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Table 1. Bat species determined from range-maps (Harvey et al. 1999, BCI website, Hoffmeister 2002) as likely to occur within the Pleasant Ridge Wind Resource Area, sorted by call frequency.

Common Name	Scientific Name
High-frequency (> 40 kHz)	
little brown bat[2]	*Myotis lucifugus*
northern bat[2]	*Myotis septentrionalis*
Indiana bat[2,3]	*Myotis sodalis*
tri-colored bat[2]	*Perimyotis subflavus*
Mid-frequency (30-40 kHz)	
eastern red bat[1,2]	*Lasiurus borealis*
evening bat	*Nycticeius humeralis*
Low-frequency (< 30 kHz)	
big brown bat[2]	*Eptesicus fuscus*
silver-haired bat[1,2]	*Lasionycteris noctivagans*
hoary bat[1,2]	*Lasiurus cinereus*

1 = long-distance migrant
2 = known casualty from wind turbines
3= Federally listed species

Table 2. Results of acoustic bat surveys conducted at the Pleasant Ridge Wind Resource Area from July 15 through October 21, 2009.

Anabat Station	Location	# of HF Bat Passes	# of MF Bat Passes	# of LF Bat Passes	# of Eastern Red Bat Passes*	# of Hoary Bat Passes**	Total Bat Passes	Detector-Nights	Bat Passes/ Night ± one standard error
Reference Data									
PR5	ground	232	557	984	43	9	1,773	90	19.7±3.06
Non-Reference Data									
PR1g	ground	23	12	58	3	1	93	19	4.89±0.72
PR1h	raised	1	21	68	7	2	90	54	1.67±0.25
PR2g	ground	20	9	56	2	0	85	28	3.04±0.54
PR2h	raised	2	18	79	2	1	99	63	1.57±0.30
PR3	ground	46	28	145	7	2	219	89	2.46±0.28
PR4	ground	44	38	186	3	2	268	75	3.57±0.45
PR6g	ground	13	10	39	0	0	62	42	1.48±0.29
PR6h	raised	2	1	4	0	1	7	41	0.17±0.07
Total ground		**146**	**97**	**484**	**15**	**5**	**727**	**253**	**3.09±0.24**
Total raised		**5**	**40**	**151**	**9**	**4**	**196**	**158**	**1.14±0.15**
Total		**151**	**137**	**635**	**24**	**9**	**923**	**411**	**2.36±0.20**
All Bat Data									
Total ground		**378**	**654**	**1,468**	**58**	**14**	**2,500**	**343**	**5.86±0.52**
Total raised		**5**	**40**	**151**	**9**	**4**	**196**	**158**	**1.14±0.14**
Total		**383**	**694**	**1,619**	**67**	**18**	**2,696**	**501**	**4.28±0.36**

*Passes by eastern red bats included in mid-frequency (MF) numbers; **Passes by hoary bats included in low-frequency (LF) numbers.

Table 3a. Weekly bat activity and the contribution of each week (%) to total recorded activity for high-frequency (HF), mid-frequency (MF), low-frequency (LF) and all bats at the reference station within the Pleasant Ridge Wind Resource Area from July 15 through October 21, 2009.

Week	HF Pass Rate	HF % Composition	MF Pass Rate	MF % Composition	LF Pass Rate	LF % Composition	All Bats Pass Rate	All Bats % Composition	Cumulative % Composition
07/15/09 to 07/21/09	4.86	13.5	9.86	11.1	33.71	23.4	48.43	18.0	18.0
07/22/09 to 07/28/09	8.71	24.2	39.86	44.9	27.00	18.7	75.57	28.1	46.1
07/29/09 to 08/04/09	NA	NA	NA	NA	NA	NA	NA	NA	NA
08/05/09 to 08/11/09	3.80	10.6	8.00	9.0	10.20	7.1	22.00	8.2	54.3
08/12/09 to 08/18/09	4.29	11.9	5.00	5.6	13.71	9.5	23.00	8.6	62.8
08/19/09 to 08/25/09	3.00	8.3	6.86	7.7	10.71	7.4	20.57	7.7	70.5
08/26/09 to 09/01/09	1.29	3.6	3.00	3.4	6.00	4.2	10.29	3.8	74.3
09/02/09 to 09/08/09	1.29	3.6	1.57	1.8	8.29	5.7	11.14	4.1	78.4
09/09/09 to 09/15/09	2.00	5.6	1.86	2.1	7.00	4.8	10.86	4.0	82.5
09/16/09 to 09/22/09	1.00	2.8	0.43	0.5	5.86	4.1	7.29	2.7	85.2
09/23/09 to 09/29/09	1.57	4.4	0.43	0.5	6.29	4.3	8.29	3.1	88.3
09/30/09 to 10/06/09	0.57	1.6	1.71	1.9	10.57	7.3	12.86	4.8	93.0
10/07/09 to 10/13/09	0	0	0.14	0.2	1.00	0.7	1.14	0.4	93.5
10/14/09 to 10/20/09	1.57	4.4	2.00	2.2	3.00	2.1	6.57	2.4	95.9
10/21/09 to 10/21/09	2.00	5.6	8.00	9.0	1.00	0.7	11.00	4.1	100

NA Not applicable, no data recoded

Table 3b. Weekly bat activity and the contribution of each week (%) to total recorded activity for high-frequency (HF), mid-frequency (MF), low-frequency (LF) and all bats at non-reference stations within the Pleasant Ridge Wind Resource Area from July 15 through October 21, 2009.

Week	HF Pass Rate	HF % Composition	MF Pass Rate	MF % Composition	LF Pass Rate	LF % Composition	All Bats Pass Rate	All Bats % Composition	Cumulative % Composition
07/15/09 to 07/21/09	0.04	0.6	0.21	4.0	0.36	1.7	0.61	1.9	1.9
07/22/09 to 07/28/09	0.52	9.2	0.48	9.0	1.09	5.1	2.09	6.5	8.4
07/29/09 to 08/04/09	0.75	13.3	1.00	18.9	0.50	2.4	2.25	7.0	15.4
08/05/09 to 08/11/09	0.44	7.8	0.76	14.3	1.84	8.7	3.04	9.5	24.9
08/12/09 to 08/18/09	0.80	14.2	0.91	17.2	1.51	7.2	3.23	10.1	35.0
08/19/09 to 08/25/09	0.63	11.1	0.54	10.2	2.00	9.5	3.17	9.9	44.9
08/26/09 to 09/01/09	0.71	12.7	0.51	9.7	2.80	13.2	4.03	12.6	57.4
09/02/09 to 09/08/09	0.56	9.9	0.18	3.3	2.15	10.2	2.88	9.0	66.4
09/09/09 to 09/15/09	0.42	7.5	0.36	6.9	3.00	14.2	3.79	11.8	78.2
09/16/09 to 09/22/09	0.03	0.5	0.06	1.1	1.12	5.3	1.21	3.8	82.0
09/23/09 to 09/29/09	0.17	3.0	0.07	1.3	2.33	11.0	2.57	8.0	90.0
09/30/09 to 10/06/09	0.26	4.6	0.15	2.8	1.19	5.6	1.59	5.0	95.0
10/07/09 to 10/13/09	0	0	0.06	1.2	0.06	0.3	0.12	0.4	95.3
10/14/09 to 10/20/09	0.06	1.1	0	0	0.44	2.1	0.50	1.6	96.9
10/21/09 to 10/21/09	0.25	4.4	0	0	0.75	3.5	1.00	3.1	100

Table 4a. Weekly bat activity and the contribution of each week (%) to total recorded activity for hoary bats and eastern red bats at the reference station within the Pleasant Ridge Wind Resource Area from July 15 through October 21, 2009.

Week	Hoary Bat Pass Rate	Hoary Bat % Composition	Eastern Red Bat Pass Rate	Eastern Red Bat % Composition	All Bats Pass Rate	All Bats % Composition	Cumulative % Composition
07/15/09 to 07/21/09	0.29	21.3	0.86	13.8	48.43	18.0	18.0
07/22/09 to 07/28/09	0.43	31.9	3.00	48.4	75.57	28.1	46.1
07/29/09 to 08/04/09	NA	NA	NA	NA	NA	NA	NA
08/05/09 to 08/11/09	0.20	14.9	0.20	3.2	22.00	8.2	54.3
08/12/09 to 08/18/09	0	0	0.86	13.8	23.00	8.6	62.8
08/19/09 to 08/25/09	0	0	0.57	9.2	20.57	7.7	70.5
08/26/09 to 09/01/09	0.14	10.6	0.14	2.3	10.29	3.8	74.3
09/02/09 to 09/08/09	0.14	10.6	0.14	2.3	11.14	4.1	78.4
09/09/09 to 09/15/09	0.14	10.6	0	0	10.86	4.0	82.5
09/16/09 to 09/22/09	0	0	0	0	7.29	2.7	85.2
09/23/09 to 09/29/09	0	0	0.14	2.3	8.29	3.1	88.3
09/30/09 to 10/06/09	0	0	0	0	12.86	4.8	93.0
10/07/09 to 10/13/09	0	0	0.14	2.3	1.14	0.4	93.5
10/14/09 to 10/20/09	0	0	0.14	2.3	6.57	2.4	95.9
10/21/09 to 10/21/09	0	0	0	0	11.00	4.1	100

NA Not applicable, no data recoded

Table 4b. Weekly bat activity and the contribution of each week (%) to total recorded activity for hoary bats and eastern red bats for non-reference stations within the Pleasant Ridge Wind Resource Area from July 15 through October 21, 2009.

Week	Hoary Bat Pass Rate	Hoary Bat % Composition	Eastern Red Bat Pass Rate	Eastern Red Bat % Composition	All Bats Pass Rate	All Bats % Composition	Cumulative % Composition
07/15/09 to 07/21/09	0	0	0.07	9.1	0.61	1.9	1.9
07/22/09 to 07/28/09	0.13	41.2	0.09	11.1	2.09	6.5	8.4
07/29/09 to 08/04/09	0	0	0	0	2.25	7.0	15.4
08/05/09 to 08/11/09	0.04	12.6	0.16	20.4	3.04	9.5	24.9
08/12/09 to 08/18/09	0.03	9	0.14	18.2	3.23	10.1	35.0
08/19/09 to 08/25/09	0.06	18.0	0.11	14.6	3.17	9.9	44.9
08/26/09 to 09/01/09	0	0	0.09	10.9	4.03	12.6	57.4
09/02/09 to 09/08/09	0	0	0.03	3.8	2.88	9.0	66.4
09/09/09 to 09/15/09	0.06	19.1	0.06	7.7	3.79	11.8	78.2
09/16/09 to 09/22/09	0	0	0	0	1.21	3.8	82.0
09/23/09 to 09/29/09	0	0	0.03	4.2	2.57	8.0	90.0
09/30/09 to 10/06/09	0	0	0	0	1.59	5.0	95.0
10/07/09 to 10/13/09	0	0	0	0	0.12	0.4	95.3
10/14/09 to 10/20/09	0	0	0	0	0.50	1.6	96.9
10/21/09 to 10/21/09	0	0	0	0	1.00	3.1	100

Table 5. Wind-energy facilities in North America with mortality data for bat species, grouped by geographic region. Bat activity rates are included where available. To date, no bat fatality estimates or studies from Southwestern or Southeastern wind-energy facilities have been made public.

Wind Energy Facility	Bat Use Estimate[A]	Mortality Estimate[B]	No. of Turbines	Total MW
Pleasant Ridge, IL (non-reference ground)	**3.09**			
	Midwest			
Top of Iowa, IA (2004)	34.9[C]	10.27	89	80
Top of Iowa, IA (2003)	34.9[C]	7.16	89	80
Crescent Ridge, IL		3.27	33	49.5
Buffalo Ridge, MN (Phase III)	2.1[C]	2.72	138	103.5
Buffalo Ridge, MN (Phase II; 1999)	2.1[C]	2.59	143	107.25
Buffalo Ridge, MN (Phase I; 1998)	2.1[C]	2.16	143	107.25
NPPD Ainsworth, NE		1.16	36	59.4
Buffalo Ridge, MN (Phase I)		0.76	73	25
Blue Sky Green Field, WI[D]	7.7	24.57	88	145
Kewaunee County, WI		6.55	31	20
Buckeye, OH	5.3[E]			
Black Fork, OH	1.1[F]		112	200
	Western			
High Winds, CA (2004)		3.01	90	162
Stateline, OR/WA (2003)		2.52	454	300
Nine Canyon, WA		2.47	37	48
Big Horn, WA		1.90	133	199.5
Combine Hills, OR		1.88	41	41
High Winds, CA (2005)		1.82	90	162
Stateline, OR/WA (2002)		1.20	454	300
Vansycle, OR		1.12	38	24.9
Klondike, OR		0.77	16	24
Hopkins Ridge, WA		0.63	83	150
Klondike II, OR		0.41	50	75
Wild Horse, WA		0.39	127	229
SMUD, CA		0.07		15

Table 5. Wind-energy facilities in North America with mortality data for bat species, grouped by geographic region. Bat activity rates are included where available. To date, no bat fatality estimates or studies from Southwestern or Southeastern wind-energy facilities have been made public.

Wind Energy Facility	Bat Use Estimate[A]	Mortality Estimate[B]	No. of Turbines	Total MW
	Rocky Mountains			
Summerview, Alb. (2006)		14.62	39	70.2
Summerview, Alb. (2005/2006)		10.27	39	70.2
Judith Gap, MT		8.93	90	135
Summerview, Alb. (2007)		8.23	39	70.2
Foote Creek Rim, WY (Phase I; 1999)		3.97	69	41.4
Foote Creek Rim, WY (Phase I; 2001/2002)		1.57	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.2	1.05	69	41.4
	Northeastern			
Buffalo Mountain, TN (2006)		39.70	18	29
Mountaineer, WV	38.3	31.69	44	66
Buffalo Mountain, TN (2000-2003)	23.7	31.54	3	2
Meyersdale, PA		18.00	20	30
Casselman, PA		15.66	23	34.5
Maple Ridge, NY (2006)		15.00	120	198
Noble Bliss, NY		14.66	67	100
Mount Storm, WV (2008)	35.2	12.11	82	164
Maple Ridge, NY (2007)		9.42	195	321.75
Noble Ellensburg, NY		5.45	54	80
Noble Clinton, NY		3.63	67	100.5
Mars Hill, ME (2007)		2.91	28	42
Erie Shores, Ontario		1.51	66	99

Table 5. Wind-energy facilities in North America with mortality data for bat species, grouped by geographic region. Bat activity rates are included where available. To date, no bat fatality estimates or studies from Southwestern or Southeastern wind-energy facilities have been made public.

Wind Energy Facility	Bat Use Estimate[A]	Mortality Estimate[B]	No. of Turbines	Total MW
	Southern Plains			
Oklahoma Wind Energy Center, OK		0.53	68	102
Buffalo Gap, TX		0.10	67	134

A=bat passes per detector night
B=number of bat fatalities/MW/year
C=averaged across phases and/or study years, and may not be directly related to mortality estimates
D=fatality and Anabat data not collected concurrently
E= Only includes data collected at met towers
F=Only includes fall migration data from October 2 – November 15

Data from the following sources:

Facility	Use Estimate	Mortality Estimate	Facility	Use Estimate	Mortality Estimate
High Winds, CA (2004)		Kerlinger et al. 2006	Crescent Ridge, IL		Kerlinger et al. 2007
Stateline, OR/WA (2003)		Erickson et al. 2004	Buffalo Ridge, MN (Phase III)		Johnson et al. 2004
Nine Canyon, WA		Erickson et al. 2003	Buffalo Ridge, MN (Phase II; 1999)	Johnson et al. 2000	Johnson et al. 2004
Big Horn, WA		Kronner et al. 2008	Buffalo Ridge, MN (Phase II; 1998)	Johnson et al. 2000	Johnson et al. 2004
Combine Hills, OR		Young et al. 2006	NPPD Ainsworth, NE		Derby et al. 2007
High Winds, CA (2005)		Kerlinger et al. 2006	Buffalo Ridge, MN (Phase I)		Johnson et al. 2000
Stateline, OR/WA (2002)		Erickson et al. 2004	Blue Sky Green Field, WI	Gruver 2008	Gruver et al. 2010
Vansycle, OR		Erickson et al. 2000	Kewaunee County, WI		Howe et al. 2002
Klondike, OR		Johnson et al. 2003	Buffalo Mountain, TN (2006)		Fiedler et al. 2007
Hopkins Ridge, WA		Young et al. 2007	Mountaineer, WV	E.Arnett (pers com. 2005)	Kerns and Kerlinger 2004
Klondike II, OR		NWC and WEST 2007	Buffalo Mountain, TN (2000-2003)	Fiedler 2004	Nicholson et al. 2005
Wild Horse, WA		Erickson et al. 2008	Meyersdale, PA		Arnett et al. 2005
SMUD, CA		URS et al. 2005	Casselman, PA		Arnett et al. 2009
Summerview, Alb. (2006)		Baerwald 2008	Maple Ridge, NY (2006)		Jain et al. 2007
Summerview, Alb. (2005/6)		Brown and Hamilton 2006	Noble Bliss, NY		Jain et al. 2009c
Judith Gap, MT		TRC 2008	Mount Storm, WV (2008)	Young et al. 2009	Young et al. 2009
Summerview, Alb. (2007)		Baerwald 2008	Maple Ridge, NY (2007)		Jain et al. 2008
Foote Creek Rim, WY (Phase I; 1999)		Young et al. 2003	Noble Ellensburg, NY		Jain et al. 2009a
Foote Creek Rim, WY (Phase I; 2001/2)	Gruver 2002	Young et al. 2003	Noble Clinton, NY		Jain et al. 2009b
Foote Creek Rim, WY (Phase I; 2000)	Gruver 2002	Young et al. 2003	Mars Hill, ME (2007)		Stantec 2008
Top of Iowa, IA (2004)	Jain 2005	Jain 2005	Erie Shores, Ont.		James 2008
Top of Iowa, IA (2003)	Jain 2005	Jain 2005	Oklahoma Wind Energy Center, OK		Piorkowski 2006
Bukeye, OH	Stantec 2008		Black Fork, OH	Ecology and Environment 2009	
			Buffalo Gap, TX		Tierney 2007

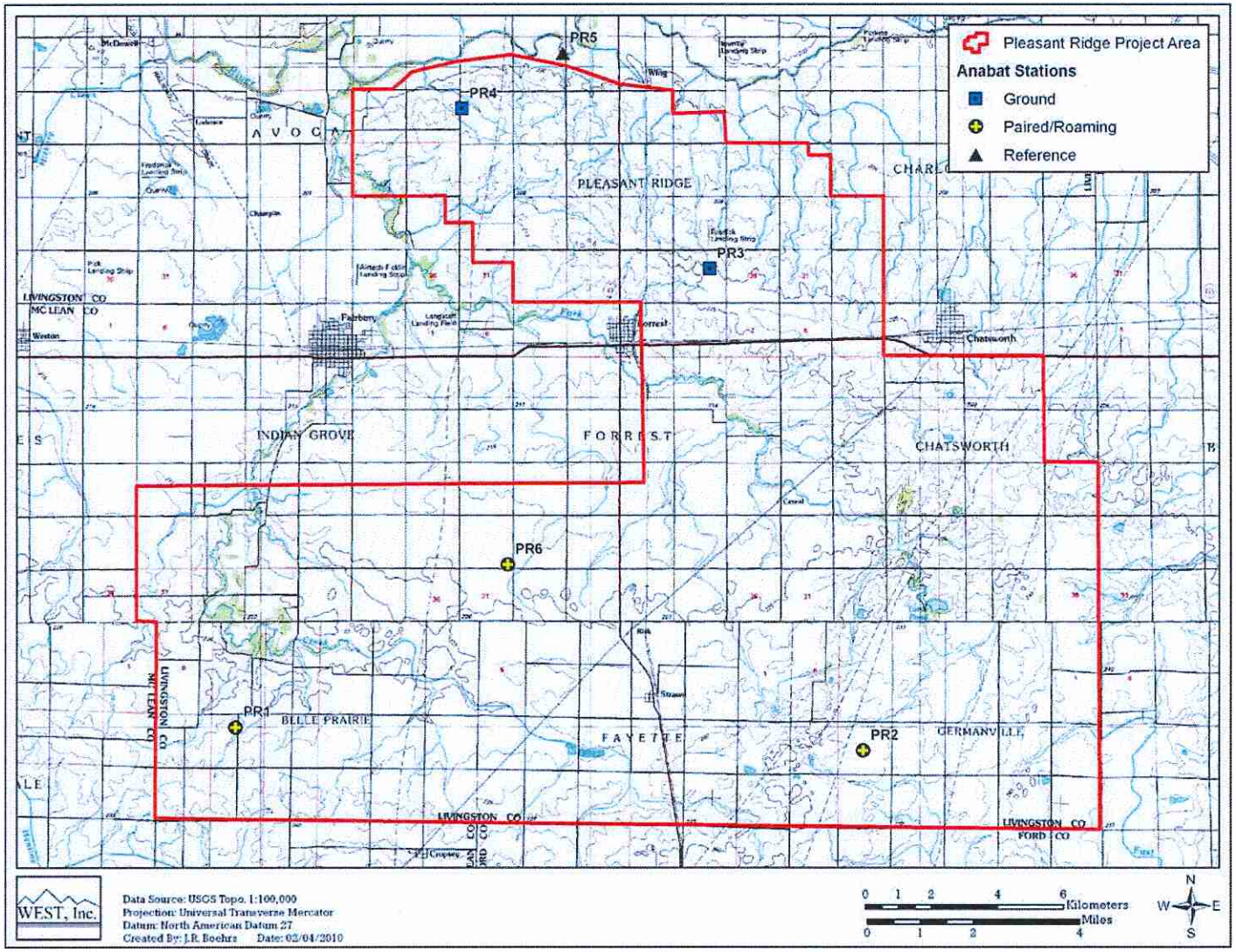


Figure 1. Study area map and Anabat sampling stations at the Pleasant Ridge Wind Resource Area.

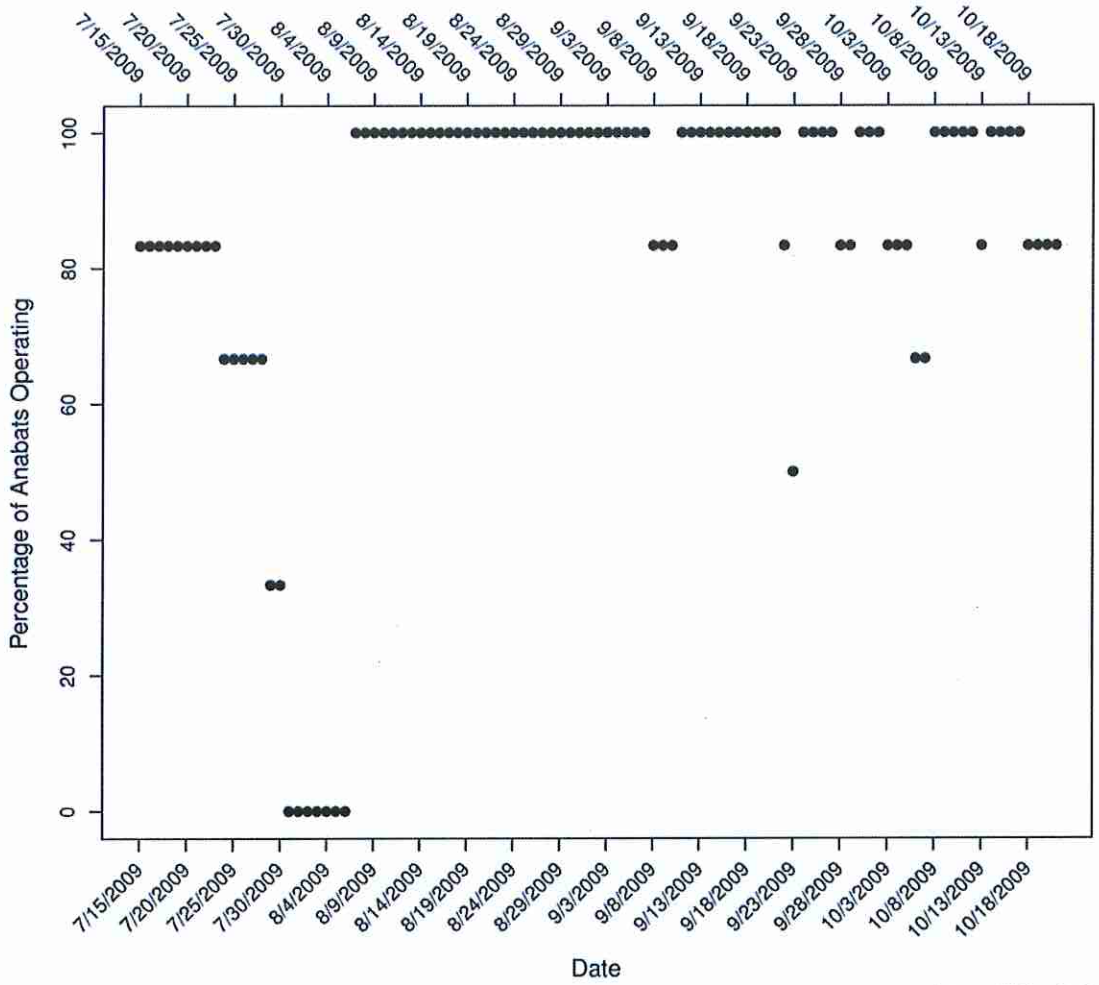


Figure 2. Percentage of all Anabat detectors (n = 9) at the Pleasant Ridge Wind Resource Area operating during each night of the study period July 15 through October 21, 2009.

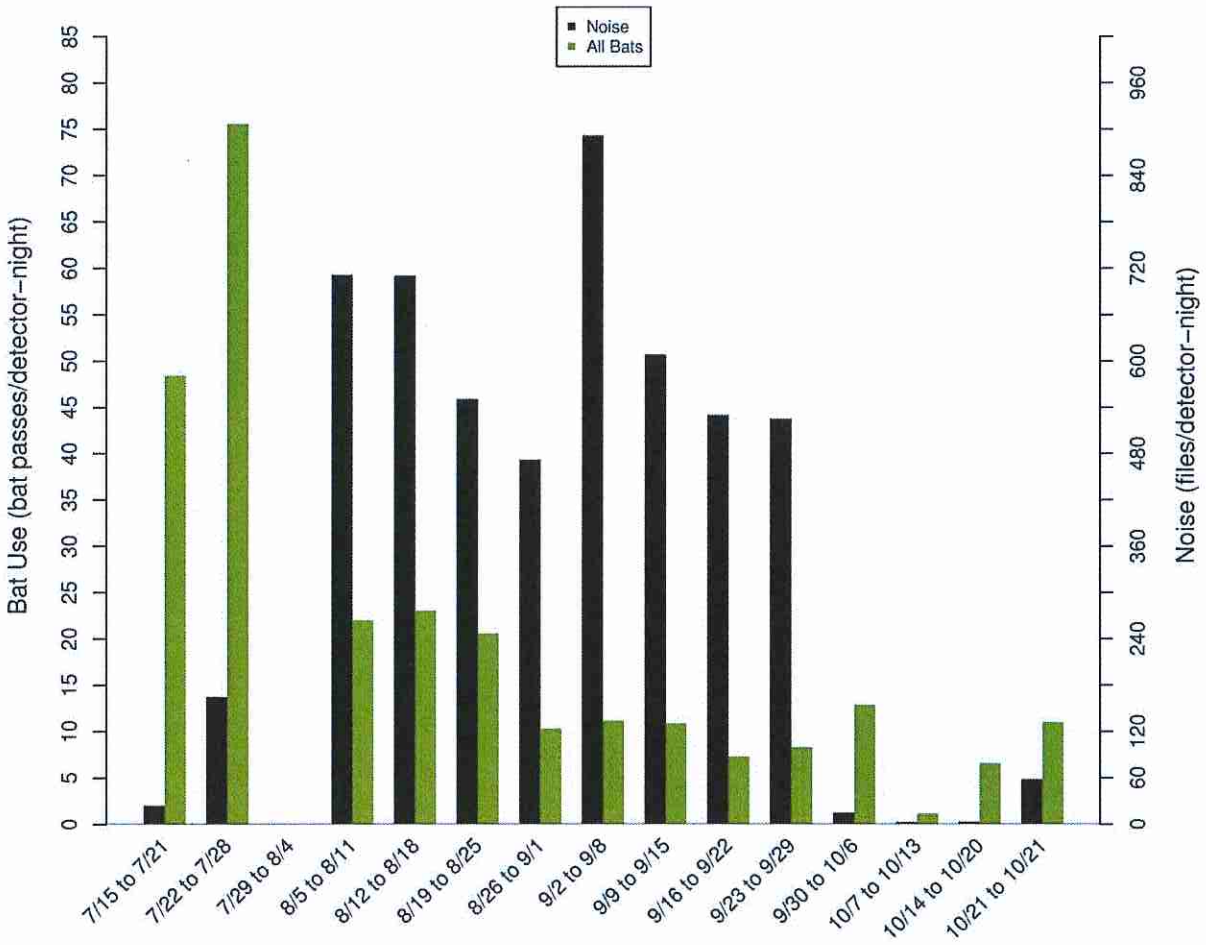


Figure 3a. Number of bat passes and noise files detected per detector-night for the reference station at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009, presented weekly.

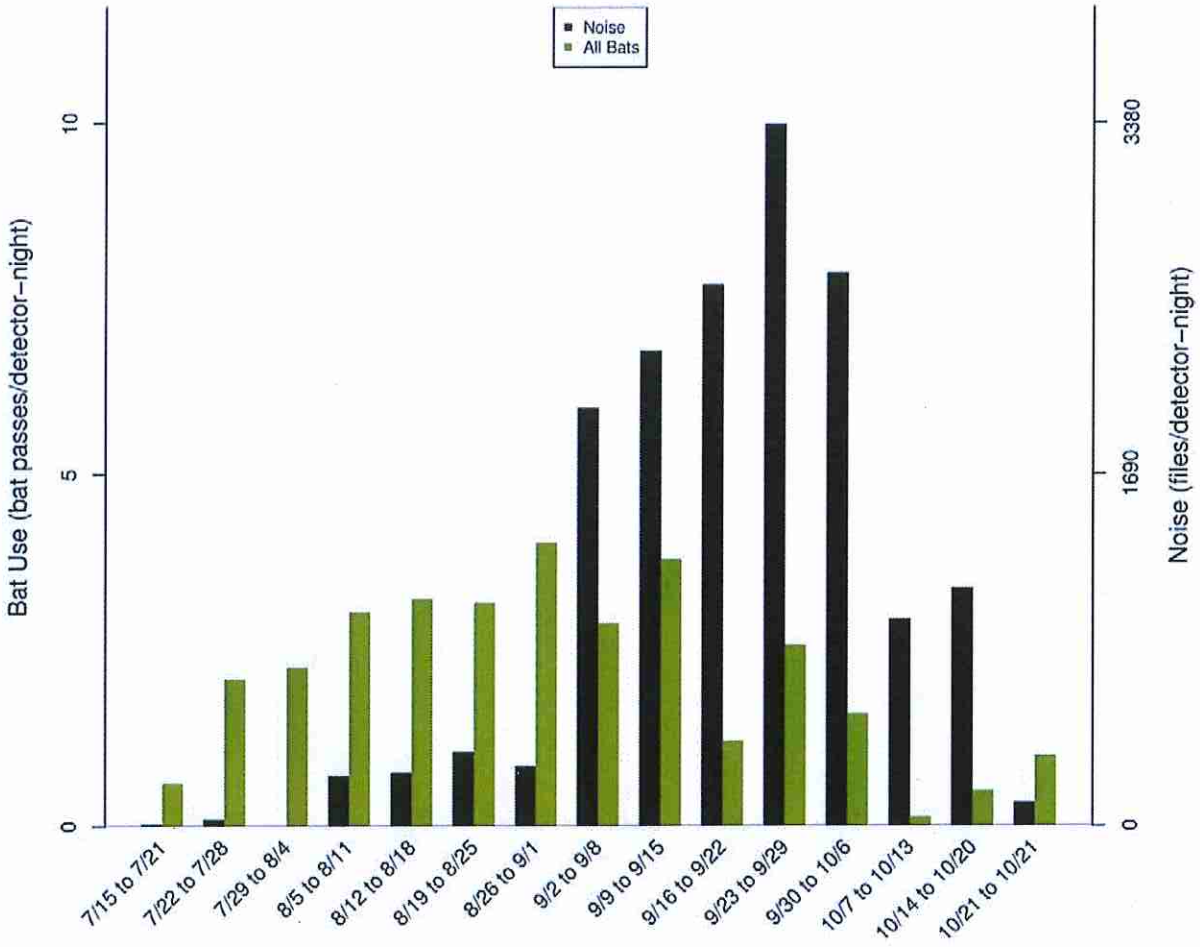


Figure 3b. Number of bat passes and noise files detected per detector-night for non-reference stations at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009, presented weekly.

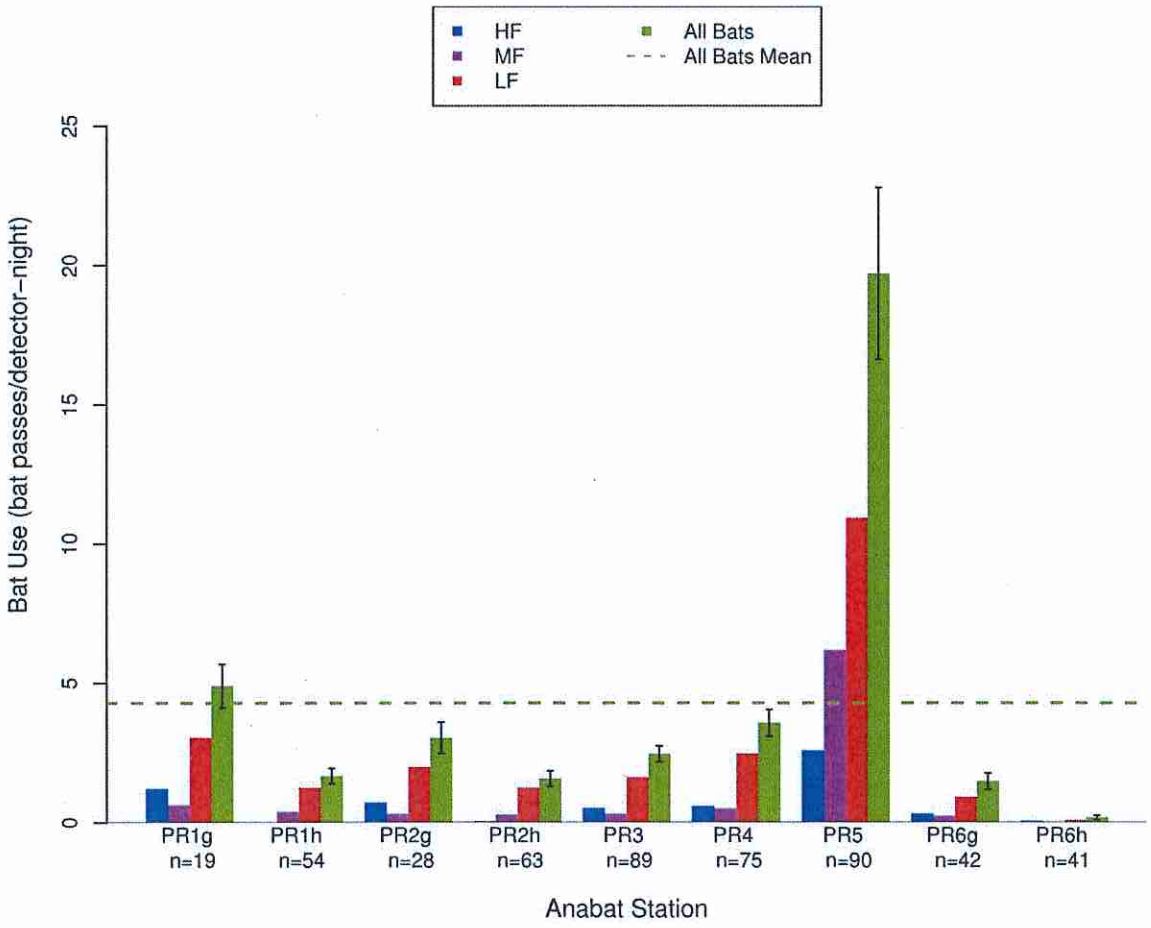


Figure 4a. Number of bat passes per detector-night by Anabat location for all stations at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21 2009.

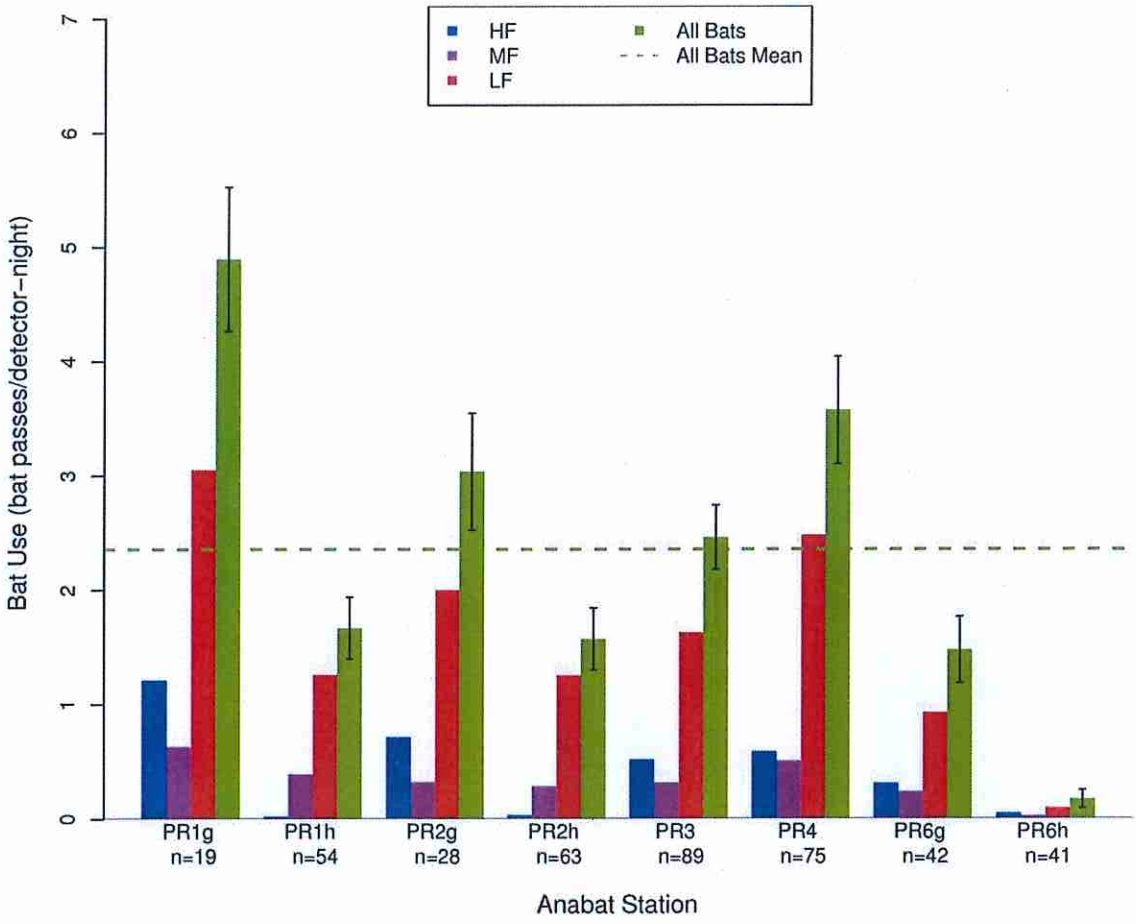


Figure 4b. Number of bat passes per detector-night by Anabat location for non-reference stations at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009.

