

HOURLY DISTANCES AND ALTITUDES OF A RECENTLY-FLEDGED TURKEY VULTURE ON ITS FIRST SOUTHBOUND MIGRATION *

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Introduction

In 2004, we fitted a nestling Turkey Vulture with a satellite transmitter, and subsequently documented its first fall migration from Saskatchewan to Costa Rica and its return the following spring as far as Nebraska.⁵ In 2007, we fitted another nestling at the same nest with a transmitter that yielded more accurate and frequent locations, and followed its migration southward. Here we report on the results of this recent migration, compare it with the previously monitored one, and provide estimates of migration speed and elevation.

Methods

On August 5 2004, a Turkey Vulture nestling was fitted with a 35g solar-assisted satellite platform terminal transmitter (PTT) and patagial tag H25. The nest was in a long-deserted farm house west of Ranger, SK (53.6249 N, 107.7620 W), where Ken McDaid, the neighboring farmer, had observed a nesting vulture each summer since 2002. The PTT averaged five irregular Doppler transmissions per day, with accuracy varying between 150 m and

10 km.¹ The four highest accuracy ratings provided 346 locations during its 67-day migration to its wintering grounds in the mountains south of San Jose, Costa Rica.⁵

On August 5, 2007, a second Turkey Vulture nestling from the same nest site west of Ranger was fitted with an improved PTT that was capable of hourly reporting with a global positioning system (GPS). The 70 g solar-powered PTT-100 transmitter #65543 (manufactured and refurbished by Microwave Telemetry, Inc., Columbia, Maryland)⁸ was attached to the bird's back and contained sensors for temperature, battery voltage, transmission counts and activity counts. The PTT transmitted hourly at a frequency of 401.650 MHz \pm 36 kHz, giving spatial readings within \pm 15 m and altitude readings accurate to \pm 22 m. A patagial tag, number A33, was placed on the right wing at the same time and here we refer to this individual Turkey Vulture by this tag number. Techniques for application of the backpack transmitter and the approval of the Animal Care Committee, University of Saskatchewan, were as described previously.⁵

