

September 12, 2007

Updated Seasonal Shutdown Analyses

DRAFT – FOR DISCUSSION AT SEPTEMBER 12TH SRC MEETING

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The preliminary interim report for the period October 2005 – May 2007 contained some analyses and results investigating the effect of winter seasonal shutdown of turbines. A revised seasonal shutdown analysis was conducted to attempt to more definitively understand the effect of shutting down the wind turbines during the winter months. This particular analysis has not been peer-reviewed by the SRC or the entire MT. The new analyses only included fatalities found during carcass searches (no incidental finds, or finds documented in the WRRS, that were not found on carcass searches), and eliminated suspected electrocutions, fatalities believed to be greater than 1 month old, and fatalities where there was evidence the cause of the fatality was something other than turbine-caused (e.g., predation of burrowing owls). In addition, a 2nd analysis was conducted eliminating feather spots as well.

With the 4 to 6 searchers used during the winter time shutdown periods, and the time to get through the entire sample of turbines, the days between searches often overlapped both a time when the turbines were shutdown and the time when the turbines were operating. To reduce the uncertainty associated with this study design problem, the following criteria was used. For a particular turbine considered shutdown for the period (e.g., November 1 – December 31st), only turbines that had less than 9 days overlap with an operating period would be included. So if a turbine was shutdown from November 1st – December 31st, and was searched on December 10 and again on January 5th, the data from the January 5th search would be included as shutdown data for that turbine. If another turbine was searched on December 12th, and then again on January 10th, the information from the January 10th turbine would not be included.

Table 7a-7f (includes feather spots) and 8a-8c (doesn't include feather spots) contain the results of the two analyses. We only conducted the 2nd analysis (no feather spots) at this time for all raptors, American kestrels and burrowing owls, since a large number of fatalities for these two species consist only of feathers. In the analysis that can include feather spots, the overall raptor fatality rate is higher at operating turbines than non-operating turbines, but with feather spots included the estimate for operating turbines is only 7% higher than non-operating turbines. However, when feather spots are eliminated from consideration, the overall fatality rate is higher at operating turbines in 44% higher than for non-operating turbines.

For red-tailed hawks, the fatality estimate is 2.6 times higher at the operating turbines compared to the non-operating turbines. The data is too limited (few fatalities) to consider discussing the other individual species.

DISCUSSION

The experimental design used to try to estimate the effect of seasonal shutdown had several problems associated with it. Because the shutdown period was fixed for all turbines, it was logistically impossible with the staff in the field to ensure that all winter time searches included only one type of treatment (shutdown or operating). In addition, the end of the first shutdown

period (November 1 – December 31st) includes the Christmas Holiday season, and technicians had time off for the holidays, further reducing the staff time for completing the searches. Finally, determining time of death of fatalities is difficult.

Condition of carcasses often makes it very difficult to determine estimated time of death. Most carcasses show signs of scavenging pretty quickly. Often only parts of birds are found as well.

There is some indication that the seasonal shutdown might be reducing mortality for red-tailed hawks, one of the target species. The data for the other 3 raptor species is too limited to make any inferences. We recommend a tighter and better design be used using more frequent searches during the winter period, and better coordination of the winter period searches with the action of shutting down individual turbines. For example, for a shutdown turbine search, it would be best to have the turbines shutdown the day before the scheduled search of a particular turbine. In addition, that turbine would not be put back in service until after the next search is completed.

Table 7a. Evaluation of the effects of seasonal shutdown for all raptors using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	operating	South	6	118.1		North	4	34.6		10	152.7	0.065
	shutdown	North	4	43.0		South	2	33.7		6	76.7	0.078
Search B	operating	South	2	40.3		North	1	9.2		3	49.5	0.061
	shutdown	North	0	9.6		South	5	22.7		5	32.3	0.155
Search C	operating	North	7	94.4		South	13	94.3		20	188.7	0.106
	shutdown	South	2	83.5		North	10	86.2		12	169.7	0.071
Search D	operating					South	7	79.1		7	79.1	0.088
	shutdown					North	4	61.4		4	61.4	0.065
Overall	operating		15	252.8	0.059		25	217.2	0.115	40	470.0	0.085
	shutdown		6	136.1	0.044		21	204.0	0.103	27	340.1	0.079