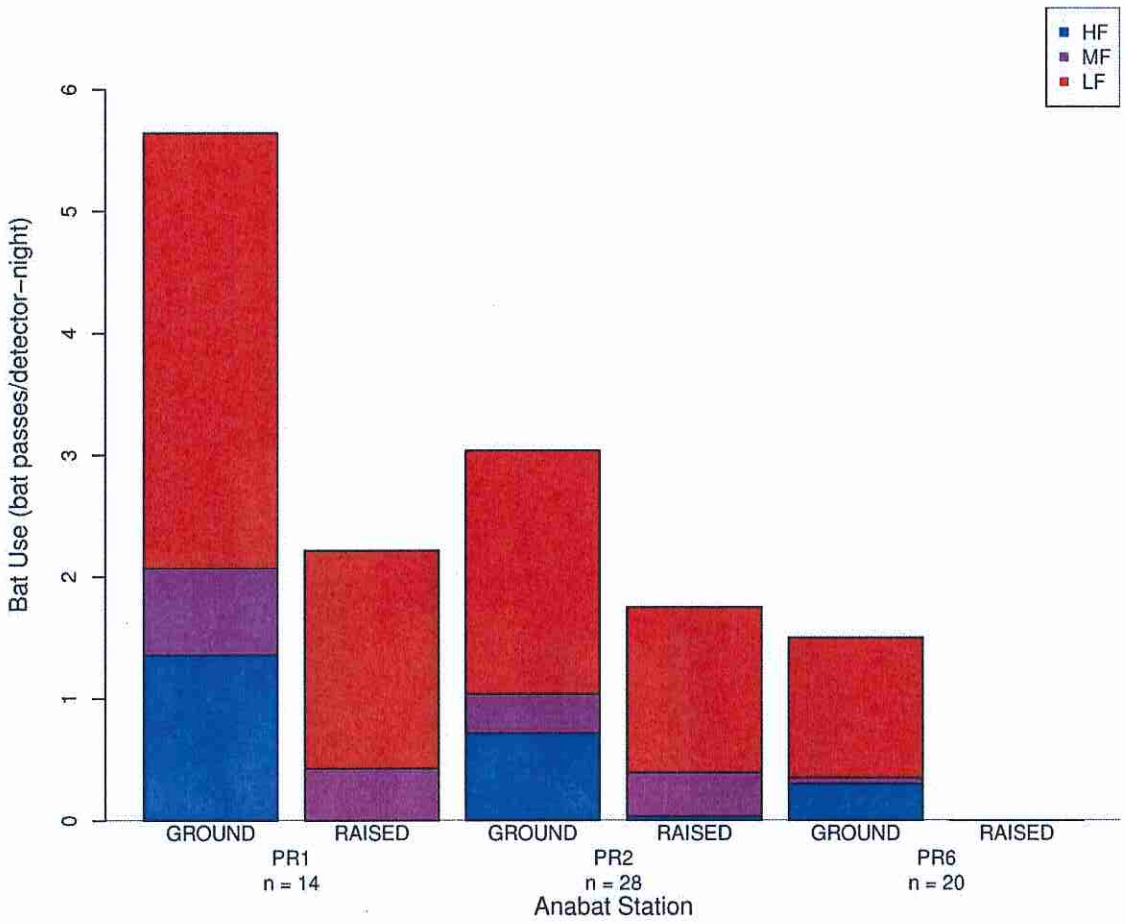


Figure 5. Number of high-frequency (HF), mid-frequency (MF), and low-frequency (LF) bat passes per detector-night recorded at paired ground and high Anabat unit stations when measured concurrently at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009.

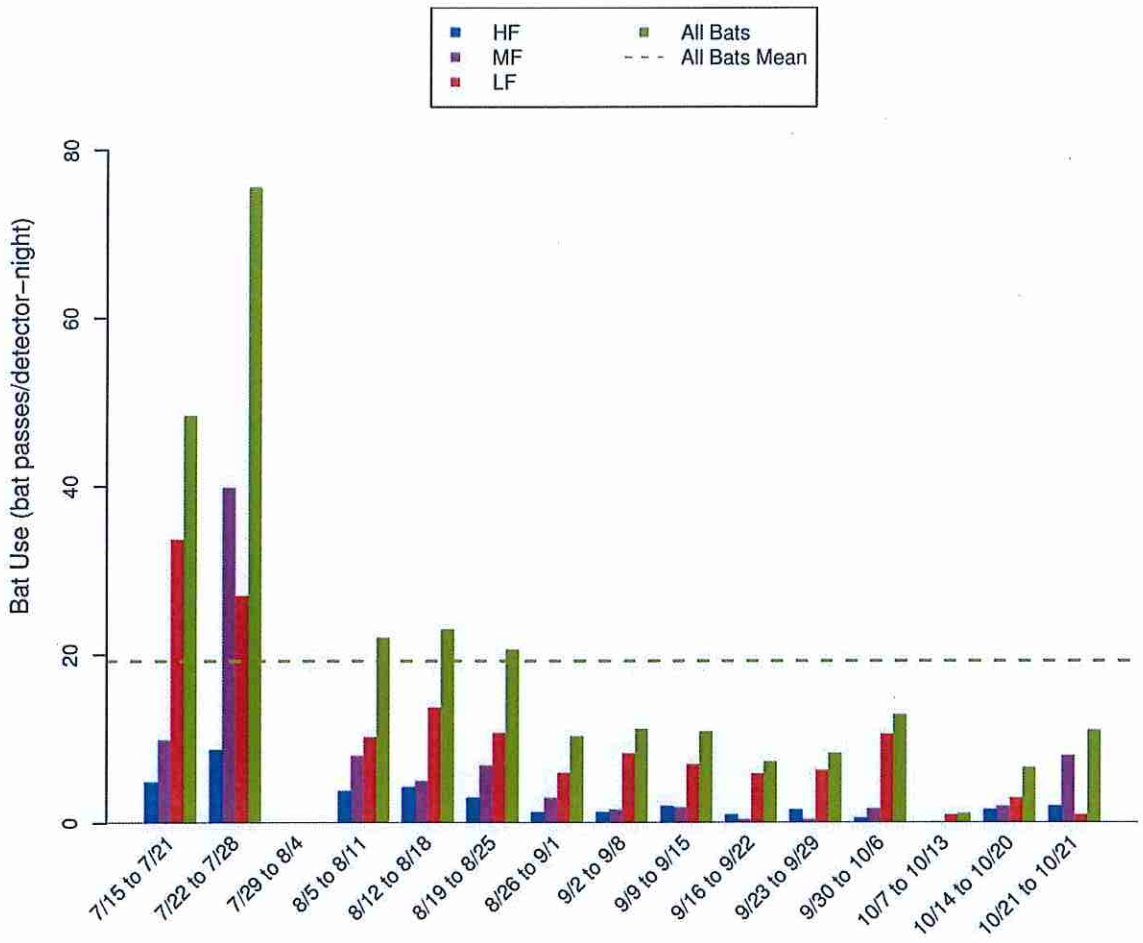


Figure 6a. Weekly activity by high-frequency (HF), mid-frequency (MF), and low-frequency (LF) bats at the reference station within the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009.

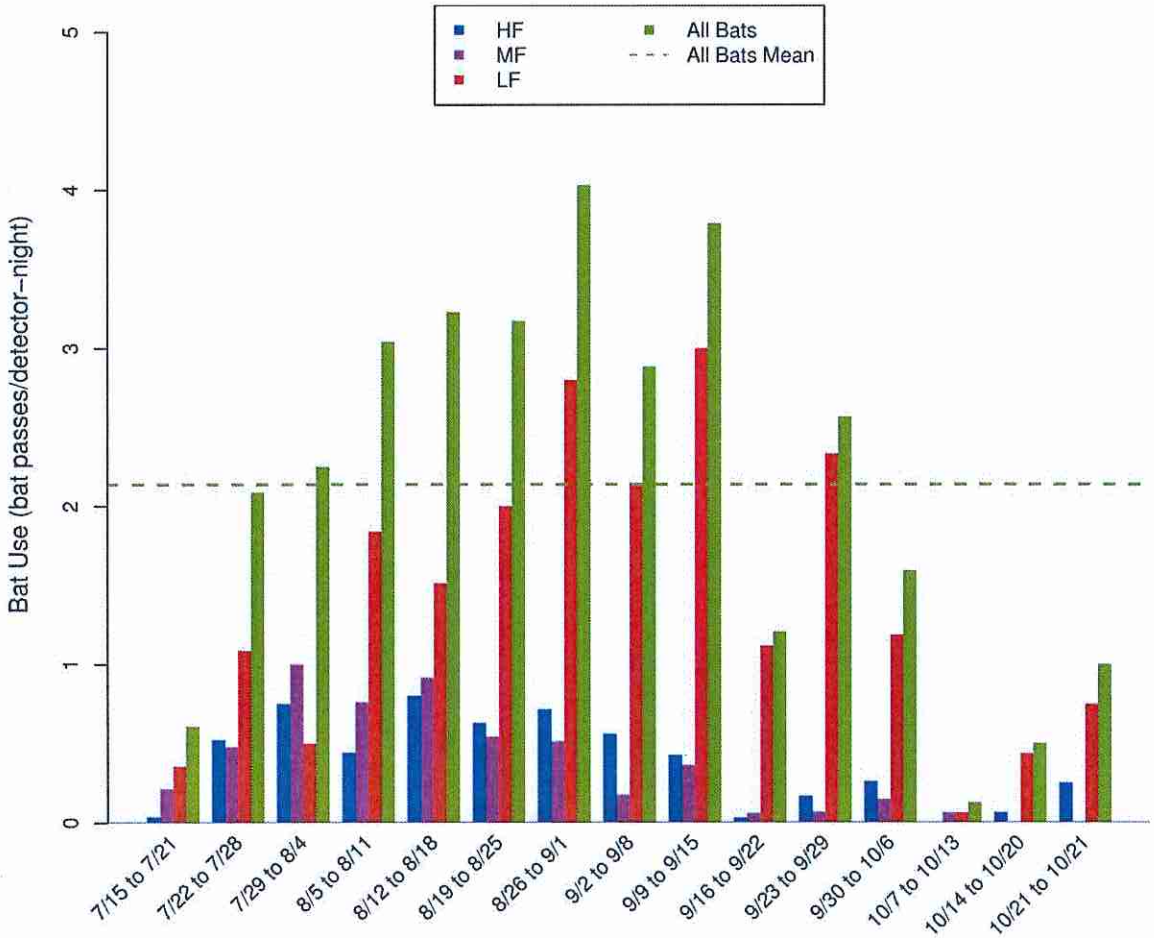


Figure 6b. Weekly activity by high-frequency (HF), mid-frequency (MF), and low-frequency (LF) bats at non-reference stations within the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009.

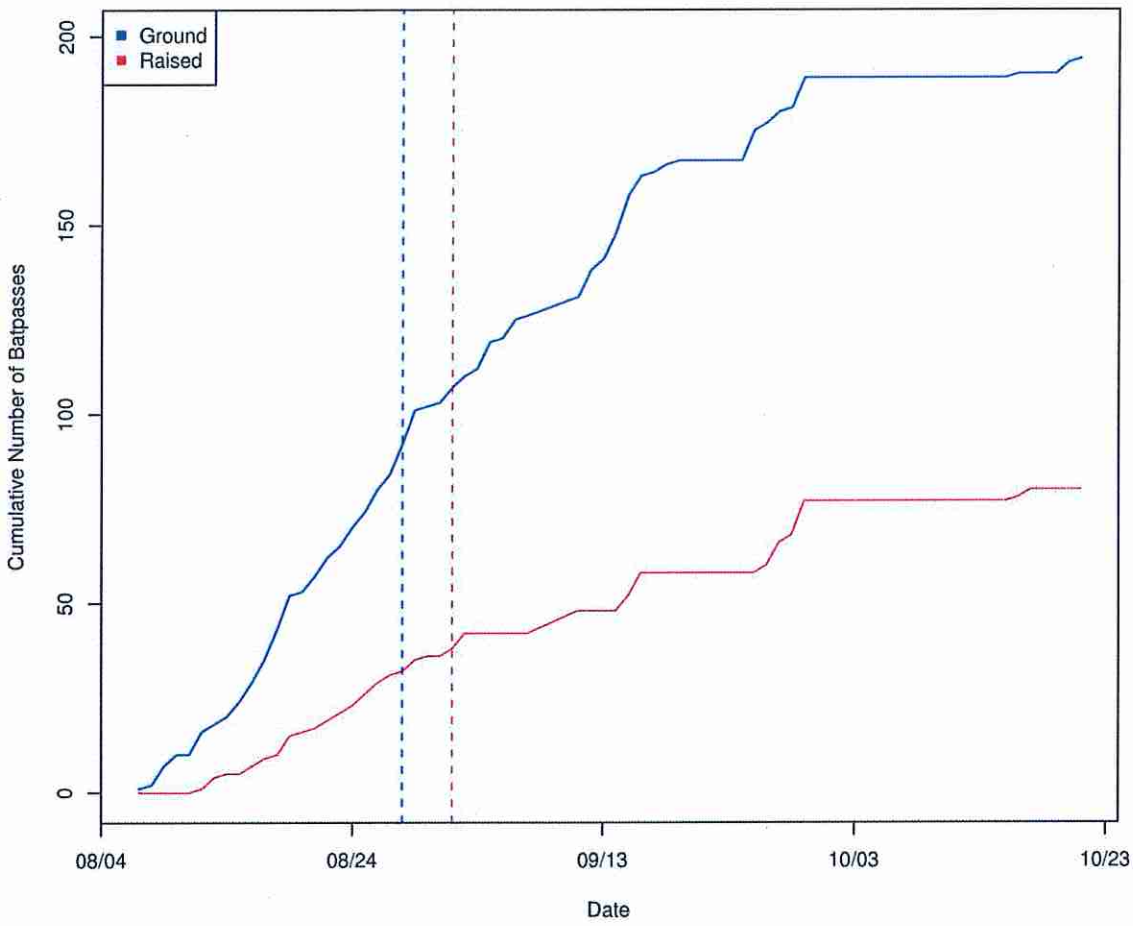


Figure 7a. Empirical cumulative distribution of bat passes at non-reference ground and raised stations within the Pleasant Ridge Wind Resource Area, July 15 through October 21, 2009. Dashed vertical lines indicate the point at which 50% of the calls occurred, an indication of the median date of bat activity.

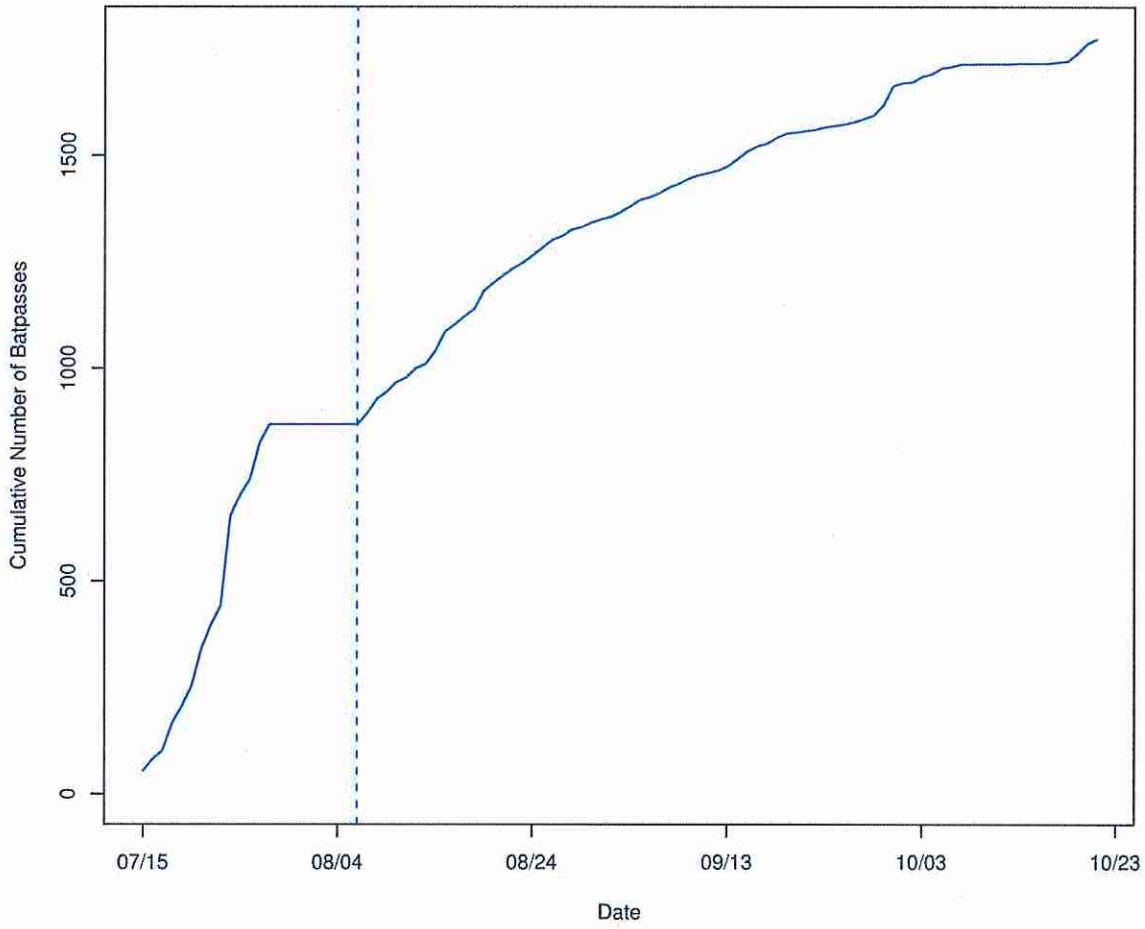


Figure 7b. Empirical cumulative distribution of bat passes at the reference station within the Pleasant Ridge Wind Resource Area, July 15 through October 21, 2009. Dashed vertical lines indicate the point at which 50% of the calls occurred, an indication of the median date of bat activity.

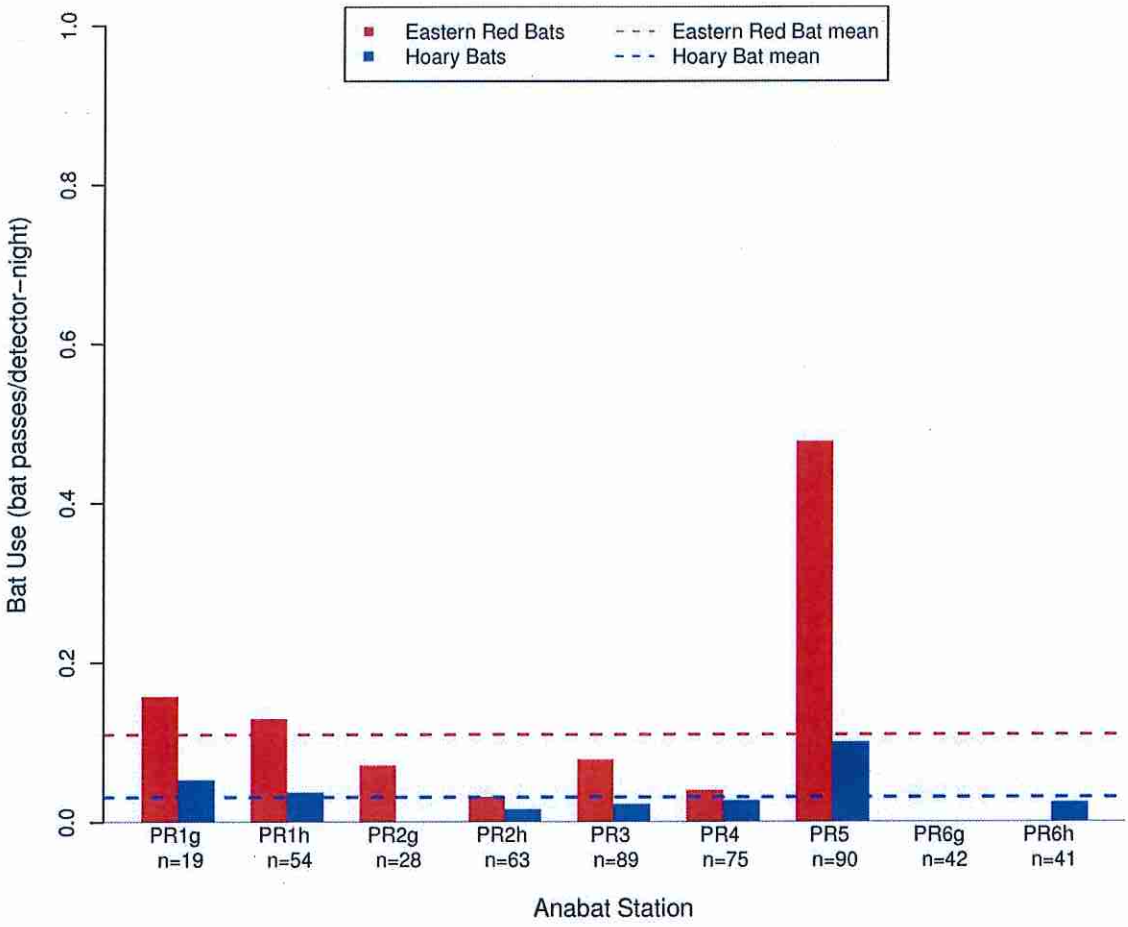


Figure 8a. Number of hoary and eastern red bat passes per detector–night by Anabat station for all stations at the Pleasant Ridge Wind Resource Area, for the study period July 15 through October 21, 2009.

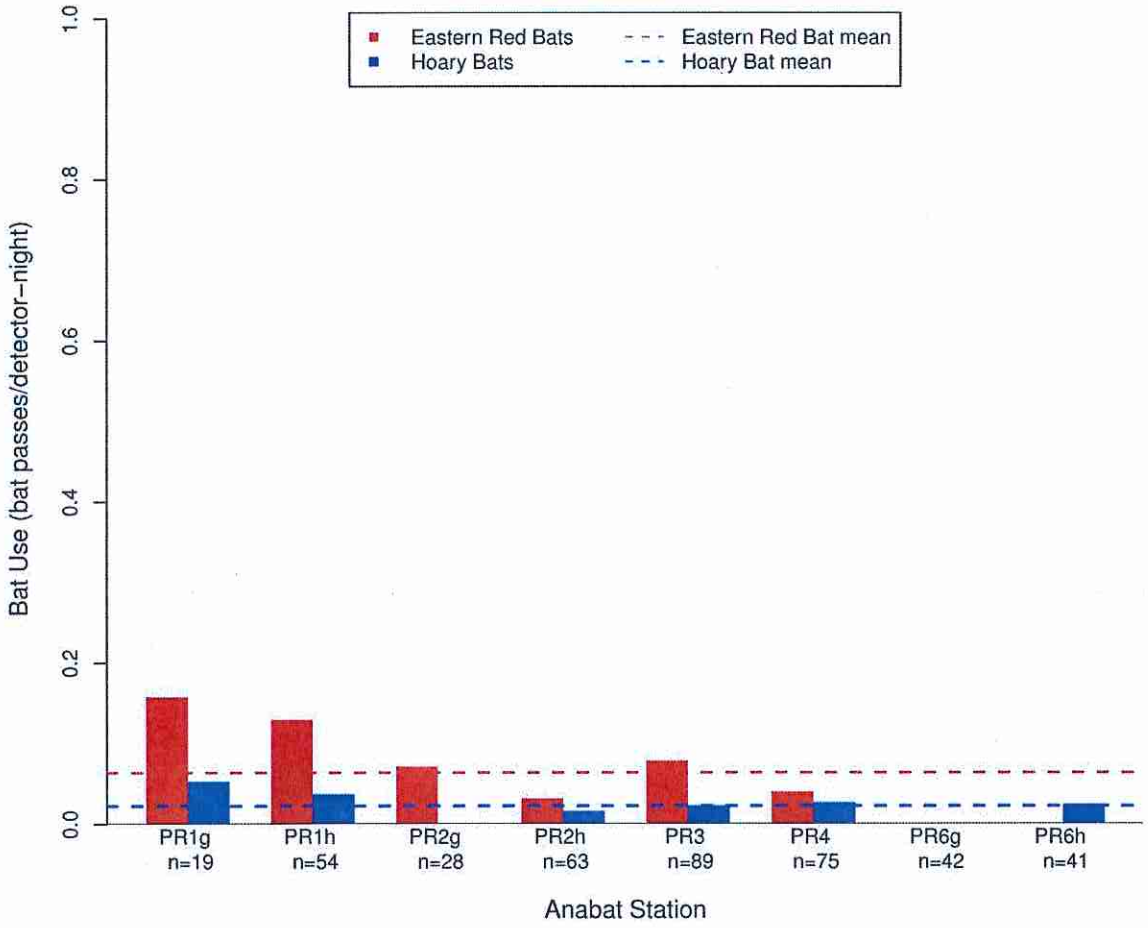


Figure 8b. Number of passes per detector–night by hoary bats and eastern red bats for non-reference Anabat stations at the Pleasant Ridge Wind Resource Area, for the study period July 15 through October 21, 2009.

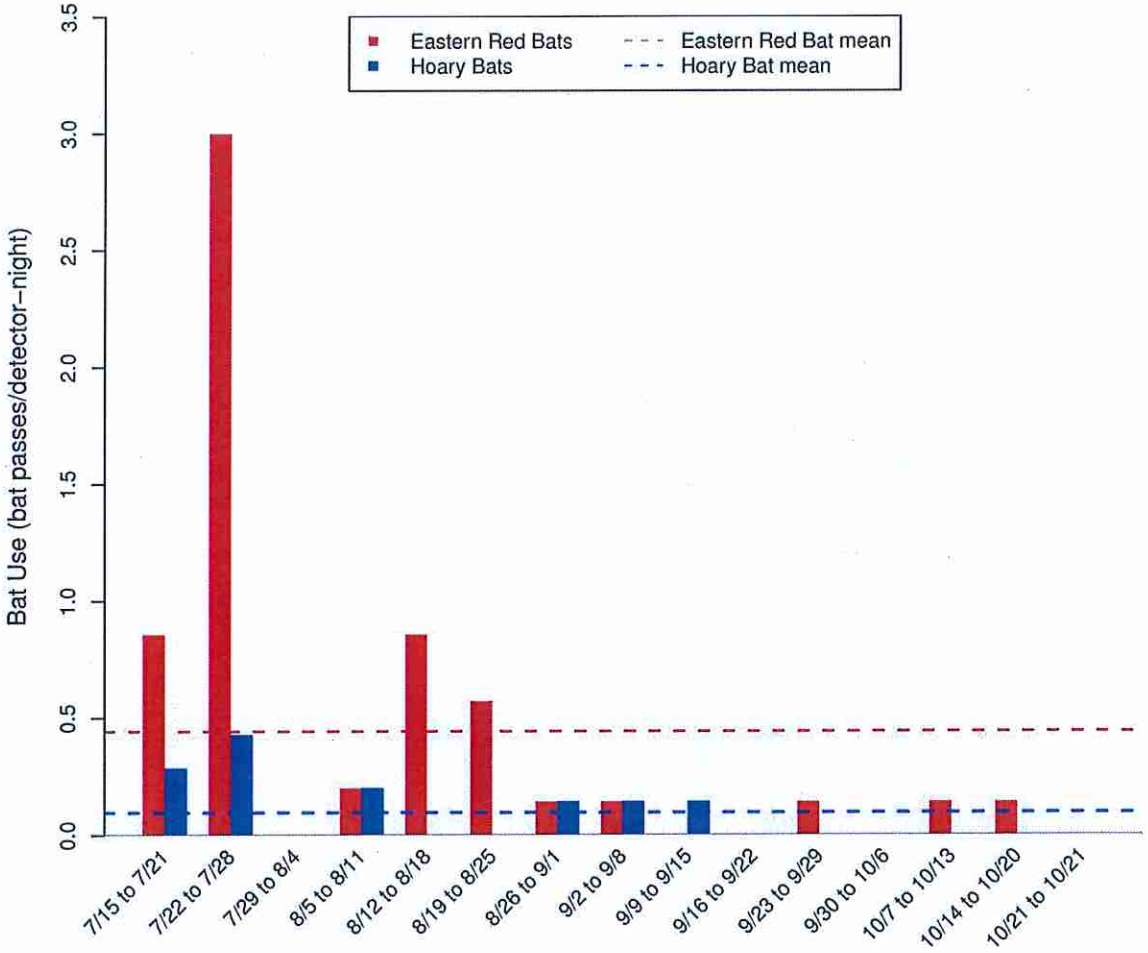


Figure 9a. Number of passes per detector–night by hoary bats and eastern red bats for the reference station at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009, presented weekly.

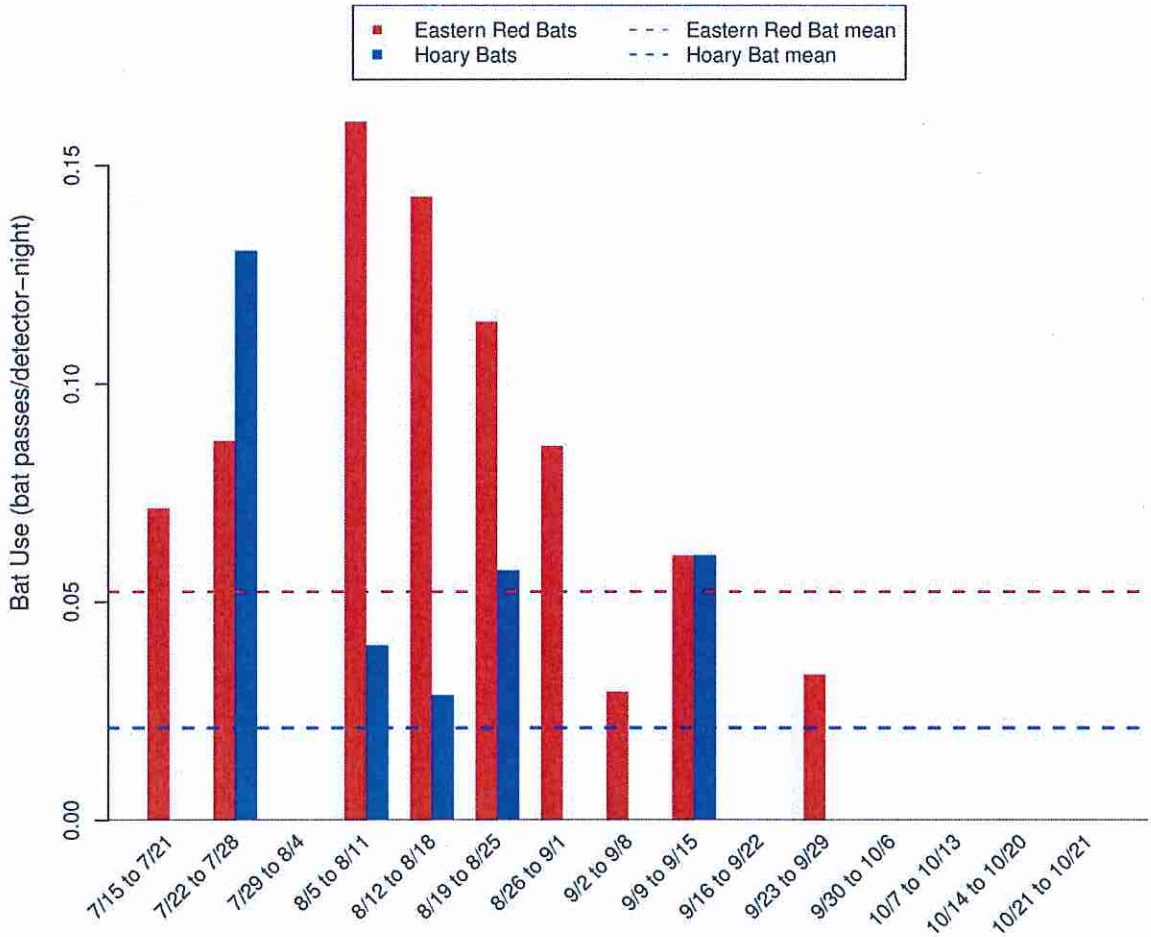
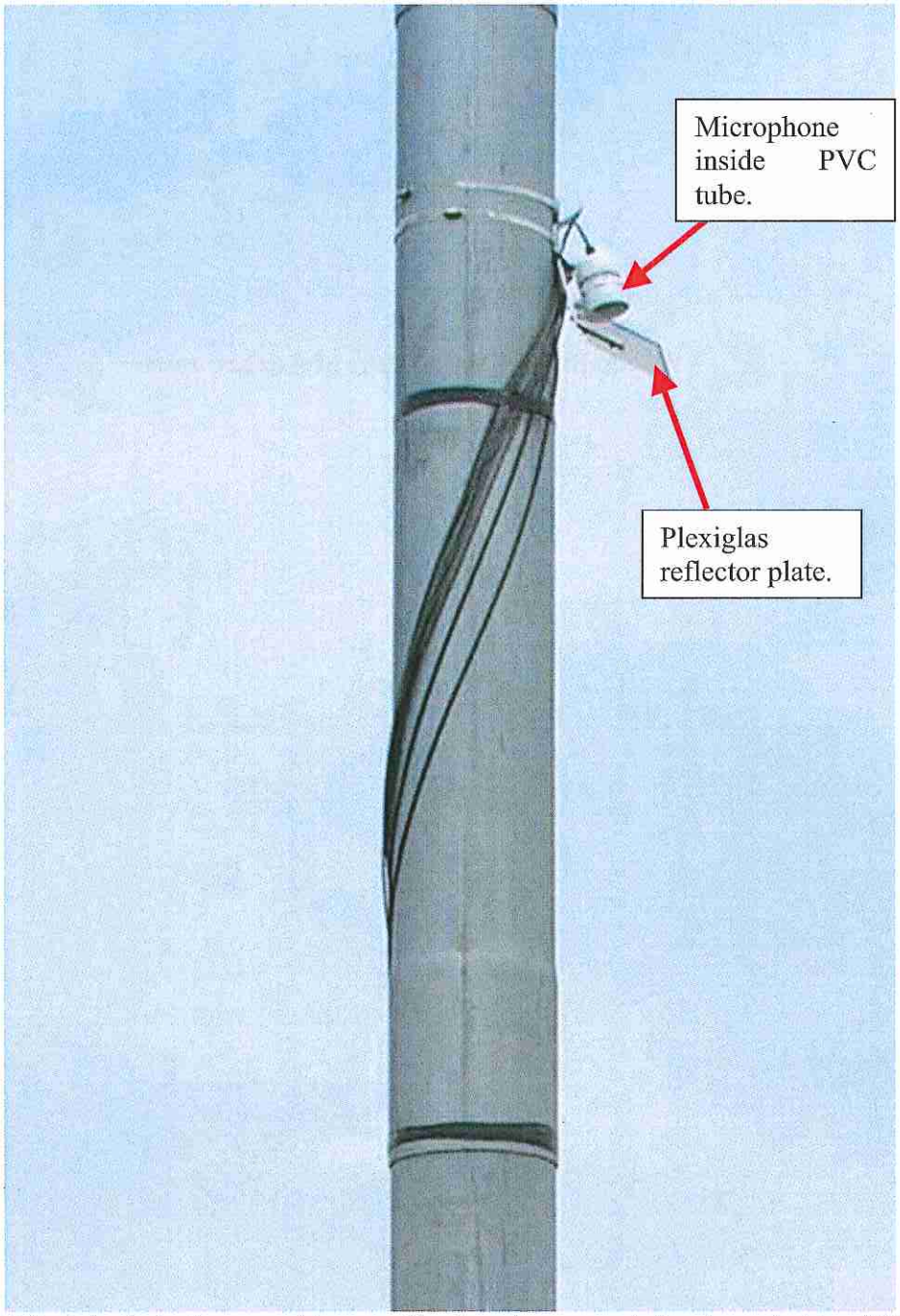
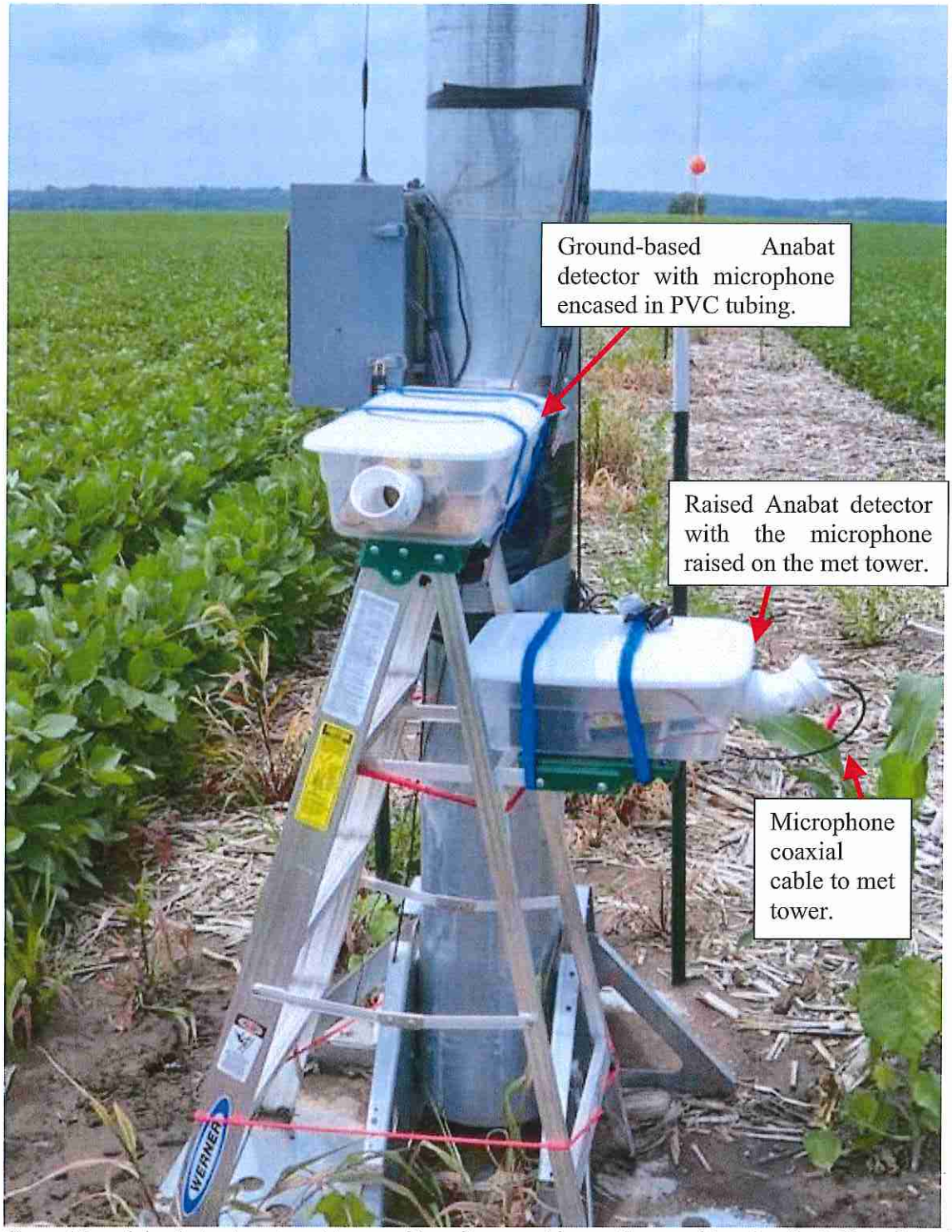


Figure 9b. Number of passes per detector–night by hoary bats and eastern red bats for non-reference stations at the Pleasant Ridge Wind Resource Area for the study period July 15 through October 21, 2009, presented weekly.

