

# **Acoustic Broadcast Raptor Monitoring and at the Arkwright Summit Wind Energy Project Chautauqua County, New York**

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**Technical Memorandum  
June 2013 – July 2013**



**Prepared for:**  
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## **EXECUTIVE SUMMARY**

EDP Renewables (EDPR) has proposed to develop the Arkwright Summit Wind Energy Project in Chautauqua County, New York. EDPR contracted Western EcoSystems Technology, Inc. (WEST) to conduct baseline studies for breeding birds, eagles and raptors at the Project site. Since forest nesting raptors, and in particular the red-shouldered hawk, a NY State Species of Special Concern [New York State Department of Environmental Conservation (NYSDEC)], has been documented breeding in the vicinity of the Project, broadcast surveys were conducted to estimate use to determine potential impacts and risks from the development of a wind energy facility. This document contains the results of these surveys.

### ***Broadcast Call Survey for Nesting Raptors***

The objective of the survey is to provide information on species of forest raptors potentially nesting in the study area and supplement the other surveys being conducted at the site for eagles and raptors. Sixty call stations were established on public roads in the Project area within or adjacent to forest habitat, distance between call stations averaged .25 miles and ranged from .07 to .5 miles apart. At each station, pre-recorded calls of red-shoulder hawks were broadcast for a period of ten minutes followed by a 4 minute listening/response period. Any response by raptors of any species was recorded. Each station was visited three times during the following dates: June 26 – 27, July 2 – 3, and July 10 – 11, 2013. Stations 53, 59, and 60 were only surveyed during the July surveys.

Broadcast surveys elicited a total of 16 responses (vocal or visual) from 3 species (13 red-shouldered hawk, 2 red-tailed hawk, 1 American kestrel) from (8) call stations (16, 25, 32, 40, 44, 48, 54, and 58).

## **STUDY PARTICIPANTS**

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## **INTRODUCTION**

EDP Renewables (EDPR) has proposed to develop the Arkwright Summit Wind Energy Project in Chautauqua County, New York. EDPR contracted Western EcoSystems Technology, Inc. (WEST) to conduct baseline studies for breeding birds, eagles and raptors at the proposed project site. Since forest nesting raptors, and in particular the red-shouldered hawk, a NY State Species of Special Concern [New York State Department of Environmental Conservation (NYSDEC)], have been documented breeding in the vicinity of the Project area, broadcast surveys were conducted to estimate use to determine potential impacts and risks from the development of a wind energy facility. This document contains the results of these surveys.

The broadcast surveys provide information on species of forest raptors potentially nesting in the study area and supplement other surveys conducted at the site for eagles and raptors.

## **STUDY AREA**

The Project is located in the northwest corner of Chautauqua County, New York. The Project study area is about two miles (three kilometers [km]) west of Fredonia and approximately three miles (five km) south of Lake Erie (Figure 1). The Project is located on relatively broad hilltops with an elevation range of 750 to 1,900 feet (ft; 229 to 579 meters [m]), generally increasing from north to south. The Project intersects with Canadaway Creek Wildlife Management Area and abuts the Boutwell Hill State Forest. Primary roads through the Project area include Route 39 to the north, Straight Road near the center and Route 83 towards the south. An existing 115-kilovolt (kV) transmission line runs along the western boundary and an existing 230-kV transmission line runs along the northern boundary. The Project vicinity is composed mainly of deciduous and mixed forests, as well as agricultural lands.

Approximately 68% of the Project area is in forested upland (deciduous and mixed forests), and 20% is composed of agricultural land (pastureland). The primary cover types are distributed fairly evenly throughout the Project area, with some concentration of mixed forests and urban, in the northern portion of the area, and a concentration of deciduous forests in the southern portion (Figure 2).

