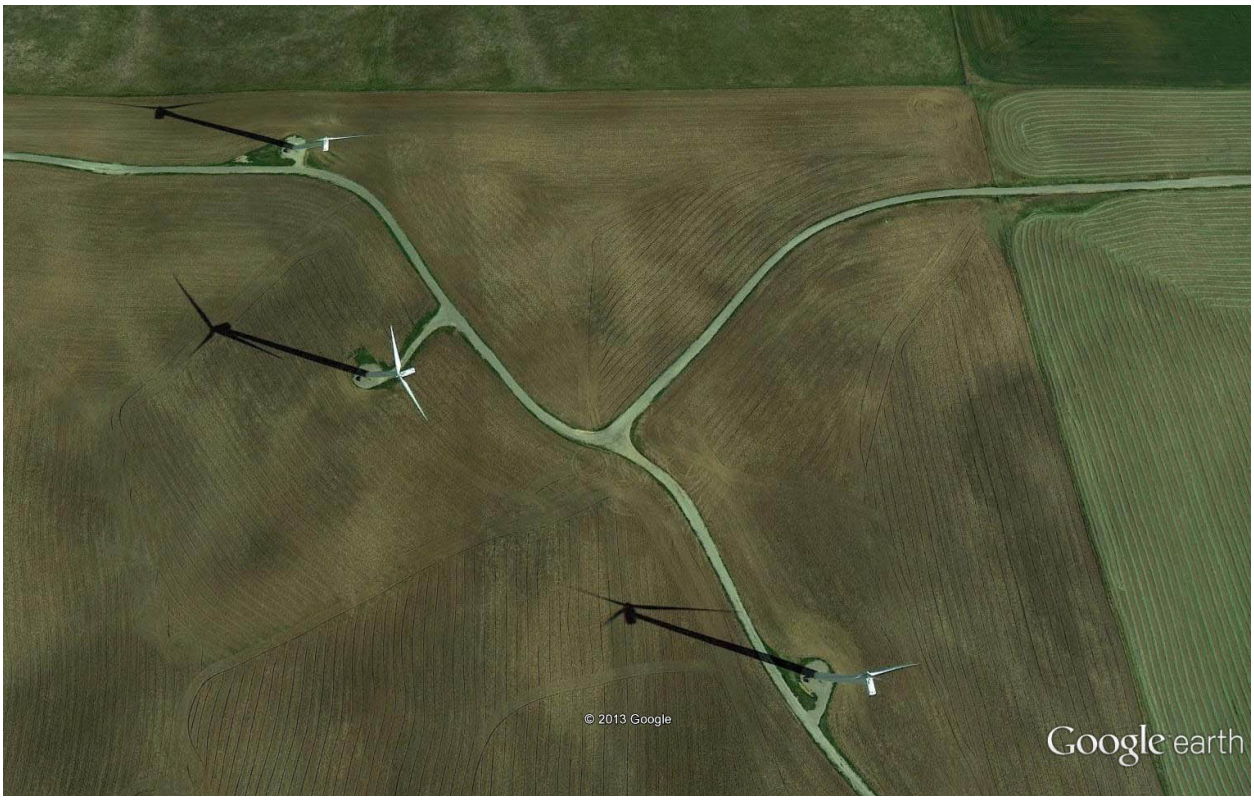
The 3-year Maple Ridge carcass searches began on June 17, 2006, the 3-year Shiloh Monitoring studies for carcass had over 2 months earlier on April 10 ,2006.

By the time the Maple Ridge surveys had begun, the Shiloh surveys had already recovered several carcasses at distances beyond 90 meters from towers. At the end of year one, **124 of the 225** turbine casualties reported from weekly surveys, 55 % **were found beyond 60 meters**. **Sixty-one were found at 90 meters and beyond**. Had formal search areas been larger than 105 meters, many more turbine victims than 225 reported would have been found.

Also impacting this formal study, were intense farming practices taking place around these turbines.

"Where turbines and project roads are located the land use is rotating agricultural crops and grazed pastures. Crops include wheat, barley, hay, safflower and fallow fields. A multi-year rotation is the norm with wheat, fallow, and grazing alternating being the regime used most often."

Plowing the soil, dense crop growth and harvesting close to towers surely had a negative impact on the total carcass numbers found during searches. This impact was not discussed.