Appendix A: Photographs of Anabat units.



Raised Anabat setup on met tower with microphone mounted on tower inside a PVC tube with a Plexiglas reflector plate.



Ground-based Anabat setup at met tower with unit encased in weatherproof housing (top). Raised Anabat detector enclosed in weatherproof housing (bottom; microphone raised and mounted on tower).

CONTAINS SENSITIVE BIOLOGICAL DATA – NOT FOR PUBLIC DISTRIBUTION OR DISCLOSURE

PN 1664.017-001

February 2009

CHIROPTERAN RISK ASSESSMENT
PROPOSED PLEASANT RIDGE
WIND ENERGY GENERATION FACILITY
LIVINGSTON COUNTY, ILLINOIS

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1.0 INTRODUCTION

Invenergy Wind Development LLC of Chicago, Illinois, proposes construction of the Pleasant Ridge wholesale wind energy generation facility in Livingston County, Illinois (Figure 1). The general location of the Pleasant Ridge facility ("project planning area") spans 165 mi^2 (427.4 km^2) of southern Livingston County. Towns near the planning area include Fairbury, Forrest, and Chatsworth, Illinois. The planning area is approximately 1 percent forested, with forested areas occurring primarily in the Vermilion River and parts of the Indian Creek floodplains. Land use within the planning area is primarily agricultural (Figure 2).

The planning area represents the maximum area considered for placement of turbines and facility infrastructure. The actual area occupied by the turbines, transmission line, and access roads that will comprise the facility will be a very small percentage of the Project planning area.

Details of the transmission line and access road routing have not been determined at this time, though the transmission line is expected to be 5 to 10 mi (8 to 16 km) in length and will terminate at the Pontiac midpoint substation near the town of McDowell, in Livingston County.

The Pleasant Ridge facility will consist of approximately 330 wind turbines, located in strings or arrays within the Project planning area. Current plans call for installation of a mix of 1.5 MW and 2.5 MW turbines (GE Model 1.5 sle and GE Model 2.5 xl. The maximum total nameplate project capacity will be 695 megawatts (MW) (assuming approximately 130 1.5 MW and 200 2.5 MW turbines.

The hub height on the GE 1.5 MW turbines is approximately 262.5 ft (80 m) agl and rotors will be approximately 126.3 ft (38.5 m) long. With the rotor tip in the 12 o'clock position, the wind turbines will reach a maximum height of approximately 388.8 ft (118.5 m) above ground level (AGL). At the 6 o'clock position, the rotor tip will be approximately 136.2 ft (41.5 m) AGL. The turbine rotor will turn at a maximum operating speed of 20.4 revolutions per minute (rpm).

Each 2.5 MW turbine will have a hub height of approximately 328.1 ft (100 m) agl and rotors will be approximately 164 ft (50 m) long. With the rotor tip in the 12 o'clock position, the wind turbines will reach a maximum height of approximately 492.1 ft (150 m) AGL. At the 6 o'clock position, the rotor tip will be approximately 164 ft (50 m) AGL. The turbine rotor will turn at a maximum operating speed of 14.1 rpm.

Both turbine models have a nominal "cut-in speed" of 7.9 miles per hour (3.5 meters per second [m/s]). That is, winds of 3.5 m/s contain sufficient energy to support the generation of electric power by the turbine. At wind speeds below 3.5 m/s, as measured by an anemometer atop each nacelle, the turbine's "primary brake" is applied (i.e., the turbine blades are feathered by orienting the primary surface of each blade parallel to the wind direction). With the primary brake applied, the blades will not rotate around the hub, or will rotate very slowly (less than 1 rpm). Control systems allow the cut-in wind speed to be set independently at each turbine. Wind speeds above 3.5 m/s will result in blade speeds of 1 to 20.4 rpm, depending upon wind speeds. If wind speeds at an operating (spinning) turbine drop below the cut-in speed, the primary brake is applied and the blades come to a stop within approximately one minute. Control systems allow the cut-in wind speed to be set

independently at each turbine. If wind speeds at an operating (spinning) turbine drop below the cut-in speed, the primary brake is applied and the blades come to a stop within approximately one minute.

Turbines will be lit with red strobe-like or incandescent flashing lights. Lighting will be limited to the minimum number required by the Federal Aviation Administration (FAA) for aircraft safety.

Each turbine tower will be set upon a concrete pad with an aboveground diameter of approximately 15 ft (4.5 m). Nominally, crops and other vegetation within approximately 180 ft (55 m) of each tower site will be cleared, yielding a maximum of 330, 2.3-acre openings (759 acres of clearing for tower sites). The total cleared area required for erection of turbines will be approximately 1.19 mi^2 (3.08 km^2), or approximately 0.07 percent of the total Project planning area. As tree cover is extremely sparse within the Project planning area and most land use is agricultural, it is expected that there will be little or no removal of trees necessary for construction of turbines.

Interactions between wind turbines and wildlife, particularly flying creatures such as birds and bats, are a known and documented occurrence. Utility-scale wind turbines can directly and indirectly affect bats that occur in or migrate through the wind energy generation facility. Collisions between bats and other aerial manmade structures are well documented. Numerous impacts with television towers, other communication towers, large buildings, power lines, and fences have been reported. Though in some cases, bat collisions with wind turbine blades appear to occur at higher rates. At this time, such cases of higher fatality rates appear to be limited to sites located on forested Appalachian ridgelines (e.g., the Meyersdale, Pennsylvania and Mountaineer, West Virginia wind energy generation facilities discussed later in this document).

In evaluating the risk of bat mortality at this site, which is located on primarily flat, agricultural land, it is useful to consider mortalities at other operating utility-scale wind energy generation facilities in the midwestern United States. Bat mortality studies have been completed at the following wind development sites in the midwestern United States. (Figure 3):

- 54.5 MW (33 turbines) Crescent Ridge Wind Power Project, Bureau County, Illinois; located approximately 78 mi (125.5 km) northwest of the Pleasant Ridge Project planning area;
- 80.1 MW (89 turbines) Top of Iowa wind power development site, Worth County, Iowa; located approximately 312 mi (502 km) northwest of the Project planning area;
- 20.5 MW (31 turbines) wind power development site near Lincoln, Kewaunee County, Wisconsin; located approximately 267 mi (430 km) north-northeast of the Project planning area; and
- 236 MW (354 turbines) Buffalo Ridge wind power development site, Lincoln and Pipestone counties, Minnesota; located approximately 471 mi (758 km) northwest of the Project planning area.

This report documents design and site attributes of the proposed Pleasant Ridge wind energy generation facility, evaluates the avenues by which bats may be affected by the Pleasant Ridge facility, and provides a review of information pertaining to bat mortality at existing wind energy generation facilities. Based upon these data, and upon information provided by state wildlife agencies and the U.S. Fish and Wildlife Service (USFWS), we qualitatively

estimate the risk of effects to bats posed by the Pleasant Ridge facility. Agency correspondence is included in Appendix A.

2.0 DESCRIPTION OF THE PROJECT AREA

2.1 REGIONAL CONDITIONS

The following text describes the ecological region in which the proposed Pleasant Ridge wind energy generation facility (the "Project") occurs. This description is useful in understanding the nature and important ecological aspects of the area.

The Project lies within the Prairie Parkland (Temperate) Ecological Province of the United States (USFS 1994). Within this Province, the Project is located in Ecoregion Section 251G—Central Loess Plains (Figure 4). Of all the wind energy generation facilities at which bat mortality studies have been completed, only one (Crescent Ridge, Bureau County, Illinois) is within this same Ecoregion Section. Ecological aspects of Crescent Ridge, Top of Iowa, Lincoln, and Buffalo Ridge (four midwestern operating wind energy generation facilities at which bat mortality studies have been completed) are shown in Table 1 for comparison. These wind energy generation facilities occupy areas dominated by agriculture and cropland comparable to the Pleasant Ridge Project planning area.

Ecoregion Section 251G comprises part of the Central Lowlands and Great Plains geomorphic provinces and is characterized by dissected loess plains with gently rolling smooth, and irregular plains mantled by loess. Section 251G is predominantly Quaternary glacial till, lacustrine, and fluvial deposits, with local windblown dune sand and loess (USFS 1994).

The natural vegetation of Section 251G-Central Loess Plains is bluestem prairie with northern floodplain forest along major drainages. Most of the land in Section 251G is now highly productive farmland, with approximately 60 percent in crops and 25 percent used for grazing (USFS 1994). Land use in Livingston County is almost exclusively cropland (NRCS 2006, Appendix B).

Precipitation typically averages 25 to 35 in (630 to 900 mm) per year. Mean annual temperature is approximately 46 to 57°F (8 to 14°C). The growing season ranges from 150 to 190 days (USFS 1994).

Approximately 1.3 percent of Livingston County is tree-covered (split approximately evenly between upland and floodplain forest) (ISGS 2008, Raile and Leatherberry 1988).

2.2 SITE-SPECIFIC CONDITIONS

BHE visited the site during the week of November 17, 2008, and representative portions were photographed (Appendix B). Topography in the Project planning area is nearly flat, and land use is primarily agricultural (predominantly corn and soybeans). Project area views, from horizon to horizon, are nearly entirely farmland, with small groups of trees, tree lines, or partially treed, narrow riparian strips sometimes visible. Wooded habitat is very uncommon, and occurs primarily along watercourses, particularly Indian Creek, approximately 5 mi (8 km) south of Fairbury where the creek changes direction from east/west to north/south; and the Vermilion River north-northwest of Fairbury. The area surrounding the Project planning area is similar, with nearly 100 percent of the landscape dedicated to row crop production. Many

of the watercourses are ditched, or occur in gullies where they are isolated from their floodplains. Active tillage therefore extends in many cases nearly to the water's edge. Heavy sediment loading, and therefore degraded conditions for aquatic insects important as prey items for some bats, was apparent based upon visual inspection of creeks at road crossings in the planning area.

Other than the Vermilion River in the northwest portion of the Project planning area, the planning area lacks significant land features such as ridgelines, river corridors, or forested expanses that may be used as landmarks by migrating bats. The quality of bat habitat at the site is low.

2.3 BATS

Fourteen species of bats have been documented in Illinois. Except for the gray bat (*Myotis grisescens*), the southeastern myotis (*M. austroriparius*), the eastern small-footed bat (*M. leibii*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), and the Mexican free-tailed bat (*Tadarida brasiliensis*), each of the remaining nine species has potential to occur on the Project area (Table 2).

The USFWS lists the gray bat as occurring in Alexander, Hardin, Jackson, Johnson, Pike, Pope, and Pulaski counties, Illinois (USFWS 2008a), well south of the Project area assessed in this document. With the exception of Pike County (approximately 100 miles southwest of Livingston County), all records are more than 200 miles south in the southern tip of the state.

The southeastern myotis ranges from Indiana and Illinois south along the Mississippi River and around the southeastern coastal plain to North Carolina. The range of this species includes only the southernmost tip of Illinois.

Some range maps for the eastern small-footed bat include the southern third of the state (NatureServe 2007). To date, there is only a single record of two individuals in Illinois (Pope County), over 200 miles south of the area addressed in this document (Steffen et al. 2006).

The Rafinesque's big-eared bat ranges through the southeastern United States, from southern Virginia south and west to eastern Texas and northward along the Mississippi River valley to southern Indiana. The range of this species includes only the southern-most portion of Illinois.

While these four species are considered to be residents of the State of Illinois, the ranges of these species are restricted to the southern portion of the state. Therefore, these species are not considered further in this Risk Assessment.

There are historical records of the Mexican free-tailed bat in Illinois. However, the Illinois Department of Natural Resources (IDNR) regards these records as an anomaly and this agency does not consider the species to be a resident or likely occurrence in the state (Joe Kath, IDNR, pers. comm.). The Mexican free-tailed bat is therefore not considered further in this Risk Assessment.

The other nine bat species that occur in Illinois include year-round residents as well as species present only during certain seasons (Table 2). The Indiana bat (*M. sodalis*) is federally listed as endangered. The remaining eight species are not federally listed, are not proposed for listing, and are not candidates for federal listing. The Indiana bat is listed as endangered by the State of Illinois. None of the other bat species potentially present at the

Project area is listed by the State of Illinois. Descriptions of each species potentially present at the Project area are provided below.

2.3.1 Indiana Bat (*Myotis sodalis*)

The Indiana bat was listed by the federal government as endangered on March 11, 1967 and is listed as endangered by the Illinois Endangered Species Protection Board. Populations across the species range (as recorded from hibernacula counts) have declined since the late 1950s. Recent estimates place the total species population at approximately 468,000 (USFWS 2008b). A principal cause of decline is destruction of hibernacula from collapse, flooding, or vandalism by humans. Suspected contributing factors include loss of suitable summer habitat and contamination by pesticides (USFWS 2007). A recovery plan for Indiana bats was developed in 1983 (USFWS 1983) and revised in 1999 (USFWS 1999) and in 2007 (USFWS 2007).

The Indiana bat is a migratory species with potential to occur in Illinois year-round (Appendix C). The USFWS assumes the Indiana bat may occur in every county in Illinois (USFWS 2008a). Blackball Mine, designated as Indiana bat Critical Habitat on September 24, 1976, is located in the Pecumsaugan Creek-Blackball Mines Nature Preserve in LaSalle County (USFWS 2008c). The mine is a Priority II Indiana bat hibernaculum based upon the prioritization scheme outlined in the 2007 Indiana Bat Recovery Plan (USFWS 2007). The USFWS and IDNR conducted the most recent census in the hibernaculum in February 2007, during which 2,513 Indiana bats were observed (Joe Kath, pers. comm.). This hibernaculum has been surveyed every other year since 1987. During the course of these surveys, the number of Indiana bats observed has increased from 291 to 2,513 individuals.

The USFWS reports a summer record for the Indiana bat in LaSalle County northwest of Livingston County. This record lacks specificity regarding the number of bats observed, the location, and the date of observation (Andy King, USFWS, pers. comm.). The record may be related to the collection of three male Indiana bats in Blackball Mine in May prior to 1990 (Hoffmeister 1989; Andy King, pers. comm.). The Illinois Natural History Survey (INHS) has summer records of Indiana bats in Randolph and Washington counties (Joyce Hoffman, INHS, pers. comm.), though the Illinois Natural Heritage Database does not reflect these records. The INHS has a summer record of the Indiana bat in adjacent Ford County, a minimum of about 30 mi (48 km) southeast of the Project planning area (Jeannie Barns, pers. comm; Joe Kath, pers. comm.; Andy King, pers. comm). Mist net surveys conducted in 1988 along the Middle Fork of the Vermilion River in Ford County captured big brown bats, eastern red bats, evening bats, and Indiana bats. Re-survey of the Indiana bat capture site in 1990 again resulted in the capture of Indiana bats. There are no records of any kind for the Indiana bat in Livingston County (Table 2, Appendix A).

Very few bat surveys have been conducted in Livingston County, Illinois. The Illinois Natural History Survey conducted mist-net activities at two sites in Livingston County in late May 1988, and no bats were captured (Joyce Hoffman, pers. comm.). A search of the Illinois Natural Heritage Database in late 2008 revealed that no federal Threatened, Endangered or Candidate bat species have been documented within the Project planning area.

Because of the scarcity of bat survey work in the Project planning area, it is helpful to augment existing capture data with records of the Illinois Department of Public Health (IDPH). Bats submitted to the health department for rabies testing are turned over to an expert for identification. While not all of the individuals submitted for testing are identified to species, many are, making these records a useful addition to species distribution information. From 1975 through 2007, IDPH records in Livingston County documented four bat species: big brown bats, eastern red bats, hoary bats, and silver-haired bats.

In winter (mid-November through March), Indiana bats hibernate in caves and mines. For the remainder of the year, Indiana bats roost in trees (Barbour and Davis 1969). In April and again in August-September, Indiana bats migrate between winter and summer habitat. Some individuals may travel 300 to 357 mi (483 to 575 km) between summer and winter roosts (USFWS 2007, Winhold and Kurta 2006). Others, particularly males, may roost in trees near hibernacula in summer. In Pennsylvania and New York, radiotelemetry studies indicate Indiana bats migrate between 10 and 60 mi (16 and 97 km) (USFWS 2007). Migrating bats have been documented traveling along power line and pipeline rights-of-way, along highways, hedgerows, tree lines, and along stream courses (Murray and Kurta 2004, Johnson and Strickland 2003, USFWS 2007, Verboom and Huitema 1997). Limited recovery records of banded Indiana bats from the Midwest indicate females and some males migrate north in the spring upon emergence from hibernation (USFWS 2007).

In spring, Indiana bats migrate from hibernacula to forested habitats. Upon emergence from hibernation, Indiana bats are active near the hibernaculum during a period called staging. Spring staging may occur from approximately mid-April through early May. During staging, Indiana bats emerging from hibernation roost in trees, and forage near their hibernacula. In Missouri, staging male and female Indiana bats traveled between 1.2 and 6.4 mi (1.9 and 10.3 km) from their hibernaculum nightly (Rommé et al. 2002). Females typically leave caves before males (Humphrey 1978, LaVal and LaVal 1980). Following mid-May emergence from hibernation, a single radio-tracked male followed for two weeks traveled 10 mi (16 km) in western Virginia (Hobson and Holland 1995).

Indiana bats typically arrive in summer habitat (primarily upland and riparian forests) in early to mid-May. This species roosts under exfoliating bark or in cavities of trees. Pregnant females form maternity colonies that may contain up to 100 or more adult bats (USFWS 2007). Male Indiana bats tend to roost singly or in small all-male groups (USFWS 2007). Males may occur in summer anywhere throughout the range of the species, including near hibernacula (Whitaker and Brack 2002).

Adults of this species feed exclusively on flying insects. Indiana bats forage most frequently in upland and riparian forests, but they also may forage along wooded edges between forests and croplands, and over fallow fields (Brack 1983, LaVal and LaVal 1980). They frequently use open space over streams as travel corridors.

In August, Indiana bats begin to leave summer habitat and migrate back to hibernacula. Autumn swarming occurs from approximately mid-August through September. During swarming, numerous bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in caves during the day (Cope and Humphrey 1977). Indiana bats periodically use tree roosts during fall swarming (Menzel et al. 2001). In Missouri, swarming Indiana bats traveled up to 4 mi (6.4 km) from roost sites (Rommé et al. 2002). In Kentucky, male Indiana bats radio tracked during October traveled up to 1.7 mi (2.7 km) from their roost sites. Kiser and Elliot (1996) found males roosted in trees between 0.5 and 1.5 mi (0.8 and 2.4 km) from the hibernaculum.

2.3.2 Northern Long-Eared Bat (*M. septentrionalis*)

The northern long-eared bat ranges from southern Canada and the central and eastern United States through northern Florida (Appendix C). This species has not been documented in Livingston County, but has been captured during surveys in adjacent McLean County (Table 2).

The northern long-eared bat is migratory (Whitaker and Hamilton 1998). Northern breeding populations generally move south to winter hibernacula, typically occupying winter habitat beginning in mid-October (NatureServe 2005). In winter (October/November through March/April), this species hibernates in caves and mines. It may hibernate in caves occupied by several other species. Northern long-eared bats occasionally emerge from hibernation and have been observed in flight during winter (Whitaker and Hamilton 1998).

In summer, this species typically roosts in trees (under exfoliating bark or in crevices and hollows) and in manmade structures (Harvey 1992, Foster and Kurta 1999). Foster and Kurta (1999) identified northern long-eared bats roosting singly or in small groups that averaged 17 individuals. This species forages along forested hillsides and ridges, often through dense vegetation (Harvey et al. 1999).

2.3.3 Little Brown Bat (*M. lucifugus*)

The little brown bat is abundant throughout forested areas of the United States as far north as Alaska (Appendix C). The species' range includes all of Illinois; however, no individuals have been documented in Livingston County (Table 2). Little brown bats have been documented in nearby McLean County.

This species often forms nursery colonies in buildings, attics, and other manmade structures (Harvey et al. 1999). These colonies are often close to a lake or stream. Males are likely solitary in the summer months (Harvey et al. 1999). In late August and early September, little brown bats prepare for hibernation, and may swarm at the entrance of caves or mines (Whitaker and Hamilton 1998). Migration between summer and winter roosts may be short distances or several hundred miles (Fenton and Barclay 1980, Whitaker and Hamilton 1998). The timing of migration and hibernation depends upon local weather conditions, with northern populations hibernating from September to early May, and southern populations hibernating from November to March (Fenton and Barclay 1980). Little brown bats typically hibernate in caves and mines, and hibernacula are typically not used as summer roosts (Harvey et al. 1999, Whitaker and Hamilton 1998).

Little brown bats often forage over water where their diet consists of aquatic insects, including mosquitoes, mayflies, midges, and caddisflies. Foraging also occurs over forest trails, cliff faces, meadows, and farmland where they consume a wide variety of insects (Harvey et al. 1999).

2.3.4 Eastern Pipistrelle (*Perimyotis subflavus*)

The eastern pipistrelle occurs in the eastern United States, and ranges throughout Illinois (Appendix C, Barbour and Davis 1969). The eastern pipistrelle has not been documented in Livingston County, but has been documented in McLean County (Table 2). This species appears abundant throughout its range. Summer and winter ranges are identical. In summer, eastern pipistrelles have been found roosting in foliage and, rarely, in buildings. They may roost singly or in colonies of up to 30 bats (Barbour and Davis 1969). In winter, eastern pipistrelles hibernate in mines, quarries, caves, and rock crevices.

2.3.5 Big Brown Bat (*Eptesicus fuscus*)

The big brown bat is common throughout its range (Appendix C) from Alaska and Canada to Mexico and South America. The big brown bat has been documented in Livingston and other nearby counties (Table 2). Big brown bats do not migrate; there appears to be no difference

in range from summer to winter (Barbour and Davis 1969). It roosts in rock crevices, expansion joints of bridges and dams, hollow trees, and manmade structures. Maternity colonies containing several hundred individuals have been recorded from attics, barns, and other buildings (Harvey 1992).

2.3.6 Eastern Red Bat (*Lasiurus borealis*)

The eastern red bat occurs from southern Canada, throughout the United States, to Mexico and Central America (Appendix C, Barbour and Davis 1969). It is common in the Midwest and central states, including Illinois (Harvey 1992, Whitaker and Hamilton 1998). The eastern red bat has been documented in Livingston County and other nearby counties (Table 2). During winter, male eastern red bats are more commonly found in northern areas of the species' winter range (which extends north to include the bottom one-third of Illinois), while females are more often found in southern areas (Cryan 2003). There is no clear segregation of the genders during summer (Cryan 2003).

Eastern red bats are migratory; however, migration patterns are poorly understood. In winter, eastern red bats may hibernate in tree foliage for short periods, but arouse and forage during warm nights.

Like most lasiurids, *L. borealis* typically roosts in tree foliage. Individual eastern red bats may use several roost sites. Eastern red bats hang from branches or leaf petioles and are camouflaged by leaves. Adults are solitary, but females and young roost together until young become volant.

2.3.7 Hoary Bat (*L. cinereus*)

The hoary bat is widespread throughout the United States, but in eastern regions, the species' distribution varies seasonally (Appendix C, Whitaker and Hamilton 1998). Breeding individuals are known from Canada south to Arkansas, Louisiana, and Georgia (Barbour and Davis 1969). The range of the hoary bat includes Illinois (Harvey et al. 1999). Hoary bats have been documented in Livingston County and in other nearby counties (Table 2).

It appears that the sexes are separate during summer, with females inhabiting the northeast region (Cryan 2003, Whitaker and Hamilton 1998). Reproductive females are found in the northeast as far south as Pennsylvania and Indiana (Whitaker and Hamilton 1998). Female hoary bats give birth between mid-May and early July (Cryan 2003).

In August, this species moves south to winter habitat in southeastern and southwestern states, the Caribbean, and Central and South America (Cryan 2003, Whitaker and Hamilton 1998). In the eastern United States, hoary bats winter in northern Florida and southern Georgia, Alabama, Louisiana, and South Carolina (Whitaker and Hamilton 1998). Hoary bats apparently migrate in groups, with large numbers passing through an area over several nights in spring and fall (Whitaker and Hamilton 1998, Zinn and Baker 1979). Females precede males in spring migration. In the north, some may hibernate rather than migrate (Whitaker 1980). Hoary bats migrate north from March through April (Whitaker and Hamilton 1998).

Hoary bats roost in foliage of deciduous or coniferous trees (Barbour and Davis 1969). The species generally is solitary except during migration and when young accompany females (Mumford and Whitaker 1982).

2.3.8 Silver-Haired Bat (*Lasionycteris noctivagans*)

The silver-haired bat is common in forested areas throughout much of North America, although it is characterized as a northern species (Appendix C, Whitaker and Hamilton 1998). This species typically is found in parts of its range containing stands of coniferous or mixed coniferous and deciduous forests (Whitaker and Hamilton 1998). This species has been documented in Livingston County and other nearby counties (Table 2).

Silver-haired bats commonly roost in tree cavities, often switching roosts during the maternity season. Silver-haired bats typically are solitary, but may congregate in small maternity colonies usually numbering fewer than 10 individuals (Whitaker and Hamilton 1998).

Females are thought to migrate farther than males, and it is possible males remain in winter habitat year-round (Whitaker and Hamilton 1998). During migration, silver-haired bats have been found roosting in trees along a ridge (Whitaker and Hamilton 1998). Typical winter roosts for this species include trees, buildings, wood piles, and rock crevices (Harvey et al. 1999). Whitaker and Hamilton (1998) depict the species' winter range as extending as far north as the southern tip of Illinois. Occasionally silver-haired bats will hibernate in caves or mines, especially in northern regions of their range.

Silver-haired bats roost in forested areas and feed predominantly in openings such as small clearings and along roadways or streams (Whitaker and Hamilton 1998). The silver-haired bat typically leaves the roost and begins to forage relatively late, with major foraging activity peaks 3, and 7 to 8 hours after sunset (Kunz 1973).

2.3.9 Evening Bat (*Nycticeius humeralis*)

The evening bat occurs throughout the eastern United States, including almost the entire state of Illinois (Appendix C), and is abundant throughout its range. This species has been documented in Livingston County and other nearby counties (Table 2). Evening bats are known to form large maternity colonies, often including up to several hundred individuals. These maternity colonies are generally formed in hollow trees, behind loose bark, or occasionally in buildings and attics. The evening bat is considered a true forest bat and is almost never observed in caves. Little is known about the migration patterns of this species; however, evening bats have been shown to put on high amounts of fat in the fall, a possible indication of a long migration. Banded evening bats have been found up to 340 mi (547 km) south of their initial banding sites. It is believed that evening bats remain active during the winter.

3.0 POTENTIAL EFFECTS TO BATS

Construction and operation of wind energy facilities present potential concerns regarding impacts to bats through three primary avenues:

- Bats may be killed by colliding with moving turbine blades.
- Construction of the turbines and associated appurtenances may degrade habitat quality through the removal of trees.
- Bats may be disturbed to the extent of being displaced by operating turbines.

The USFWS issued the *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) to address the potential impacts to wildlife from wind power projects. An appendix to the guidelines outlines a protocol designed to provide a framework for the initial steps in investigating a site. The protocol was originally developed to assess sites in Montana but has been modified to apply nationwide (USFWS 2002, USFWS 2003). The protocol uses a Potential Impact Index (PII), which is an initial assessment of the suitability of a proposed site. The PII relies on the comparison of the proposed site with a high quality reference site that is located within the same geographic area as the proposed site. Habitat degradation at the reference site would result in the maximum negative impact on wildlife (including bats).

The PII Score is separated into three checklists: Physical Attribute checklist, Species Occurrence and Status checklist, and the Ecological Attractiveness checklist (USFWS 2003).

1. The Physical Attribute Checklist considers topographic, meteorological, and site characteristics that may influence bird and bat occurrence and movements.

2. The Species Occurrence and Status Checklist includes all federally endangered, threatened and candidate species; all state endangered, threatened, and species of management concern; birds of conservation concern; birds of high recreational or other value; and any other species of concern listed by State Natural Heritage Programs.

3. The Ecological Attractiveness Checklist evaluates the presences and influence of features and conditions that may draw birds and bats to the site or vicinity.

As this risk assessment addresses potential impacts to bats, BHE did not consider or evaluate presence of, or potential impacts to birds. Therefore, the information necessary to determine a PII score was not generated as part of this desktop assessment, and a PII score was not determined. Based upon habitat conditions at the Pleasant Ridge project planning area, the PII score would be low. This qualitative assessment is based on the land cover and attributes of the Project planning area, and an overall lack of suitable habitat for wildlife species whose ranges overlap the area.

3.1 BAT MORTALITY AT WIND ENERGY GENERATION FACILITIES

Much of the information available regarding mortality caused by collisions with moving turbine blades is contained in technical reports completed for wind site owners/developers, is unpublished, and is often difficult to obtain. Anecdotal information can be found in numerous studies intended to address avian impacts, although these data are suspect in that study methods were not designed to detect bat mortality.

A report published in 2008 summarized 21 studies of bat mortality at 19 wind energy generation facilities across the United States and one Canadian Province: five studies in the Pacific Northwest, one in the Rocky Mountains, three in Alberta, Canada, five in the Midwest, one in south-central United States, and six in the eastern states (Arnett et al. 2008). Average mortality in these 21 studies ranged from 0.1 to 69.6 bats killed per turbine per year. Methods used in these studies varied; mortality estimates were adjusted in many cases for the biases presented by searcher efficiency and removal of carcasses by scavengers during mortality monitoring studies. A majority of studies (13 of 21) used bird carcasses as surrogates for bats while conducting searcher efficiency trials and calculating scavenging

rates (Arnett et al. 2008). Bat mortality has been recorded both anecdotally and in ongoing studies at other wind energy generation facilities as well.

Documented bat kills at North American wind energy generation facilities have been generally highest in the east (Appalachian Mountains), moderate in the Midwest, and lowest in the western states. In most cases, documented mortality was low - less than five bats per turbine per year. Nationwide, more than 93 percent of fatalities documented in the U.S. as of winter 2006 (Arnett et al. 2008) have been of six species, with hoary bats accounting for nearly one-half of all mortality:

- hoary bat (40.7 percent),
- eastern red bat (21.2 percent),
- silver-haired bat (15.4 percent),
- eastern pipistrelle (8.0 percent),
- little brown bat (6.0 percent), and
- big brown bat (2.4 percent).

Migratory, or so-called "tree bats" (hoary bats, silver-haired bats and eastern red bats) accounted for over 77 percent of known fatalities through the end of 2006. Bats that roost (winter and/or summer) in caves, sometimes referred to as "cave bats," comprised the remaining approximately 23 percent.

A mortality study conducted at the Crescent Ridge Wind Power Project in Bureau County, Illinois, was released in May 2007. This study recorded approximate mortality of nine bats per turbine per year, all of "tree bat" species (approximately 40 percent of carcasses recovered were hoary bats, approximately 30 percent were silver-haired bats, and approximately 30 percent were eastern red bats) (Kerlinger et. al 2007).

Although mortality has been documented in all months when bats are not hibernating, a significant majority of mortality has been documented in mid-July through mid-October during the post-maternity dispersal from summer habitat to winter habitat. At the Buffalo Mountain Windfarm in Tennessee, 70 percent of all bat fatalities occurred between August 1 and September 15 (Fiedler 2004). At Crescent Ridge, 20 of 21 bats killed by turbines were found in September and October. Overall, mortality appears highest between approximately July 15 and September 15. However, at the Summerview facility in Alberta, Canada, 6 percent of the 272 silver-haired bat fatalities occurred in May and June, suggesting that some mortality does occur during the spring migration period. These findings were supported in Tennessee, where 84 percent of the 19 silver-haired bat fatalities occurred between mid-April and early June (Arnett et al. 2008). Mortality is very low during the summer maternity period, even when substantial numbers of bats are present at or near wind energy generation facilities. In a study in Minnesota at the Buffalo Ridge Wind Power Development, researchers found bat activity as measured by ultrasound detectors during summer was not correlated with bat mortality (Johnson et al. 2003a).

To date only one study has attempted to correlate the timing of fatalities between sites. Kerns et al. (2005) conducted simultaneous fatality searches from August 1 to September 13, 2004 at the Mountaineer and Meyersdale facilities in West Virginia, and Pennsylvania, respectively. The timing of all fatalities, while periodic and highly variable during the study was highly correlated between the two sites. Additionally, the timing of hoary and eastern red bat fatalities were positively correlated for the two sites (Kerns et al. 2005)

The sites at which the highest mortality has been documented occur at approximately 2,760 ft (840 m) above msl (Meyersdale, Pennsylvania), 3,363 ft (1,025 m) (Mountaineer, West Virginia), and 3,314 ft (1,010 m) at Buffalo Mountain, Tennessee on forested Appalachian Mountain ridgelines. At this time, the greatest risk of bat mortalities is expected at similar sites/locations.

The presence of FAA-approved lighting on towers has been the subject of speculation regarding bat mortality. Studies completed in 2003 at the Mountaineer site (Kerns and Kerlinger 2004), and in 2004 at the Mountaineer and Meyersdale sites (Arnett 2005) found no significant difference in mortality at unlit towers and at towers lit by L-864-type flashing red strobe-like or incandescent lights. Similar results were documented at the Vansycle Ridge site in Oregon (Erickson et al. 2000), in northern Wisconsin (Howe et al. 2002), the Stateline project (Erickson et al. 2003a), the Nine Canyon project in Washington State (Erickson et al. 2003b), the Klondike facility in Oregon (Johnson et al. 2003b), the Summerview project in Alberta (Brown and Hamilton 2006), and the Maple Ridge project in New York (Jain et al. 2007). It also appears that mortality does not vary among the types of lighting used on wind turbines. At the Top of Iowa project, all turbines are lit with FAA lighting: 46 with non-pulsating red beacons, 37 with pulsating red beacons, and six with a combination of flashing white beacons and non-flashing red beacons. Jain (2005) found no significant difference in bat mortality between these towers.

Many of the nine species of bats with potential to be present during some portion of the year at the Pleasant Ridge Project planning area have been killed at one or more operating wind energy generation facilities. No fatalities of federally listed bat species have been documented at wind energy generation facilities in the U.S. Based upon results of mortality monitoring completed to date, hoary bats, silver-haired bats, and eastern red bats account for the majority of bat kills. These species accounted for approximately 77 percent of the mortality in turbine searches conducted through the end of 2006 (summary of mortality studies contained in Arnett et al. 2008). At the three project sites in the Midwest that were included in Arnett et al. (2008), these species accounted for 84.5 percent of the mortality observed. A study conducted in Bureau County, Illinois, had similar results: all of the bat carcasses recovered during mortality studies were hoary bats, silver-haired bats, or eastern red bats (Kerlinger et al. 2007). Based on these findings, we expect these three species to account for a majority of the mortality associated with the proposed Pleasant Ridge project.

Little information exists upon which to base conclusions regarding the biological significance of bat mortality at wind energy generation facilities. For instance, data do not exist to support conclusions regarding the biological significance of the numbers of bats killed at wind farms. Unfortunately, total population estimates do not exist for any of the bat species known to have been killed at wind energy generation facilities.

Reasonably accurate population estimates exist for the federally endangered Indiana bat, one of the most uncommon North American species. Although neither this species nor any other federally listed bat species has been identified during bat mortality studies at wind energy generation facilities, we mention the size of the population of this species for context. In 2007, there were an estimated 468,184 Indiana bats in existence (USFWS 2008b). Populations of species that have been killed at wind energy generation facilities are much more common than this listed species, and may be an order of magnitude (or more) higher.

3.2 BAT COLLISION MORTALITY

Specific pre-construction techniques/protocols that accurately predict risk of chiropteran mortality at wind sites do not exist. Post-construction mortality monitoring remains the best source for these data. Therefore, comparison of the Pleasant Ridge Project area to other nearby similar sites with known mortality is a useful approach.

As discussed above, the highest levels of bat mortality documented to date have occurred at a wind energy generation facilities located in West Virginia (Mountaineer), Pennsylvania (Meyersdale), and Tennessee (Buffalo Mountain). They possess substantial similarities in Ecoregion (i.e., Allegheny Mountains), topography (i.e., ridgelines), elevation (i.e., 2,760 to 3,363 ft [840 to 1,025 m] above msl), and geographic location (i.e., eastern U.S.), and are markedly dissimilar to the proposed Project site described herein. Wind energy generation facilities with lower mortality (e.g., the Lincoln site in Wisconsin; the Buffalo Ridge site in Minnesota; or the Top of Iowa site in Iowa) are located in midwestern states, are located on flat terrain, and have been constructed in agricultural areas or other non-forested sites (e.g., short grass prairie, pasture; Table 1). As discussed in Section 2.0, the Pleasant Ridge Project planning area described herein is nearly devoid of tree cover (Appendix B, Figure 2). Further, tree cover in all of Livingston County totals only 1.3 percent.

Based upon published and unpublished information available at this time, similarities in the projects discussed in Table 1, and anticipated similarity in the behavior of bats at these sites, it is likely that mortality resulting from the Project will be most similar to that at the Crescent Ridge site in Illinois, Top of Iowa site in Iowa; the Lincoln site in Wisconsin; and the Buffalo Ridge site in Minnesota. Annual kill estimates based upon post-construction monitoring studies was 8.04 bats per turbine per year at Top of Iowa; 4.26 bats per turbine per year at Lincoln; and 1.32 bats per turbine per year at Buffalo Ridge. Post-construction studies at Top of Iowa, Lincoln, and Buffalo Ridge, were all multi-year studies encompassing spring through fall (approximately mid-March through mid-November for each).

Mortality studies at Crescent Ridge were conducted from August through November 2005, March through May 2006, and August 2006, and the total estimate of bat mortality during the whole of the survey was approximately nine bats per turbine (Kerlinger et al. 2007). However, mortality at the Crescent Ridge facility in Illinois was highly seasonal: almost all (20 out of 21) documented bat kills occurred in late fall (September and October). A single bat carcass was documented in August, and no bat kills were documented in spring. No monitoring was completed in either year during the months of June or July, when it is reasonable to expect some mortality to take place; thus the extrapolated estimate of nine bats killed per turbine may not be as accurate an estimate of annual mortality as might be found in a more comprehensive study.

When comparing mortality among wind energy generation facilities, it is useful to consider rotor-swept area. Rotor-swept area is the amount of vertical airspace occupied ("swept") by the blades of each turbine. Bat mortality can be adjusted for rotor-swept area to facilitate comparison of mortality among turbines of varying sizes. Phases 2 and 3 of the Buffalo Ridge wind generation facility are comprised of two different turbine types of different sizes and thus varying rotor swept areas. Available literature does not differentiate between these two turbine types when discussing bat mortality, therefore, it was not possible to adjust the annual kill estimates at this site to account for rotor swept area.

At the Crescent Ridge, Top of Iowa, and Lincoln facilities, however, each individual facility is comprised of a single model of turbines, and rotor swept areas within each facility are identical.