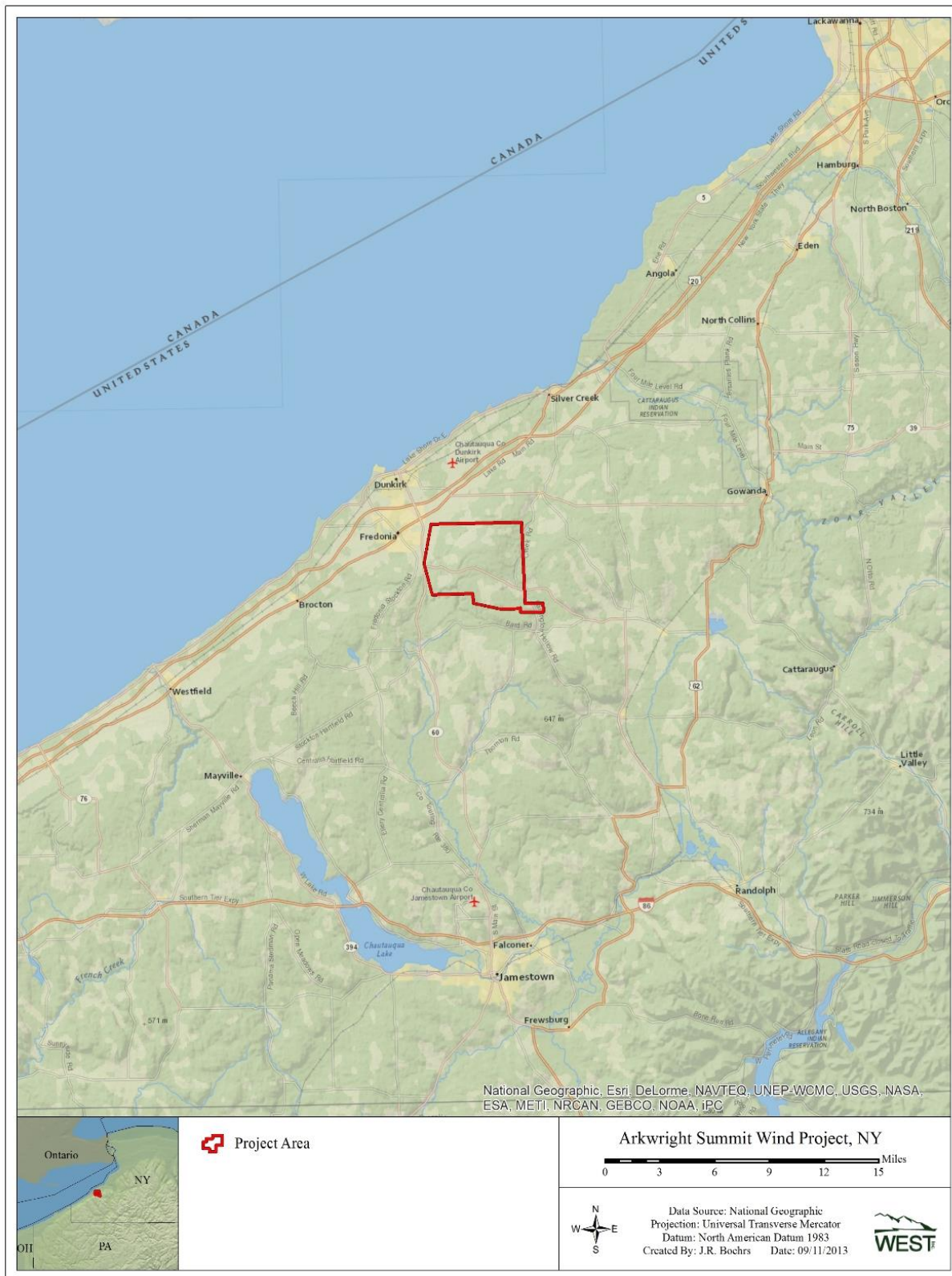


Figure 1. Location of the Arkwright Summit Wind Project.



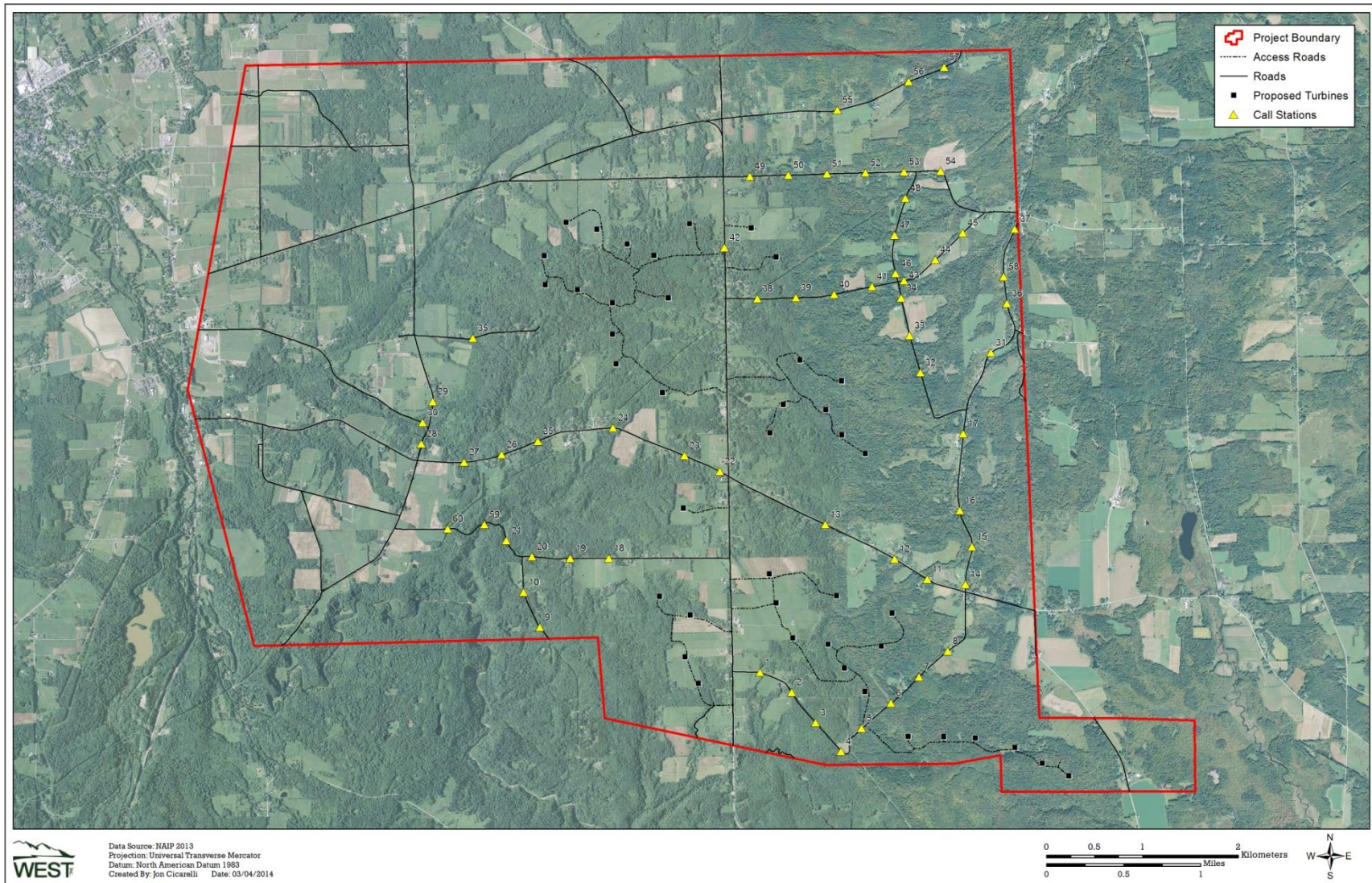


Figure 2. Location of proposed turbines and call stations in the Arkwright Summit Wind Project.