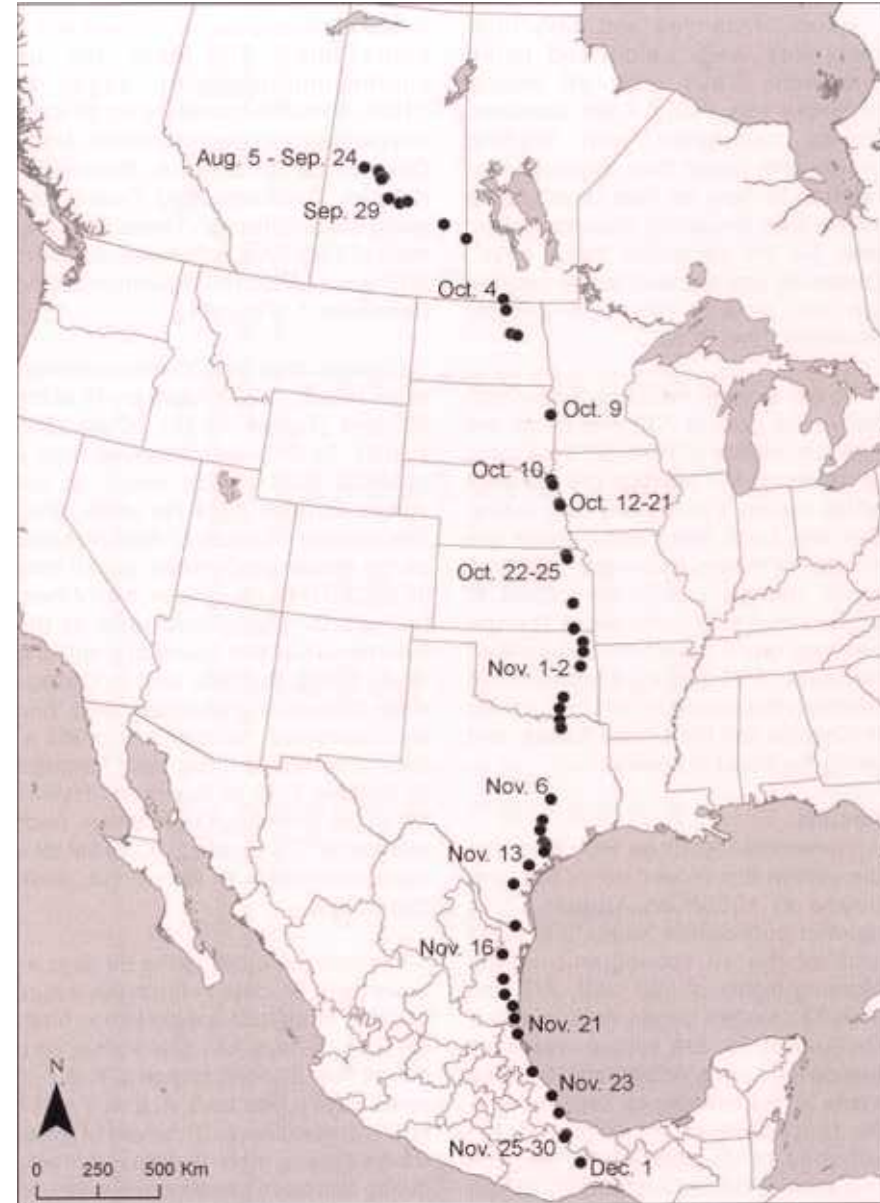


Figure 1. Each dot represents the bird's position at the beginning of a "travel day".
Map by David R. Barber

Hourly distances and daily total distances were calculated using Greenwich. Days with all hourly distances less than 5.4 km, assumed to be consistent with feeding movements rather than migration, are referred to here as 'rest days'; those with at least one hourly distance greater than 5.4 km are called 'travel days'. Distances are rounded to the nearest km and time is given in Central Standard Time (CST).

To get a rough estimate of how high above the ground A33 was flying, we took the altitude of the night-time roost to represent the average ground level of the terrain it was flying over during the day. Each flight altitude was the number of meters above the night-time roost. Using the night-time roost to approximate ground level for the previous day's travel seemed justified because A33 traveled across the relatively flat terrain of the Great Plains in Canada and the United States, and along the coast in Mexico.

Results

Transmitter readings indicated that the vulture first moved out of the farm house at 1000h on August 13; it roosted outside the house that night and for the 10 subsequent nights. Morning flights of 130, 150, 270 and then 330 meters began on August 14. On August 28, the vulture was back beside the house. A flight of 610 m was made in the evening of September 4. Its first flight of more than 1 km occurred on September 10, and the first over 2 km on September 19, the day that Ken McDaid phoned to tell CSH he saw the tagged nestling flying at a distance from the house. On each of these flights and many shorter ones, the bird returned promptly to near where it began.

At 1000h CST on September 24, 2007, the bird traveled 19 km south in

3 hours but returned to its nest site 2 hours later. The next day its southbound migration began at 1100h. It traveled or rested for 69 days in a gentle arc through Manitoba, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma and Texas, and along the gulf through Tamaulipas and most of Vera Cruz. It then veered inland to Oaxaca, Mexico on November 30 and December 1 (Figure 1).

Location data for A33 were received every hour for all 24 hours on 45 of the 69 days (Tables 1a-1d). In all, 1565 signals (94.5%) were received from a potential total of 1656 hours, as the vulture traveled 5014 km in 69 days. The number of hours of data received on the remaining 24 days ranged from 16 to 23. Three travel days, two of them in important locations, one at the Nebraska-Kansas boundary and the other during the final day in Oaxaca when the vulture presumably died, had an inadequate number of signals to determine hourly distances (7 signals on October 7, 16 on November 19, and 11 on the final day, December 1, each marked by "?" in Table 1). Only the total daily distance was known for those three days.