We estimated mortality at the Pleasant Ridge site under two different build out scenarios. Scenario 1 (S1) includes the use of 330 1.5 MW turbines. Scenario 2 (S2)included site build out with 130 1.5 MW turbines, and 200 2.5 MW turbines. If annual kill estimates (8.04 bats per turbine per year), based upon post-construction monitoring at Top of Iowa are applicable, annual facility-wide mortality at the Pleasant Ridge Project, adjusted for rotor swept area, can be predicted to be from 5,817 (S1) to 8,237 (S2). If annual kill estimates (4.26 bats per turbine per year), based upon post-construction monitoring at Lincoln are applicable, annual facility-wide mortality at Pleasant Ridge, adjusted for rotor swept area, can be predicted to be from 3,773 (S1) to 5,343 (S2). For the sake of comparison only, if the extrapolated estimate of annual mortality at Crescent Ridge (9 bats per turbine per year) is applicable, annual facility-wide mortality at Pleasant Ridge, adjusted for rotor-swept area, can be predicted to be 2,620 (S1) to 3,711 (S2). These numbers are intended as estimates, and should be interpreted with caution given, for example, the difference in rotor rpm of turbines at the Lincoln site compared to those planned for the proposed Project described herein. Because rotor speed of the Lincoln turbines (28.5 rpm) is substantially higher than the turbines planned for installation at Pleasant Ridge (approximate maximum rpm of 22 for the GE 1.5sle and 16.5 for the GE 2.5xl), the actual annual mortality at the Pleasant Ridge Project site may be notably different than predicted above.

The Pleasant Ridge Project is not proximate to an Indiana bat hibernaculum. The nearest known hibernaculum is Blackball Mine in LaSalle County, where at last count (February 2007) 2,513 Indiana bats were observed (Figures 5 and 6). The center of the Pleasant Ridge Project planning area is approximately 55 miles (88 km) from the Blackball Mine hibernaculum . It is reasonable to expect that the direction of flight of Indiana bats, and of other species of bats utilizing the Blackball Mine hibernaculum, is not random. These movements are likely concentrated along the only forested areas in the vicinity: the Illinois River that runs east-west approximately one mile south of the hibernaculum, the Little Vermilion River to the north of the hibernaculum, the Vermilion River to the southeast of the hibernaculum, and the Fox River to the northeast of the hibernaculum. No contiguous forested tracts link the Pleasant Ridge Project planning area to these forested corridors, or to the hibernaculum. The Vermilion River traverses the Project planning area but forest cover along the river is discontinuous, with large stretches where there are no trees. No other major waterways cross the Project planning area, and the many smaller waterways that do cross the Project planning area have minimal vegetative cover, and pass repeatedly through developed areas, minimizing their utility as bat travel corridors or foraging areas. Murray and Kurta (2004) found that Indiana bats will choose to travel along forested corridors as opposed to non-forested corridors, even if the distance traveled is greater. This suggests that all of the waterways crossing the Project planning are minimally suitable as travel corridors for Indiana bats. Thus no effects to Indiana bats during spring and fall migration to and from the Blackball Mine hibernaculum are expected.

The INHS reports records of Indiana bats in Ford County captured during mist net surveys on the Middle Fork of the Vermilion River, southeast of the Project planning area. The records are 18 to 20 years old and the exact capture location is unknown. The Illinois Natural Heritage Database has no records of Indiana bats in Ford County. However, the Middle Fork of the Vermilion River, at its closest point to the Project area, is approximately 30 mi (48 km) away, and no contiguous forested corridors connect the Middle Branch of the Vermilion River to waterways on the Project planning area.

It is unlikely that male, female, and juvenile Indiana bats will occupy the Project planning area during summer. Habitat conditions in the Project planning area, which is nearly devoid of trees and is composed largely of open fields/agricultural land, are less than suitable for foraging or roosting bats. Indiana bats, even if present, are likely to be very rare at the Pleasant Ridge Project area during summer, and are likely to be active at heights largely below the rotor-swept area as described above. As such, the chance of collisions between Indiana bats and turbine blades during the summer is very low. Studies completed to date have documented very low mortality during spring and summer months, even when concurrent mist net surveys and/or ultrasound acoustic detection devices indicate the presence of substantial numbers of bats. No effects to Indiana bats during summer are expected.

Furthermore, other bat species that may suffer mortality at the Pleasant Ridge Project area are widely dispersed in the U.S. and only a very small minority of each species' population will forage in, roost in, travel through, or migrate over the Pleasant Ridge Project area. For example, if the range-wide population of hoary bats is assumed to be 5,130,000 (10 times the population of Indiana bats), and if hoary bats comprise 50 percent of expected mortality (0.5 x ~5,817 = 2,909), then annual fatalities of hoary bats would equate to six one-hundredths of 1 percent (0.06 percent) of the species' population.

3.3 HABITAT DEGRADATION

The landscape within the Project planning area is dominated by agriculture and tree cover is sparse. Construction of the Project in this agricultural area will have little effect upon the amount of forested area, the presence of suitable roost trees or other roost structures (e.g., barns), the presence of available prey, or other habitat attributes in this area of thoroughly disturbed and degraded habitat.

The USFWS is routinely consulted regarding potential impacts to the Indiana bat associated with a wide variety of projects. Their concerns commonly focus upon habitat modifications near hibernacula and maternity sites, and modification of proximate forested habitat. Where such habitat modifications occur, the USFWS often recommends project-specific consultation and avoidance/conservation measures.

Removal of tree cover within the Project planning area may affect summer habitat of the Indiana bat, if the species is present on the Project area. If forest removal in occupied Indiana bat summer habitat occurs, there is often substantial agency concern regarding potential for direct mortality. However, the Pleasant Ridge Project planning area is almost devoid of trees (Appendix B, Figure 2). Furthermore, tree clearing during construction will be avoided to the maximum extent practicable; there will be no clearing of vegetation or construction of turbine towers within the Vermilion River floodplain.

Based upon the best available information, including the near absence of trees and suitable roosting habitat in the Project area, and the absence of proximate records of the species, the likelihood of an Indiana bat maternity colony in the Project area is exceedingly low. The project is not proximate to a known hibernaculum, thus there is low potential that migrating/staging/swarming individuals may move through the Project area during spring and fall, or that transient males might be present during the summer. The potential that Indiana bats will inhabit the Pleasant Ridge Project area during any time of year is very low.

3.4 DISTURBANCE AND DISPLACEMENT OF BATS

Speculations have been made concerning the potential disturbance of bats by operating wind energy generation facilities, and the potential for resulting displacement of bats from otherwise suitable habitat. Data do not exist to dismiss the risk of such disturbance or displacement, but preliminary information now available supports the conclusion that wind turbines and their blades do not substantially disturb/displace bats. In 2004 at the Mountaineer and Meyersdale wind energy generation facility sites, bats were commonly observed foraging in forest openings at turbine sites. Thermal imaging equipment was used to investigate bat behavior near wind towers. Bats landed on towers, foraged near rotating blades, pursued rotating blades, and flew in patterns that appeared to indicate purposeful collision avoidance (Horn et al. 2008). The presence of bats near operating turbines was also documented at the Buffalo Ridge site in Minnesota (Johnson et al. 2003a), and the Buffalo Mountain site in Tennessee (Fiedler 2004). Based upon the best available information it appears operating turbines do not significantly disturb or displace bats.

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TABLES

Table 1. Attributes of the Pleasant Ridge Project area as compared to other Midwestern wind energy generation facilities where post-construction studies of bat mortality have been conducted.

Feature	Pleasant Ridge (Livingston Co., IL)	Crescent Ridge (Bureau Co., IL)	Lincoln (Kewaunee Co., WI)	Buffalo Ridge (Lincoln and Pipestone Cos., MN)	Top of Iowa (Worth Co., IA)
Ecoregion (Section)	Central Loess Plains Section	Central Loess Plains Section	Northern Great Lakes Section	North-Central Glaciated Plains Section	Minnesota and Northeastern Iowa Morainal, Oak Savannah Section and North-Central Glaciated Plains Section
Position	Towers to be placed in open agricultural areas	Towers located in agricultural areas	Towers located on ridges of glacial till approximately 30-60 m (98-197 ft) above the surrounding lowlands	Towers located on ridge consisting of terminal moraines and stream dissected lands	Towers located in agricultural areas surrounded by grasslands and wetlands
Approximate average elevation (above msl)	233 m (764 ft)	274 m (900 ft)	240-270 m (787-886 ft)	546-610 m (1,791-2001 ft)	366-396 m (1,200 - 1,300 ft)
Vegetative cover	Primarily corn and soybeans	Primarily corn and soybeans	Pasture and agricultural land	Primarily corn, soybeans, pastures, and grasslands	Primarily cropland
No. of turbines	330 (1.5 MW)	33 (1.65 MW)	31 (0.66-MW)	354 (0.75-MW)	89 (0.90-MW)

Table 1. Attributes of the Pleasant Ridge Project area as compared to other Midwestern wind energy generation facilities where post-construction studies of bat mortality have been conducted.

Feature	Pleasant Ridge (Livingston Co., IL)	Crescent Ridge (Bureau Co., IL)	Lincoln (Kewaunee Co., WI)	Buffalo Ridge (Lincoln and Pipestone Cos., MN)	Top of Iowa (Worth Co., IA)
Turbine string(s)	Data not available	Irregular array along 9-mile ridge, installed in 2 phases.	14 WPS turbines in 3 rows within 1.5 km of one another; 17 MGE turbines in 2 irregular clusters approximately 3.5 km apart	Phase 1: 10 turbine strings each with 3 - 20 turbines spaced at 91-183 m (298-600 ft) intervals (73 turbines total) Phase 2: 26 turbine strings each with 2 - 12 turbines spaced at 100-200 m (328-656 ft) intervals (143 turbines total) Phase 3: 36 turbine strings each with 2-13 turbines spaced at 250-500 m (820-1640 ft) intervals (138 turbines total)	89 turbines spread across 865 ha in an irregular array
Hub height	1.5MW: 80 m (262 ft) 2.5MW: 100 m (328 ft)	78 m (256 ft)	65 m (213 ft)	Phase 1: 36 m (118 ft) Phase 2 and 3: 50 m (164 ft)	72 m (237 ft)
Rotor diameter	1.5MW: 77 m (253 ft) 2.5 MW: 100 m (328 ft)	82 m (269 ft)	47 m (154 ft)	Phase 1: 33 m (108 ft) Phase 2 and 3: 46 and 48 m (151-157 ft)	52 m (171 ft)
Max. rotor height	1.5MW: 119 m (390 ft) 2.5MW: 150 m (492 ft)	119 m (390 ft)	89 m (292 ft)	Phase 1: 53 m (174 ft) Phase 2 and 3: 74 m (243 ft) or 73 m (240 ft)	98 m (322 ft)
Min. rotor height	1.5MW: 42 m (138 ft) 2.5 MW: 50 m (164 ft)	37 m (121 ft)	42 m (138 ft)	Phase 1: 19.5 m (70 ft) Phase 2 & 3: 26 m (85 ft) or 27 m (88 ft)	46 m (151 ft)

Table 1. Attributes of the Pleasant Ridge Project area as compared to other Midwestern wind energy generation facilities where post-construction studies of bat mortality have been conducted.

Feature	Pleasant Ridge (Livingston Co., IL)	Crescent Ridge (Bureau Co., IL)	Lincoln (Kewaunee Co., WI)	Buffalo Ridge (Lincoln and Pipestone Cos., MN)	Top of Iowa (Worth Co., IA)
Rotor swept area	S1: 4,657 m^2/turbine 1,536,810 m^2 total S2: 2,176,210 m^2	5,281 m^2/turbine 174,273 m^2 total	1,735 m^2/turbine 53,785 m^2 total	Phase 1: 855 m^2 per turbine; 62,437 m^2 total Phase 2: 1,735 m^2 average per turbine; 248,105 m^2 total Phase 3: 1,735 m^2 average per turbine; 239,430 m^2 total	2,124 m^2/turbine 189,036 m^2 total
Operating rotor rpm	1.5 MW: 20.4 2.5 MW: 14.1	14.4	28.5	Phase 1: 14 to 50 Phase 2 and 3: 16 to 30	15 or 22
Turbine cut in speed	3.5 m/s 7.8 mph	3.5 m/s 7.8 mph	4.0 m/s 8.9 mph	Phase 1: 4.0 m/s or 9 mph Phase 2 and 3: 3.6 m/s or 8 mph	Data not available
Lighting	Per FAA regulations	10 of 33 turbines lighted	Data not available	Phase 1: no lighting Phase 2: 6 turbines lighted Phase 3: 69 turbines lighted	46 of 89 towers lighted
Bat species in the region (bats listed for all sites other than Pleasant Ridge are those species detected in mortality searches. Percent of total detected mortality is indicated).	Hoary bat Eastern red bat Eastern pipistrelle Big brown bat Silver-haired bat Little brown bat N. long-eared bat Indiana bat Evening bat	Hoary bat (38.1%) Silver-haired bat (28.6%) Eastern red bat (28.6%)	Eastern red bat (37.5%) Hoary bat (34.7%) Silver-haired bat (18.1%) Myotis spp. (8.3%) Big brown bat (1.4%)	Hoary bat (67%) Eastern red bat (17%) Silver-haired bat (3%) Big brown bat (3%) Eastern pipistrelle (2%) Little brown bat (2%)	Hoary bat (28%) Eastern red bat (23.5%) Little brown bat (23.5%) Silver-haired bat (11.8%) Big brown bat (10.5%) Eastern pipistrelle (2.6%)

Table 2. Bats potentially present within five miles of the proposed Pleasant Ridge Planning Area during summer, winter, and spring/fall migration.

Species	Status	Potential Seasonal Presence within 5 mi (8 km) of the Pleasant Ridge Planning Area[1]			Identified in Livingston County?[2]
		Summer	Winter	Migration	
Indiana bat (*Myotis sodalis*)	Federal: endangered IL: endangered	Yes	No	Yes	No
Northern long-eared bat (*Myotis septentrionalis*)	None	Yes	No	Yes	No
Little brown bat (*Myotis lucifugus*)	None	Yes	No	Yes	No
Eastern pipistrelle (*Perimyotis subflavus*)	None	Yes	No	Yes	No
Big brown bat (*Eptesicus fuscus*)	None	Yes	Yes	Yes[3]	Yes
Eastern red bat (*Lasiurus borealis*)	None	Yes	No	Yes	Yes
Hoary bat (*Lasiurus cinereus*)	None	Yes	No	Yes	Yes
Silver-haired bat (*Lasionycteris noctivagans*)	None	Yes	No	Yes	Yes
Evening bat (*Nycticeius humeralis*)	None	Yes	No	Yes	No

[1]Based upon documented occurrences or, in the absence of such data, the professional opinion of Dr. Joyce Hofmann, Illinois Natural Heritage Survey and/or Joseph Kath, Illinois Department of Natural Resources.
[2]Data obtained from the Illinois Natural History Survey (known bat captures documented since 1985) and the Illinois Department of Public Health and the Illinois Department of Agriculture (records of bat submitted to laboratories for rabies testing since 1980). Seasonal information included where available. Absence of records in the county likely reflects lack of surveys rather than absence of the species.
[3]Species is not migratory, and may be present during spring and fall.

FIGURES

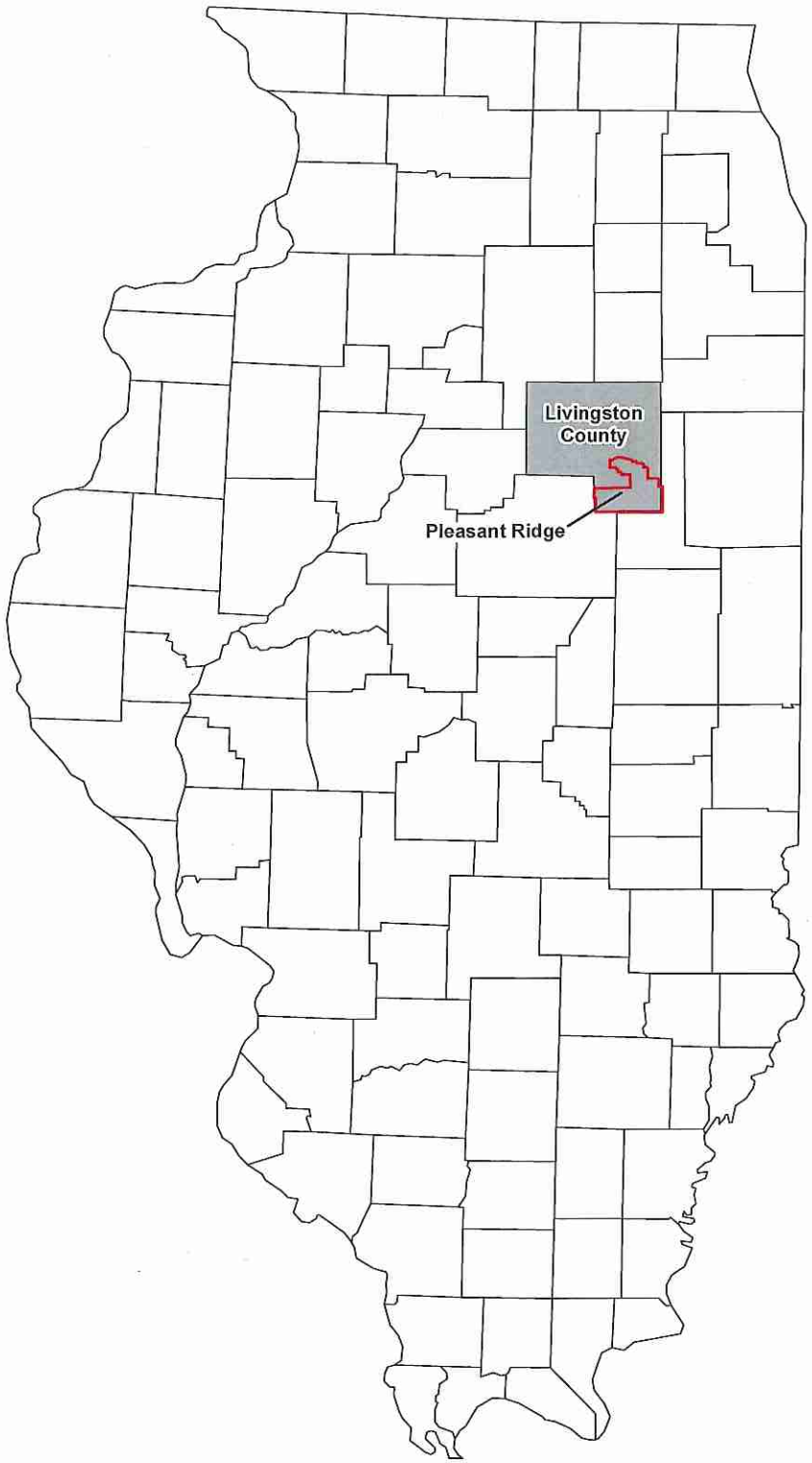

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Figure 1. Proposed Pleasant Ridge wind energy generation facility, Livingston County, Illinois.

Project No. 1664.017	January 2009

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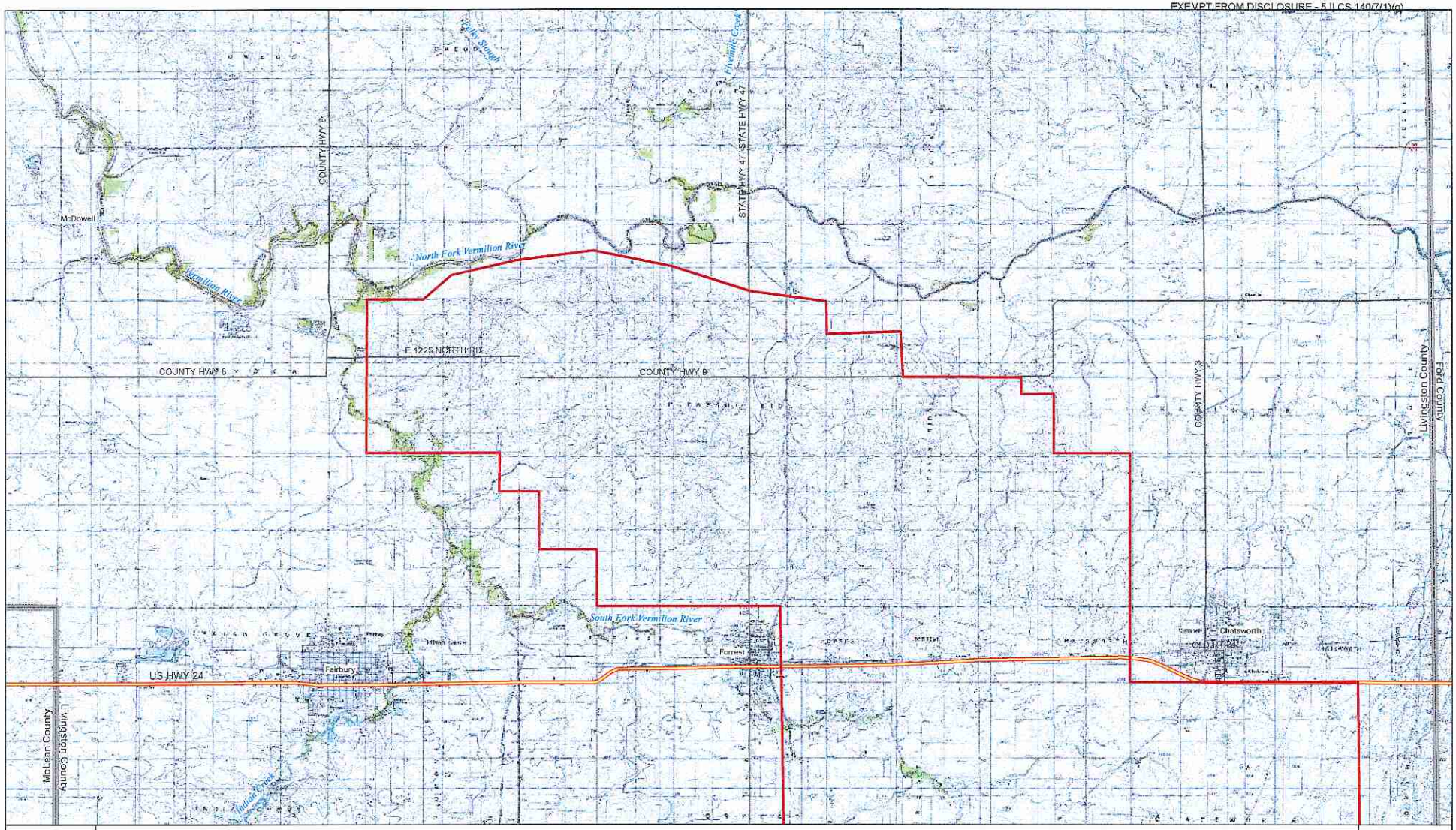

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Figure 2a. Proposed Pleasant Ridge wind energy generation facility (northern half), Livingston County, Illinois.

January 2009	Project No. 1664.017	Miles 1 0 1 2	Base Map: USGS 7.5 Minute Topographic Maps - Southeast Pontiac, Forrest North, Chatsworth North, Fairbury, Forrest South, Chatsworth South, Buckley NW Quads, Illinois.

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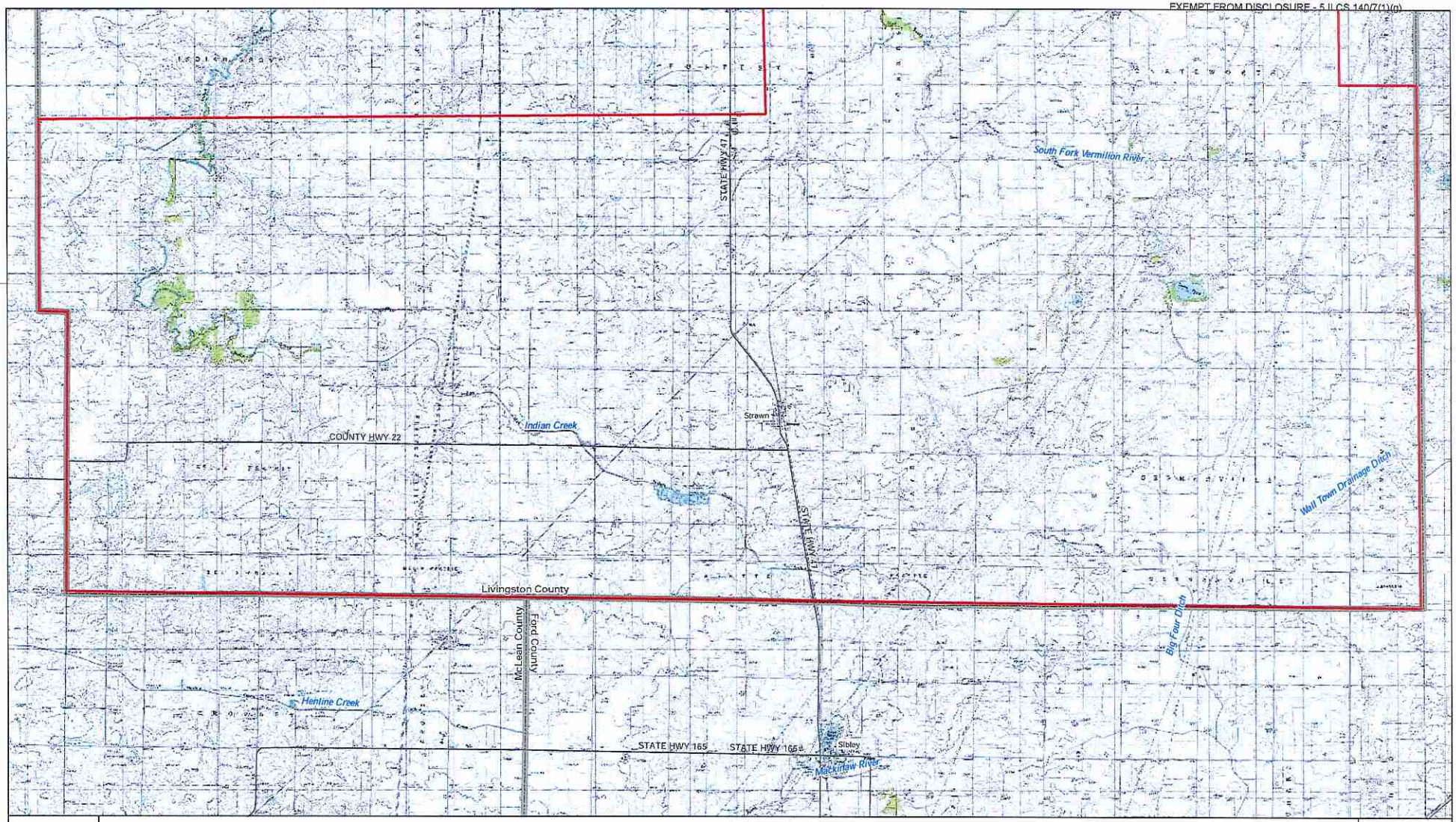

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Figure 2b. Proposed Pleasant Ridge wind energy generation facility (**southern half**), Livingston County, Illinois.

January 2009	Project No. 1664.017	Miles 1 0 1 2	Base Map: USGS 7.5 Minute Topographic Maps - Fairbury, Forest South, Chatsworth South, Buckley NW, Colfax, Sibley, Melvin West, Melvin East Quads, Illinois.

BHE ENVIRONMENTAL

Worth County, Iowa - Top of Iowa
Kewaunee County, Wisconsin - Lincoln
Bureau County, Illinois - Crescent Ridge
Lincoln and Pipestone Counties, Minnesota - Buffalo Ridge

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Figure 3. Nearby wind energy generation facilities at which bat mortality studies have been completed.

Project No. 1664.017

January 2009

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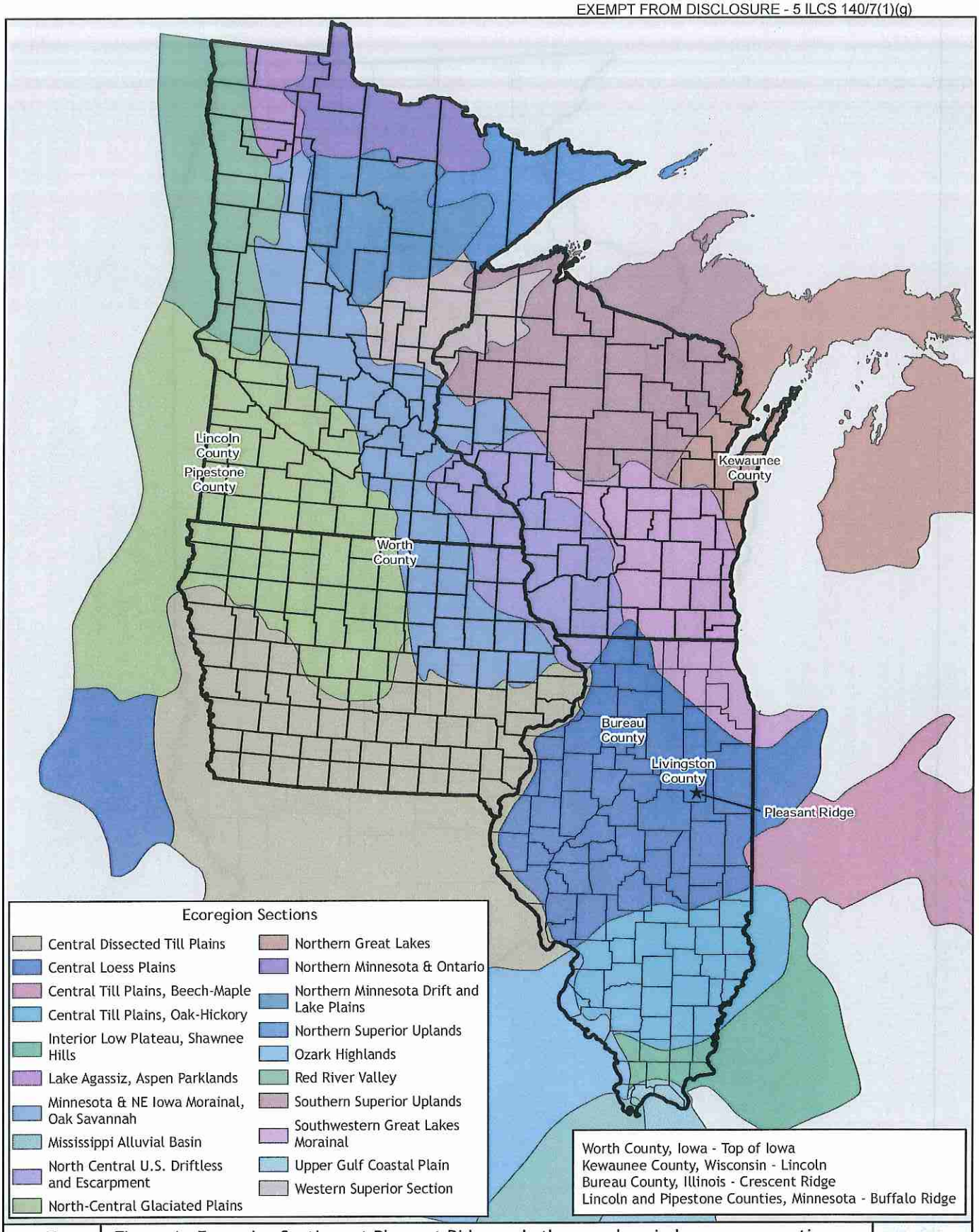

Figure 4. Ecoregion Sections at Pleasant Ridge and other nearby wind energy generation facilities.

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Figure 5. Approximate location of the Pecumsaugan Creek - Blackball Mines Nature Preserve, LaSalle County, Illinois.

Project No. 1664.017

January 2009

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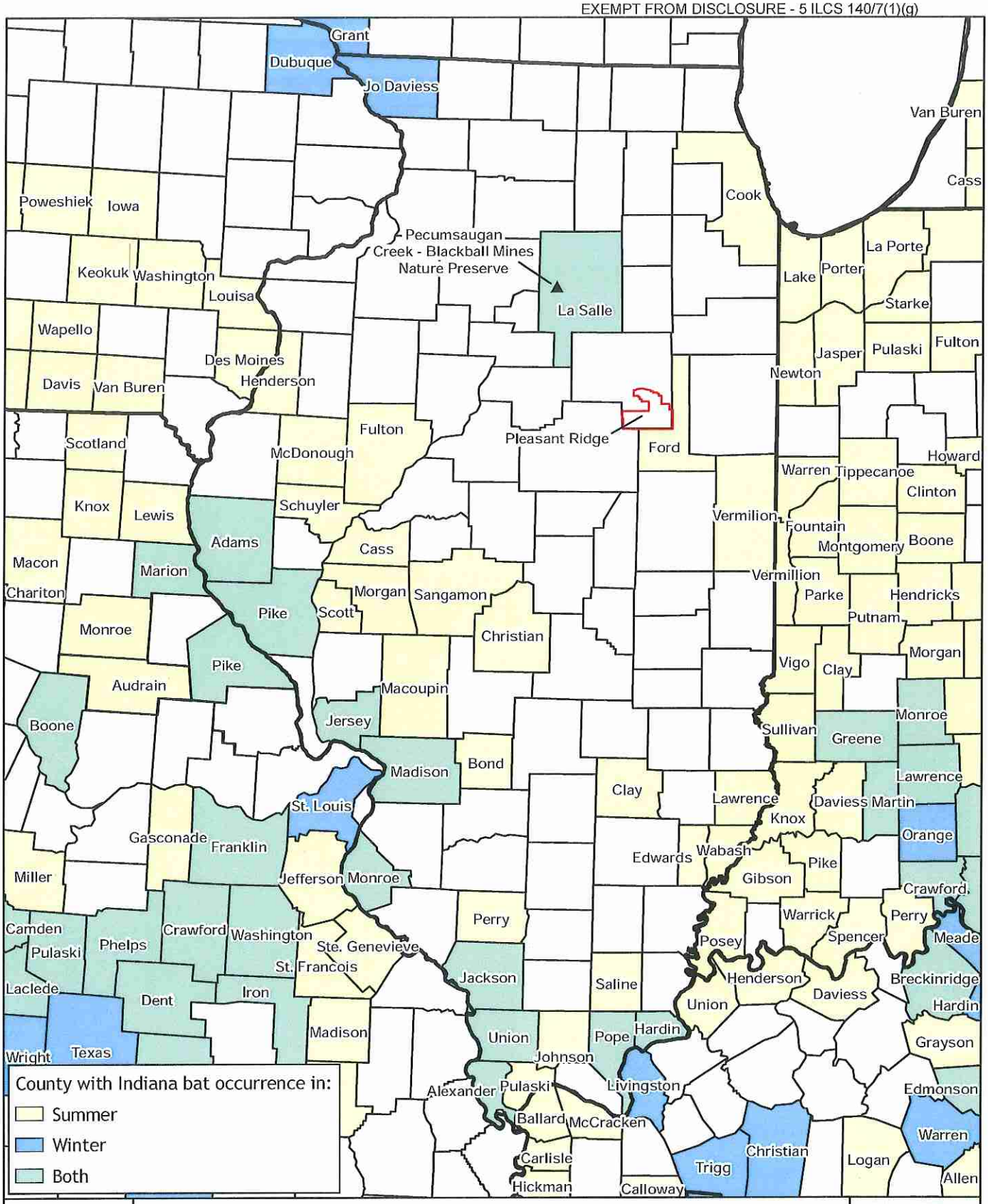

Figure 6. Counties in which the Indiana bat (*Myotis sodalis*) occurs near the proposed Pleasant Ridge wind energy generation facility, Livingston County, Illinois.

Project No. 1664.017	January 2009

APPENDICES

APPENDIX A
Agency Correspondence

EcoCAT
Ecological Compliance Assessment Tool

Applicant:	BHE Environmental, Inc.	*IDNR Project #:*	0903707
Contact:	Melanie Gregory	Date:	11/10/2008
Address:	11733 Chesterdale Road Cincinnati, OH 45246		

Project: Invenergy Wind LLC Pleasant Ridge-South
Address: Rural Forrest, Forrest

Description: Utility-scale wind energy conversion center.

Natural Resource Review Results

Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)
The Illinois Natural Heritage Database shows the following protected resources may be in the vicinity of the project location:

Mackinaw River INAI Site
Sibley Grove INAI Site
Weston Cemetery Prairie INAI Site
Sibley Grove Nature Preserve
Weston Cemetery Prairie Nature Preserve
Barn Owl *(Tyto alba)*
Loggerhead Shrike *(Lanius ludovicianus)*
Upland Sandpiper *(Bartramia longicauda)*

An IDNR staff member will evaluate this information and contact you within 30 days to request additional information or to terminate consultation if adverse effects are unlikely.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Ford
Township, Range, Section:

25N, 9E, 7	25N, 9E, 18

County: Livingston
Township, Range, Section:

25N, 6E, 1	25N, 6E, 2
25N, 6E, 3	25N, 6E, 4
25N, 6E, 5	25N, 6E, 6
25N, 6E, 7	25N, 6E, 8
25N, 6E, 9	25N, 6E, 10
25N, 6E, 11	25N, 6E, 12
25N, 6E, 13	25N, 6E, 14

IDNR Project Number: 0903707

25N, 6E, 15	25N, 6E, 16
25N, 6E, 17	25N, 6E, 18
25N, 7E, 1	25N, 7E, 2
25N, 7E, 3	25N, 7E, 4
25N, 7E, 5	25N, 7E, 6
25N, 7E, 7	25N, 7E, 8
25N, 7E, 9	25N, 7E, 10
25N, 7E, 11	25N, 7E, 12
25N, 7E, 13	25N, 7E, 14
25N, 7E, 15	25N, 7E, 16
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25N, 8E, 9	25N, 8E, 10
25N, 8E, 11	25N, 8E, 12
25N, 8E, 13	25N, 8E, 14
25N, 8E, 15	25N, 8E, 16
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26N, 6E, 25	26N, 6E, 26
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26N, 7E, 34	26N, 7E, 35
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26N, 8E, 11	26N, 8E, 12
26N, 8E, 13	26N, 8E, 14
26N, 8E, 15	26N, 8E, 16

IDNR Project Number: 0903707

26N, 8E, 17	26N, 8E, 18
26N, 8E, 19	26N, 8E, 20
26N, 8E, 21	26N, 8E, 22
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26N, 8E, 31	26N, 8E, 32
26N, 8E, 33	26N, 8E, 34
26N, 8E, 35	26N, 8E, 36

IL Department of Natural Resources Contact
Keith Shank
217-785-5500
Division of Ecosystems & Environment

Local or State Government Jurisdiction
Livingston County Regional Planning Commission
Chuck Schopp
1110 West Water Street, Suite 3
Pontiac, Illinois 61764

Disclaimer

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

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3. IDNR reserves the right to enhance, modify, alter, or suspend the website at any time without notice, or to terminate or restrict access.

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Privacy

EcoCAT generates a public record subject to disclosure under the Freedom of Information Act. Otherwise, IDNR uses the information submitted to EcoCAT solely for internal tracking purposes.

EcoCAT
Ecological Compliance Assessment Tool

Applicant:	BHE Environmental, Inc.	*IDNR Project #:*	0903706
Contact:	Melanie Gregory	Date:	11/10/2008
Address:	11733 Chesterdale Road Cincinnati, OH 45246		

Project: Invenergy Wind LLC Pleasant Ridge-North
Address: Rural Forrest, Forrest

Description: Utility-scale commercial wind energy conversion project.