## **METHODS**

### **Broadcast call surveys**

Utilizing broadcast survey methods has been shown to be effective in locating low density and/or secretive forest dwelling raptor species (Iverson and Fuller 1991, BLM 2012, McLoed and Andersen 1998, Henneman et al. 2007). In 2013, broadcast call surveys were used to gather baseline data on forest raptors potentially nesting in the study area. Sixty survey locations, i.e., call stations, were established throughout the Project area via a desktop exercise using ArcGIS ESRI ArcGIS® (ESRI, Redlands, California, USA). Call stations were established approximately every 0.25 miles (0.40 km) along public roads within the Project Area boundary (Figure 2). Call stations were eliminated if a point fell within the line of sight of an occupied dwelling or was located in open habitat beyond the audible range of forest habitat. Surveys were conducted at intervals of approximately 5-10 days between surveys. Most call stations were visited three times during the following dates: June 26 – 27, July 2 – 3, and July 10 – 11, 2013. Stations 53, 59, and 60 were only surveyed during the July surveys for a total of two visits to these call stations. Surveys were scheduled during the typical nesting stage for forest nesting raptors (i.e., prior to the fledging of young), late June – mid July (McLoed and Anderson 1998, Mosher et al. 1990). Surveys conducted early in the breeding season, prior to egg hatch, show to elicit the highest response rate (McLoed and Anderson 1998).

Call Broadcast procedures followed a modification of methods outlined by Iverson and Fuller (1991), and McLoed and Andersen (1998). Because red-shouldered hawk (RSHA) is the main species of concern in this area, the broadcast surveys were conducted using a conspecific RSHA call (McLoed and Andersen 1998). A red-shouldered hawk territorial defense call was broadcast through a FoxPro® NX3 model digital game caller (FoxPro Inc., Lewistown, Pennsylvania, USA). Six calls each of 20-second (sec) duration were broadcast at 1-minute (min) intervals with a 40-second (sec) listening period between successive calls. After the final call, there was a listening period of four min and 40 sec, for a total of 10 min at each call station. Calls were broadcast in all directions and observers looked and listened in all directions to maximize spatial coverage around each survey point.

Surveys were conducted under conditions used for Breeding Bird Surveys (BBS): wind speed less than or equal to Beaufort Scale 3 (i.e., 12-19 km/hour [7.5-12 miles/hour]) and no constant precipitation (Robbins et al. 1986). In addition, surveys were not conducted if visibility was less than one km (0.6 mile). Temperature, wind speed, percent cloud cover, and presence of precipitation were recorded at the start of each survey. Observers also noted any noise or disturbance present during the broadcast surveys. Surveys were conducted from approximately one half-hour before sunrise to one half hour before sunset (Iverson and Fuller 1991, McLoed and Andersen 1998).

Locations of all responses were recorded using a handheld GPS and attribute data were recorded on datasheets. A response by a raptor was defined as a vocalization after a broadcast



had been initiated, approach to a call station, or visual of an individual/individuals circling overhead or at some distance. All raptor responses were recorded with the following data: time elapsed since start of broadcast (latency); estimated distance and direction to the bird; species, age and sex if possible; and type of response (VOC-vocal non-approach; VOCA – vocal approach; VOCV – vocal non-approach with visual; and NVOC – non-vocal approach).

## **RESULTS**

### **Acoustic Broadcast Surveys**

Broadcast surveys were conducted at each call station three times with the exception of stations 53, 59 and 60. The surveys occurred during June and July, 2013: June 26-27, July 2-3, and July 10-11. Broadcast surveys elicited a total of 16 responses (vocal or visual) from 3 species (13 red-shouldered hawk, 2 red-tailed hawk, 1 American kestrel) from (8) call stations (16, 25, 32, 40, 44, 48, 54, and 58) (Table 1, Figure 3, and Appendix A). A possible response on July 2, at call station (48) was believed to be that of a red-shouldered hawk; the observation was a quick vocal response and brief visual in the direction of call station (54) where a pair of red-shouldered hawk was observed earlier that day. One red-tailed hawk was observed circling overhead during the last few minutes of a survey at call station (58) on June 27, and the broadcast survey on July 11 at call station (40) stimulated a vocal non-approach with a distant visual (VOCV) response by red-tailed hawk. The broadcast surveys also resulted in a non-vocal approach (NVOC) response by an American kestrel at call station (44) on July 2 (Table 1 and Appendix A). Non-diurnal raptor responses included observations of circling turkey vultures and common ravens, the flushing of a great-horned owl (*Bubo virginianus*), and vocal responses by wild turkey (Appendix A).

The average response time latency was 137 seconds and average distance of first response was approximately 167 m.

Due to noise and human activity in the area, as well as interruptions of the field technician by residents of the area or police (Appendix A), potentially not all vocal responses were heard by the technician or non-vocal approaches noted. Noise (e.g., mowing, chainsaws, road construction, and highway traffic) in the broadcast vocalization area may have also prevented raptor species from hearing and responding to broadcast calls. Human activity may have also played a role in habituating raptors; possibly lessening response behaviors (see Fuller and Mosher 1987).