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 7b. Evaluation of the effects of seasonal shutdown for red-tailed hawks using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# Found	MW Searched	Fatality Index	# Found	MW Searched	Fatality Index	# Found	MW Searched	Fatality Index	
Search A	Operating	South	2	118.1		North	3	34.6		5	152.7	0.033
	Shutdown	North	2	43.0		South	0	33.7		2	76.7	0.026
Search B	Operating	South	1	40.3		North	0	9.2		1	49.5	0.020
	Shutdown	North	0	9.6		South	0	22.7		0	32.3	0.000
Search C	Operating	North	6	94.4		South	2	94.3		8	188.7	0.042
	Shutdown	South	2	83.5		North	0	86.2		2	169.7	0.012
Search D	Operating					South	4	79.1		4	79.1	0.051
	Shutdown					North	1	61.4		1	61.4	0.016
Overall	Operating		9	252.8	0.036		9	217.2	0.041	18	470.0	0.038
	Shutdown		4	136.1	0.029		1	204.0	0.005	5	340.1	0.015

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 7c. Evaluation of the effects of seasonal shutdown for burrowing owls using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	operating	South	0	118.1		North	0	34.6		0	152.7	0.000
	shutdown	North	0	43.0		South	0	33.7		0	76.7	0.000
Search B	operating	South	0	40.3		North	0	9.2		0	49.5	0.000
	shutdown	North	0	9.6		South	0	22.7		0	32.3	0.000
Search C	operating	North	0	94.4		South	4	94.3		4	188.7	0.021
	shutdown	South	0	83.5		North	6	86.2		6	169.7	0.035
Search D	operating					South	1	79.1		1	79.1	0.013
	shutdown					North	2	61.4		2	61.4	0.033
Overall	operating		0	252.8	0.000		5	217.2	0.023	5	470.0	0.011
	shutdown		0	136.1	0.000		8	204.0	0.039	8	340.1	0.024

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 7d. Evaluation of the effects of seasonal shutdown for American kestrels using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	operating	South	0	118.1		North	0	34.6		0	152.7	0.000
	shutdown	North	0	43.0		South	0	33.7		0	76.7	0.000
Search B	operating	South	0	40.3		North	0	9.2		0	49.5	0.000
	shutdown	North	0	9.6		South	0	22.7		0	32.3	0.000
Search C	operating	North	0	94.4		South	4	94.3		4	188.7	0.021
	shutdown	South	0	83.5		North	6	86.2		6	169.7	0.035
Search D	operating					South	1	79.1		1	79.1	0.013
	shutdown					North	2	61.4		2	61.4	0.033
Overall	operating		0	252.8	0.000		5	217.2	0.023	5	470.0	0.011
	shutdown		0	136.1	0.000		8	204.0	0.039	8	340.1	0.024

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 7e. Evaluation of the effects of seasonal shutdown for golden eagles using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	operating	South	0	118.1		North	0	34.6		0	152.7	0.000
	shutdown	North	0	43.0		South	0	33.7		0	76.7	0.000
Search B	operating	South	0	40.3		North	0	9.2		0	49.5	0.000
	shutdown	North	0	9.6		South	0	22.7		0	32.3	0.000
Search C	operating	North	0	94.4		South	0	94.3		0	188.7	0.000
	shutdown	South	0	83.5		North	0	86.2		0	169.7	0.000
Search D	operating					South	1	79.1		1	79.1	0.013
	shutdown					North	0	61.4		0	61.4	0.000
Overall	operating		0	252.8	0.000		1	217.2	0.005	1	470.0	0.002
	shutdown		0	136.1	0.000		0	204.0	0.000	0	340.1	0.000