Mortality list- page 3 of 7

ID#	Report Date	Estimated Month Death	Species Name	Fatality /Injury	Species Group	Tower	Dist (m)	Deg (GN)*	Days Since Death
SH-053-07	2/15/2007	FEB	European Starling	Fatality	Passerine	C1	9	301	7
SH-153-06	12/5/2006	DEC	European Starling	Fatality	Passerine	C25	2	85	4
SH-116-06	10/12/2006	OCT	Golden-Crowned Kinglet	Fatality	Passerine	B14	80	81	4
SH-132-06	10/25/2006	OCT	Golden-Crowned Sparrow	Fatality	Passerine	A12	100	271	4
SH-137-06	10/27/2006	OCT	Hammond's Flycatcher	Fatality	Passerine	C5	19	173	1
SH-001-06	4/10/2006	MAR 06	Horned Lark	Fatality	Passerine	A12	102	248	14
SH-029-07	1/29/2007	JAN	Horned Lark	Fatality	Passerine	C8	95	10	7
SH-136-06	10/27/2006	OCT	Horned Lark	Fatality	Passerine	C8	72	262	4
SH-152-06	12/4/2006	NOV	Horned Lark	Fatality	Passerine	A22	100	296	7
SH-157-06	12/13/2006	DEC	Horned Lark	Fatality	Passerine	B7	71	48	7
SH-016-06	6/5/2006	JUN	House Sparrow	Fatality	Passerine	C4	5	118	1
SH-017-06	6/11/2006	JUN	Northern Mockingbird	Fatality	Passerine	E7	73	300	7
SH-006-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	91	180	7
SH-007-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	95	182	7
SH-008-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	102	181	7
SH-009-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	102	181	7
SH-010-06	5/15/2006	MAY	Red-winged Blackbird	Fatality	Passerine	B20	51	177	14
SH-011-06	5/17/2006	APR 06	Red-winged Blackbird	Fatality	Passerine	H10	61	136	30
SH-012A-07	1/9/2007	JAN	Red-winged Blackbird	Fatality	Passerine	E3	14	294	7
SH-014-06	5/24/2006	MAY	Red-winged Blackbird	Fatality	Passerine	A9	43	74	1
SH-019-06	6/17/2006	JUN	Red-winged Blackbird	Fatality	Passerine	D1	92	254	7
SH-019-07	1/23/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	80	248	7
SH-028-06	7/17/2006	JUL	Red-winged Blackbird	Fatality	Passerine	A6	0	38	7
SH-029-06	7/19/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B7	96	154	7
SH-032-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	45	7	7
SH-033-06	7/26/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B7	74	286	4
SH-033-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	55	10	7
SH-034-06	7/26/2006	JUL	Red-winged Blackbird	Fatality	Passerine	B4	0	38	4
SH-034-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	38	255	7
SH-036-07	1/29/2007	JAN	Red-winged Blackbird	Fatality	Passerine	C5	56	113	7
SH-037-06	7/28/2006	JUL	Red-winged Blackbird	Fatality	Passerine	E7	99	340	30
SH-040-06	8/7/2006	UNK	Red-winged Blackbird	Fatality	Passerine	A6	22	220	UNK
SH-040-07	1/30/2007	JAN	Red-winged Blackbird	Fatality	Passerine	E7	106	294	7
SH-059-07	3/1/2007	FEB	Red-winged Blackbird	Fatality	Passerine	C1	52	346	7
SH-065-07	3/10/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	G2	93	237	4
SH-067-07	3/13/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	A23	2	284	4
SH-073-07	3/20/2007	MAR 07	Red-winged Blackbird	Fatality	Passerine	C1	3	240	4
SH-090-06	9/28/2006	UNK	Red-winged Blackbird	Fatality	Passerine	A24	66	12	UNK
SH-139-06	11/3/2006	OCT	Red-winged Blackbird	Fatality	Passerine	B18	63	310	7
SH-056-07	2/28/2007	FEB	Savannah Sparrow	Injury	Passerine	A9	90	176	1
SH-079-06	9/15/2006	SEP	Savannah Sparrow	Fatality	Passerine	B4	62	144	7
SH-159-06	12/14/2006	DEC	Savannah Sparrow	Fatality	Passerine	E3	1	68	4
SH-036-06	7/27/2006	JUL	Tree Swallow	Fatality	Passerine	C3	43	20	4
SH-046-07	2/5/2007	JAN	Tree Swallow	Fatality	Passerine	E3	99	48	7
SH-066-06	9/6/2006	AUG	Tree Swallow	Fatality	Passerine	C8	10	275	7
SH-037-07	1/29/2007	JAN	Tri-colored Blackbird	Fatality	Passerine	C6	100	284	7
SH-020-07	1/23/2007	JAN	Unidentified Sparrow spp.	Fatality	Passerine	C8	87	174	7
SH-135-06	10/26/2006	OCT	Unidentified Sparrow spp.	Fatality	Passerine	C13	86	112	7