**Table 1. Summary of survey effort and observations during each round of acoustic broadcast surveys.**

Round	Number of Surveys Conducted*	Number of Unique Raptor Species	Number of Individuals Detected (visual or response)	Species
1	57	2	3	Pair RSHA - Individual RTHA
2	60	2	6	2 Pair RSHA - Individual RSHA (possible) - Individual AMKE
3	60	2	7	3 Pair RSHA - Individual RTHA
<b>Overall</b>	<b>177</b>	<b>3</b>	<b>16</b>	

Round 1 = June 26 – 27, Round 2 = July 2-3, Round 3 = July 10-11.

\* = Due to restricted access stations 53, 59, and 60 were only surveyed two times each

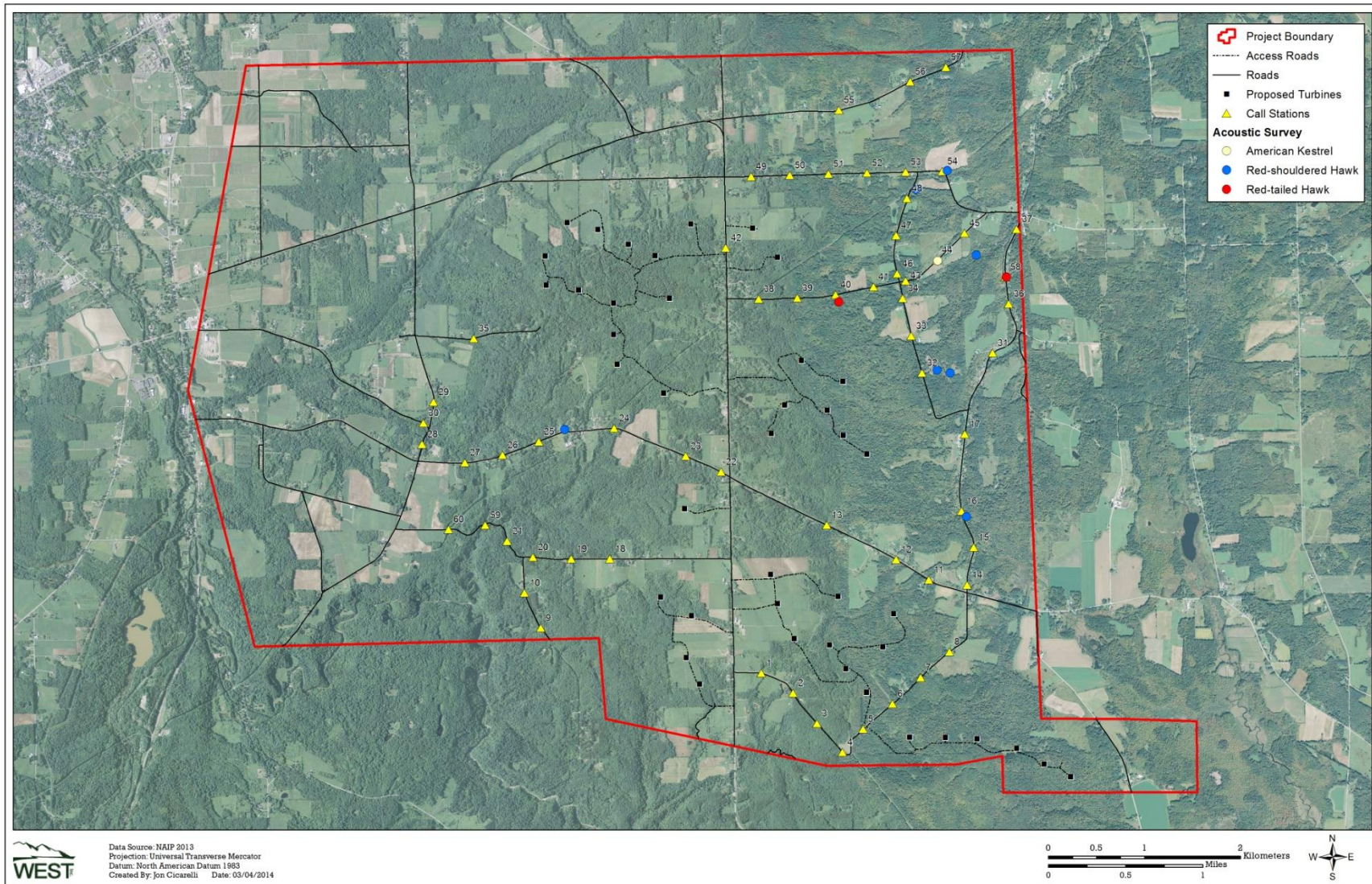


Figure 3. Raptor response locations and call stations at the Arkwright Summit Wind Project

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## **Appendix A. Summary of the Broadcast Survey at the Arkwright Wind Project**

**Appendix A. Summary of the broadcast survey from the Arkwright Wind Project during June 26-27, July 2-3, and July 10-11, 2013.**

Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
06/26/13	1	645460.14	4694422.06	6:04	6:14	No	--	n/a	n/a	--	--	
06/26/13	2	645788.56	4694213.88	6:15	6:25	No	--	n/a	n/a	--	--	Chainsaw being operated within broadcast vocalization range
06/26/13	3	646038.09	4693899.63	6:27	6:37	No	--	n/a	n/a	--	--	
06/26/13	4	646305.72	4693599.22	6:40	6:50	No	--	n/a	n/a	--	--	
06/26/13	5	646520.39	4693839.64	6:52	7:02	No	--	n/a	n/a	--	--	
06/26/13	6	646826.08	4694101.01	7:06	7:16	No	--	n/a	n/a	--	--	
06/26/13	7	647119.46	4694375.82	7:22	7:32	No	--	n/a	n/a	--	--	
06/26/13	8	647418.24	4694644.49	7:40	7:50	No	--	n/a	n/a	--	--	
06/26/13	18	643882.10	4695612.65	8:04	8:14	No	--	n/a	n/a	--	--	
06/26/13	19	643479.76	4695611.89	8:15	8:25	No	--	n/a	n/a	--	--	Road construction in general area with tree trimming activities within broadcast vocalization range
06/26/13	10	642992.70	4695256.77	8:29	8:39	No	--	n/a	n/a	--	--	
06/26/13	9	643161.62	4694893.36	8:42	8:52	No	--	n/a	n/a	--	--	
06/26/13	21	642811.82	4695796.23	8:57	9:07	No	--	n/a	n/a	--	--	
06/26/13	20	643078.35	4695630.78	9:10	9:20	No	--	n/a	n/a	--	--	
06/26/13	22	645038.33	4696517.52	9:26	9:36	No	--	n/a	n/a	--	--	Busy highway with significant vehicle noise
06/26/13	40	646232.54	4698363.70	9:50	10:00	No	--	n/a	n/a	--	--	
06/26/13	39	645832.77	4698327.93	10:03	10:13	No	--	n/a	n/a	--	--	
06/26/13	38	645430.75	4698318.06	10:18	10:26	No	--	n/a	n/a	--	--	
06/26/13	42	645088.73	4698851.35	10:31	10:41	No	--	n/a	n/a	--	--	
06/26/13	57	647381.63	4700731.49	10:55	11:05	No	--	n/a	n/a	--	--	A chainsaw and weedeater are being operated nearby within vocalization range
06/26/13	56	647009.03	4700580.61	11:08	11:18	No	--	n/a	n/a	--	--	
06/26/13	55	646265.95	4700284.73	11:20	11:30	No	--	n/a	n/a	--	--	
06/26/13	49	645351.72	4699594.75	11:36	11:46	No	--	n/a	n/a	--	--	
06/26/13	13	646140.93	4695963.29	11:52	12:02	No	--	n/a	n/a	--	--	Busy highway with vehicle noise

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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
06/26/13	12	646862.00	4695606.79	12:07	12:17	No	--	n/a	n/a	--	--	Busy highway with vehicle noise, two turkey vultures (TUVU) observed circling overhead and low
06/26/13	11	647203.65	4695394.33	12:21	12:31	No	--	n/a	n/a	--	--	Busy highway with vehicle noise
06/26/13	14	647602.36	4695338.91	12:36	12:46	No	--	n/a	n/a	--	--	
06/26/13	15	647670.08	4695732.98	12:51	1:01	No	--	n/a	n/a	--	--	
06/26/13	16	647544.45	4696110.03	1:05	1:20	Yes	RSHA	120	75	10	VOCA	Immediate territorial response with two individuals observed flying through the forest and across the road less than 50 meters from my position. Pair became quiet and unresponsive until one adult was observed flying back in quietly and perching out of sight and began wailing. The pair then became quiet and no further visual or vocal response was made
06/26/13	17	647579.91	4696909.79	1:27	1:37	No	--	n/a	n/a	--	--	TUVU observed circling overhead
06/26/13	31	647868.51	4697755.26	1:40	1:50	No	--	n/a	n/a	--	--	Two adult and one fledgling Common raven (CORA) and one turkey vulture observed after broadcast calls initiated
06/27/13	50	645753.86	4699607.46	6:45	6:55	No	--	n/a	n/a	--	--	
06/27/13	51	646155.93	4699621.00	7:05	7:10	No	--	n/a	n/a	--	--	
06/27/13	52	646558.13	4699631.33	7:15	7:25	No	--	n/a	n/a	--	--	CORA responded vocally and flew in. Police arrived to question my activity (concerned neighbors), interrupting survey
06/27/13	54	647343.43	4699647.32	7:33	7:43	No	--	n/a	n/a	--	--	
06/27/13	48	646975.99	4699365.25	8:03	8:13	No	--	n/a	n/a	--	--	