We designated 49 of the 69 days as travel days, i.e. days in which the vulture traveled more than 5.4 km in one hour. On 2 travel days A33 flew 1 hour, on 6 days it flew 2 hours, and on 4, 8, 9, 6, 8 and 2 days it flew for 3, 4, 5, 6, 7 and 8 hours, respectively. On seven of these travel days, interruptions midway during that day's travel occurred for one (n = 5) or two (n = 2) hours. On average, A33 flew 4.3 hours during each travel day, or just over 3 hours per 24 hour period for the 69 days elapsed time, including the 20 rest days.

On five days (October 4, 9, 10 and 21, and November 6), the vulture traveled more than 200 km. Only five

Table 1a. Daily speeds and altitudes of vulture A33 in 2007, Saskatchewan to Manitoba

Transmitter 65543	A33 Patagial tag right wing		highest altitude ASL (m)	hr of highest altitude at night (m)	approx height above ground (m)	# days rest	# days travel	av km/ av max day total above ground (km)						
	hrs start finish	hrs no distance >5.4km movt												
24/9	24	1000 1500	3	2	43	17	1056	1400	590	466				
25/9	24	1100 1600	5		66	27	879	1300	534	345				
26/9	24		0		8	5	590		527	63				
27/9	24	1100 1300	2		28	7	612	1300	528	84				
28/9	24		0		19	5	548	1000	508	40				
29/9	24	900 1100	2		87	50	557	1000	485	72				
30/9	24	1200 1600	4		50	17	985	1300	588	397				
1/10	23	1200 1400	2		46	20	603		545	58				
2/10	24	1100 1700	6		178	33	1327	1300	532	795				
3/10	24	1100 1700	6		115	29	618		527	91				
4/10	24	900 1700	8		293	49	1395	1400	459	936				
Canada			38		933					3347	2	9	85	304

Table 1b. Daily speeds and altitudes of vulture A33 in 2007, North Dakota to Nebraska

Transmitter 65543		A33 Patagial tag right wing				highest altitude		hr of lowest		approx		av km/ av max						
DATE	hrs of data	start hour	finish hour	hrs >5.4km	hrs no movt	hrs distance (km)	max hourly distance (km)	ASL (m)	highest altitude ASL (m)	highest altitude ASL (m)	hr of lowest altitude at night (m)	approx height above ground (m)	# days rest	# days travel	av height total above ground (km)			
5/10	24	1000	1300	3	3	46	15	500	500	461	39	39						
6/10	24			0	0	2	1	474	474	455	19	19						
7/10	21	900	1400	5	5	103	32	788	788	460	328	328						
8/10	24	1300	1500	2	2	28	14	480	480	375	105	105						
9/10	24	900	1700	7	7	354	67	848	848	524	324	324						
10/10	21	1000	1700	7	7	268	48	1041	1041	405	636	636						
11/10	24	1400	1500	1	1	26	6	554	554	366	188	188						
12/10	23	1000	1600	5	5	86	10	912	912	307	605	605						
13/10	22			0	0	11	4	364	364	289	75	75						
14/10	18			0	0	5	2	360	360	320	40	40						
15/10	22			0	0	0	0	317	317	298	19	19						
16/10	21			0	0	1	0	335	335	297	38	38						
17/10	22			0	0	1	0	355	355	245	110	110						
18/10	22			0	0	1	0	342	342	315	27	27						
19/10	24			0	0	5	2	364	364	353	11	11						
20/10	21			0	0	16	5	408	408	302	106	106						
21/10	7			?	?	201	?	337	337	323	14	14						
North Dakota - Nebraska														2684	7	9	72	168
														1154				