Natural Resource Review Results

Consultation for Endangered Species Protection and Natural Areas Preservation (Part 1075)
The Illinois Natural Heritage Database shows the following protected resources may be in the vicinity of the project location:

Greater Redhorse *(Moxostoma valenciennesi)*
Loggerhead Shrike *(Lanius ludovicianus)*
River Redhorse *(Moxostoma carinatum)*
Spike *(Elliptio dilatata)*
Upland Sandpiper *(Bartramia longicauda)*

An IDNR staff member will evaluate this information and contact you within 30 days to request additional information or to terminate consultation if adverse effects are unlikely.

Location

The applicant is responsible for the accuracy of the location submitted for the project.

County: Livingston

Township, Range, Section:

26N, 7E, 1	26N, 7E, 2
26N, 7E, 3	26N, 8E, 5
26N, 8E, 6	27N, 5E, 1
27N, 5E, 2	27N, 5E, 11
27N, 5E, 12	27N, 5E, 13
27N, 5E, 14	27N, 5E, 23
27N, 5E, 24	27N, 6E, 3
27N, 6E, 4	27N, 6E, 5
27N, 6E, 6	27N, 6E, 7
27N, 6E, 8	27N, 6E, 9
27N, 6E, 10	27N, 6E, 11
27N, 6E, 12	27N, 6E, 13
27N, 6E, 14	27N, 6E, 15

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27N, 6E, 16	27N, 6E, 17
27N, 6E, 18	27N, 6E, 19
27N, 6E, 20	27N, 6E, 21
27N, 6E, 22	27N, 6E, 23
27N, 6E, 24	27N, 6E, 25
27N, 6E, 36	27N, 7E, 7
27N, 7E, 8	27N, 7E, 9
27N, 7E, 10	27N, 7E, 11
27N, 7E, 13	27N, 7E, 14
27N, 7E, 15	27N, 7E, 16
27N, 7E, 17	27N, 7E, 18
27N, 7E, 19	27N, 7E, 20
27N, 7E, 21	27N, 7E, 22
27N, 7E, 23	27N, 7E, 24
27N, 7E, 25	27N, 7E, 26
27N, 7E, 27	27N, 7E, 28
27N, 7E, 29	27N, 7E, 30
27N, 7E, 31	27N, 7E, 32
27N, 7E, 33	27N, 7E, 34
27N, 7E, 35	27N, 7E, 36
27N, 8E, 17	27N, 8E, 18
27N, 8E, 19	27N, 8E, 20
27N, 8E, 29	27N, 8E, 30
27N, 8E, 31	27N, 8E, 32
28N, 5E, 35	28N, 5E, 36
28N, 6E, 31	28N, 6E, 32
28N, 6E, 33	

IL Department of Natural Resources Contact
Keith Shank
217-785-5500
Division of Ecosystems & Environment

Local or State Government Jurisdiction
Livingston County Regional Planning Commision
Chuck Schopp
1110 West Water St, Suite 3
Pontiac, Illinois 61764

Disclaimer

The Illinois Natural Heritage Database cannot provide a conclusive statement on the presence, absence, or condition of natural resources in Illinois. This review reflects the information existing in the Database at the time of this inquiry, and should not be regarded as a final statement on the site being considered, nor should it be a substitute for detailed site surveys or field surveys required for environmental assessments. If additional protected resources are encountered during the project's implementation, compliance with applicable statutes and regulations is required.

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IDNR Project Number: 0903706

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Mr. Charles T. Schopp, Livingston County
Invenergy Pleasant Ridge Energy Facility
January 2, 2009

Code 0903706/0903707

January 2, 2009

Mr. Charles T. Schopp, Administrator
Livingston County Regional Planning Commission
1110 W. Water St., Suite 3
Pontiac, IL 61764

RE: **Invenergy Wind Energy LLC Pleasant Ridge Energy Facility, Livingston County**
Endangered Species Consultation Program
EcoCAT Database Reviews #0903706 and 0903707

Dear Mr. Schopp:

The Department received from BHE Environmental, Inc., this proposed action near Fairbury for consultation in accordance with the *Illinois Endangered Species Protection Act* [520 ILCS 10/11], the *Illinois Natural Areas Preservation Act* [525 ILCS 30/17], and Title 17 *Illinois Administrative Code* Part 1075.

As indicated by the accompanying EcoCAT Reports, the Department currently has documented records of State-listed endangered or threatened species in the vicinity or within the provided footprint of this proposal. However, for various reasons, this does not mean other listed species are currently absent from the vicinity, or that they may not occur within the vicinity at some time during the extended life of this activity (>25 years). The Department's data are far from comprehensive, and land owners in this area are free to alter potential habitats as their needs require, which will affect the incidence of State-listed species.

The proposed activity will occur mainly in the watershed of the Vermilion River (Illinois river Drainage) which provides essential habitat to several endangered or threatened species of fish and mussels, which are not necessarily limited to the river, but may also ascend tributary streams. Soil erosion associated with construction and long-term operation of wind energy facilities has the potential to adversely affect these species and habitats unless carefully

controlled.

In addition, Livingston County provides important staging areas for migratory birds protected by federal law. Extensive wind energy facilities may adversely affect the ability of such species to arrive on their arctic breeding grounds in good reproductive condition.
An attachment is provided which describes endangered, threatened, and migratory species which may be affected by this proposal and some recommendations to avoid, minimize, or mitigate for potential adverse effects.

The consultation process for this proposal is terminated, unless the County desires additional information or advice related to this proposal.

Should you need additional information regarding the consultation process, or should you have any questions, please do not hesitate to contact me.

Sincerely,

Keith M. Shank
Impact Assessment Section
Division of Ecosystems and Environment
Ph. (217) 785-5500
Fax (217) 524-4177

cc: Melanie Gregory, BHE Environmental, Inc.

Attachment

Invenergy Wind LLC Pleasant Ridge Energy Facility
Livingston County

Wildlife Impact Recommendations

Livingston County may wish to consider permit conditions requiring the applicant to monitor, assess, and report possible fish and wildlife effects of the proposed action in the following ways.

- Incorporate best management practices to minimize risk to federally-listed and state-listed species, as outlined in this Attachment. Focus should be on appropriate avoidance and minimization of habitat disturbance, with mitigation measures implemented as applicable.

- Where feasible, permanent engineering solutions to soil erosion and water quality issues should be required and maintained, particularly with reference to service and access roads.

- Perform pre-construction assessments of avian and bat usage within the project area. Such assessments should include inventories of habitat types in and near the project area, including crop rotations or choices, and observations of both migratory and resident bird usage. Consideration of all seasons should be included, although spring migration is anticipated to be of greatest interest. Acoustic bat activity monitoring is also appropriate, particularly during the fall migratory season when activity would be expected to be highest. Specific federally-listed and state-listed species of interest are discussed in the following narrative. Risks to protected species should be evaluated and appropriate regulatory permits sought for potential incidental taking of protected animals.

- Perform at least one year of post-construction monitoring and assessment, noting any changes in wildlife usage patterns and evaluating potential causes of such changes.

- Consideration should be given to periodic repetition of the post-construction wildlife surveys during the life of the project.

Natural resources within, or in the vicinity of, the proposed wind energy facility are listed below, along with a discussion of potential issues.

Vermilion River (Illinois River Drainage)

The project area is drained by three major tributaries of the Vermilion River (Illinois River Drainage): The North Fork, the South Fork, and Indian Creek. Below Pontiac, the Vermilion River is rich in aquatic fauna, including a number of State-listed endangered or threatened fish and mussels, described further below. The northern tributaries of the North Fork are very rich in mussel diversity, with a number of them being designated as Illinois Natural Area Inventory (INAI) Sites because they support more than ten species of mussels. This high level of mussel

diversity implies a similarly rich diversity of fish hosts, despite the presence of dams at Pontiac which interrupt upstream movement of migratory fishes. Consequently, it remains prudent to assume that fish species documented downstream of Pontiac are also present above Pontiac.

The construction and long-term operation of wind power facilities pose the risk of damage to these aquatic resources through erosion, sedimentation, and siltation. Particular care should be taken to assure that permanent installations, such as service roads on private property, are adequately engineered and maintained to prevent soil losses and their adverse effects downstream.

Weston Cemetery INAI Site and Nature Preserve

The five-acre Weston Cemetery Prairie is located just south of Weston, McLean County, about three miles outside of the project footprint, and distant enough that it will be unaffected by any direct physical effects of the proposed action. However, it is likely that wind turbines will be visible from the Nature Preserve.

Sibley Grove INAI Site and Nature Preserve

The 50-acre Sibley Grove Nature Preserve is located just southeast of Sibley, Ford County, outside of the footprint and distant enough that it will be unaffected by direct effects of the proposed action. However, at less than five miles, many turbines will be visible from the Nature Preserve, and the Preserve provides breeding, wintering, and staging habitat for a number of State-listed endangered or threatened migratory bird species which may be at risk from wind turbine or power line collisions inside the footprint.

Sibley State Habitat Area

This 643-acre property of the Department of natural Resources is located about three miles south of the project area, in Ford County. The SHA is undergoing grassland restoration, and provides breeding, wintering, and staging habitat for a number of migratory birds species, including Northern Harriers and Short-Eared Owls (see below).

Documented Listed Species

Loggerhead Shrike, *Lanius ludovicianus*.

The threatened Loggerhead Shrike is adapted to the savanna conditions of interspersed grasslands, shrubs, and trees. This species has been adversely affected by the decline in animal husbandry and the abandonment of the "shelter-belt" fence-row conservation practice, which has severely reduced both breeding and foraging habitat. The Shrike, also known as the "butcher bird," needs thorny trees and shrubs, even barbed wire, on which to impale its prey, which may be left for several days before being eaten. Areas which support large insects and small rodents, major food items, are also necessary. Due to losses of suitable habitat, Loggerhead Shrikes may attempt reproduction in trees near human habitations and in other areas where they would normally not be expected.

The nearest documented Shrike breeding record since listing is a 2007 record located in McLean County five miles west of Fairbury, but only two miles outside the project footprint. A number of other recent records exist in McLean County, and this bird is broadly distributed across the State.

The primary consideration for wind energy facilities is the potential for further loss of remaining Shrike habitat, if fence-rows are cleared to avoid wind turbulence or to improve turbine exposure, or if road-side trees are cleared to create turning radii for turbine carriers or to establish power lines. A pre-construction survey to identify the presence of Shrike nests should be conducted for areas with suitable habitat if work is proposed during the breeding season in order to avoid direct mortality. "Resident" foraging birds are not thought to be at significant risk from operating wind turbines, but potential risk associated with migrants should be considered.

Upland Sandpiper, *Bartramia longicauda*.

This State-listed threatened grassland bird prefers habitat of short-grass prairie/pasture. For many years this ground-nesting species was thought to be area sensitive, requiring ten acres or more of grassland habitat for successful breeding. However, many recent breeding efforts are occurring in grassed waterways of row-crop fields, which provide considerably less than ten acres of habitat, and from along roadsides.

A 1994 breeding record for the Upland Sandpiper exists for an area along the County Line three miles southeast of Chatsworth, within the project footprint, and three other breeding records were established in 2005 near Blackstone in northwestern Livingston County, indicating this species may be found across the County where suitable habitat exists.

There has already been at least one instance (in 2008) of identification of Upland Sandpipers at the commencement of wind project construction in Stephenson County, a county which had, until then, no prior breeding record for this species. Therefore a lack of recent observations does not prove the species is absent from any given area.

The Upland Sandpiper engages in an aerial courtship display which passes through the rotor-swept elevations of utility-scale wind turbines, placing it at risk of collision mortality. Whether this species will be sensitive to the proximity of vertical structures, or to shadow "flicker" on potential nesting areas, has not been demonstrated, but such shadows may prove to be an issue.

The Department recommends mapping all habitat types within the project footprint, and checking even relatively small areas of appropriate habitats for the presence of this species prior to any initiation of construction disturbance during the breeding season.

Potential Listed Species

Henslow's Sparrow, *Ammodramus henslowii*.

The Henslow's Sparrow is listed by Illinois as a threatened species. Breeding populations of this grassland bird have been documented in LaSalle, McLean, Ford, and Iroquois Counties, and may occur within the project area where suitable habitat exists, or as a migrant.

As a breeding bird, the Henslow's Sparrow is area-sensitive, requiring minimum amounts of contiguous habitat. It is sensitive to and avoids vertical structures and habitat openings, such as roads and trails, which fragment habitat. Wind turbines have the potential to fragment otherwise suitable habitat, exclude or displace breeding birds from suitable habitat, and to kill or injure birds through blade-strike. The response of this species to the presence of distant, yet visible, wind turbines has yet to be documented.

Short-Eared Owl, *Asio flammeus*.

The endangered Short-Eared Owl nests and winters in grasslands and wetlands. Livingston County lies within both breeding and wintering ranges, although breeding Short-Eared Owls have not been reported in Livingston County since they were listed. However, large numbers of wintering owls have been observed in suitable winter habitat in McLean, Ford, and Iroquois Counties.

Highly nomadic, the Short-Eared owl depends heavily on vole and mouse populations, and the size of its breeding and hunting territories varies inversely with prey population sizes. When prey populations are high, owls may be ground-roosting every few meters in suitable habitat. The Northern Harrier (also listed, see below) often harasses this Owl, stealing its food.

This Owl's hunting flights are often less than ten feet off the ground (a circumstance which makes this bird highly vulnerable to collisions with vehicles); during aerial mating rituals, flights occur at typical wind turbine rotor-swept height. This Owl is highly dependent on its acute hearing to locate and seize prey. The degree to which noise from wind turbines may interfere with predation behavior is unknown.

The effects of wind turbines on Short-Eared Owls may be heavily influenced by the proximity of turbines to breeding, roosting, and hunting areas. Once turbines are built, this proximity relationship will be subject to change as land owners alter land management practices. This is likely to be of concern mainly if attractive habitat for Owls and their prey is created within or near the turbine array following construction.

Barn Owl, *Tyto alba*.

This endangered raptor nests in larger tree cavities and in barns or abandoned buildings, sometimes within city limits. A 1990 breeding record exists for Ford County, west of Melvin, about five miles south of the project footprint; none have been recorded from Livingston County since the species was listed.

This owl hunts both open woodlands and grasslands; its preferred prey consists of small rodents such as mice and voles. The main risk posed by wind power facilities to this species is the

removal of suitable nesting trees and abandoned buildings to facilitate transportation of wind turbine components or to maximize wind energy conversion. Both trees and buildings should be examined for Barn Owl occupancy prior to removal.

Northern Harrier, *Circus cyaneus*.

The State-listed endangered Northern Harrier (sometimes called the Marsh Hawk) is a ground-nesting grassland hawk. It has not been recently documented as nesting in Livingston County, but is a frequently-observed migrant. The species has a statewide range. While many sources indicate the species needs large open areas of habitat, Illinois studies have demonstrated this hawk can use relatively small patches of habitat for successful breeding, especially in the vicinity of larger habitats. Breeding is often associated with wetlands such as marshes, sedge meadows, and wet prairies.

While most hunting activities occur at fairly low altitudes, below typical rotor-swept elevations, hunting can expose this bird to collision risk. Like the Upland Sandpiper, this species engages in an aerial courtship display which places it at risk of collision with wind turbines. Wind farm construction and operation may alter concentrations of prey species.

This hawk relies heavily on its acute hearing to locate prey, and--if the noise generated by wind turbines interferes with this function (which is not known to be the case)--turbines might adversely affect their ability to hunt near the turbines, reducing available food resources.

Although this hawk typically flies at low altitudes while hunting, a percentage of flights do occur at elevations where turbine rotors could present a collision threat. If pre-construction surveys indicate use of the project area by migrant Harriers, post-construction surveys should be performed to determine whether the Harrier continues to hunt territories in proximity to turbines. If so, the risk of taking should be carefully evaluated.

Bald Eagle, *Haliaeetus leucocephalus*; Osprey, *Pandion haliaetus*.

Neither of these species are known to breed in Livingston County, but may occur as migrants. Except for areas along the Vermilion River, Livingston County lacks suitable breeding habitat.

An ill Bald Eagle was collected by IDNR staff east of Paxton, Ford County, in 1997, and an immature Osprey was injured by a wind turbine in McLean County during its Fall 2008 migration. Neither of these events was expected. The Department lacks sufficient data about migration routes and behavior for these species to estimate the frequency with which they may occur in the project area during migration. A number of current Osprey nests in Northern Illinois occur on manmade structures, and it is possible the migrating immature Osprey was attempting to perch on a wind turbine at the time it was injured.

Indiana Bat, *Myotis sodalis*.

No collections or captures of this bat are known from Livingston County. Summer nursery colonies of this bat, listed by the federal government and Illinois as endangered, have been

documented in forested riparian tracts along the Middle Fork of the Vermilion River (Wabash Drainage) and the Big Four Ditch in Ford County. Nursing females may forage above crop-fields a mile or more from the nursery colony. This species winters in caves or mines some distance from summer habitats, but its migratory behavior is poorly understood. No hibernation sites are known from Livingston County, although critical hibernating habitat is known in LaSalle County at the Blackball Mine near Peru.

The risk to bats from collisions with moving wind turbine blades appears to be up to four times higher than for birds. To date, no Indiana Bats have been documented as killed by wind turbines. But, until recently, no utility-scale wind farms have been proposed or constructed within the range of Indiana Bats, so the risk to this species from wind turbines remains unquantified.

Potential summer nursery or roosting habitat for the Indiana Bat exists along the tributaries of the Vermilion River. Individuals roosting in these areas may forage above fields within the project area. The greatest risk may be to Indiana Bats migrating across or through the project area. Efforts to identify and monitor the foraging and migration behavior of bats in the project area may establish the degree of risk which this facility could pose to this species.

The Department rates the potential for an incidental take of an Indiana Bat at this facility as low, but cannot rule it out. More common bat species undoubtedly occupy habitats in the vicinity, and are probably at risk of mortality, directly through collisions with wind turbines, or indirectly through barotrauma (lung hemorrhages caused by extremely low air pressures in the vortices created by wind turbine vanes).

It is recommended that an Anabat detector survey be conducted, particularly during the fall bat migratory season (August 1 through October 31) when activity would be expected to be the highest, in order to characterize bat activity in the project area. High frequency bat signals could indicate the presence of the Indiana Bat in the vicinity, and a high level of bat activity may warrant post-construction mortality studies.

Greater Redhorse, *Moxostoma valenciennesi*; River Redhorse, *Moxostoma carinatum*.

Both the Greater and the River Redhorse have been documented from the Vermilion River below Pontiac, as well as from tributary streams such as Rooks Creek and Wolf Creek. Several dams in Pontiac have interrupted the ability of fish to move upstream for many years. However, in the Fox River, the River Redhorse has demonstrated the ability to persist in relatively short river reaches of one-to-two miles for more than 60 years following this type of isolation from other river segments by dams upstream and downstream. The Greater Redhorse, in particular, was thought at one time to be extirpated from Illinois until re-discovered in the Vermilion River in the 1970's. Therefore the strong possibility exists that these species may still be found in the North and South Forks of the Vermilion River.

These species appear to prefer larger medium- or high- gradient streams as adults, although juveniles may prefer smaller streams and shallower waters for the first few years of their lives. Adults may reach ages of 20 years or more. Both are members of the sucker family, eating mainly invertebrates from the stream bed; River Redhorse possess specialized pharyngeal

grinding teeth which allow them to eat hard-shelled crustaceans and young mussels. Like other Redhorses (there are six other species in Illinois), spawning occurs in shallow water (< than one foot) over clean gravel and cobble bottoms with fairly strong current and well-oxygenated water, triggered at specific water temperatures.

These species are adversely affected by siltation and sedimentation which cover spawning sites and smother food resources; effective control of soil erosion during construction and operation of wind energy facilities is important for maintaining these resources. Any in-stream work may pose the risk of incidentally taking these species if present.

Spike Mussel, *Elliptio dilatata*.

The State-listed threatened Spike Mussel is found in rivers and larger creeks in sand, gravel, and cobble substrates. The fish host(s) which support this species through its parasitic larval phase are not known. Like other mussels, it feeds on plankton and detritus filtered from the water column as the current passes by. Unlike many species of mussels, the Spike requires both high and low seasonal water temperatures to trigger spawning and glochidial release, so any factor which increases or decreases seasonal temperature ranges and the temperature extremes can be detrimental. Clearing riparian trees and installing or removing agricultural field tiles are examples of factors which can affect prevailing temperature regimes.

The Spike was documented in the Vermilion River at Pontiac between 1976 and 1988; searches in the same areas as late as 2004 did not recover additional living specimens, but due to limited search efforts, this does not indicate this species is extirpated in the upper Vermilion watershed.

Siltation and sedimentation of the river bed are the main potential adverse effects associated with the construction and operation of a wind energy facility.

Migratory Birds

American Golden Plover, *Pluvialis dominica*.

This migratory bird breeds in the Arctic tundra, migrates south along the Atlantic seaboard to South America in the winter, but returns northward through central North America. Areas of Illinois and Indiana provide important spring migration staging areas, which may be occupied by this species for a month or more while birds go through a molt before resuming migration. It has become a species of concern due to its relatively low global population estimate of around 300,000 birds.

Based on 25 years of Spring Bird Count data, it is likely that significant numbers of this species congregate in Livingston County, within or adjacent to the project footprint. Because large operating wind energy facilities already exist or are currently under construction in Livingston and neighboring Counties, it is possible Plovers which usually stage elsewhere may be displaced into Livingston County. Large numbers of this species are routinely observed south of Sibley Grove in Ford County. Pre- and post-construction surveys should be performed to observe this species.

Plovers tend to aggregate in dense concentrations, and are known to fly in large tight groups through the approximate rotor-swept elevation, which may expose them to collision mortality risk. Concerns also exist pertaining to habitat fragmentation by service roads, and displacement from habitat due to potential sensitivity to vertical structures and human activity.

A research project has begun in an effort to better understand the behavior and needs of this species, as well as how it may be affected by the presence of wind turbines. Some preliminary results were recently published [O'Neal, *et. al.* (2008)] .

One apparent finding is that the species definitely concentrates in a few areas, rather than being generally dispersed across suitable habitat, resulting in temporarily dense population "hot-spots." However, where these may be located may be influenced year-to-year by poorly understood climatic cues. Very few birds appeared in 2008 in the expected concentration areas; instead, major concentrations occurred more than one hundred miles to the south. Anecdotal evidence indicates this is an unusual occurrence.

A number of observers had reported a daytime habitat preference for short grass, soybean stubble, or bare ground with standing water or residual moisture, but O'Neal first reported a night roost preference for standing corn stubble cover, with crepuscular movement between the two. O'Neal reported all observations of Plovers were located more than 70 meters from adjacent roads, suggesting an intolerance for breaks in habitat. (Effects of traffic were not investigated.) Interestingly, O'Neal also reported several observations of predation of the Golden Plover by the Northern Harrier, suggesting that species may follow large flocks of Plovers.

Smith's Longspur, *Calcarius pictus*

The Smith's Longspur breeds along the northern margin of the boreal forest, wintering in southern Missouri and southwestern Illinois, and returning north through Illinois in the early spring, a few weeks earlier than the Golden Plover. Consequently, it is rarely recorded during Spring Bird Counts. The global population estimate for this species is a mere 75,000 birds. Moving in small flocks of 10-20 individuals, local flights are at high speed within rotor-swept elevations. It has similar habitat preferences to that of the Plover. Sensitivity to the presence of vertical structures is unknown.

Whooping Crane, *Grus americana*, and Sandhill Crane, *Grus canadensis*.

An experimental population, now close to 100 individuals in number, of the federally-listed endangered Whooping Crane has been established with breeding grounds in Wisconsin and wintering areas in Florida. Spring and Fall migrations take these very large birds through Illinois. Whooping Cranes often "stop over" during migration and this may occur virtually anywhere in the State. The State-listed threatened Sandhill Crane, which breeds in Illinois, may accompany Whooping Cranes during migration in mixed flocks, as well as in flocks consisting solely of Sandhill Cranes.

Whooping Cranes do "stop over" in Livingston County, sometimes for extended periods. In November 2006, during their first unescorted Fall Migration, a pair of Cranes rested for four days along the upper East Branch Vermilion River (Wabash Drainage) in Ford County, just beyond the Livingston County Line. Nearly 100 Sandhill Cranes were observed in Ford County during spring migration in 2008. And during the Fall 2008 migration, 22 Whooping Cranes "stopped-over" in western Livingston County for several days.

Part of the "experimental" aspect of the Eastern Migratory Flock of Whooping Cranes is the use of ultra-light aircraft to teach captive-bred Crane chicks the migration route to Florida. In the past, this route avoided Livingston County, but in 2008 the route was shifted westward, and now passes directly through Livingston County with a planned "stop-over" there. In 2008, as it turned out, favorable winds carried the first-year cohort across Livingston County without a stop. However, one of the 14 young birds refused to fly over a wind energy facility in McLean County at an elevation of 2,500 feet, and had to be led around. This suggests that, for a segment of the Whooping Crane population, the sight of wind turbines could pose an issue during migration.

During "stop-overs," which may last several days or weeks, cranes often forage on waste corn in nearby agricultural fields, and seldom rise to high altitudes when doing so. Wind turbines and associated power lines pose a collision risk for these large birds, which require some distance to achieve safe altitudes. Most non-predation losses to this flock have been to power line collisions, presumably during foraging activities, or when arriving or departing roosting areas.

One strategy to reduce the danger to these species is to avoid siting turbines close to potential stop-over habitat (ponds or wetlands of any type). (In November 2007, photographic evidence was obtained of a Whooping Crane and about 50 Sandhill Cranes foraging well within a quarter mile of a Wisconsin wind turbine, suggesting these species are not deterred by the presence of a turbine.) Buffers as great as five miles have been suggested, but in Illinois' landscape such buffers would preclude wind turbines in most locations, and have not been shown to be necessary.

Alternatively, stop-over habitat more distant from planned turbine locations could be enhanced to be more attractive to cranes and draw then away from danger (although the factors which cause cranes to choose particular sites are poorly understood). The visibility of power lines should be maximized with appropriate line markers. The developer may wish to consider other voluntary efforts to promote Crane conservation.
Due to the extremely high public profile of the Whooping Crane, the Department suggests the developer/operator of this particular facility coordinate at least annually with the Whooping Crane Eastern Partnership (www.bringbackthecranes.org) to track the passage of Whooping Cranes through the vicinity, and explore additional measures to reduce potential losses of these birds. If either species is consistently observed in proximity to wind turbines or associated power lines, the developer or operator should seek an Incidental Take Authorization from the appropriate regulatory agency.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Rock Island Field Office
1511 47th Avenue
Moline, Illinois 61265
Phone: (309) 757-5800 Fax: (309) 757-5807

IN REPLY REFER TO:
FWS/RIFO

November 12, 2008

Mr. Melanie Gregory
Project Manager
BHE Environmental, Inc.
11733 Chesterdale Road
Cincinnati, Ohio 45246

Dear Ms. Gregory:

This responds to your letter of September 22, 2008, requesting our comments on proposed plans for a wind farm development in Livingston County, Illinois. Thank you for the opportunity to review the proposed location and provide information concerning threatened and endangered species, as well as non-listed migratory species.

Threatened and Endangered Species

To facilitate compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, Federal agencies are required to obtain from the U.S. Fish and Wildlife Service (Service) information concerning any species, listed or proposed to be listed, which may be present in the area of a proposed action.

As of August 9, 2007, the bald eagle is no longer included on the list of threatened and endangered species. It remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. For more information go to http://www.fws.gov/midwest/eagle/guidelines/index.html.

We are furnishing you the following list of species which may be present in the concerned area:

Habitat Descriptions for Federal Threatened and Endangered Species in Livingston County, Illinois

The endangered **Indiana bat** (*Myotis sodalis*) is known to occur in several Illinois counties, but we are unaware of any records for Livingston County. Potential habitat for this species occurs statewide; therefore, Indiana bats are considered to potentially occur in any area with forested habitat.

Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. The species or size of tree does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present.

During the summer, the Indiana bat frequents the corridors of small streams with riparian woods as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, over farm ponds, and in pastures.

Suitable summer habitat in Illinois is considered to have the following characteristics within a ½ mile radius of a project site:

1) forest cover of 15% or greater;
2) permanent water;
3) one or more of the following tree species: shagbark and shellbark hickory that may be dead or alive, and dead bitternut hickory, American elm, slippery elm, eastern cottonwood, silver maple, white oak, red oak, post oak, and shingle oak with slabs or plates of loose bark;
4) potential roost trees with 10% or more peeling or loose bark

If the project site contains any habitat that fits the above description, it may be necessary to conduct a survey to determine whether the bat is present. In addition, a search for this species should be made prior to any cave-impacting activities. If habitat is present or Indiana bats are known to be present, they must not be harmed, harassed, or disturbed, and this field office should be contacted for further assistance.

The **eastern prairie fringed orchid** *(Platanthera leucophaea)* is considered to potentially occur statewide in Illinois based on its historical records and habitat distribution, but we are unaware of any records for Livingston County. It occupies mesic to wet grassland habitats. There is no critical habitat designated for this species. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage, or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. Growth of the prairie fringed orchid begins in May and flowering occurs in July. This species should be searched for whenever wet prairie remnants or other wet meadows are encountered.

The **prairie bush clover** (*Lespedeza leptostachya*) is listed as threatened and considered to potentially occur statewide in Illinois based on its historical records and habitat distribution, but we are unaware of any records for Livingston County. It occupies dry to mesic prairies with gravelly soil. There is no critical habitat designated for this species. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage, or removal

of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever prairie remnants are encountered.

In order to determine if your project "may affect" these species, we invite you to use a new tool the Service has designed to help with the consultation process – the new Section 7(a)(2) Technical Assistance webpage (http://www.fws.gov/midwest/endangered/section7/s7process/index.htm). By following the instructions, you can determine what your action area is, whether listed species may be found within the action area, and if the project may affect listed species.

You will find several products on the site that can streamline the consultation process for this and future projects. When determining if listed species may be located within a project area, you can download county specific species lists for all of the states in Region 3. Species specific best management practices will also eventually be available. Example letters and templates are available to assist with documenting "no effect" determinations and preparing requests for "not likely to adversely affect" concurrence.

The website's step-by-step process includes a specific section for HUD, pipeline, and telecommunications projects. This part of the site includes specific activities which appropriately fit the criteria for a no effect determination and includes a printable form for documenting the determination for your administrative record.

Wetlands

Because wetlands are vital as flood water retention areas and for groundwater retention and filtration, and also because they provide habitat for many plants and animals, priority consideration should be given to avoid impacts to these wetland areas. Any future activities in the study area that would alter these wetlands may require a Section 404 permit. Unavoidable impacts will require a mitigation plan to compensate for any losses of wetland functions and values. The U.S. Army Corps of Engineers, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61201, should be contacted for information about the permit process.

Migratory Birds

In addition to trying to ensure that proposed wind power turbines do not adversely affect threatened and endangered species, the Service is also interested in minimizing potential impacts to other wildlife resources, particularly migratory birds. The siting of new turbines creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating neotropical songbirds. The problem is especially acute at tall, lighted, guyed turbines, particularly in inclement night weather conditions during spring and fall songbird migrations. The construction of wind power turbines which results in mortality to birds is contrary to the Migratory Bird Treaty Act (MBTA) and the Code of Federal Regulations at Part 50 designed to implement the MBTA. Some of the species which may be affected are also protected under the Endangered Species Act and Bald and Golden Eagle Act.

The Migratory Bird Treaty Act (16 U.S.C. 703-712) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. While the Act has no provision for allowing unauthorized take, it must be recognized that some birds may be killed at structures such as wind farm turbines, even if all reasonable measures to avoid it are implemented. The Service's Division of Law Enforcement carries out its mission to protect migratory birds not only through investigations and enforcement, but also through fostering relationships with individuals and industries that proactively seek to eliminate their impacts on migratory birds.

The American Golden Plover (*Pluvialis dominica*) and the Smith's Longspur (*Calcarius pictus*) are both species that pass through Illinois primarily during the spring migration (mid-March to late April) with the greatest numbers reported in the east central portion of Illinois (including large concentrations in Livingston County). These species also may overwinter or stage migrations in Illinois. Livingston County is the locus for a spring migration staging area for the plover, where they spend about two months during a molt.

Research into the actual causes of bird collisions with towers is limited. A Wind Energy Working Group composed of government agencies, industry, academic researchers, and non-government organizations has been formed to develop a research protocol to determine the best ways to construct turbines to minimize bird strikes. To assist field staff in the review of wind farm proposals until the results of that research are available, the Service is working to develop standard recommendations based on a review of currently available information. We refer you to the Service Interim Guidance on Avoiding and Minimizing Wildlife Impacts from Wind Turbines at our website: http://www.fws.gov/habitatconservation/wind.htm.

Site Development Recommendations

1. Avoid siting turbines on major bird migration corridors or in areas where birds are highly concentrated, unless mortality risk is low (i.e., birds present rarely enter the rotor-swept area, such as sage grouse). Examples of high concentration areas for birds are wetlands, State or Federal refuges, staging areas, rookeries, and landfills. Avoid known migratory or daily movement flyways and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility.

2. Site turbines to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls). For example, golden eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include avoiding siting turbines in a dip or pass in a ridge.

3. Avoid placing turbines near bat hibernation and breeding colonies, in migration corridors, and in flight paths between colonies and feeding areas.

4. Avoid siting turbines in habitats of any species of wildlife, fish, or plant protected under the Endangered Species Act.

5. Develop a habitat restoration plan for the proposed site in conjunction with Federal, State, and local natural resource managers that avoids negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors; remove carrion, and practice responsible animal husbandry to avoid attracting bald eagles and other raptors.

6. Configure turbines to minimize mortality; for example, orient rows of turbines parallel to known bird movements.

7. Where the height of the rotor-swept area produces a high risk for wildlife, adjust tower height where feasible to reduce the risk of strikes.

Turbine Design and Operation Recommendations

1. Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities. Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting. Do not use guy wires for turbine or meteorological tower supports (*see Mitigating Bird Collisions with Power Lines. APLIC. 1994).*

2. If taller turbines (top of the rotor-swept area is >199 feet AGL) which require lights for aviation safety must be constructed, the minimum amount of pilot warning and obstruction avoidance lighting specified by the Federal Aviation Administration (FAA) should be used. Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.

3. Where feasible, place electric power lines underground to avoid electrocution of birds. Use *Mitigating Bird Collisions With Power Lines* (APLIC 1994), and *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* (APLIC, 2006) for any required above-ground lines, transformers, or conductors.

The Service recommends that all sites be monitored for impacts on wildlife after construction is completed. Post-construction monitoring is important to the Service, industry, and public because of the limited information available on impacts of wind turbines and wind resource areas on wildlife. Therefore, post-construction monitoring should be designed to detect major impacts. The intended timeframe for post-construction monitoring is not expected to exceed three years, however. Major impacts may be considered as statistically significant increases in mortality rates of any wildlife. Monitoring effort may be intensive or cursory, depending on results of pre-construction use and mortality studies. Simple, infrequent mortality surveys on impact and control plots may be all that is needed at wind resource areas where recorded pre-construction use by wildlife was low. We strongly recommend the use of dogs trained to detect bird and, if possible, bat carcasses to assist human visual location of carcasses. At least three turbines (allowing for at least two degrees of freedom in statistical analysis), selected at random,

have the entire search rectangle groomed to compare with those that have only mowed search strips. An alternative to grooming the entire search area for selected turbines would be to erect small-bar nets over random portions of the search area to collect carcasses. This would allow for more complete visual location and also provide a control on the impact of ground scavengers. The monitoring plan should include recording any injured bats that are also found in the search area.

These comments provide technical assistance only and do not constitute the report of the Secretary of the Interior on the project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act, do not fulfill the requirements under Section 7 of the Endangered Species Act, nor do they represent the review comments of the U.S. Department of the Interior on any forthcoming environmental statement.

We also recommend that you contact the Illinois Department of Natural Resources for information on any state listed species or resource concerns in the project area. We are aware that they have mapped areas of concern for wind farm sitings. If you have questions, please contact Heidi Woeber of my staff at (309) 757-5800, extension 209.

Sincerely,

Richard C. Nelson
Field Supervisor

S:\Office Users\Heidi\windLivingstonCoILBHE112008.doc

Literature Cited

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006 (CEC-500-2006-022). Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: the State of the Art in 1994. Edison Electric Institute, Washington, D.C. 78 pp.

APPENDIX B
Photographs

Photo 1. Typical agricultural land use, 3 miles east of Town of Forrest.

Photo 2. Typical agricultural land use, 3 miles southeast of Town of Forrest.

Photo 3. Typical degraded, channeled/grassy watercourse, South Fork Vermilion River 3 miles southeast of Town of Forrest.

Photo 4. Typical agricultural land use, 4 miles south of Fairbury.

Photo 5. Indian Creek, 4 miles south-southwest of Fairbury.

Photo 6. Indian Creek, 4 miles south-southwest of Fairbury.

Photo 7. Typical degraded, channeled/grassy watercourse, tributary to South Fork Vermillion River 6 miles south of Fairbury.

Photo 8. South Fork Vermillion River 4 miles north of Fairbury.

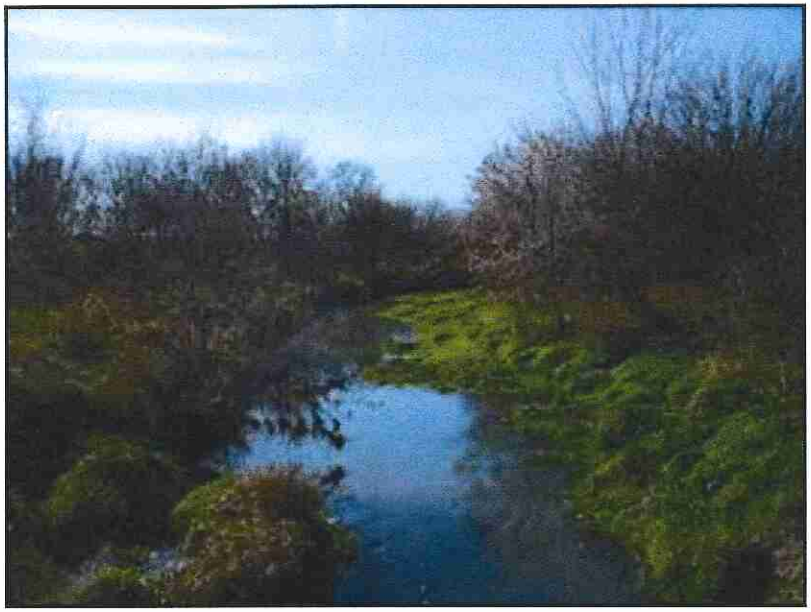


Photo 9. Hickory Creek 7 miles northwest of Fairbury.