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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
06/27/13	47	646864.03	4698979.16	8:18	8:28	No	--	n/a	n/a	--	--	Wild turkey responded each time broadcast played
06/27/13	46	646874.99	4698582.64	8:37	8:47	No	--	n/a	n/a	--	--	
06/27/13	45	647575.77	4699005.21	8:51	9:01	No	--	n/a	n/a	--	--	
06/27/13	44	647288.12	4698723.99	9:03	9:13	No	--	n/a	n/a	--	--	
06/27/13	43	646962.14	4698507.00	9:14	9:24	No	--	n/a	n/a	--	--	
06/27/13	41	646626.75	4698443.94	9:26	9:36	No	--	n/a	n/a	--	--	
06/27/13	23	644671.73	4696682.60	9:38	9:48	No	--	n/a	n/a	--	--	
06/27/13	24	643923.81	4696972.32	9:51	10:01	No	--	n/a	n/a	--	--	
06/27/13	25	643139.45	4696834.16	10:03	10:13	No	--	n/a	n/a	--	--	
06/27/13	26	642763.32	4696691.64	10:14	10:24	No	--	n/a	n/a	--	--	
06/27/13	27	642370.07	4696613.40	10:25	10:35	No	--	n/a	n/a	--	--	
06/27/13	28	641925.81	4696806.96	10:37	10:47	No	--	n/a	n/a	--	--	
06/27/13	30	641937.78	4697026.97	10:48	10:58	No	--	n/a	n/a	--	--	
06/27/13	29	642044.40	4697244.64	11:00	11:10	No	--	n/a	n/a	--	--	
06/27/13	35	642461.17	4697907.82	11:12	11:22	No	--	n/a	n/a	--	--	
06/27/13	37	648118.91	4699044.78	13:57	14:07	No	--	n/a	n/a	--	--	Red-tailed hawk (RTHA) observed circling overhead during last two minutes of survey
06/27/13	58	648002.00	4698548.00	14:11	14:21	No	RTHA	n/a	n/a	--	--	
06/27/13	36	648034.00	4698267.14	14:25	14:35	No	--	n/a	n/a	--	--	
06/27/13	34	646932.90	4698326.48	14:46	14:56	No	--	n/a	n/a	--	--	
06/27/13	33	647020.44	4697933.83	14:58	15:08	No	--	n/a	n/a	--	--	
06/27/13	32	647132.99	4697547.58	15:10	15:20	No	--	n/a	n/a	--	--	
07/02/13	28	641925.81	4696806.96	6:55	7:05	No	--	n/a	n/a	--	--	
07/02/13	30	641937.78	4697026.97	7:09	7:19	No	--	n/a	n/a	--	--	
07/02/13	29	642044.40	4697244.64	7:21	7:31	No	--	n/a	n/a	--	--	
07/02/13	35	642461.17	4697907.82	7:33	7:43	No	--	n/a	n/a	--	--	
07/02/13	55	646265.95	4700284.73	9:00	9:10	No	--	n/a	n/a	--	--	
07/02/13	57	647381.63	4700731.49	9:14	9:24	No	--	n/a	n/a	--	--	
07/02/13	56	647009.03	4700580.61	9:26	9:36	No	--	n/a	n/a	--	--	
07/02/13	49	645351.72	4699594.75	9:41	9:51	No	--	n/a	n/a	--	--	
07/02/13	50	645753.86	4699607.46	9:53	10:03	No	--	n/a	n/a	--	--	



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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
07/02/13	51	646155.93	4699621.00	10:05	10:15	No	--	n/a	n/a	--	--	
07/02/13	52	646558.13	4699631.33	10:19	10:29	No	--	n/a	n/a	--	--	
07/02/13	54	647343.43	4699647.32	10:32	10:42	Yes	RSHA	80	54	5	VOCA	Immediate response from small forested habitat patch, one adult observed as it flew toward call station and perched within site and continued wailing. Both individuals then observed flying off and out of site to south southeast
07/02/13	53	646960.36	4699640.04	10:53	11:03	No	--	n/a	n/a			
07/02/13	48	646975.99	4699365.25	11:05	11:15	Possible	RSHA	40	200	60	VOCV	Distant short response and quick visual of a raptor flying through open patch in distance. Likely pair heard at station 54
07/02/13	47	646864.03	4698979.16	11:20	11:30	No	--	n/a	n/a	--	--	
07/02/13	46	646874.99	4698582.64	11:32	11:42	No	--	n/a	n/a	--	--	
07/02/13	34	646932.90	4698326.48	11:44	11:54	No	--	n/a	n/a	--	--	
07/02/13	33	647020.44	4697933.83	12:02	12:12	No	--	n/a	n/a	--	--	
07/02/13	32	647132.99	4697547.58	12:14	12:24	Yes	RSHA	90	75	480	VOCA	Pair observed in the final 4-minute period flying directly at me vocalizing a territorial defense/alarm wail, perched directly overhead then began flying back and forth overhead. Pair continued to wail as I left call station
07/02/13	17	647579.91	4696909.79	12:37	12:47	No	--	n/a	n/a	--	--	Mowing activities at nearby residence, neighbor came out to ask what I was doing survey interrupted
07/02/13	16	647544.45	4696110.03	12:53	13:03	No	--	n/a	n/a	--	--	Previous detection at this location
07/02/13	15	647670.08	4695732.98	13:05	13:15	No	--	n/a	n/a	--	--	

**Appendix A. Summary of the broadcast survey from the Arkwright Wind Project during June 26-27, July 2-3, and July 10-11, 2013.**

Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
07/02/13	14	647602.36	4695338.91	13:16	13:26	No	--	n/a	n/a	--	--	Busy and loud road intersection
07/02/13	31	647868.51	4697755.26	13:30	13:40	No	--	n/a	n/a	--	--	Road construction interrupted survey
07/02/13	45	647575.77	4699005.21	13:45	1:55	No	--	n/a	n/a	--	--	RTHA observed soaring to the southwest
07/02/13	44	647288.12	4698723.99	13:56	14:06	No	AMKE	n/a	n/a	300	NVOC	American kestrel (AMKE) observed flying directly at broadcast station, seven TUVU observed circling overhead
07/02/13	43	646962.14	4698507.00	14:08	14:18	No	--	n/a	n/a	--	--	
07/02/13	41	646626.75	4698443.94	14:19	14:29	No	--	n/a	n/a	--	--	
07/02/13	40	646232.54	4698363.70	14:31	14:41	No	--	n/a	n/a	--	--	
07/02/13	39	645832.77	4698327.93	14:42	14:52	No	--	n/a	n/a	--	--	
07/02/13	38	645430.75	4698318.06	14:54	15:04	No	--	n/a	n/a	--	--	
07/02/13	42	645088.73	4698851.35	15:59	16:09	No	--	n/a	n/a	--	--	
07/02/13	22	645038.33	4696517.52	16:17	16:27	No	--	n/a	n/a	--	--	
07/02/13	23	644671.73	4696682.60	16:28	16:38	No	--	n/a	n/a	--	--	
07/02/13	24	643923.81	4696972.32	16:39	16:49	No	--	n/a	n/a	--	--	
07/02/13	25	643139.45	4696834.16	16:50	17:00	No	--	n/a	n/a	--	--	
07/02/13	26	642763.32	4696691.64	17:01	17:11	No	--	n/a	n/a	--	--	
07/02/13	27	642370.07	4696613.40	17:12	17:24	No	--	n/a	n/a	--	--	
07/03/13	59	642581.25	4695962.59	6:15	6:25	No	--	n/a	n/a	--	--	
07/03/13	60	642200.25	4695920.26	6:28	6:38	No	--	n/a	n/a	--	--	
07/03/13	18	643882.10	4695612.65	6:47	6:57	No	--	n/a	n/a	--	--	
07/03/13	19	643479.76	4695611.89	6:58	7:08	No	--	n/a	n/a	--	--	
07/03/13	20	643078.35	4695630.78	7:09	7:19	No	--	n/a	n/a	--	--	Wild turkeys heard vocalizing during broadcast survey
07/03/13	10	642992.70	4695256.77	7:20	7:30	No	--	n/a	n/a	--	--	
07/03/13	9	643161.62	4694893.36	7:32	7:42	No	--	n/a	n/a	--	--	
07/03/13	21	642811.82	4695796.23	7:45	7:55	No	--	n/a	n/a	--	--	
07/03/13	1	645460.14	4694422.06	8:04	8:14	No	--	n/a	n/a	--	--	
07/03/13	2	645788.56	4694213.88	8:15	8:25	No	--	n/a	n/a	--	--	
07/03/13	3	646038.09	4693899.63	8:26	8:36	No	--	n/a	n/a	--	--	

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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
07/03/13	4	646305.72	4693599.22	8:37	8:47	No	--	n/a	n/a	--	--	
07/03/13	5	646520.39	4693839.64	8:48	8:58	No	--	n/a	n/a	--	--	
07/03/13	6	646826.08	4694101.01	10:40	10:50	No	--	n/a	n/a	--	--	
07/03/13	7	647119.46	4694375.82	10:52	11:02	No	--	n/a	n/a	--	--	
07/03/13	8	647418.24	4694644.49	12:10	12:20	No	--	n/a	n/a	--	--	
07/03/13	11	647203.65	4695394.33	12:22	12:32	No	--	n/a	n/a	--	--	
07/03/13	12	646862.00	4695606.79	12:33	12:43	No	--	n/a	n/a	--	--	Busy highway with vehicle noise
07/03/13	13	646140.93	4695963.29	12:45	12:55	No	--	n/a	n/a	--	--	
07/03/13	36	648034.00	4698267.14	13:04	13:14	No	--	n/a	n/a	--	--	
07/03/13	58	648002.00	4698548.00	13:15	13:25	No	--	n/a	n/a	--	--	
07/03/13	37	648118.91	4699044.78	13:27	13:37	No	--	n/a	n/a	--	--	
07/10/13	59	642581.25	4695962.59	6:45	6:55	No	--	n/a	n/a	--	--	
07/10/13	60	642200.25	4695920.26	7:24	7:34	No	--	n/a	n/a	--	--	Pause in survey due to a temporary moderate rain event
07/10/13	28	641925.81	4696806.96	7:40	7:50	No	--	n/a	n/a	--	--	
07/10/13	30	641937.78	4697026.97	7:52	8:02	No	--	n/a	n/a	--	--	
07/10/13	29	642044.40	4697244.64	8:03	8:13	No	--	n/a	n/a	--	--	
07/10/13	35	642461.17	4697907.82	8:16	8:26	No	--	n/a	n/a	--	--	
07/10/13	27	642370.07	4696613.40	8:30	8:40	No	--	n/a	n/a	--	--	
07/10/13	26	642763.32	4696691.64	8:42	8:52	No	--	n/a	n/a	--	--	Busy highway with vehicle noise
07/10/13	25	643139.45	4696834.16	8:55	9:05	Yes	RSHA	74	300	0	VOCA	Red-shouldered hawk pair heard wailing when I arrived at station, continued to wail as I started broadcasting one individual flew over road 70 m east of my location providing a brief visual. It is likely this pair was responding to broadcast calls conducted at station 26; however, due to traffic noise I likely did not hear