Table 1c. Daily speeds and altitudes of vulture A33 in 2007, Kansas to Texas

22/10	16			0	0	1	0	403	403	367	36	36						
23/10	24			0	0	1	0	395	395	384	11	11						
24/10	24			0	0	2	0	413	413	370	43	43						
25/10	24			0	0	2	0	407	407	391	16	16						
26/10	24	1300	1500	2	2	19	10	720	720	537	183	183						
27/10	23	800	1600	8	8	187	38	1033	1033	290	743	743						
28/10	24	1000	1600	6	6	107	24	903	903	213	690	690						
29/10	24	900	1600	7	7	82	16	629	629	193	436	436						
30/10	24	1100	1500	4	4	46	17	625	625	261	364	364						
31/10	24	1200	1600	4	4	65	16	732	732	137	595	595						
1/11	24	800	1600	6	6	152	33	406	406	172	234	234						
2/11	24			0	0	2	0	225	225	152	73	73						
3/11	24	1300	1600	3	3	60	22	890	890	164	726	726						
4/11	24	1100	1500	4	4	48	11	774	774	135	639	639						
5/11	24	1100	1500	4	4	42	12	788	788	179	609	609						
6/11	24	900	1600	7	7	305	57	870	870	113	757	757						
7/11	21	900	1600	6	6	94	26	443	443	99	344	344						
8/11	24	1200	1600	3	3	46	13	792	792	66	726	726						
9/11	24	1000	1600	5	5	56	16	825	825	32	793	793						
10/11	22	1000	1100	1	1	15	6	326	326	49	277	277						
11/11	17	1000	1100	1	1	13	8	753	753	20	733	733						
12/11	24	1000	1200	2	2	26	11	707	707	9	698	698						
13/11	24	1100	1600	5	5	88	25	600	600	16	584	584						
14/11	24	1000	1700	7	7	108	20	654	654	45	609	609						
15/11	24	1200	1700	5	5	186	50	639	639	24	615	615						
Oklahoma - Texas														11534	7	19	67	444
														1753				
														90				

Transmitter 65543		A33 Patagial tag right wing				Patagial tag right wing		Patagial tag right wing		Patagial tag right wing		Patagial tag right wing		
DATE	hrs of data	start hour	finish hour	hrs no distance >5.4km movt	hrs daily distance (km)	max hourly distance (km)	highest altitude ASL (m)	hr of highest altitude	lowest altitude at night (m)	approx height above ground (m)	# days rest travel	# days total 69days	av km/ day height above ground (km)	
16/10	24	900	1600	7	132	24	463	1200	53	410				
17/10	24	900	1600	7	107	19	419	1100	67	352				
18/10	24	1100	1500	4	71	25	1003	1400	321	682				
19/10	16	?	?	?	62	?	358	700	102	256				
20/11	24	900	1400	5	63	14	517	1000	0	517				
21/11	24	1000	1500	5	73	20	483	1200	0	483				
22/11	24	900	1500	6	177	57	412	1300	13	399				
23/11	24	1100	1600	5	130	33	405	1600	309	96				
24/11	22	900	1600	7	82	18	558	1500	80	478				
25/11	24	1000	1400	4	104	27	501	1300	4	497				
26/11	24			0	3	1	49	700	0	49				
27/11	23			0	3	1	57	0	0	57				
28/11	23			0	2	0	45	0	0	45				
29/11	24			0	4	1	35	800	0	35				
30/11	23	1100	1400	3	35	10	336	1200	0	336				
1/12	11	?	?	?	126	?	292	2000	289	3				
Mexico				53	1174					4695	4	12	73	293
TOTAL				211	5014						20	49		

A-33 in 2007, Saskatchewan to Oaxaca. ? represents absent hourly data. L represents a low-altitude travel day within ~120 m of the ground. Hours are given in Central Standard Time, "24-hr clock."