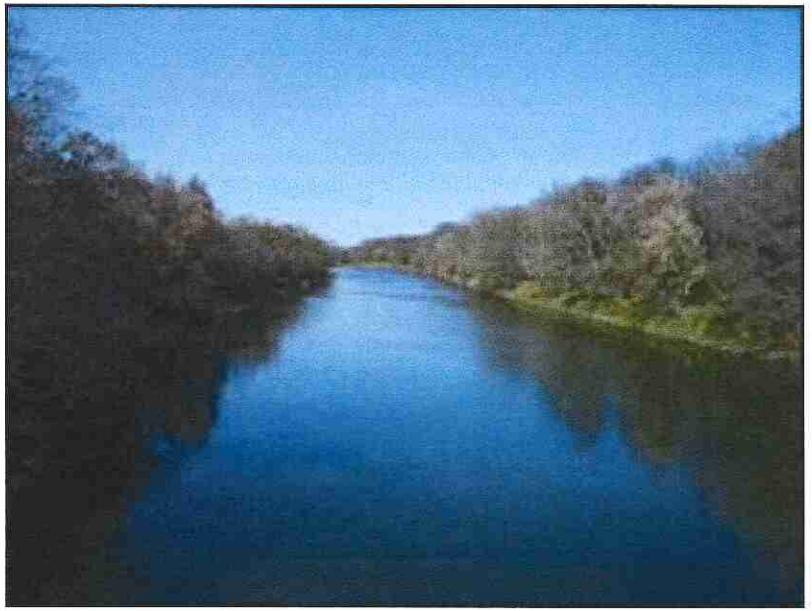
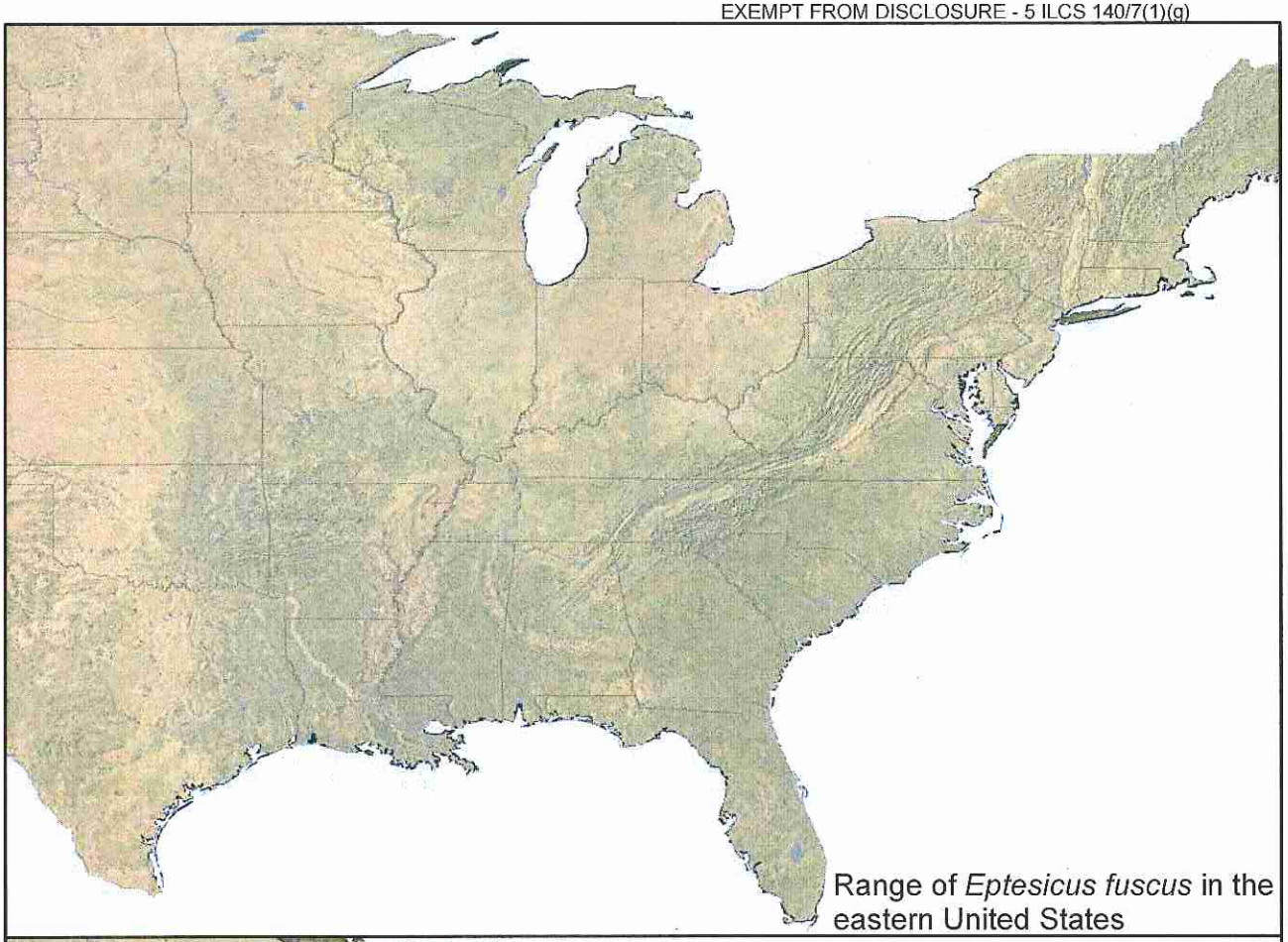


Photo 10. Vermilion River 7 miles northwest of Fairbury.

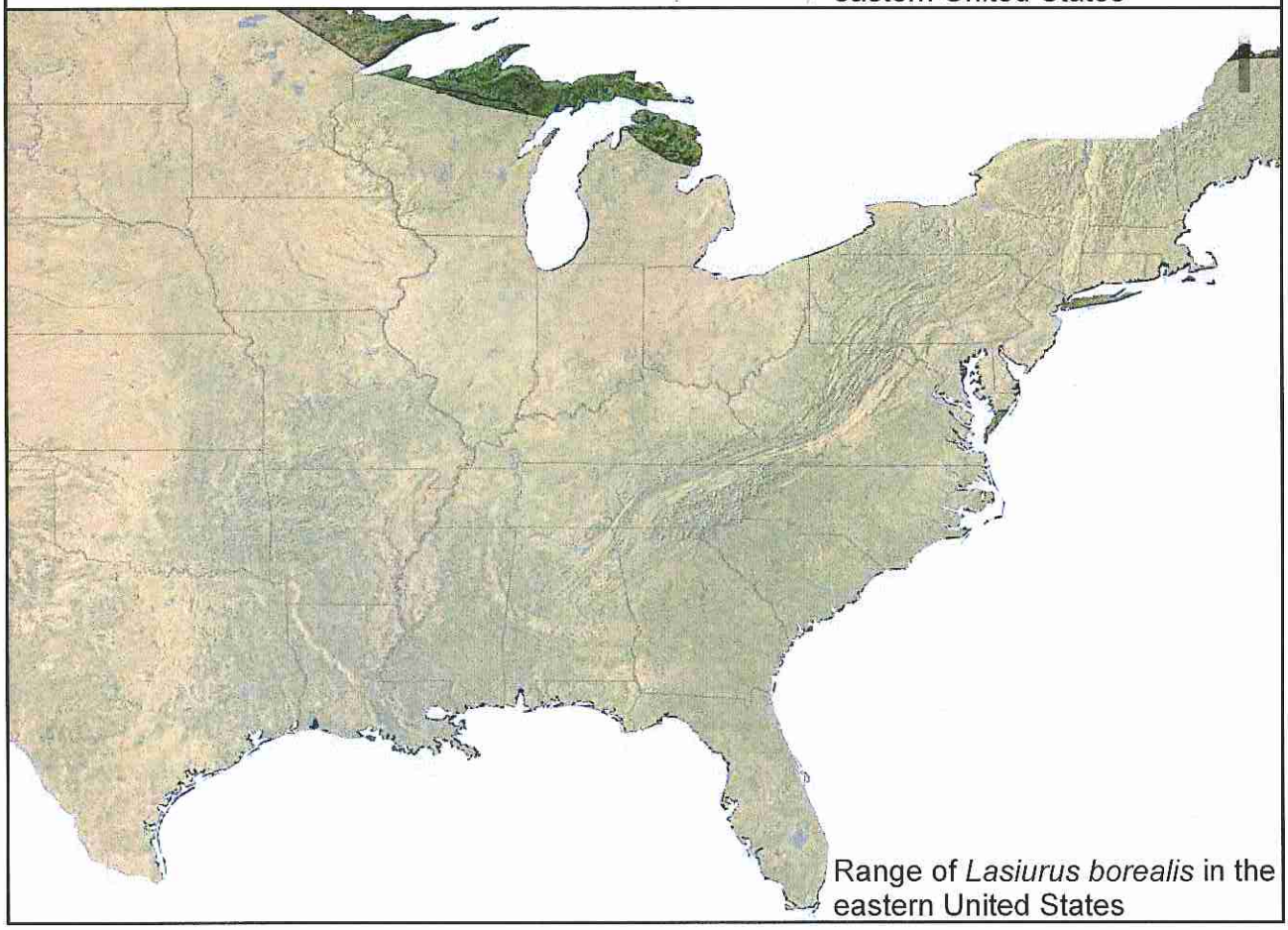
Photo 11. Typical agricultural land use, 6.5 miles northwest of Fairbury.

Photo 12. Typical agricultural land use, 3 miles east-northeast of Town of Forrest.

APPENDIX C
Bats of the Pleasant Ridge Project Planning Area: Range Maps

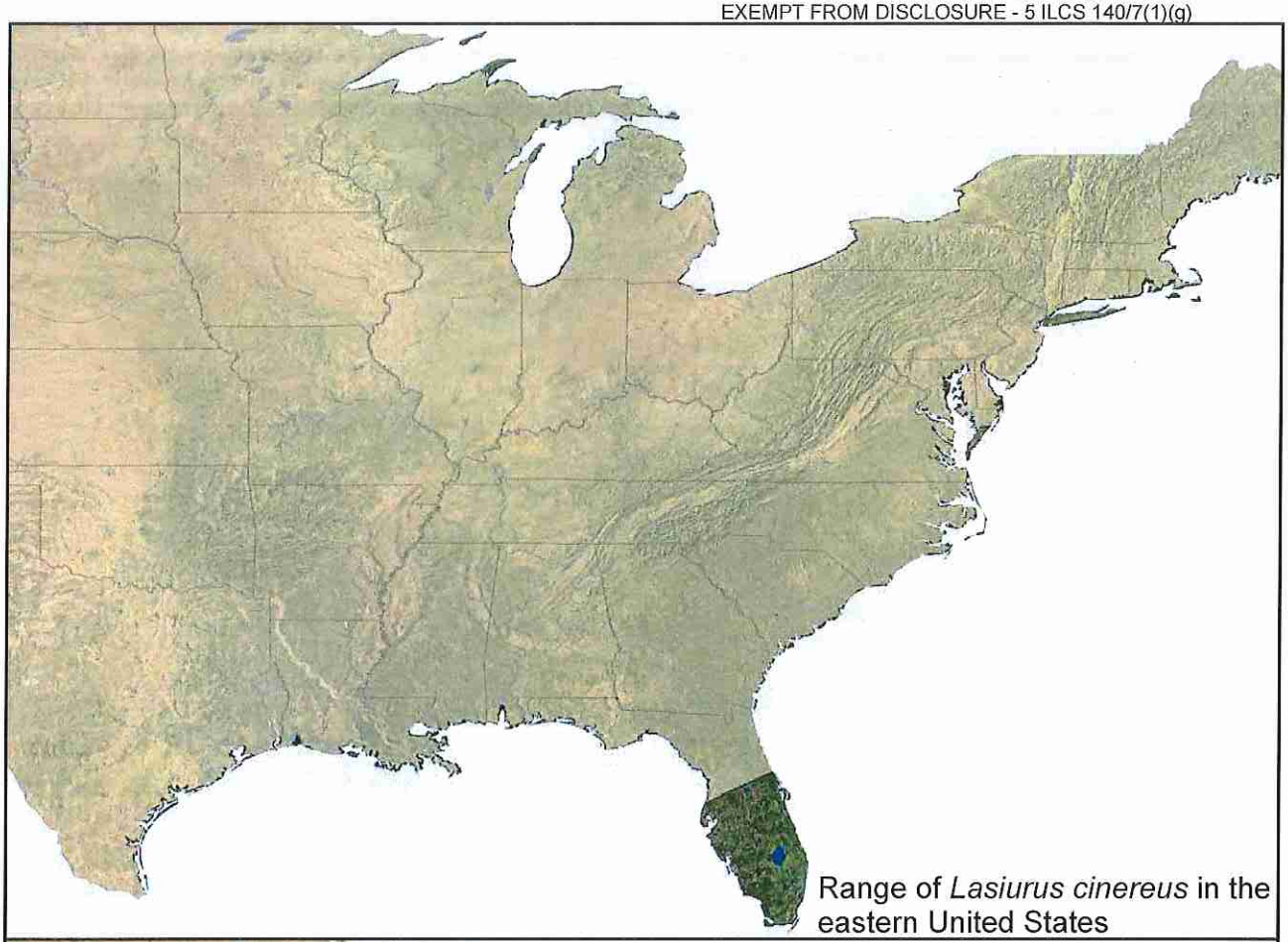


Range of *Eptesicus fuscus* in the eastern United States

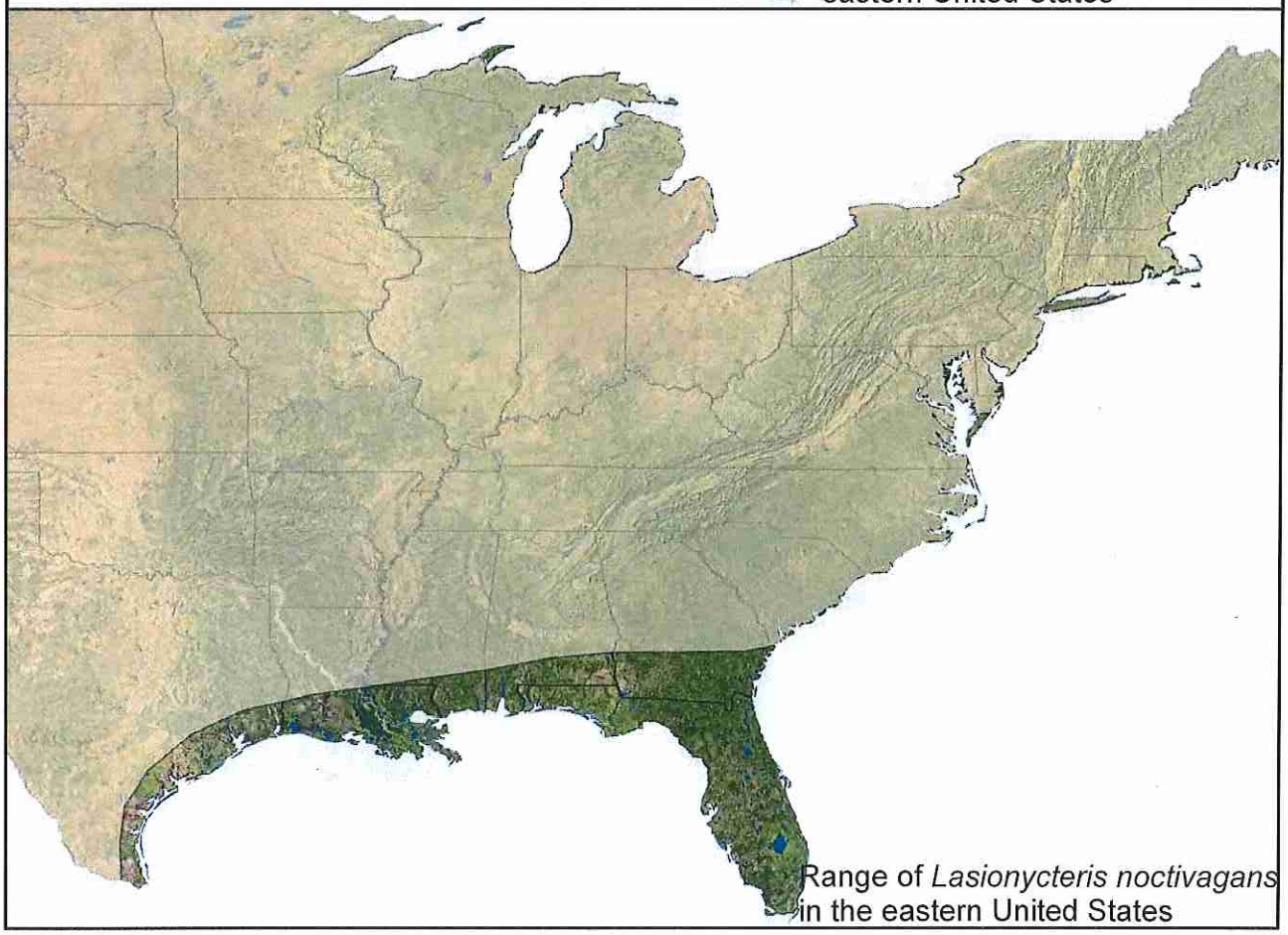


Range of *Lasiurus borealis* in the eastern United States

Bat Range data obtained from - http://www.natureserve.org/getData/mammalMaps.jsp (06/21/2005)



Range of *Lasiurus cinereus* in the eastern United States



Range of *Lasionycteris noctivagans* in the eastern United States

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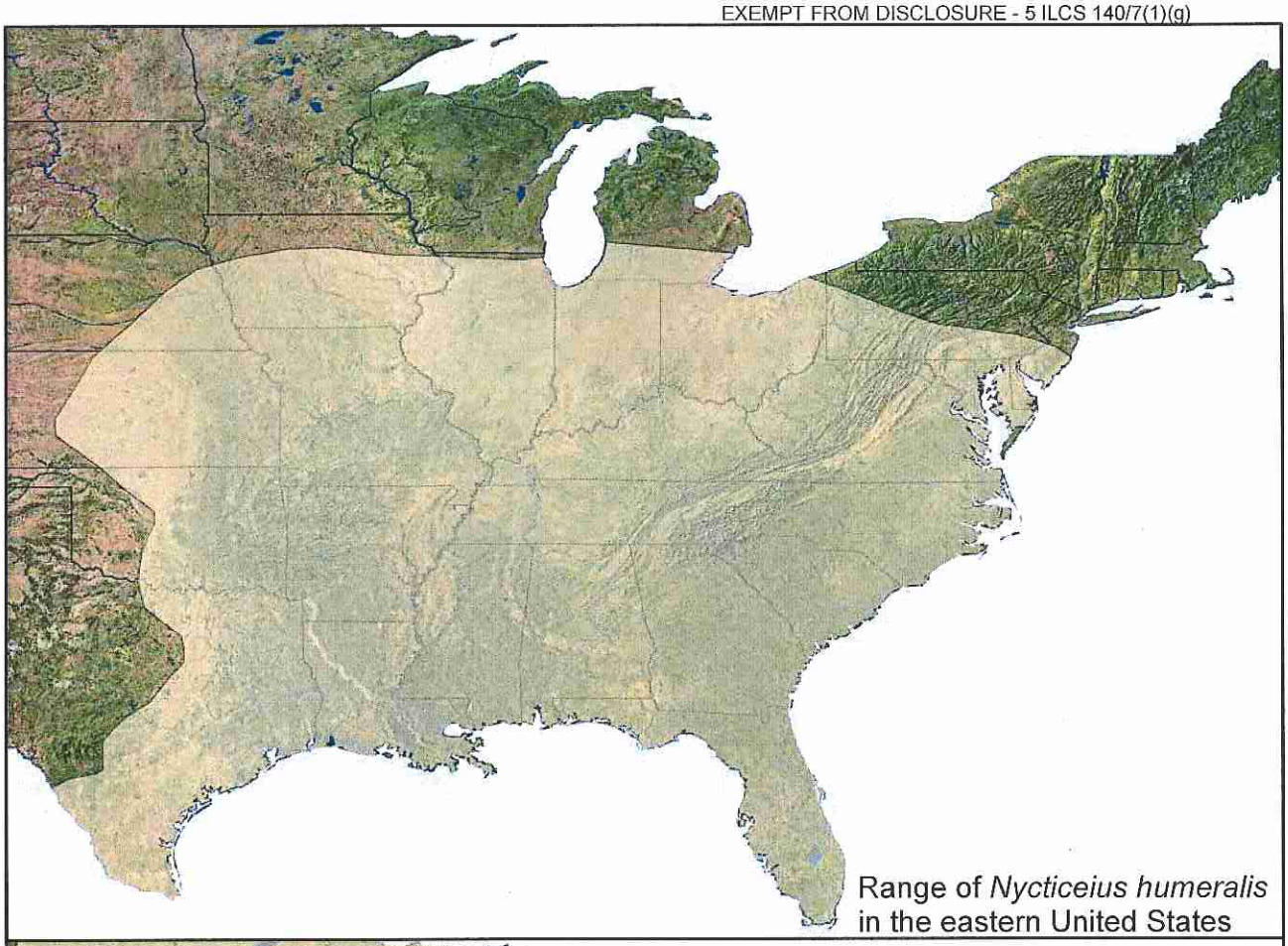
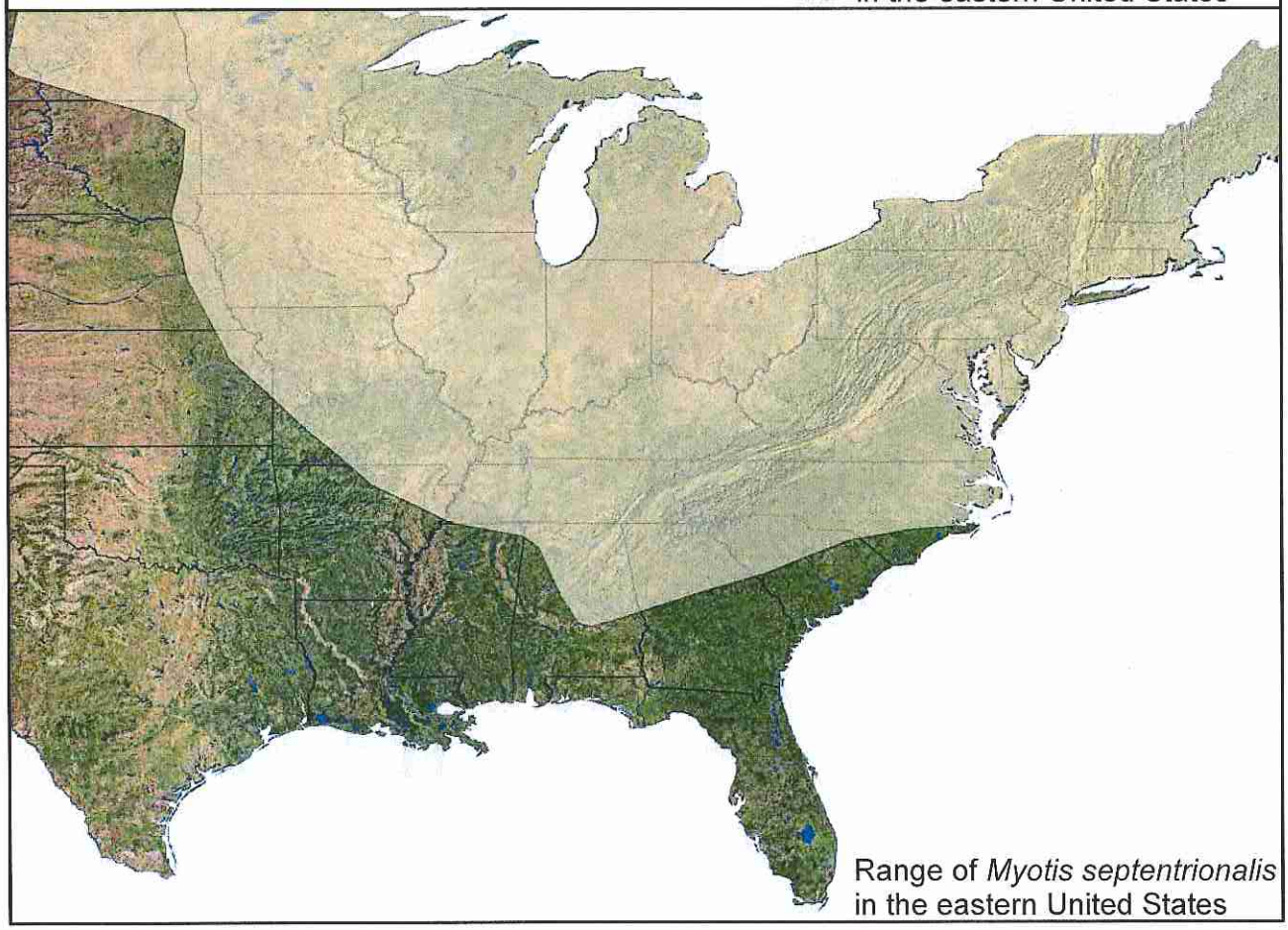


Range of *Nycticeius humeralis* in the eastern United States



Range of *Myotis septentrionalis* in the eastern United States

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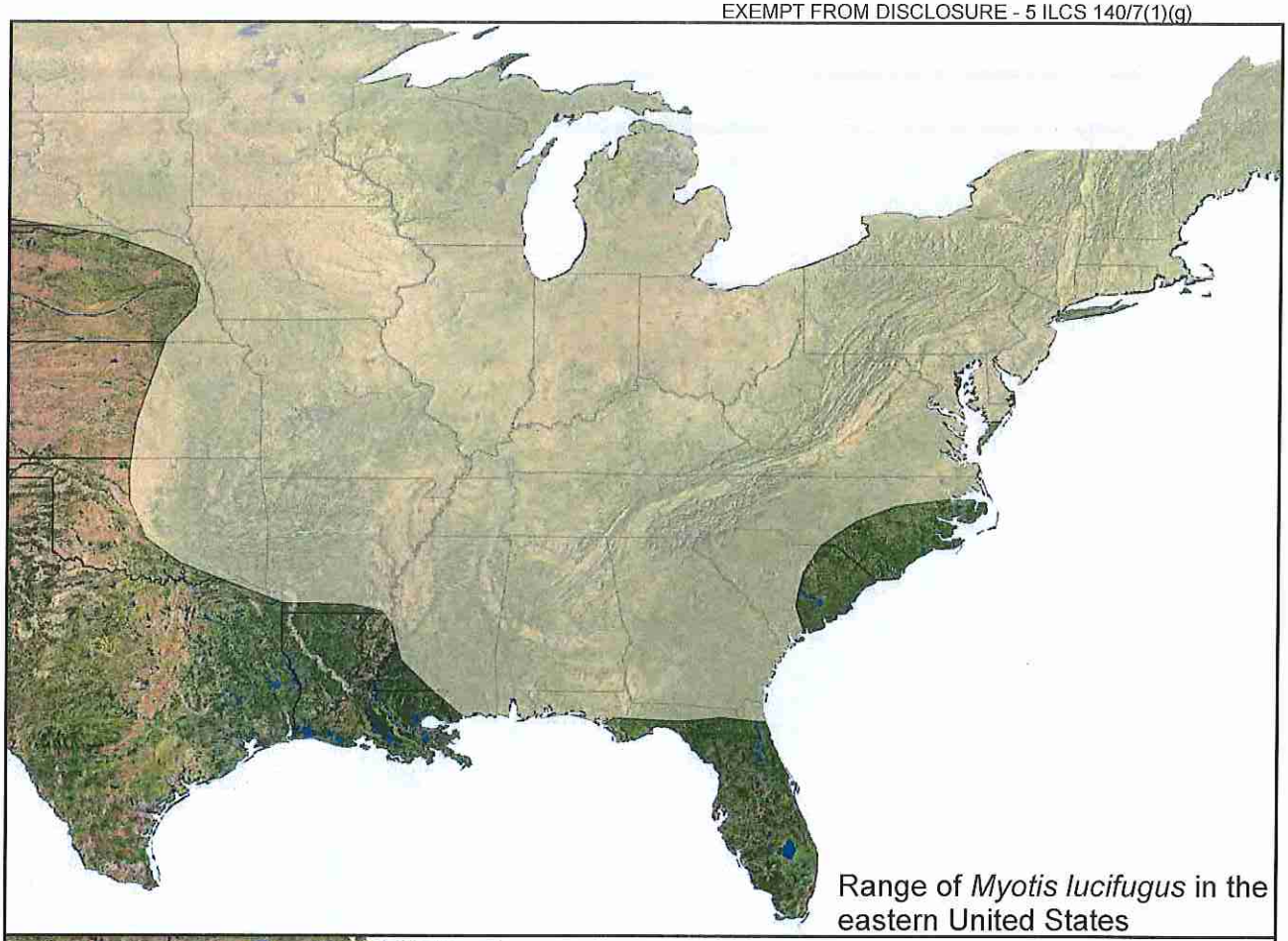
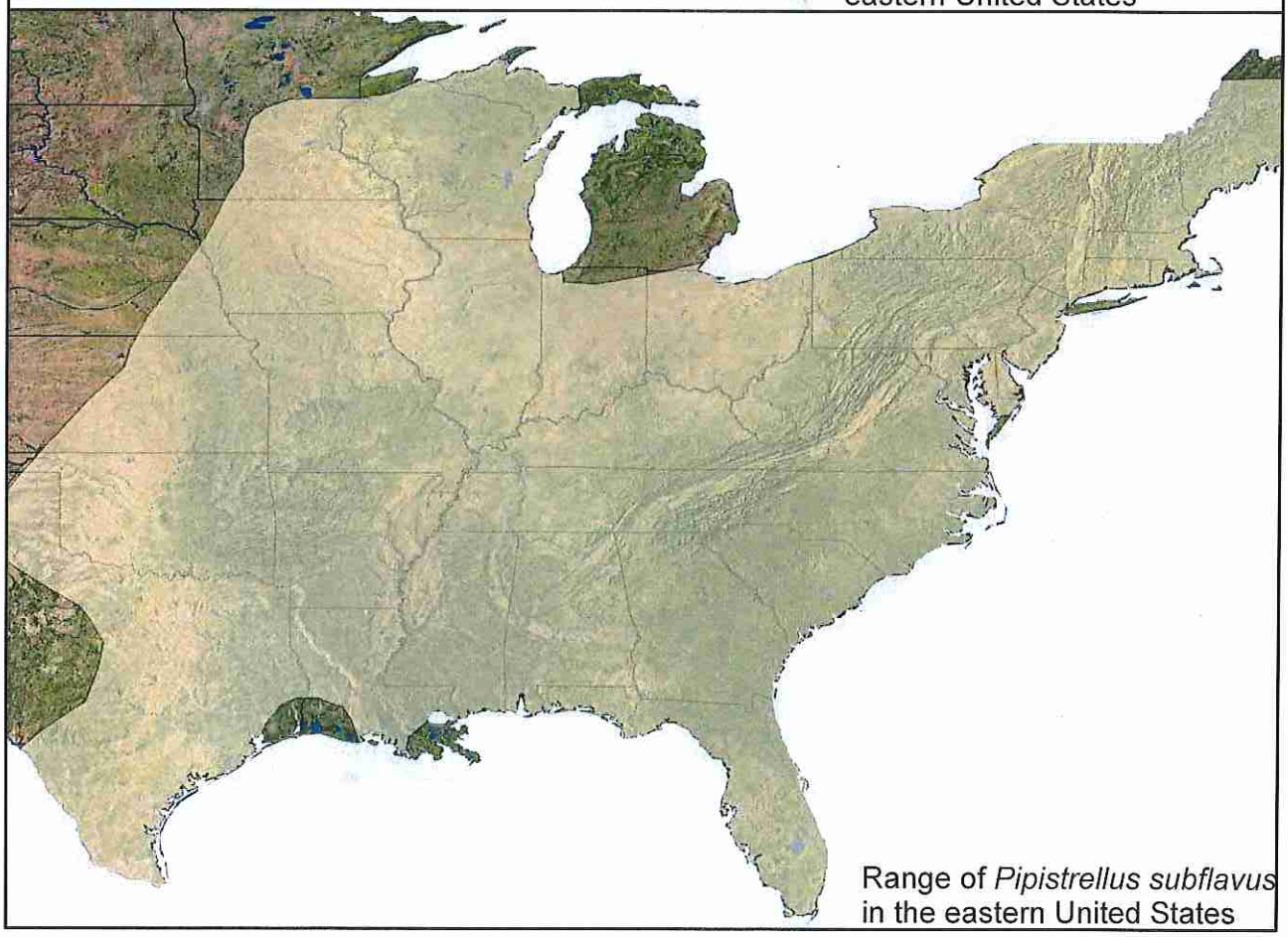
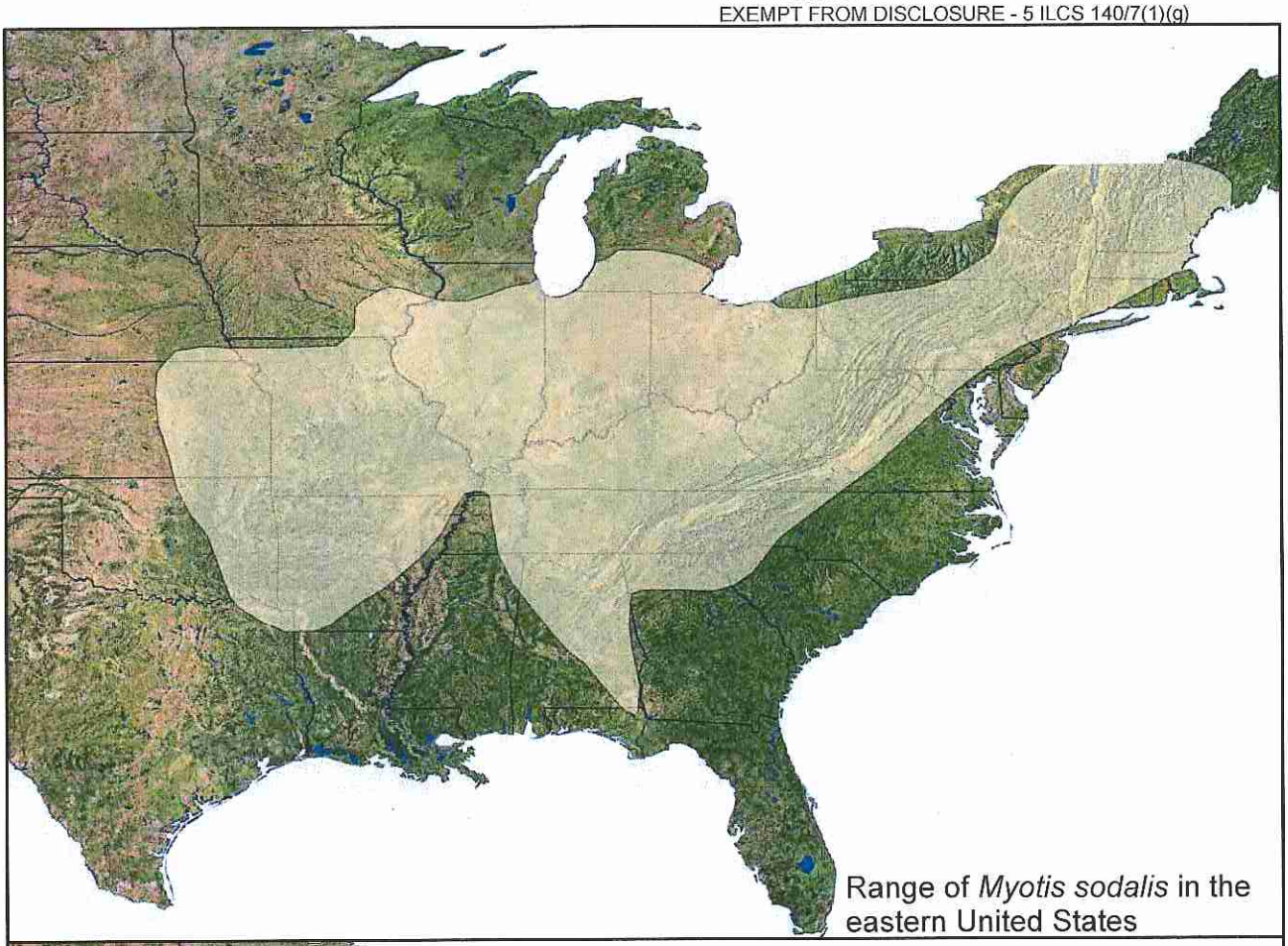


Range of *Myotis lucifugus* in the eastern United States

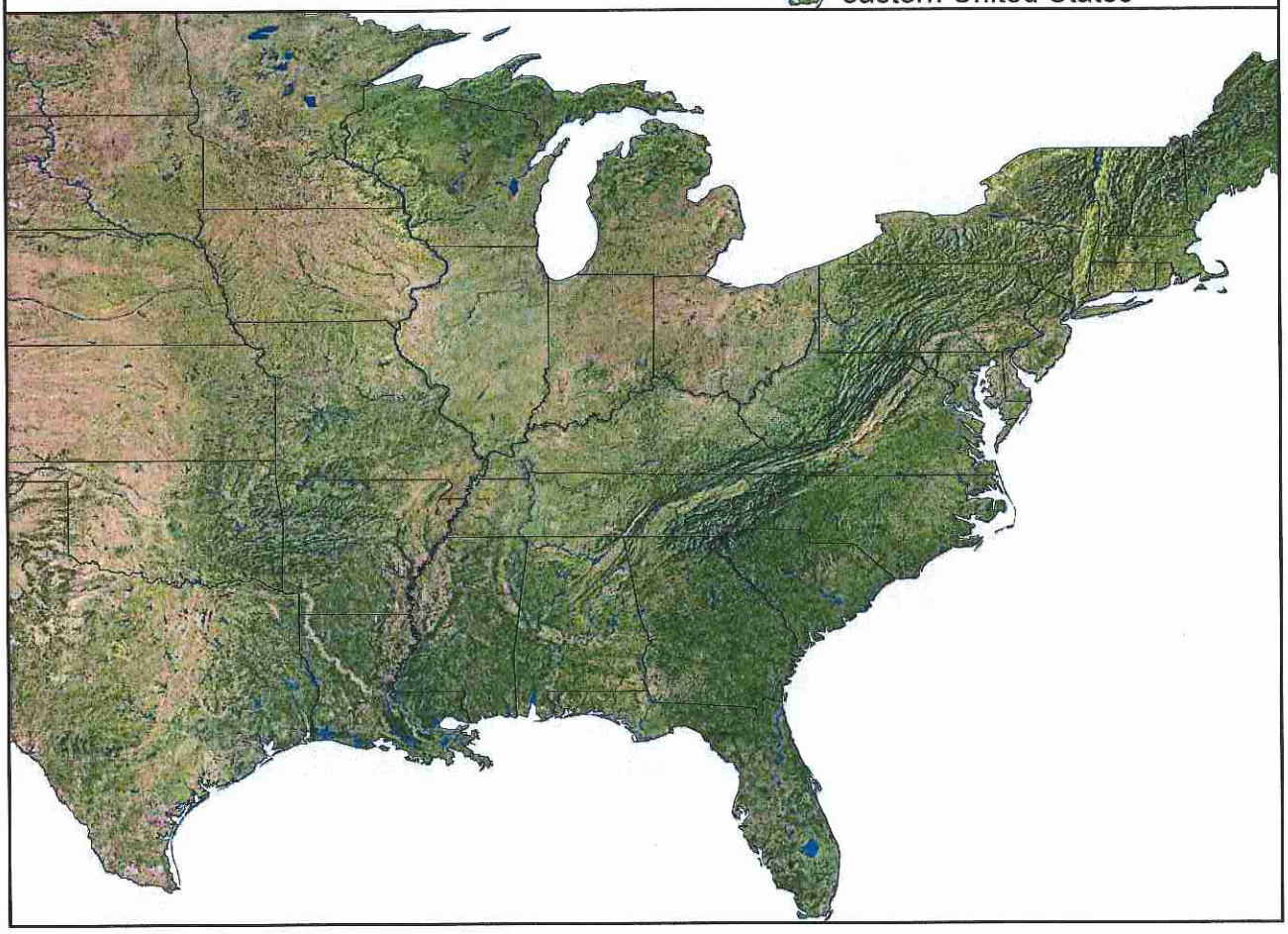


Range of *Pipistrellus subflavus* in the eastern United States

Bat Range data obtained from - http://www.natureserve.org/getData/mammalMaps.jsp (06/21/2005)



Range of *Myotis sodalis* in the eastern United States



Bat Range data obtained from - http://www.natureserve.org/getData/mammalMaps.jsp (06/21/2005)

Summer Indiana Bat Studies for the Pleasant Ridge Wind Energy Project Livingston County, Illinois

Final Report
June 30 – July 20, 2011

Prepared for:

Invenergy LLC

One South Wacker Drive, Suite 1900
Chicago, IL 60606

Prepared by:

Dr. Kevin Murray, Tim Sichmeller and Kimberly Bay

Western EcoSystems Technology, Inc.
408 West Sixth Street
Bloomington, Indiana 47404

October 19, 2011

WEST Inc.