60-90 meters

90 meters and above

With science, proper study design and adjustments are made when looking for the truth. The researchers involved with both the Maple Ridge and the Shiloh study, knew over half the carcasses were flying past 60 meters at Shiloh's 1.5 MW turbines. Small birds were being smashed nearly 3 times further out from towers than those reported killed around Altamont's small 100 kW turbines. Some were inadvertently found out to 200 meters even though this area was not being formally searched.

Yet no changes were made to expand formal search areas in either the Maple Ridge or Shiloh 3-year studies. Nor were there any new (more than appropriate) mathematical adjustments to account for the many long-distance carcasses obviously being missed.

Instead of making logical suggestions or adjustments to either of these 3-year studies, I found changes like this …….

"The March 2007 golden eagle incident was wrongly included as a turbine incident in the Year 1 report but moved to "incidental" in this report as it was found outside the search area."

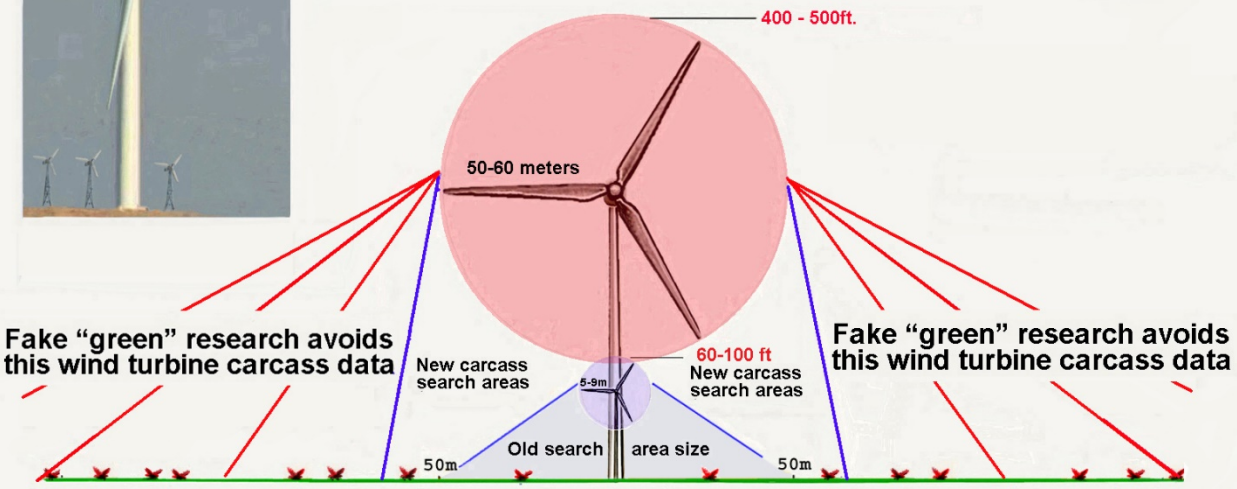
When comparing these two studies, the Shiloh carcass searches beyond 80 meters from towers, looked at about 15000 sq. meters per turbine, the Maple Ridge study about 90 sq. meters per turbine.

Both of the studies I have I discussed here were flawed for various reasons and both underreported turbine mortality. Of the two, the New York Maple Ridge study was more severely flawed. This study clearly concealed far more mortality, with under grossly undersized search areas, deceptive search methodologies and inappropriate calculations

Jim Wiegand

Unscientifific and Deceptive Wind Energy Research

For 25 years the industry used 50 meter search areas around 40-100 kW wind turbines. It was also determined that 85% of the carcasses could be found in a 50 meter area around these small turbines. New methodologies and meaningless regulations have allowed search areas to proportionaly shrink by up to 150 times .....



New wind industry search areas sizes of 50-75 meters approved with unscientific USFWS and Canadian monitoring guidelines