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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
07/10/13	24	643923.81	4696972.32	9:12	9:22	No	--	n/a	n/a	--	--	
07/10/13	23	644671.73	4696682.60	9:50	10:00	No	--	n/a	n/a	--	--	
07/10/13	22	645038.33	4696517.52	10:02	10:12	No	--	n/a	n/a	--	--	
07/10/13	18	643882.10	4695612.65	10:15	10:25	No	--	n/a	n/a	--	--	
07/10/13	19	643479.76	4695611.89	10:27	10:37	No	--	n/a	n/a	--	--	
07/10/13	20	643078.35	4695630.78	10:39	10:49	No	--	n/a	n/a	--	--	
07/10/13	21	642811.82	4695796.23	10:52	11:02	No	--	n/a	n/a	--	--	
07/10/13	10	642992.70	4695256.77	11:05	11:15	No	--	n/a	n/a	--	--	
07/10/13	9	643161.62	4694893.36	11:17	11:27	No	--	n/a	n/a	--	--	
07/10/13	13	646140.93	4695963.29	11:37	11:47	No	--	n/a	n/a	--	--	
07/10/13	12	646862.00	4695606.79	11:51	12:01	No	--	n/a	n/a	--	--	
07/10/13	11	647203.65	4695394.33	12:03	12:13	No	--	n/a	n/a	--	--	
07/10/13	8	647418.24	4694644.49	12:18	12:28	No	--	n/a	n/a	--	--	
07/10/13	7	647119.46	4694375.82	12:32	12:42	No	--	n/a	n/a	--	--	
07/10/13	6	646826.08	4694101.01	12:47	12:57	No	--	n/a	n/a	--	--	
07/10/13	5	646520.39	4693839.64	12:59	13:09	No	--	n/a	n/a	--	--	
07/10/13	4	646305.72	4693599.22	13:12	13:24	No	--	n/a	n/a	--	--	
07/10/13	3	646038.09	4693899.63	13:28	13:38	No	--	n/a	n/a	--	--	TUVU observed circling overhead
07/10/13	2	645788.56	4694213.88	13:40	13:50	No	--	n/a	n/a	--	--	
07/10/13	1	645460.14	4694422.06	13:52	14:02	No	--	n/a	n/a	--	--	
07/10/13	14	647602.36	4695338.91	14:10	14:20	No	--	n/a	n/a	--	--	
07/10/13	15	647670.08	4695732.98	14:22	14:32	No	--	n/a	n/a	--	--	
07/10/13	16	647544.45	4696110.03	14:36	14:46	No	--	n/a	n/a	--	--	Great-horned owl flushed from perch 25 m north of call station overlooking fresh road kill.
07/10/13	17	647579.91	4696909.79	14:50	15:00	No	--	n/a	n/a	--	--	
07/11/13	42	645088.73	4698851.35	7:05	7:15	No	--	n/a	n/a	--	--	
07/11/13	55	646265.95	4700284.73	7:26	7:36	No	--	n/a	n/a	--	--	
07/11/13	56	647009.03	4700580.61	7:38	7:48	No	--	n/a	n/a	--	--	
07/11/13	57	647381.63	4700731.49	7:50	8:00	No	--	n/a	n/a	--	--	
07/11/13	49	645351.72	4699594.75	8:05	8:15	No	--	n/a	n/a	--	--	
07/11/13	50	645753.86	4699607.46	8:17	8:27	No	--	n/a	n/a	--	--	



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Date	Station Number	UTM NAD 83		Broadcast		Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing	Start Time	End Time							
07/11/13	51	646155.93	4699621.00	8:29	8:39	No	--	n/a	n/a	--	--	
07/11/13	52	646558.13	4699631.33	8:41	8:51	No	--	n/a	n/a	--	--	
07/11/13	53	646960.36	4699640.04	8:54	9:04	No	--	n/a	n/a	--	--	
07/11/13	54	647343.43	4699647.32	9:05	9:15	No	--	n/a	n/a	--	--	
07/11/13	48	646975.99	4699365.25	9:18	9:28	No	--	n/a	n/a	--	--	
07/11/13	47	646864.03	4698979.16	9:30	9:40	No	--	n/a	n/a	--	--	
07/11/13	46	646874.99	4698582.64	9:42	9:52	No	--	n/a	n/a	--	--	
07/11/13	34	646932.90	4698326.48	9:55	10:05	No	--	n/a	n/a	--	--	
07/11/13	33	647020.44	4697933.83	10:06	10:16	No	--	n/a	n/a	--	--	
07/11/13	32	647132.99	4697547.58	10:20	10:30	Yes	RSHA	84	150	120	VOCA	Auditory response heard from a distance of approximately 150 m, and then within seconds a visual and auditory observance at approx. 75 m. Adult pair observed in territorial defense behavior perching momentarily almost overhead, then continued to fly in and out of sight continuously wailing.
07/11/13	31	647868.51	4697755.26	11:00	11:10	No	--	n/a	n/a	--	--	
07/11/13	36	648034.00	4698267.14	11:13	11:23	No	--	n/a	n/a	--	--	
07/11/13	58	648002.00	4698548.00	11:24	11:34	No	--	n/a	n/a	--	--	
07/11/13	37	648118.91	4699044.78	11:35	11:45	No	--	n/a	n/a	--	--	
07/11/13	45	647575.77	4699005.21	11:47	11:57	No	--	n/a	n/a	--	--	
07/11/13	44	647288.12	4698723.99	11:59	12:09	Yes	RSHA	70	400+	--	VOC	Likely hearing vocalization of pair from call station 32, no visual made
07/11/13	43	646962.14	4698507.00	12:11	12:21	No	--	n/a	n/a	--	--	
07/11/13	41	646626.75	4698443.94	12:23	12:33	No	--	n/a	n/a	--	--	
07/11/13	40	646232.54	4698363.70	12:36	12:46	Yes	RTHA	150	80	120	VOCV	RTHA response vocalizing and observed circling over open pasture area
07/11/13	39	645832.77	4698327.93	12:50	13:00	No	--	n/a	n/a	--	--	
07/11/13	38	645430.75	4698318.06	13:05	13:15	No	--	n/a	n/a	--	--	

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Broadcast												
Date	Station Number	UTM NAD 83		Start Time	End Time	Response	Species <sup>1</sup>	Bearing Degrees	Distance (m) of First Response	Latency <sup>2</sup> (seconds)	Response Behavior <sup>3</sup>	Comments
		Easting	Northing									

<sup>1</sup> RSHA - Red-shouldered hawk; RTHA - Red-tailed hawk; AMKE - American Kestrel

<sup>2</sup> Time elapsed since initial response

<sup>3</sup> VOC - Vocal non-approach; VOCA - Vocal approach; VOCV - Vocal non-approach with distant visual; NVOC - Non-vocal approach