NATURAL RESOURCES ♦ SCIENTIFIC SOLUTIONS

EXECUTIVE SUMMARY

Invenergy, LLC (Invenergy) is considering development of the Pleasant Ridge Wind Energy Project (PRWEP) in Livingston County, Illinois. Invenergy requested that Western EcoSystems Technology, Inc. (WEST) conduct a summer Indiana bat mist-net survey at the PRWEP. The main goals of the 2011 bat survey work at the PRWEP were to: 1) determine the presence/probable absence of the Indiana bat during the summer and 2) document the occurrence of other bat species. A better understanding of bat distribution and ecology at PRWEP will aid in developing strategies for minimizing the impact of development on bats.

Mist-nest surveys were conducted at six sites between June 30 and July 20, 2011. Bats were captured at five of six sites, resulting in a total of 83 bats. The number of individuals captured at each location, excluding recaptures, varied from zero (PR-1) to 29 (PR-6), with a mean of 13.8 bats per site. Five species of bats were captured. Big brown bats were the most common species (56 individuals; 67.5% of total captures) followed by eastern red bats (20.5%), northern long-eared bats (6.0%), evening bats (2.4%), and hoary bats (2.4%). One individual of an unidentified *Myotis* species was also captured. This bat escaped from the mist-net before it could be identified.

Because there was suitable riparian forest habitat for the Indiana bat along the South Fork and North Fork of the Vermilion River either within or near the PRWEP, mist-net survey effort exceeded the standard recommended by the USFWS. Regardless of this extra effort, no Indiana bats or other sensitive bat species were documented at the six surveyed mist-net sites. Therefore, the results of the current mist-net survey at the proposed Pleasant Ridge Wind Energy Project support the determination of probable absence of the Indiana bat from the project area during the summer. The lack of previous summer Indiana bat capture records in Livingston County and the paucity of *Myotis* captures during the survey also support this determination.

STUDY PARTICIPANTS

Western EcoSystems Technology

Kevin Murray	Project Manager, Bat Biologist
Timothy Sichmeller	Bat Biologist, Field Crew Supervisor
Matthew Clement	Bat Biologist, Report Editor
Kimberly Bay	Data Analyst and Report Manager
J.R. Boehrs	GIS Technician
Christina Roderick	Report Compiler
Jon Cicarelli	GIS Technician
Andrea Palochak	Technical Editor
Chris Rea	Field Technician
Aaron Rinker	Technician Biologist

REPORT REFERENCE

Kevin Murray, Tim Sichmeller and Kimberly Bay. Summer Indiana Bat Studies for the Pleasant Ridge Wind Energy Project, Livingston County, Illinois. Final Report: June 30 – July 20, 2011. Prepared for Invenergy LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana.

ACKNOWLEDGEMENTS

Thank you to Matthew Thornton (project manager) and Julie Fosdick of Invenergy LLC for aid in coordination and logistical support of the survey.

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BACKGROUND

Invenergy, LLC (Invenergy) is considering development of the Pleasant Ridge Wind Energy Project (PRWEP) in Livingston County, Illinois. Invenergy requested that Western EcoSystems Technology, Inc. (WEST) conduct a summer Indiana bat mist-net survey at the PRWEP. The main goals of the 2011 bat survey work at the PRWEP were to: 1) determine the presence/probable absence of the Indiana bat during the summer and 2) document the occurrence of other bat species. A better understanding of bat distribution and ecology at the PRWEP will aid in developing strategies for minimizing potential impacts to bats.

STUDY AREA

The survey area included the PRWEP plus a 1000-ft buffer and contained approximately 58,930 acres in southern Livingston County, Illinois (Figure 1). According to the National Landcover Dataset (USGS NLCD 2001), the dominant landcover type within the PRWEP is cultivated cropland (corn [*Zea mays*] and soybean [*Glycine max*]), composing 92.3% (54,372 acres) of the total land area (Figure 2). Developed lands are the second most common cover type, composing 5.9% (3,486 acres) of the study area. Deciduous forests occupy 0.7% (416 acres) of the study area and woody wetlands occupy 0.3% (158 acres) of the study area. These two habitats are considered potential bat habitat and together occupy 1.0% (574 acres) of the study area.

The PRWEP falls within the Central Corn Belt Plains Ecoregion, which encompasses a large portion of central Illinois (Woods et al. 2007). The Central Corn Belt Plains Ecoregion is composed of vast glaciated plains and is scattered with sand sheets and dunes. Much of the Central Corn Belt Plains Ecoregion was originally dominated by tall-grass prairie and had scattered groves of trees and marshes occurring on level uplands. Today, most of the ecoregion has been cleared for highly productive farms producing corn, soybeans, and livestock. Streams within the Central Corn Belt Ecoregion have been tiled, ditched, and tied into existing drainage systems, which has reduced the amount of aquatic habitat. Streams running through the PRWEP are channelized; however, there are also natural streams in the area including the South Fork of the Vermilion River that flows through the center of the survey area. The North Fork of the Vermilion River runs outside the northern boundary of the survey area and the Vermilion River begins northwest of the survey area where the South Fork and North Fork merge (Figure 1).

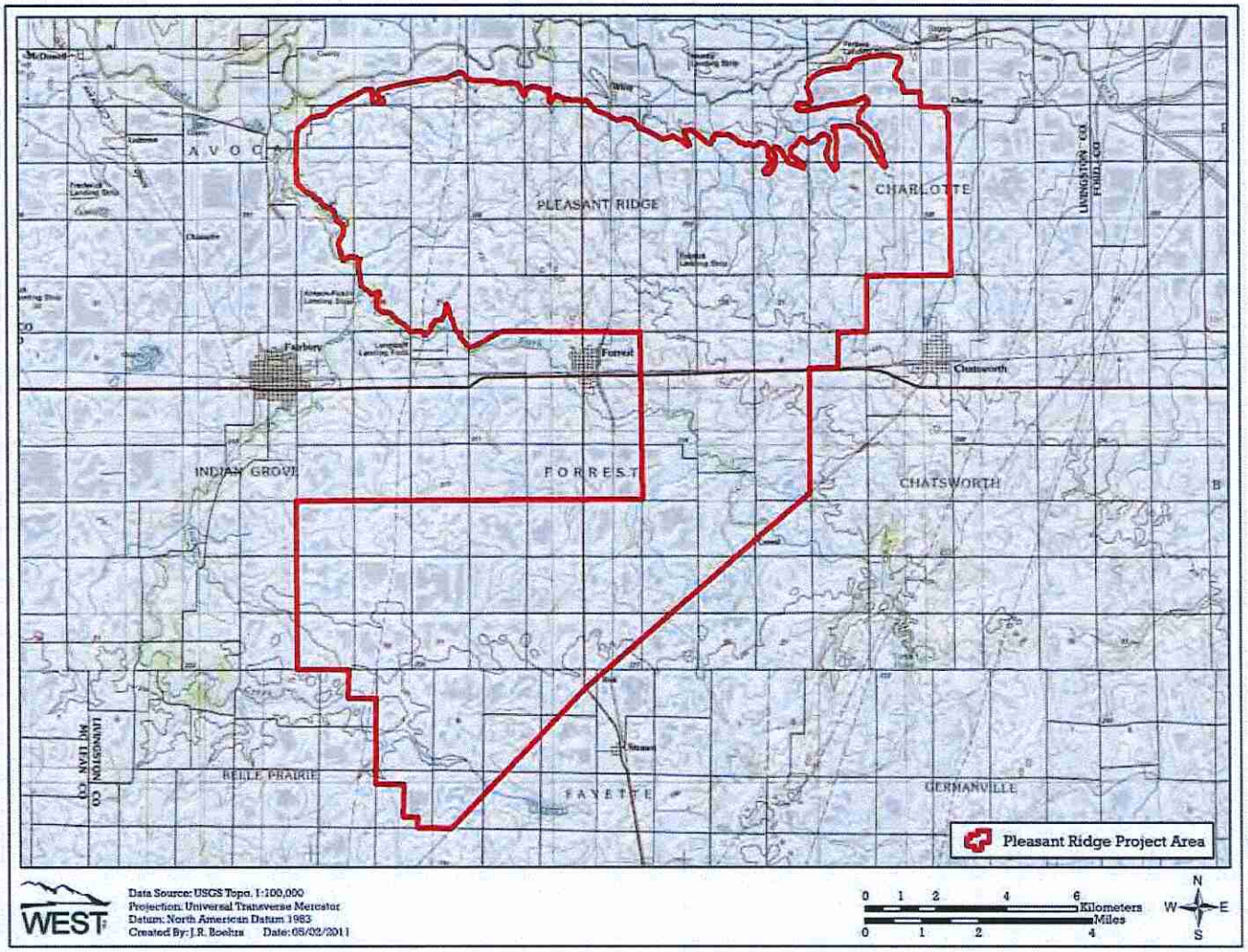

Figure 1. Topographic map of the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

OVERVIEW OF BAT DIVERSITY

The state of Illinois is within the range of the federally endangered Indiana bat (*Myotis sodalis*). A total of 16 active hibernacula in the state house an estimated 53,342 Indiana bats or about 12.8% of the revised 2009 population estimate for the species (USFWS 2011). In spring, female Indiana bats migrate from winter hibernacula to summer roosting habitat where they form maternity colonies. Indiana bats typically form maternity colonies under the exfoliating bark of large-diameter snags associated with bottomland, riparian, and upland forest tracts. Twenty-eight maternity colonies have been documented in 20 Illinois counties. The proposed PRWEP is located in Livingston Co., Illinois. There are no summer or winter records of *M. sodalis* in Livingston County. However, two adjacent counties (LaSalle and Ford Counties) do have capture records and LaSalle Co. to the north has a priority two hibernacula (Blackball Mine) housing approximately 1,800 bats (USFWS 2007).

In addition to the Indiana bat, 11 other species of bats are found in Illinois. Those species include: the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), Rafinesque's Big-eared bat (*Corynorhinus rafinesquii*), northern long-eared myotis (*M. septentrionalis*), little brown myotis (*M. lucifugus*), southeastern myotis (*M. austroriparius*), gray bat (*M. grisescens*), evening bat (*Nycticeius humeralis*), and tri-colored bat (*Perimyotis subflavus*). However, the gray bat (state- and federally-endangered), southeastern bat (state-endangered), and Rafinesque's Big-eared bat (state-endangered) have restricted ranges in Illinois and are extremely unlikely to be encountered in Livingston County. With the spread of white-nose syndrome (WNS) throughout the eastern U.S., several once common and abundant bat species, such as the little brown bat and northern long-eared bat, are experiencing population declines (Frick et al. 2010). There is increasing potential for these species to be listed as threatened or endangered by state and federal agencies (CBD 2010, ODNR 2010, WDNR 2010).

METHODS

Mist-Net Surveys

Summer mist-net surveys were conducted to determine: 1) the presence/probable absence of the Indiana bat and other sensitive bat species, and 2) the relative abundance of all bat species. All mist-netting efforts focused on the federally endangered Indiana bat and exceeded the US Fish and Wildlife Service (USFWS) mist-netting guidelines, outlined in the *Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision* (April 2007). All mist-net surveys were performed by an individual permitted by USFWS personnel to capture and handle Indiana bats.

Mist-netting was conducted from June 30 to July 20, 2011, consistent with USFWS guidelines for Indiana bat mist-net surveys (see USFWS 2007). Female Indiana bats typically form maternity colonies under the exfoliating bark of large-diameter snags and live trees. Roost trees are usually associated with canopy gaps or forested edges which allow roosts to receive direct sunlight for a significant portion of the day. Habitats most commonly associated with the roost

trees of Indiana bats include woody wetlands, bottomlands, floodplains, riparian and upland deciduous forest tracts (USFWS 2007). Whenever possible, mist-net effort was focused on the largest mature forest blocks within these habitat types or within potential travel corridors.

The USFWS guidelines for Indiana bat surveys recommend a minimum of one mist-net site per 123 acres of suitable forest habitat (USFWS 2007). The PRWEP borders riparian forest habitat along the North Fork and South Fork of the Vermilion River. To account for this habitat, a 1000-ft buffer was placed around the project boundary (Figure 2). Deciduous forest and woody wetlands within the project area and 1000-ft buffer were considered to represent potential habitat for the Indiana bat and covered approximately 574 acres of the PRWEP and buffer (< 1.0% of the survey area; USGS NLCD 2006; Figure 2). The survey included six mist-net sites (Appendix C-1). By using a 1000-ft buffer to determine survey effort, by mist-netting sites outside the project boundary, and by mist-netting a total of 6 sites, WEST exceeded the standard USFWS bat survey guidelines for Indiana bats.

Specific mist-net sites were determined by on-site scouting by bat biologists with Indiana bat research experience (T.Sichmeller and Dr. K. Murray). Mist-net sites were selected based on the following criteria: 1) presence of relatively large, contiguous forested areas; 2) presence of permanent water resources; 3) presence of suitable Indiana bat habitat; and 4) presence of flight corridors (such as streams, trails, or open woods). All mist-net surveys were performed by an individual permitted and approved by USFWS personnel to capture and handle Indiana bats (T. Sichmeller, Dr. K. Murray).

Mist-nets were placed perpendicularly across flight corridors such as streams, trails, and roads. Nets filled the corridor from side to side and extended from ground-level up to overhanging canopy. Depending on canopy height, a typical net set consisted of two to three vertically stacked mist nets to a total height of five to seven m (16 to 23 ft). Standard 2-ply, 50 denier, nylon mist nets with a mesh size of 38 millimeters (mm; 1.5 inches) were used at all mist-net sites. At each site, a minimum of two net locations were surveyed. Within sites, net locations were at least 30 m (98 ft) apart. Mist-netting began at sunset and continued for five hours following sunset. Nets were checked approximately every 10 minutes. Disturbance in the form of noise, movement, and light was minimized at all mist-net sites.

For each mist-net night the date, start and end time, site description, site coordinates, mist-net specifics, and weather data (e.g. temperature, cloud cover, moon phase, and wind speed) were recorded. All captured bats were identified to species. In addition, sex, age, reproductive condition, body mass (grams [g]), forearm length (mm), and capture status (recapture/new) were recorded for each bat. Whenever possible, Indiana bats and other species of bats were photo-documented with voucher photographs taken of species-specific identifiable features (e.g. head, pelage, calcar, foot, toe hairs).

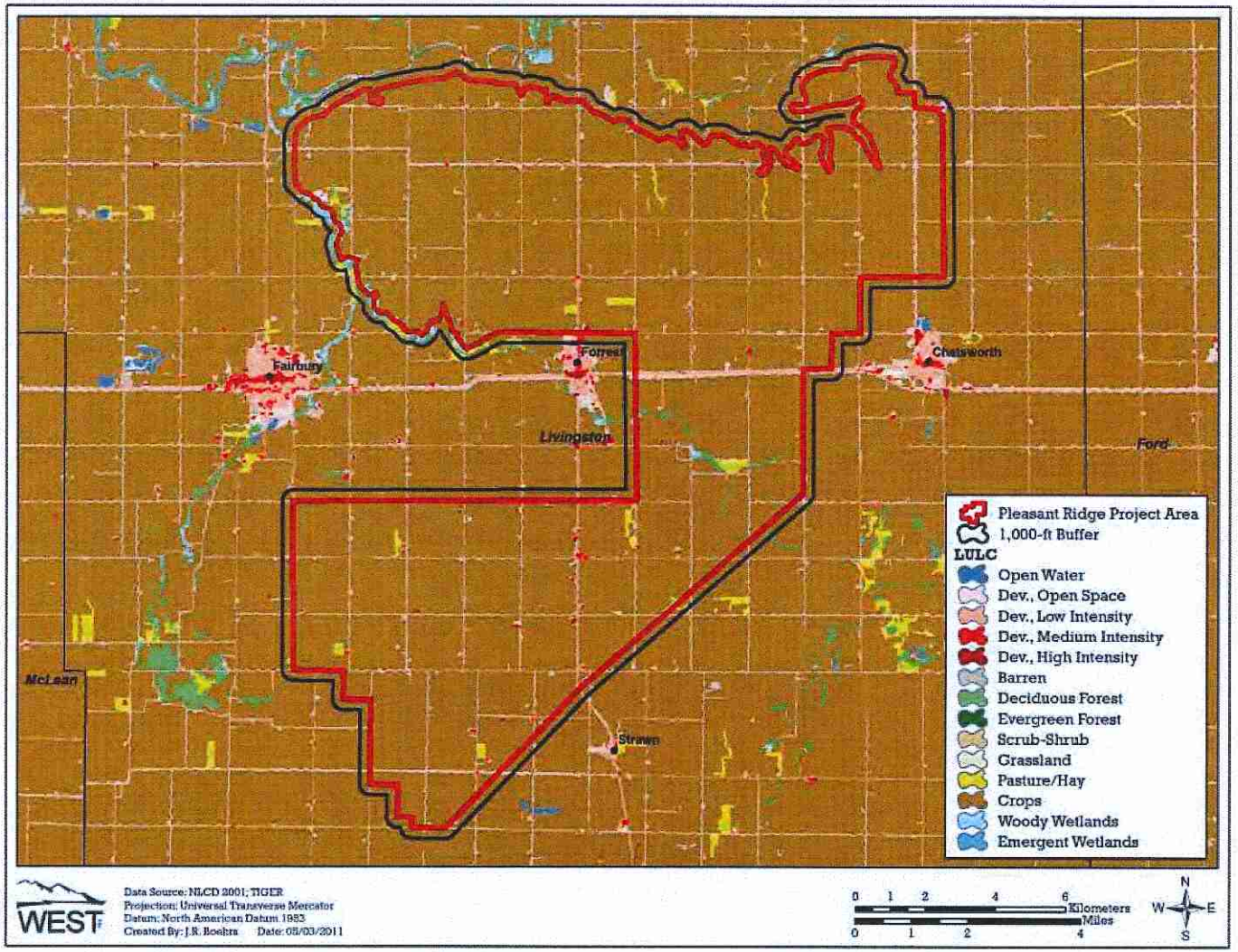

Figure 2. Land use/land cover (LULC) types at the proposed Pleasant Ridge Wind Energy Project. Areas in green represent deciduous forest which is potential habitat for the Indiana bat (USGS NLCD 2006). The black boundary represents a 1,000-ft buffer around the project area.

To assess damage from WNS, a Reichard Index score (0-3) was recorded for all captured bats (Reichard 2009). To prevent cross-contamination of captured bats with *Geomyces destructans*, the fungus that causes WNS, the USFWS decontamination protocol was followed for all mist-netting efforts (USFWS 2010b). Whenever possible, two tissue samples (one from each wing) were taken from each captured bat with a 2-3 mm biopsy punch in order to screen bat populations near the PRWEP for WNS. Captured bats were measured and processed immediately and usually released within 15 minutes.

RESULTS

Mist-Net Surveys

Mist nest surveys were conducted at a total of 14 nets at six sites (26 net nights) between June 30 and July 20, 2011. Eight of the 14 nets were set over creeks, while the remaining six were set over forested roads and trails near riparian areas (Table 1; Appendices A and B). Bats were captured at five of six sites, resulting in a total of 83 bats (Table 2). The number of individuals captured at each location varied from zero (PR-1) to 29 (PR-6), with a mean of 13.8 bats per site. Five species of bats were captured. Big brown bats were the most common species (56 individuals; 67.5% of total captures) followed by eastern red bats (20.5%), northern long-eared bats (6.0%), evening bats (2.4%), and hoary bats (2.4%) (Table 2). One individual of an unidentified *Myotis* species was also captured. This bat escaped from the mist-net before it could be identified. No sensitive species of bats were captured during the survey.

Table 1. Location and site description of six mist-net sites at the Pleasant Ridge Wind Energy Project, Illinois; June 30 to July 20, 2011.

Site ID	Net	UTM†		Site Description
PR-1	a	383399	4510593	South Fork of the Vermilion River
	b	383469	4510677	South Fork of the Vermilion River
PR-2	a	384121	4509829	South Fork of the Vermilion River
	b	384146	4509736	South Fork of the Vermilion River
PR-3	a	372551	4518221	S. Fork of Vermilion River (near confluence)
	b	372576	4518395	S. Fork of Vermilion River (near confluence)
PR-4	a	384532	4509446	South Fork of the Vermilion River
	b	384584	4509485	South Fork of the Vermilion River
PR-5	a	380086	4521131	Forested Road near N. Fork of Vermilion River
	b	379928	4520993	Forested Trail near N. Fork of Vermilion River
	c	379954	4521019	Forested Trail near N. Fork of Vermilion River
PR-6	a	375059	4514088	Forested Trail near S. Fork of Vermilion River
	b	375104	4513999	Forested Trail near S. Fork of Vermilion River
	c	375123	4514112	Forested Trail near S. Fork of Vermilion River

† = NAD 1983; UTM zone 16T

Table 2. Summary of bat captures at six mist-net survey sites at Pleasant Ridge Wind Energy Project. Numbers in parentheses in Grand Total row show percent of total captures represented by each species.

Site Number	Big Brown Bat	Eastern Red Bat	Evening Bat	Hoary Bat	Northern Long-Eared Bat	Unidentified Myotis Species	Total
PR-1	0	0	0	0	0	0	**0**
PR-2	5	3	0	1	0	0	**9**
PR-3	6	0	0	1	2	0	**9**
PR-4	2	8	0	0	0	0	**10**
PR-5	22	2	0	0	1	1	**26**
PR-6	21	4	2	0	2	0	**29**
Grand Total	**56 (68%)**	**17 (21%)**	**2 (2%)**	**2 (2%)**	**5 (6%)**	**1 (1%)**	**83**

DISCUSSION

Mist-nest surveys at six sites within the survey area resulted in the capture of 83 bats of five species (Table 2). Big brown bats (67.5% of total captures) and eastern red bats (20.5% of total captures) were the two most commonly captured bats during the study. One species of the genus *Myotis* was encountered (northern long-eared bat) and this was the third most common species captured. However, myotid bats were uncommon at mist-net sites with only 5 individuals captured (Table 2).

Because there is potential for Indiana bat mortality at wind turbines (see USFWS 2011), it is important to determine the presence/probable absence of Indiana bats at or near proposed wind projects. The proposed PRWEP is located in Livingston County, Illinois. No summer or winter records of Indiana bats were previously documented in this county (USFWS 2007). However, there are summer reproductive records from an adjacent county to the southeast, Ford County. Also, there is a priority two hibernacula in an adjacent county to the northwest, LaSalle County (USFWS 2007). Because there was suitable riparian forest habitat for the Indiana bat along the South Fork and North Fork of the Vermilion River either within or near the PRWEP, mist-net survey effort exceeded the standard recommended by the USFWS (USFWS 2007). Regardless of this extra effort, no Indiana bats or other sensitive species were documented at the six mist-net sites surveyed in the PRWEP (Table 2).

CONCLUSIONS

A total of five species of bats were captured at six mist-net sites at the proposed PRWEP. Those species included the big brown bat, eastern red bat, northern long-eared bat, evening bat, and hoary bat. The results of the current mist-net survey at the proposed Pleasant Ridge Wind Energy Project support the determination of probable absence of the Indiana bat from the project area during the summer. The lack of previous summer Indiana bat capture records and the paucity of *Myotis* captures during the mist-net survey also support this determination.

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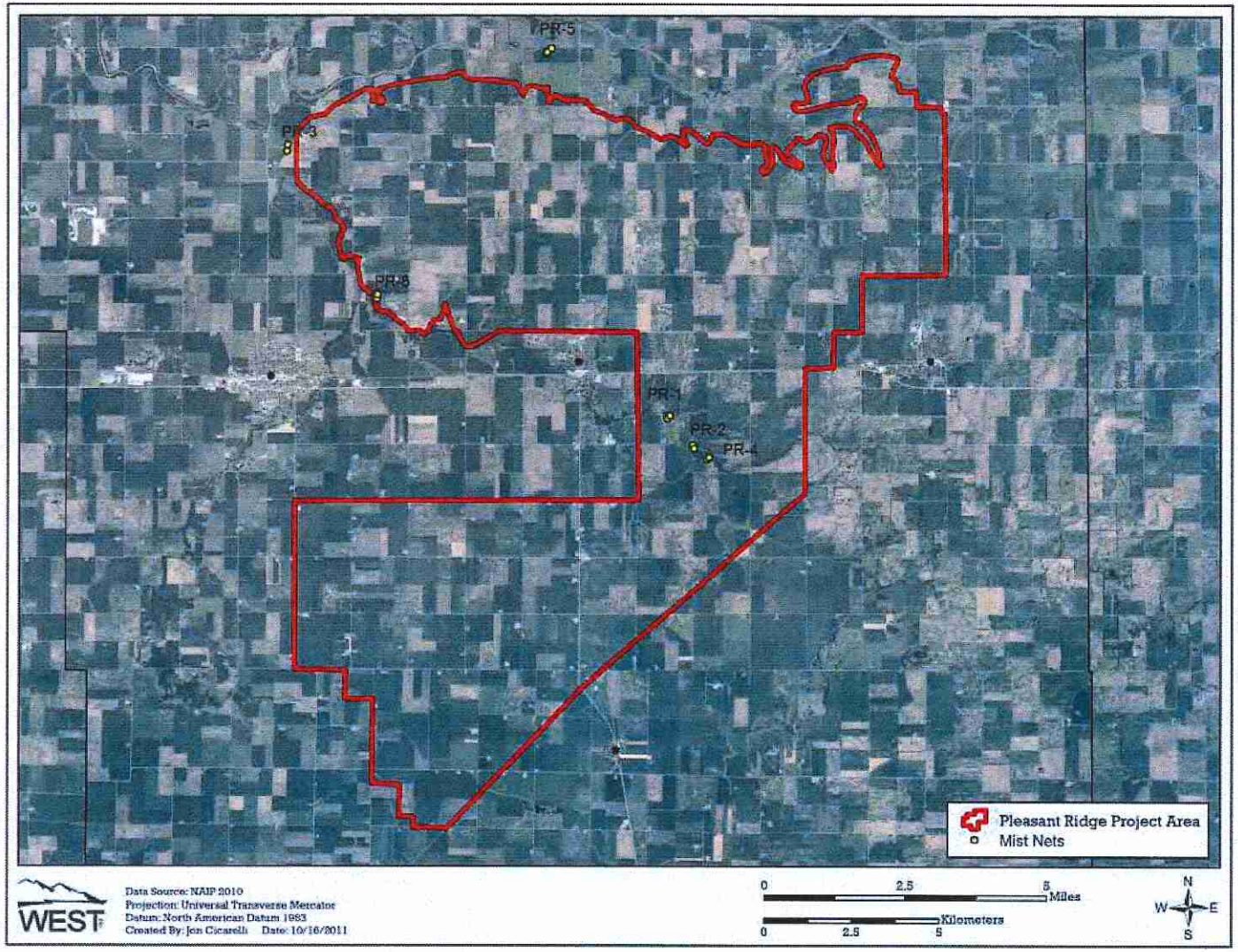
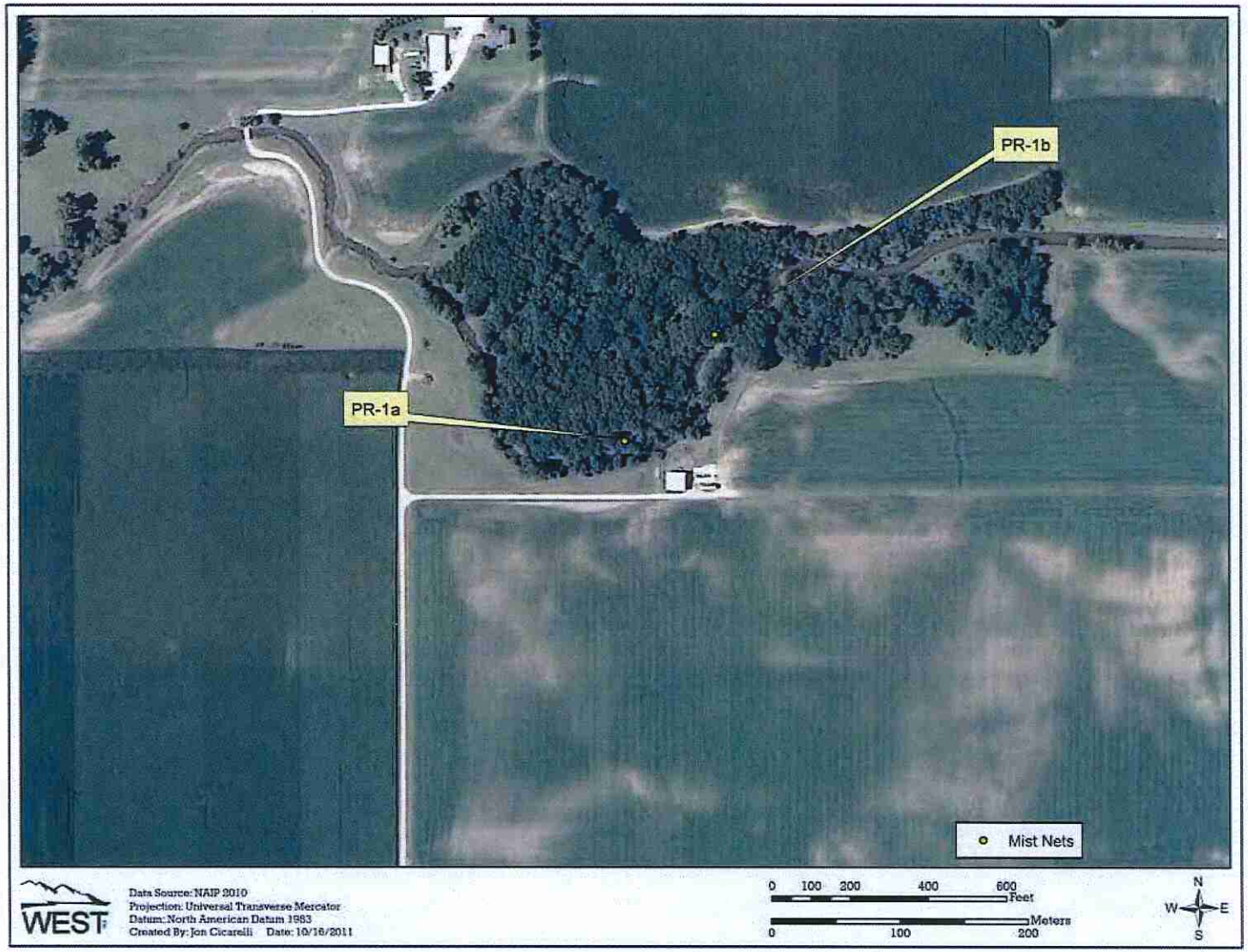
Appendix A. Maps of Mist-Net Sites

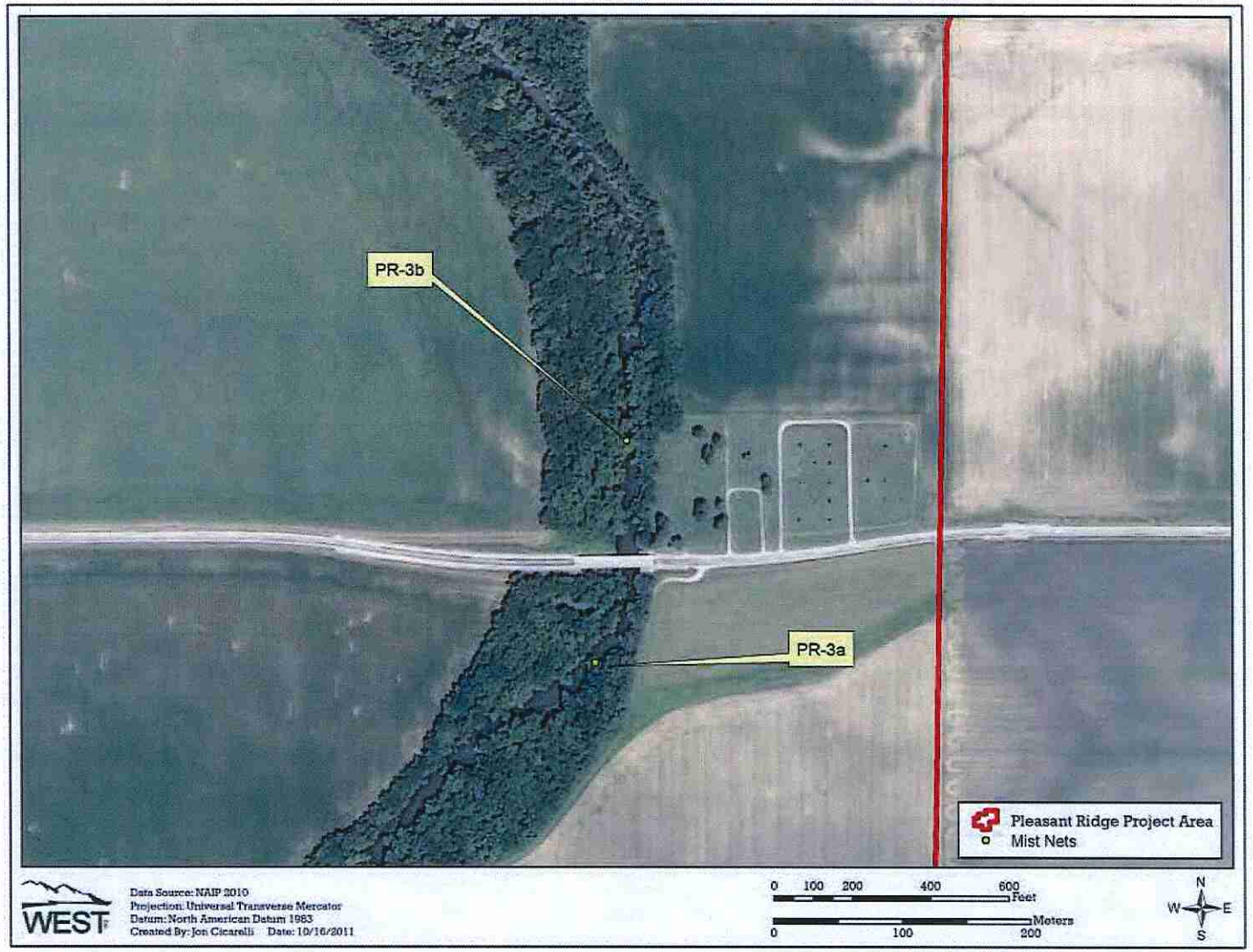


Appendix A-1. Overview of six mist-net locations at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.



Appendix A-2. Aerial view of Mist-Net Site PR-1 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

Appendix A-3. Aerial view of Mist-Net Site PR-2 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.



Appendix A-4. Aerial view of Mist-Net Site PR-3 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

Appendix A-5. Aerial view of Mist-Net Site PR-4 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

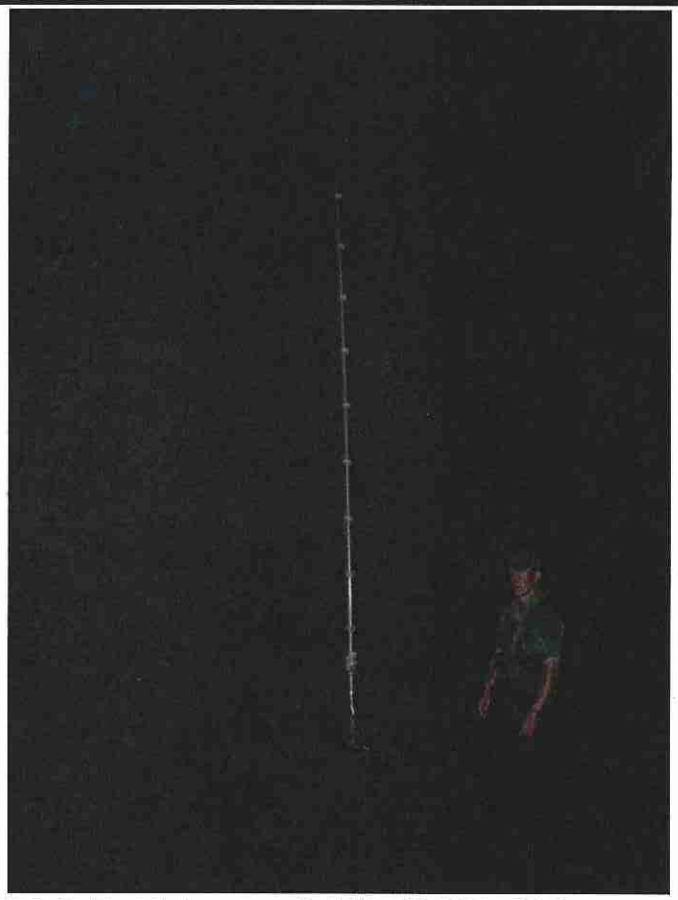
Appendix A-6. Aerial view of Mist-Net Site PR-5 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

Appendix A-7. Aerial view of Mist-Net Site PR-6 at the proposed Pleasant Ridge Wind Energy Project in Livingston County, Illinois.

Appendix B. Pictures of Mist-Net Sites and Captured Bats

Appendix B-1. Bat habitat surveyed at Mist-Net Site PR-1

Appendix B-2. Bat habitat surveyed at Mist-Net Site PR-2



Appendix B-3. Bat habitat surveyed at Mist-Net Site PR-3

Appendix B-4. Bat habitat surveyed at Mist-Net Site PR-4

Appendix B-5. Bat habitat surveyed at Mist-Net Site PR-5

Appendix B-6. Bat habitat surveyed at Mist-Net Site PR-6

Appendix B-7. Northern long-eared bat (top) and hoary bat (bottom) captured at Mist-Net Site PR-3

Appendix B-8. Evening bat captured at Mist-Net Site PR-6

Appendix C. Summary of Mist-Net Capture Data

Appendix C-1. Details of bats captured at Mist-Net Site PR-2, July 2-3, 2011.

Species	Sex	Age	Reproductive Condition	Reichard Score	Forearm Length (mm)	Body Weight (g)
			July 2			
eastern red bat	Female	Adult	lactating	0	41.2	14.0
big brown bat	Male	Adult	scrotal	0	46.7	19.8
eastern red bat	Female	Adult	pregnant	0	41.5	16.8
big brown bat	Male	Adult	scrotal	0	45.3	20.5
big brown bat	----	----	----	----	----	----
big brown bat	Male	Adult	scrotal	0	44.6	18.5
big brown bat	Male	Adult	scrotal	0	45.7	20.5
			July 3			
eastern red bat	Male	Adult	scrotal	0	41.9	14.3
hoary bat	Male	Adult	non-reproductive	0	51.3	17.8

---- = bat escaped from net

Appendix C-2. Details of bats captured at Mist-Net Site PR-3, July 17-18, 2011.