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 7f. Evaluation of the effects of seasonal shutdown for American kestrels using only fatalities thought to be turbine related (or unknown) and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	Location	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a
Search A ^b	operating	South	2	118.1		North	0	34.6		2	152.7	0.013
	shutdown	North	0	43.0		South	1	33.7		1	76.7	0.013
Search B	operating	South	0	40.3		North	0	9.2		0	49.5	0.000
	shutdown	North	0	9.6		South	0	22.7		0	32.3	0.000
Search C	operating	North	2	94.4		South	0	94.3		2	188.7	0.011
	shutdown	South	0	83.5		North	1	86.2		1	169.7	0.006
Search D	operating					South	0	79.1		0	79.1	0.000
	shutdown					North	0	61.4		0	61.4	0.000
Overall	operating		4	252.8	0.016		0	217.2	0.000	4	470.0	0.009
	shutdown		0	136.1	0.000		2	204.0	0.010	2	340.1	0.006

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 8a. Evaluation of the effects of seasonal shutdown for all raptors using only fatalities thought to be turbine related (or unknown), eliminating all feather spots, and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	Operating	South	3	118.1		North	4	34.6		7	152.7	0.046
	Shutdown	North	3	43.1		South	1	33.7		4	76.8	0.052
Search B	Operating	South	1	40.3		North	1	9.2		2	49.5	0.040
	Shutdown	North	0	9.6		South	3	22.7		3	32.3	0.093
Search C	Operating	North	9	94.4		South	5	94.3		14	188.7	0.074
	Shutdown	South	3	83.5		North	3	86.2		6	169.7	0.035
Search D	Operating	North				South	5	79.1		5	79.1	0.063
	Shutdown	South				North	1	61.4		1	61.4	0.016
Overall	Operating		13	252.8	0.051		15	217.2	0.069	28	470.0	0.060
	Shutdown		6	136.2	0.044		8	204.0	0.039	14	340.2	0.041

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 8b. Evaluation of the effects of seasonal shutdown for burrowing owls using only fatalities thought to be turbine related (or unknown), eliminating all feather spots, and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>		
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a
Search A ^b	Operating	South	0	118.1	0.000	North	0	34.6	0.000	152.7	0.000
	Shutdown	North	0	43.1	0.000	South	0	33.7	0.000	76.8	0.000
Search B	Operating	South	0	40.3	0.000	North	0	9.2	0.000	49.5	0.000
	Shutdown	North	0	9.6	0.000	South	0	22.7	0.000	32.3	0.000
Search C	Operating	North	0	94.4	0.011	South	2	94.3	0.011	188.7	0.011
	Shutdown	South	0	83.5	0.006	North	1	86.2	0.006	169.7	0.006
Search D	Operating					South	0	79.1	0.000	79.1	0.000
	Shutdown					North	0	61.4	0.000	61.4	0.000
Overall	Operating		0	252.8	0.004		2	217.2	0.009	470.0	0.004
	Shutdown		0	136.2	0.003		1	204.0	0.005	340.2	0.003

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).

Table 8c. Evaluation of the effects of seasonal shutdown for American kestrels using only fatalities thought to be turbine related (or unknown), eliminating all feather spots, and estimated to be <30 days old.

Search	Phase	Location	<u>Year 1</u>			<u>Year 2</u>			<u>Combined</u>			
			# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	# found	MW Searched	Fatality Index ^a	
Search A ^b	Operating	South	1	118.1		North	0	34.6		1	152.7	
	Shutdown	North	0	43.0		South	0	33.7		0	76.7	
Search B	Operating	South	0	40.3		North	0	9.2		0	49.5	
	Shutdown	North	0	9.6		South	0	22.7		0	32.3	
Search C	Operating	North	1	94.4		South	0	94.3		1	188.7	
	Shutdown	South	0	83.5		North	1	86.2		1	169.7	
Search D	Operating					South	0	79.1		0	79.1	
	Shutdown					North	0	61.4		0	61.4	
Overall	Operating		2	252.8	0.008		0	217.2	0.000	2	470.0	0.004
	Shutdown		0	136.1	0.000		1	204.0	0.005	1	340.1	0.003

^a Number found / MW searched / search

^b 2nd winter period search, usually conducted in late November or early December after the clearing search in 2005 (October/November).