Table 2 Distances and altitudes of vulture A-33, by region, Saskatchewan to Oaxaca

Region	Dates	# days rest travel	# days travel	# max km/ day	av direct av km height		av max		
					total km day	total km day	dist direct km	height above ground km	
SK, MB	24/9 - 4/10	2	9	293	933	85	781	71	304
ND, SD, NE	5/10 - 20/10	7	9	354	1154	72	864	54	168
KS, OK, TX	21/10 - 15/11	7	19	305	1753	67	1725	66	444
Mexico	16/11 - 1/12	4	12	132	1174	73	1032	65	293
Total		20	49	354	5014	73	4402	64	

of the 1565 recorded hours clocked a speed greater than 50 km/hr, with a maximum of 67 km/hr at 1500h on October 9. Four of these five occasions with higher speed were associated with higher than average elevations.

The highest altitude above sea level (1395 m) and the highest altitude above ground (936 m) occurred near Cartwright, MB on October 4. Later, the vulture traveled in near-continuous thermals along the Caribbean coast of Mexico (KLB). One might have expected it to fly at greater heights farther north, where it would soar and glide between thermals, rather than in the south where thermal streets often form and where there should be less circle soaring and inter-thermal gliding. The northerly location of the highest altitude is the only evidence that tends to support this hypothesis. However, in a further test, the *mean* of single daily *maximum* heights reached above ground, lumping both travel and rest days, was calculated: 304 m in Canada, 168 m over the Dakotas and Nebraska, 444 m over Kansas through Texas, and 293 m over Mexico (Table 2). The only "travel days" (in addition to the "rest days" with regularly low flights) that involved flights entirely below ~ 120 m above ground, were four in Canada and two in North Dakota (L in column 9 in Table 1). Similarly, the average distance per day, based on all 69 days, failed to show any appreciable change between the four regions: 85, 72, 67 and 73 km/day as the vulture moved southward (Table 2).

Direct-line distances, between the first and the final readings of each period (Table 2), were shorter, at 781 km for Canada (mean, 71 km/day), 864 km for North Dakota to Nebraska (54 km/day), 1725 km for Kansas to Texas (66 km/day), and 1032 km for Mexico

(65 km/day), for a total-distance direct-line mean of 64 km/day.

An unexpected event was reported to the banding office by Bob Funke, a conservation officer/ game warden based at Fredonia, Kansas. He was called by farmer Walt Griffith, near Neosho Falls, because Griffith had observed a Red-tailed Hawk harassing a Turkey Vulture, and read its wing tag A33; the vulture then took refuge from the hawk by flying through a large open door into Griffith's machinery shed. Funke, on getting the call, rushed about 36 km to the Griffith farm and found the vulture hiding under a workbench. He extracted the vulture, and noticed to his surprise that the vulture also had a transmitter with antenna attached to its back. As Funke demonstrated the transmitter to the equally amazed farmer, the vulture slid out of his arms, flew out the door and went 16 km more before stopping for that night.

Discussion

For the first time in North America, we were able to calculate the hourly speed and altitude of a recently-fledged Turkey Vulture during its first southbound migration. As expected for a bird using thermals, almost all the southward travel of vulture A33 occurred during midday, usually between 900h and 1700h, during 49 'travel days.' The remaining 20 days presumably involved resting and eating, without southbound progress.

This vulture started south from the same deserted house as the 2004 vulture, H25. The southward migration path of A33 as far as Oaxaca (Figure 1) was almost identical to that of the 2004 vulture that wintered in Costa Rica. The 2004 vulture, H25, however, began the journey four days earlier, reached Oaxaca 22 days earlier, on 9

November, and covered 5316 km in 72 days (map in Houston et al. 2007). A33 averaged 64 km/day using a direct-line distance from start point to end point as compared to 74 km/day for the direct-line distance of H25 in 2004.