Species	Sex	Age	Reproductive Condition	Reichard Score	Forearm Length (mm)	Body Weight (g)
July 17						
big brown bat	Male	Adult	scrotal	0	46.3	16.0
northern long-eared bat	Female	Juvenile	non-reproductive	0	32.6	6.3
big brown bat	Male	Juvenile	non-reproductive	0	46.4	12.5
hoary bat	Female	Adult	pregnant	0	55.3	24.8
big brown bat	Female	Juvenile	non-reproductive	0	47.9	16.5
July 18						
big brown bat	Female	Adult	lactating	0	47.2	22.5
big brown bat	Male	Juvenile	non-reproductive	0	46.8	14.8
northern long-eared bat	Male	Juvenile	non-reproductive	0	36.1	7.0
big brown bat	Female	Juvenile	non-reproductive	0	46.7	13.5

Appendix C-3. Details of bats captured at Mist-Net Site PR-4, July 17-18, 2011.

Species	Sex	Age	Reproductive Condition	Reichard Score	Forearm Length (mm)	Body Weight (g)
July 17						
eastern red bat	Female	Adult	non-reproductive	0	43.4	16.2
eastern red bat	Male	Adult	scrotal	0	37.4	10.5
eastern red bat	Male	Adult	scrotal	0	38.5	11.6
eastern red bat	Male	Adult	scrotal	0	39.3	11.9
eastern red bat	Male	Juvenile	Unknown	0	38.3	7.8
eastern red bat	Female	Juvenile	Unknown	0	37.9	8.0
big brown bat	Male	Adult	scrotal	0	43.3	18.0
big brown bat	Female	Adult	lactating	0	45.4	22.1
eastern red bat	Female	Adult	lactating	0	41.8	14.2
July 18						
eastern red bat	Female	Adult	post-lactating	0	40.1	16.3

Appendix C-4. Details of bats captured at Mist-Net Site PR-5, July 19-20, 2011.

Species	Sex	Age	Reproductive Condition	Reichard Score	Forearm Length (mm)	Body Weight (g)
July 19						
big brown bat	Female	Adult	lactating	0	46.4	21.8
big brown bat	Male	Adult	scrotal	0	46.1	18.4
big brown bat	Female	Juvenile	non-reproductive	0	46.5	18.0
big brown bat	Male	Juvenile	non-reproductive	0	48.2	17.5
big brown bat	Female	Juvenile	non-reproductive	0	47.7	18.6
big brown bat	Female	Juvenile	non-reproductive	0	48.1	17.3
northern long-eared bat	Male	Adult	scrotal	0	36.5	6.8
unidentified *Myotis* sp.	----	----	----	----	----	----
eastern red bat	----	----	----	----	----	----
big brown bat	Female	Adult	lactating	0	45.6	21.1
big brown bat	Male	Adult	scrotal	0	48.1	18.8
big brown bat	----	----	----	----	----	----
big brown bat	Female	Juvenile	non-reproductive	0	45.4	14.3
big brown bat	Male	Adult	scrotal	0	46.9	18.8
big brown bat	Male	Adult	scrotal	0	46.3	17.4
big brown bat	Female	Juvenile	non-reproductive	0	48.0	14.6
big brown bat	----	----	----	----	----	----
big brown bat	Male	Juvenile	non-reproductive	0	45.9	15.0
big brown bat	Female	Juvenile	non-reproductive	0	49.4	18.7
July 20						
big brown bat	Male	Juvenile	non-reproductive	0	44.8	15.8
big brown bat	Male	Juvenile	non-reproductive	0	44.0	14.5
big brown bat	Female	Adult	non-reproductive	0	49.1	23.0
big brown bat	Female	Adult	post-lactating	0	47.6	23.0
eastern red bat	Female	Adult	lactating	0	41.3	14.0
big brown bat	Male	Juvenile	scrotal	0	46.3	18.5
big brown bat	Female	Adult	lactating	0	48.4	22.9

---- = bat escaped from net

Appendix C-5. Details of bats captured at Mist-Net Site PR-6, July 19-20, 2011

Species	Sex	Age	Reproductive Condition	Reichard Score	Forearm Length (mm)	Body Weight (g)
July 19						
big brown bat	Male	Juvenile	scrotal	0	43.9	13.5
big brown bat	Male	Juvenile	scrotal	0	45.3	16.8
big brown bat	Male	Juvenile	scrotal	0	48.1	16.0
eastern red bat	Female	Adult	lactating	0	41.6	12.8
big brown bat	Male	Adult	scrotal	0	46.9	17.5
eastern red bat	Female	Juvenile	non-reproductive	0	39.6	8.0
eastern red bat	Female	Adult	non-reproductive	0	39.8	11.3
eastern red bat	Female	Juvenile	non-reproductive	0	42.2	10.8
big brown bat	Male	Adult	scrotal	0	46.2	18.3
big brown bat	Female	Juvenile	non-reproductive	0	49.3	19.0
big brown bat	Male	Juvenile	non-reproductive	0	46.8	14.5
northern long-eared bat	Male	Juvenile	scrotal	0	36.7	6.8
northern long-eared bat	Female	Juvenile	non-reproductive	0	35.3	7.0
big brown bat	Female	Juvenile	non-reproductive	0	47.2	17.3
big brown bat	Male	Juvenile	scrotal	0	45.5	14.5
big brown bat	Male	Juvenile	non-reproductive	0	45.9	15.0
July 20						
big brown bat	Female	Juvenile	non-reproductive	0	44.3	16.0
big brown bat	Female	Juvenile	non-reproductive	0	46.2	14.2
big brown bat	Male	Juvenile	non-reproductive	0	45.5	16.2
big brown bat	Female	Juvenile	non-reproductive	0	46.8	15.4
big brown bat	Female	Juvenile	non-reproductive	0	47.2	15.5
big brown bat	Male	Juvenile	non-reproductive	0	46.5	15.3
evening bat	Female	Juvenile	non-reproductive	0	36.4	9.5
big brown bat	Male	Adult	scrotal	0	48.4	18.3
big brown bat	Female	Juvenile	non-reproductive	0	45.5	13.5
big brown bat	Male	Adult	scrotal	0	45.0	17.5
big brown bat	Male	Adult	scrotal	0	47.2	18.0
big brown bat	Male	Juvenile	scrotal	0	47.5	16.3
evening bat	Female	Juvenile	non-reproductive	0	36.1	9.0

Appendix D. Mist-Net Survey Capture Data Sheets (separate PDF)

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-1
Location (Co./State)
GPS:
Date/Net Night: 6-30-11 / NIGHT 1
Biologists:

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
No bats										

Other Species Observed:

Bat Capture Data Form

Project: PLEASANT RIDGE
Site Label: PR-1
Location (Co./State)
GPS:
Date/Net Night: ~~2010~~ 7-1-11 / NIGHT 2
Biologists:

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
No bats										

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR2
Location (Co./State): Livingston / IL
GPS: 16T 0384145 4509792
Date/Net Night: 7/2/11 1st night
Biologists: T. Sichmeller C. Reg

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
LABO 1	2125	F	A	Preg	0	41.5	16.8	PR2b1		Hole Punch
EPFU 1	2215	M	A	Scrot	0	45.3	20.5	PR2b1		Hole Punch
EPFU 2	2215	–	–	–	–	–	–	PR2b1		Escaped net
EPFU 2	2255	M	A	Scrot	0	44.6	18.5	PR2b1		Hole Punch
EPFU 3	2330	M	A	Scrot	0	45.7	20.5	PR2b1		Hole Punch
LABO 2	0:50	F	A	LAE	0	41.2	14.00	PR2A		Hole Punch
EPFU 4	0:50	M	A	Scrot	0	46.7	19.8	PR2A		Hole Punch

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR2
Location (Co./State) Livingston / IL
GPS: 16 T 384145 4509792
Date/Net Night: 07/03/2011
Biologists: T Sichmeller / C Rea

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
LACI 1	2305	M	A	Non Scrot	0	51.3	17.8	PR2A		
LABO 1	015	M	A	Scrot	0	41.9	14.3	PR2a		

Other Species Observed:

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-3
Location (Co./State): Livingston / IL
GPS: 16T 372579 4518304
Date/Net Night: 7/17/11 1st night
Biologists: T. Schmeller A. Rinker

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
LACI	2300	F	A	Preg	0	55.3	24.8	b		
EPFU [1]	2305	F	J	NR	0	42.9	16.5	b		
EPFU [2]	0030	M	A	Sc	0	46.3	16.0	B		
MYSE	0030	F	J	NR	0	32.6	6.3	B		
EPFU [3]	0030	J	M	NR	0	46.4	12.5	B		

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-3
Location (Co./State): Livingston/IL
GPS: 16T 0372579 4518304
Date/Net Night: 7/18/11 2nd night
Biologists: T. Sichmiller, A. Rinker

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
EPFU 1	2350	F	J	NR	0	46.7	13.5	a		
EPFU 2	0100	M	J	NR	0	46.8	14.8	A		
EPFU 3	0100	F	A	Lac	0	47.2	22.5	A		
MYSE	0200	M	J	NR	0	36.1	7.0	a		Recapture from last night

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-4
Location (Co./State) Livingston County / Illinois
GPS:
Date/Net Night: 07/17/2011 / Night 1
Biologists: K. Murray / C. Re

Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Measurements (millimeters & grams) Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
~~LABO~~ LABO1	2100	A	♂	Scrot	Ø	37.4	10.5	A		WP ID = LABO1
LABO 2	22:05	A	♂	SCROTAL	Ø	38.5	11.6	A		WP ID = LABO2
LABO 3	22:05	A	♂	Scrot	Ø	39.3	11.9	A		WP ID = LABO3
LABO ●	22:05	Juv.	♂	—	Ø	38.3	7.8	A		WP Not Taken
LABO 4	22:15	Juv.	♀	—	Ø	37.9	8.0	B		WP ID = LABO4
EPFU	2235	A	♂	SCROTAL	Ø	43.3	18.0	A		WP ID = EPFU1
EPFU	23:05	A	♀	Lac.	Ø	45.4	22.1	A		WP ID = EPFU2
LABO	23:45	A	♀	Lac.	Ø	41.8	14.2	A		WP ID = LABO5
LABO	0025	A	♀	NonRep	Ø	43.4	16.1	A		WP ID = LABO6

Other Species Observed:

Project: PLEASANT RIDGE
Site Label: PR-4
Location (Co./State)
GPS:
Date/Net Night: 7.18.11 / NIGHT 2
Biologists: K. Murray / C. Rea

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
LABO	2325	♀	A	Post Lac.	Ø	40.1	16.3	A		WP ID = LABO 1

Other Species Observed:

Bat Capture Data Form

Project: PLEASANT RIDGE
Site Label: PR-5
Location (Co./State) / IL
GPS:
Date/Net Night: 7.19.11 / NIGHT 1
Biologists: K. MURRAY, C. REA

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
MYSE	20:55	♂	A	Scrot.	Ø	36.5	6.8	B		WP ID= MYSE 1
MYOTIS SPP.	20:55	–	–	–	–	–	–	B		Escaped net
LABO	21:10	UNK	UNK	UNK	→	→	→	A		Escaped net
EPFU	21:30	♀	A	Lac.	Ø	45.6	21.1	B		WP ID= EPFU 1
EPFU	21:45	UNK	UNK	→	→	→	→	B		Escaped net
EPFU	21:45	♀	Juv.	Non-Rep	Ø	45.4	14.3	B		No wing punches
EPFU	21:45	♂	A	Scrot.	Ø	46.9	18.8	B		WP ID = EPFU 2
EPFU	21:45	♂	A	Scrot.	Ø	46.3	17.4	B		No wing punches
EPFU	21:45	♂	A	Scrot.	Ø	48.1	18.8	B		WP ID = EPFU 3
EPFU	22:10	♂	J	NR	Ø	45.9	15.2	A		WP ID = EPFU 4
EPFU	22:10	♀	J	NR	Ø	48.0	14.6	A		WP ID = EPFU 5
EPFU	22:35	♀	J	NR	Ø	49.4	18.7	B		No wing Punches
EPFU	22:10	UNK	→	→	→	→	→	B		Escaped net
EPFU	0:35	♀	J	NR	Ø	46.5	18.0	B		No WP
EPFU	0:35	♀	A	Lac.	Ø	46.4	21.8	B		No WP

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR - 5
Location (Co./State) / IL
GPS:
Date/Net Night: 7.19.11 / Night 1
Biologists: K Murray, C. Rea

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
EPFU	0:35	♂	J	NR	Ø	48.2	17.5	B		No WP
EPFU	0:35	♀	J	NR	Ø	47.7	18.6	B		No WP
EPFU	0:35	♂	A	Scrot.	Ø	46.1	18.4	B		No WP
EPFU	01:05	♀	J	NR	Ø	48.1	17.3	B		NO WP

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-5
Location (Co./State):
GPS:
Date/Net Night: 7.20.11 / Night 2
Biologists: K. Murray, C Rea

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
EPFU	21:05	♂	J	NR	Ø	44.0	14.5	B		WPID = EPFU 1
EPFU	22:00	♀	A	NR	Ø	49.1	23.0	B		WPID = EPFU 2
EPFU	22:15	♀	A	PL	Ø	47.6	23.0	A		WPID = EPFU 3
LABO	22:30	♀	A	L	Ø	41.3	14.0	A		WPID = LABO 1
EPFU	22:50	♂	J	SCROTAL	Ø	46.3	18.5	A		WPID = EPFU 4
EPFU	23:10 [illegible]	♀	A	L	Ø	48.4	22.9	A		WPID = EPFU 5
EPFU	24:00	♂	J	NR	Ø	44.8	15.8	B		WPID = EPFU 6

Other Species Observed:

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: PR-6
Location (Co./State) Livingston / IL
GPS: 16T 0375093 4514052
Date/Net Night: 7/19/11 1st night
Biologists: T. Sichmeller, A. Rinker

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
LABO 1	2040	F	A	Lac	0	41.6	12.8	A		
EPFU 1	2115	M	A	Scrot	0	46.9	17.5	B		
LABO 2	2140	F	J	NR	0	39.8	11.3	A		
LABO 3	2140	F	J	NR	0	39.6	8.6	A		
LABO 4	2140	F	J	NR	0	42.2	10.8	A		
EPFU 2	2305	M	A	Scrot.	0	46.2	18.3	A		
EPFU 3	2305	F	J	NR	0	49.3	19.0	A		
MYSE 1	2320	M	J	Scrot	0	36.7	6.8	A		
EPFU	2320	M	J	NR	0	46.8	14.5	A		
MYSE 2	2335	F	J	NR	0	35.3	7	B		
EPFU	2355	F	J	NR	0	47.2	17.3	A		
EPFU	2355	M	J	scrot	0	45.5	14.5	A		
EPFU	2355	M	J	NR	0	45.9	15	A		
EPFU	2400	M	J	Scrot	0	43.9	13.5	B		
EPFU	2445	M	J	scrot	0	45.3	16.8	A		

Other Species Observed:

Bat Capture Data Form

Project:
Site Label:
Location (Co./State)
GPS: 16T 375093 4514052
Date/Net Night:
Biologists:

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
EPFU	0125	M	J	Scrot	0	48.1	6.0	9		

Other Species Observed:

Bat Capture Data Form

Project: Pleasant Ridge
Site Label: FR-6
Location (Co./State): Livingston/IL
GPS: 16T 0375093 4514052
Date/Net Night: 7/20/11 2nd night
Biologists: Tim S., Aaron R.

				Measurements (millimeters & grams)						
Species (use 4 letter spp. Abbreviation)	Time (Military)	Sex	Age	Reproductive Status	Reichard Score	Forearm	Weight	Net #	Recapture/ Band	Comments
EPFU 1	2105	M	A	Scrot	0	48.4	18.3	a		
EPFU 2	2105	F	J	NR	0	45.5	13.5	a		
EPFU 3	2220	M	A	Scrot	0	45.0	17.5	B		
EPFU	2255	M	A	Scrot	0	47.2	18.0	a		
NYHU	2330	F	J	NR	0	36.1	9	A		
EPFU	2330	M	J	Scrot	0	47.5	16.3	A		
EPFU	2430	F	J	NR	0	46.8	15.4	A		
EPFU	2430	M	A	Scrot	0	44.3	16.0	A		
EPFU	2430	M	J	NR	0	45.5	16.2	A		
EPFU	2430	F	J	NR	0	46.2	14.1	A		
EPFU	0100	M	J	NR	0	46.5	15.3	a		
EPFU	0100	F	J	NR	0	47.2	15.5	a		
NYHU	0100	F	J	NR	0	36.4	9.5	a		

Other Species Observed:

Site Description and Weather Data Form

1/2

Project: Pleasant Ridge

Site #: PR1

Location (County/State): Livingston / IL

GPS (area between nets): 16T 0383450 4510565

Date/Net Night: 06/30/2011 1st night

Biologists: Tim Sichmeller, C. Rea

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00								
21:00	25.5	1.5	W	50	N	55%	None	
22:00	25.0	1.7	W	20	N	68	None	
23:00	25.3	4.6	W	100	N	63	None	
0:00	24.6	2.6	W	85	N	56	None	
1:00	24.5	2.5	W	100	N	58	None	
2:00								
3:00								

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: 16T 383399 4510593

2nd Net GPS: 16 383469 4510677

1st Net Height: 2h

2nd Net Height: 3h

1st Net Width: 9m

2nd Net Width: 9m

Comment: Sunset @ 2038

(if additional nets) Closed nets @ 0130

Vegetation

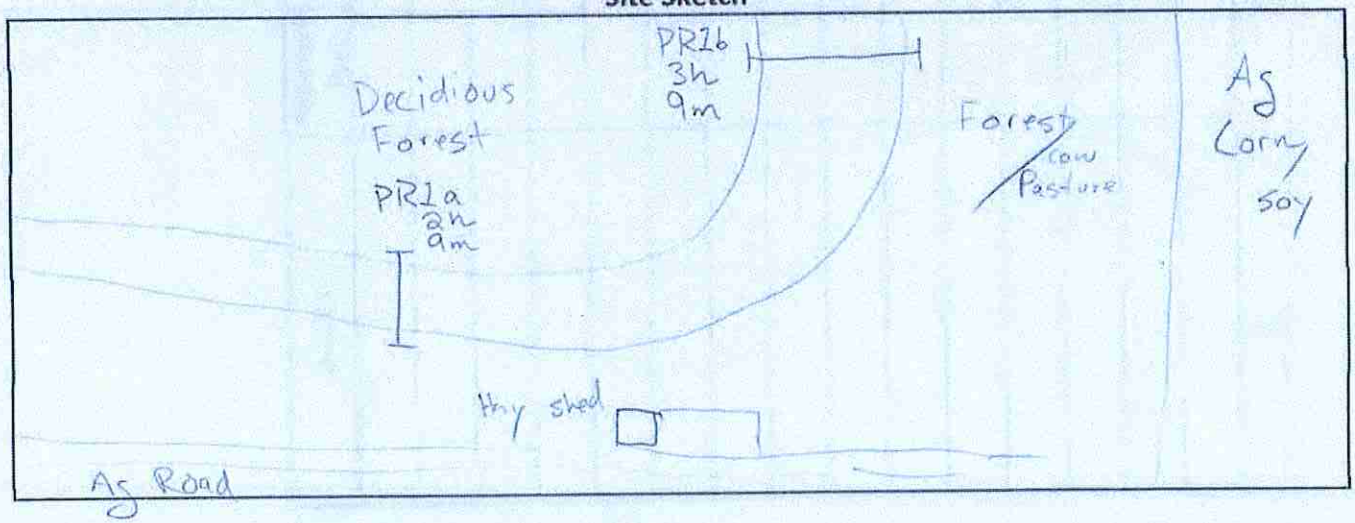
Canopy Species:

Understory Species

Percent Canopy Closure

Average Canopy dbh (estimate)

Site Sketch



Site Description and Weather Data Form

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Project: Pleasant Ridge
Site #: PR1
Location (County/State): Livingston / IL
GPS (area between nets): 16T 383450 4510565
Date/Net Night: 7/1/11 2nd night
Biologists: T. Sichmeller, C. Rea

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:~~00~~30	23.9	0.8	NE	25	N	64	None	
21:00	23.2	0.2	NE	25	N	99	None	
22:00	23.8	3.2	NE	0	N	>90	None	
23:00	23.8	1.8	NE	15	N	>90	None	
0:00	23.6	0.0	NE	10	N	>90	None	
1:00	23.6	2.1	NE	20	N	>90	None	
2:00								
3:00								

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: 2nd Net GPS:

1st Net Height: See page 1 2nd Net Height:

1st Net Width: 2nd Net Width:

Comment: Sunset @ 2030
(if additional nets) closed nets @ 0130

Vegetation

Canopy Species: Understory Species

Percent Canopy Closure Average Canopy dbh (estimate)

Site Sketch

See page 1

Site Description and Weather Data Form

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Project: Pleasant Ridge
Site #: PR2
Location (County/State): Livingston / IL
GPS (area between nets): 16T 384145 4509792
Date/Net Night: 7/2/11 1st night
Biologists: T. Sichmeller C. Reg

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00			—					
21:00	26.7	0	—	60	N	57	none	
22:00	24.8	0	—	85	N	85	None	
23:00	23.2	0	—	40	N	>90	None	
0:00	22.2	0.4	E	15	N	90	None	
1:00	20.9	0	—	15	N	>90	None	
2:00								
3:00								

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

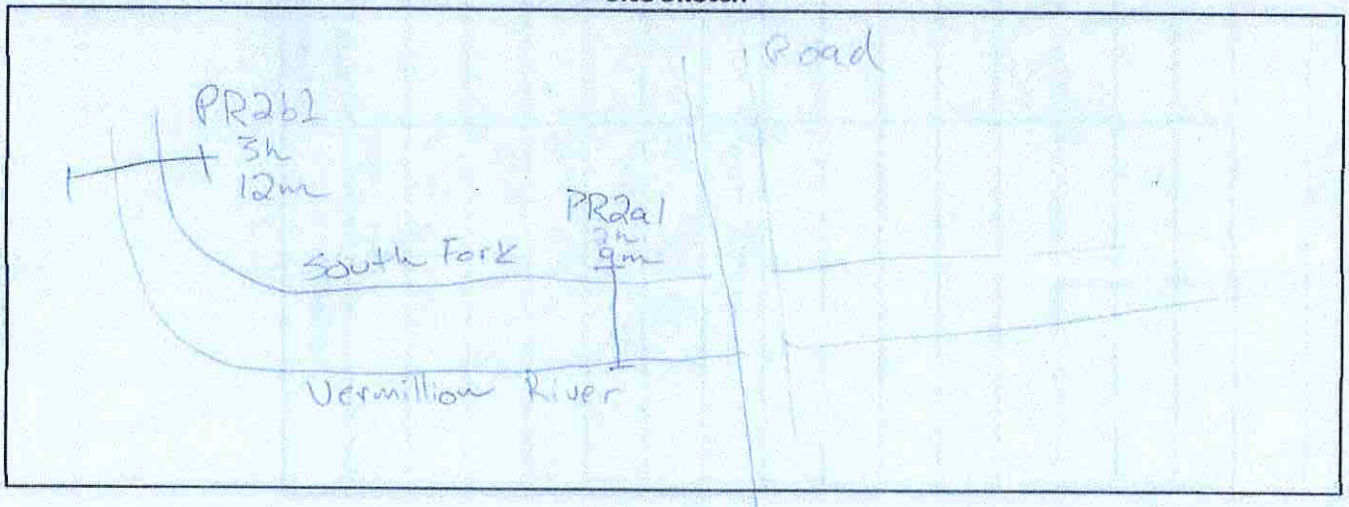
Mist-net data:

1st Net GPS: 16T 384121 4509829
2nd Net GPS: 16T 384146 4509736
1st Net Height: 2h
2nd Net Height: 3h
1st Net Width: 9m
2nd Net Width: 12m
Comment: sunset @2028
(if additional nets) close nets @ 0130

Vegetation

Canopy Species:
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch



Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR2
Location (County/State): Livingston / IL
GPS (area between nets): 16T 384145 4509792
Date/Net Night: 07/03/2011 2nd night
Biologists: T. Sichmeller / C. Rea

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00	24.7	1.8	W	80	N	58	None	
21:00	23.1	0	-	95	N	67	None	
22:00	21.9	1.0	W	80	N	71	None	
23:00	21.6	1.5	W	100	N	78	None	
0:00	21.4	0.9	W	100	N	77	None	
1:00	20.6	0.7	W	85	N	83	None	
2:00								
3:00								

Moon Phase: (New) 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: See page 1
2nd Net GPS:
1st Net Height:
2nd Net Height:
1st Net Width:
2nd Net Width:
Comment: Sunset @ 2028
(if additional nets) Close nets @ 0130

Vegetation

Canopy Species:
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch

See page 1

Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR-3
Location (County/State): Livingston / IL
GPS (area between nets): 16T 357259 4518304
Date/Net Night: 7/17/11 1st night
Biologists: A. Rinker T. Sichmeller

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00		0	-	85	N		None	
21:00	29.4	0	-	85	N	90	None	
22:00	25.0	0	-	70	N	90	None	
23:00	23.9	0	-	50	N	90	None	
0:00								
1:00	23.0	0	-	10	N	90	None	
2:00								
3:00								

Moon Phase: New 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: 16T 357255 4518221
2nd Net GPS: 16T 357276 4518395
1st Net Height: 2h
2nd Net Height: 2h
1st Net Width: 12m
2nd Net Width: 12m
Comment:
(if additional nets)

Vegetation

Canopy Species:
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch

Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR-3
Location (County/State): Livingston / IL
GPS (area between nets): 16T 372915 4518304
Date/Net Night: 7/18/11 2nd night
Biologists: T. Schmeller, A. Rinker

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00 30	29.5	1.5	N	90	N	74	None	
21:00	27.3	0	-	80	N	79	None	
22:00	27.0	0	-	100	N	83	None	
23:00	25.2	0	-	50	N	90	None	
0:00	24.8	0	-	35	N	90	Dew	
1:00								
2:00								
3:00								

Moon Phase: New 1/4 1/2 (3/4) Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: See Pg 1
2nd Net GPS:
1st Net Height:
2nd Net Height:
1st Net Width:
2nd Net Width:
Comment:
(if additional nets)

Vegetation

Canopy Species:
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch

See Pg 1

Site Description and Weather Data Form

Project: PLEASANT RIDGE
Site #: PR-4
Location (County/State):
GPS (area between nets):
Date/Net Night: 07.17.11 / NIGHT 1
Biologists:

Time:	Temp F°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00								
21:00	81.5	CALM	—	0%	N	60%	NO	—
22:00	76.6	CALM	—	0%	N	79%	NO	—
23:00	75	CALM	—	0%	N	89%	NO	—
0:00	73.8	CALM	—	0%	N	83%	NO	—
1:00	73.4	CALM	—	0%	N	85%	NO	—
2:00								
3:00								

Moon Phase: New 1/4 1/2 3/4 Full WANING GIBBOUS

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

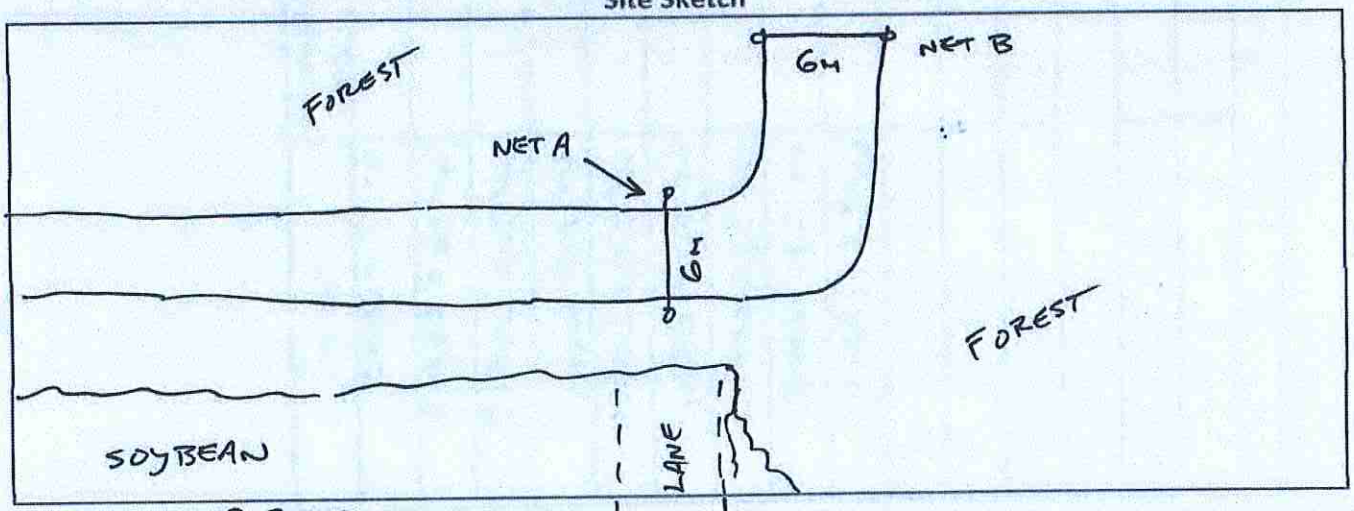
NET A	NET B
1st Net GPS: 16T 0384532 4509446	2nd Net GPS: 16T 0384584 4509485
1st Net Height: 7.8 m	2nd Net Height: 7.8 m
1st Net Width: 6m	2nd Net Width: 6m
Comment: NET OVER CREEK	NET OVER CREEK

(if additional nets)

Vegetation

Canopy Species: BLACK WILLOW, HONEY LOCUST, HACKBERRY
Understory Species PRUNUS SP., HACKBERRY,
Percent Canopy Closure 35%
Average Canopy dbh (estimate) 24 cm

Site Sketch



SUNSET @ 20:23
NETS OPENED @ 20:20
NETS CLOSED @ 01:25

Site Description and Weather Data Form

Project: PLEASANT RIDGE
Site #: PR-4
Location (County/State):
GPS (area between nets):
Date/Net Night: 7.18.11 / NIGHT 2
Biologists:

Time:	Temp F°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00	78.8	SLIGHT	—	35%	N	83%	NO	—
21:00	79.5	SLIGHT	—	50%	N	86%	NO	—
22:00	78.8	SLIGHT	—	0%	N	89%	NO	—
23:00	77.9	SLIGHT	—	5%	N	90%	NO	—
* 0:00	77.4	"	—	0%	N	91%	NO	—
1:00	77.9	5	West	0%	N	98%	No	
2:00								
3:00								

Moon Phase: New 1/4 1/2 (3/4) Full

**Data below only needed for first day of netting, unless conditions change*

SEE NIGHT 1

Mist-net data:

1st Net GPS: 2nd Net GPS:

1st Net Height: 2nd Net Height:

1st Net Width: 2nd Net Width:

Comment:
(if additional nets)

Vegetation

Canopy Species: Understory Species

Percent Canopy Closure Average Canopy dbh (estimate)

Site Sketch

* Wind speed 6.0 km/hr @ 0030

NETS OPENED @ 20:10

SUNSET @ 20:22

NETS CLOSED @

Site Description and Weather Data Form

Project: PLEASANT RIDGE
Site #: PR-5
Location (County/State):
GPS (area between nets):
Date/Net Night: 7.19.11 / NIGHT 1
Biologists:

Time:	Temp F°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00	83.5	CALM	—	55%	N	75%	NO	—
21:00	76.8	Calm	—	40%	N	72%	No	—
22:00	75.2	Calm	—	15%	N	77%	No	
23:00	73.9	CALM	—	0%	N	85%	NO	
0:00	73.0	CALM	—	5%	N	88%	NO	
1:00	74.1	CALM	—	0%	N	89%	NO	
2:00								
3:00								

Moon Phase: New 1/4 (1/2) 3/4 Full WANING GIBBOUS

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

NET A
1st Net GPS: 16T 0380086 4521131
1st Net Height: 7.8m (3X high)
1st Net Width: 9m

NET B
2nd Net GPS: 16T 0379928 4520993
2nd Net Height: 5.2m (2X high)
2nd Net Width: 6m

Comment:
(if additional nets)

Vegetation

Canopy Species: Silver Maple, Hackberry, White Oak sp. Ash spp.
Understory Species: Oak sp, Hickory Sp, Elm, Hackberry Hawthorn
Percent Canopy Closure 75%
Average Canopy dbh (estimate)

Site Sketch

NET A OVER TWO TRACK ROAD THRU FOREST
NET B along ATV trail next to creek/slough
NET C "
↳ NIGHT 2 ONLY

SUNSET @ 20:22
NETS OPENED AT [redacted] 20:05
NETS CLOSED AT @ 01:25

Site Description and Weather Data Form

CONFIDENTIAL BUSINESS INFORMATION
EXEMPT FROM DISCLOSURE - 5 ILCS 140/7(1)(g)

Project: Pleasant Ridge
Site #: PR-5
Location (County/State): / IL
GPS (area between nets):
Date/Net Night: 7.19.11 / Night 1
Biologists: K Murray, C Rae

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00								
21:00								
22:00								
23:00								
0:00								
1:00								
2:00								
3:00								

Moon Phase: New 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: 2nd Net GPS:

1st Net Height: 2nd Net Height:

1st Net Width: 2nd Net Width:

Comment:
(if additional nets)

Vegetation

Canopy Species: Understory Species

Percent Canopy Closure Average Canopy dbh (estimate)

Site Sketch

Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR-5
Location (County/State):
GPS (area between nets):
Date/Net Night: 7.20.11 / Night 2
Biologists: K Murray, C Rea

Time:	Temp both F° + C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
→ F° 20:30	83.1	Calm	—	15%	N	72%	No	
→ C° 21:00	28	0	—	5%	N	83%	No	
22:00	27	0	—	0%	N	94%	No	
23:00	26	0	—	0%	N	95%	No	
0:00	26	0	—	0%	N	94%	No	
1:00	24	0	—	0%	N	97%	No	
2:00								
3:00								

Moon Phase: New 1/4 (1/2) 3/4 Full

**Data below only needed for first day of netting, unless conditions change*

*ADDED THIRD NET ON 7.20.11 NET C

Mist-net data:

3rd ~~1st~~ Net GPS: 16T 0379954 4521019 — 2nd Net GPS:

3rd ~~1st~~ Net Height: 2.6m (1X high) — 2nd Net Height:

3rd ~~1st~~ Net Width: 6m — 2nd Net Width:

Comment:
(if additional nets)

Vegetation

Canopy Species: — Understory Species

Percent Canopy Closure — Average Canopy dbh (estimate)

Site Sketch

Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR-6
Location (County/State): Livingston / IL
GPS (area between nets): 16T 375093 4514052
Date/Net Night: 7/19/11 1st night
Biologists: T. Sichmeller, A. Rinker

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00 30	32.1	0	—	30	N	100	None	
21:00	26.2	0	—	10		90	None	
22:00								
23:00								
0:00								
1:00	24.9	0	—	20	N	84	None	
2:00								
3:00								

Moon Phase: New 1/4 1/2 (3/4) Full

***Data below only needed for first day of netting, unless conditions change*

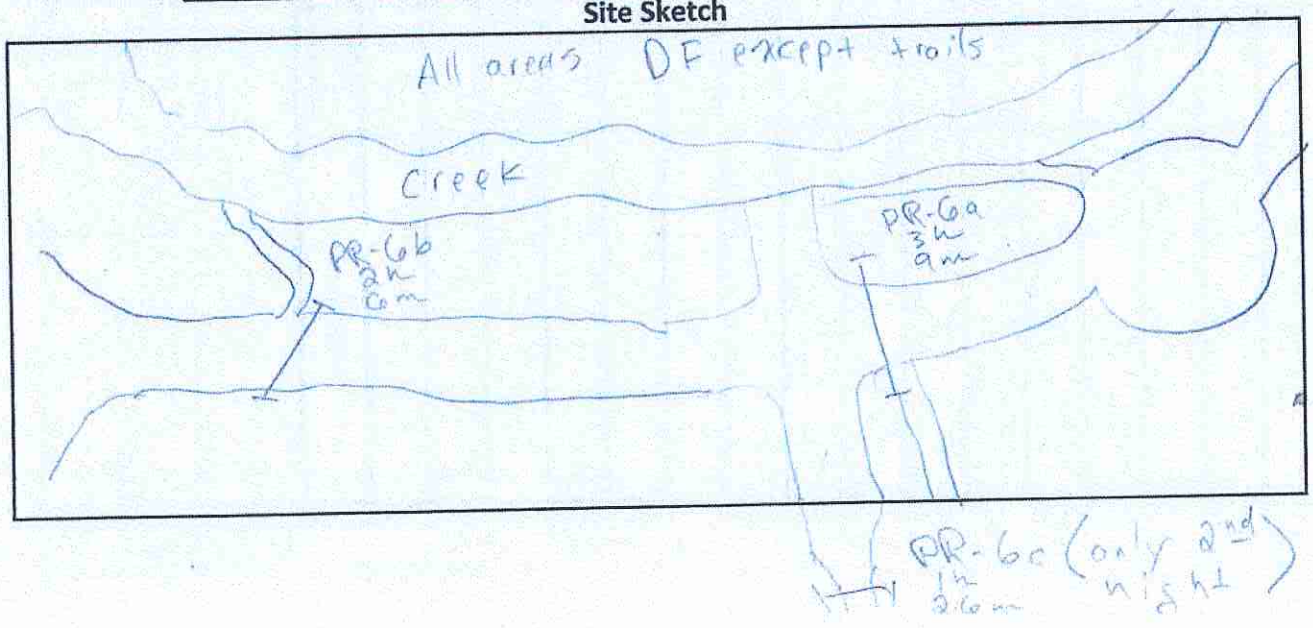
Mist-net data:

1st Net GPS: 16T 375059 4514088
2nd Net GPS: 16T 375104 4513999
1st Net Height: 3m
2nd Net Height: 2m
1st Net Width: 9m
2nd Net Width: 6m
Comment: Sunset @ 2022
(if additional nets) close nets @ 0125

Vegetation

Canopy Species: Quercus sp.
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch



Site Description and Weather Data Form

Project:
Site #: PR 6
Location (County/State):
GPS (area between nets): 16T 375093 4514052
Date/Net Night: 7/19/11 / NIGHT 1 (pg. 2)
Biologists:

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00								
21:00								
22:00								
23:00								
0:00								
1:00								
2:00								
3:00								

Moon Phase: New 1/4 1/2 3/4 Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: 2nd Net GPS:

1st Net Height: 2nd Net Height:

1st Net Width: 2nd Net Width:

Comment:
(if additional nets)

Vegetation

Canopy Species: Understory Species

Percent Canopy Closure Average Canopy dbh (estimate)

Site Sketch

Site Description and Weather Data Form

Project: Pleasant Ridge
Site #: PR-Co
Location (County/State): Livingston/IL
GPS (area between nets): 16T 375093 4514652
Date/Net Night: 7/20/11 2nd night
Biologists: T. Sichmeller A. Rinker

Time:	Temp C°	Wind Speed (kph)	Wind Direction (from the origin)	% Cloud Cover	Nets Illuminated (Y/N & which one)	Relative Humidity	Precipitation	Comments
20:00	31	1	S	80	N	73	None	
21:00	28	1	S	50	N	88	None	
22:00								
23:00								
0:00								
1:00	26	0	-	18	N	92	None	
2:00								
3:00								

Moon Phase: New 1/4 1/2 (3/4) Full

***Data below only needed for first day of netting, unless conditions change*

Mist-net data:

1st Net GPS: see pg 1
2nd Net GPS:
1st Net Height:
2nd Net Height:
1st Net Width:
2nd Net Width:
Comment: added a single 2.6m North of PR-Log
(if additional nets) at 16T 375103 4514112
Sunset @ 2021

Vegetation

Canopy Species: Close nets @ 0125
Understory Species
Percent Canopy Closure
Average Canopy dbh (estimate)

Site Sketch

see pg 1