When rest days and travel days are pooled, A33 traveled an average of 73 km per day for 69 days. In spite of prevailing northwesterly winds, it surpassed 50 km/hr only five times, an hourly speed consistent with the soaring speeds of 40 km/hr reported by Coles (a vulture keeping pace with a railway train)² and the 55 km/hr reported by Kirk and Mossman.⁷

Another species that most often uses soaring-gliding flight rather than powered flight during migration is the Golden Eagle. The eagle's travels resembled those of vultures in several ways. Juveniles making their first flight south from Alaska reached only a maximum of 261 km/day in 1997, but 472 km/day in 1999, only moderately greater than the 354 and 305 km of the juvenile vulture's longest day's travel. The eagles also took advantage of thermals for midday travel and employed stopovers of from 2 to 19 days.⁹

In contrast, raptors that use flapping flight rather than soaring-gliding flight have the potential to travel faster. A combined, pooled group of individual Saskatchewan Swainson's Hawks with leg bands, each encountered at one terminal site only, together suggest a coverage of over 10,000 km in 54 days, an average of 185 km/day, arriving in northern Argentina as early as November 7.¹⁰ An adult Saskatchewan Swainson's Hawk, fitted with a Doppler transmitter and followed every day or two for the entire journey, required 96 days to reach its

wintering grounds in La Pampa province, Argentina on 30 November, a distance of 10,415 km in 96 days, averaging 108 km/day.⁴ An adult Saskatchewan Osprey fitted with a Doppler transmitter covered a remarkable 1145 km in two days, from Rapid City, South Dakota to Matador Texas, and it also averaged a healthy 287 km/day for its 19 days of major southbound travel.⁶ However, the next year the same Osprey required 9 days longer to make its trip to Costa Rica (Houston 2004).³

Acknowledgments

Ralph Matzner, the landowner, and Ken McDaid, a neighbor, have kept a watchful eye on the vulture nest site near Ranger each summer since 2002. Myron Barton devoted several days to clearing underbrush to reach the GPS location of the fallen-off transmitter, 65543, which was found, on the third and final search, by Pieter Stoffel on August 2, 2006, and subsequently refurbished by Microwave Telemetry Inc. Michael J. Mossman posed important questions that have improved the value of this paper. Claude Bouchard, Professor Emeritus, Université de Laval, wrote the distance-measuring program Grinwich, adding an extra calculation to provide a daily as well as an hourly distance.

We thank Dr. Paul Howey for valuable information and assistance and for waiving the fee for Groundtrack when his company refurbished the transmitter, which thus became available for re-use in 2007. Sarkis and Bobbye Acopian supported the purchase of the PTT and other Hawk Mountain Sanctuary aspects of the project.

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EASTERN WOOD-PEWEE NEST IN SOUTHEASTERN SASKATCHEWAN

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On the morning of 21 June 2008, I carefully identified a female Eastern Wood-Pewee building a nest at a former provincial picnic site in the Souris Valley along Highway # 9. It was hovering to pick dry tops of brome grass (*Bromus* sp.) and then returned to integrate this material into the rim of the nearly completed nest. The nest was 'saddled' on the larger branch of a large Green Ash (*Fraxinus pennsylvanica*) within a mature grove of Box Elder (*Acer negundo*) and American Elm (*Ulmus americanus*) with an open understory. The male called sporadically nearby.

These were two of five Eastern Wood-Pewees recorded that day along the route from Roche Percee to Hwy # 9. I saw another pair interact at the former Roche Percee Provincial Recreation Site and a single bird calling 5.5 km to the east at Longney's Crossing.

This species is a resident in smaller numbers in the riparian areas along

the Souris River including the specific area of this nest. Other general areas where I and others have observed this species include Moose Mountain Provincial Park, the eastern Qu'Appelle Valley, Good Spirit Provincial Park and Duck Mountain Provincial Park. There have also been scattered reports from several other locations.

Alan R. Smith describes the Eastern Wood-Pewee as 'a rare but regular summer resident in mature deciduous forests' mainly in the Southeastern area.² Although it has long been accepted as a possible/probable breeding species, this is apparently the first nest record of a species that was first observed in Saskatchewan by Ernest Thompson Seton at Runnymede on 14 June 1884.¹

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