

# Flight behavior of Griffon Vultures near wind turbines in Tarifa, Spain

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## Introduction

- Understanding the behavior of birds around structures such as wind turbines and transmission lines is important in assessing the potential effects of those structures on bird populations.
- Although Griffon Vultures (*Gyps fulvus*) are known to collide with wind turbines, the current ability to model collision risk of this species (and most other raptors) is poor because so few data are available on collision-avoidance behavior and avoidance rates.
- Even small errors in avoidance rates can have a large effect on predicted fatality rates. Below is a hypothetical example for a location where modeling predicted 10 fatalities per year under the assumption of no collision avoidance:

Percent of birds exhibiting collision-avoidance behavior	Fatality estimate (birds/year)
0	10
90	1
95	0.5
99	0.1

- In this poster, we describe the anti-collision responses of resident and migrant Griffon Vultures near wind turbines in Tarifa, Spain, and discuss potential implications of this work for a similar North American species, the California Condor.

## Methods

- We used visual methods to study the flight behavior of Griffon Vultures near Kenetech 33 MVS turbines in Tarifa, Spain, in 1994–1995. These older turbine models had a hub height of 25–30 m, a blade diameter of 33 m, and rotate at 14–54 rpm.
- We classified behavioral responses into three basic categories: change in flight direction, change in flight altitude, or change in flight direction and altitude. We assumed that any change in flight behavior occurring within 100 m of a turbine was a response to the turbine(s).



## Results

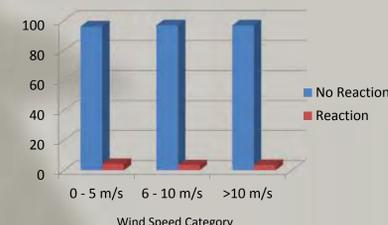
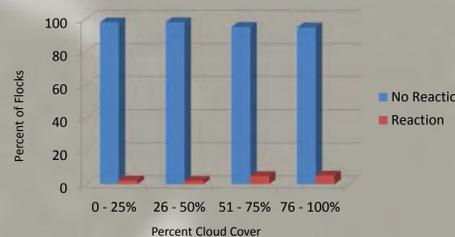
- We observed 2,613 flocks (groups of  $\geq 1$  bird) of vultures within 100 m of turbines; over 10% of all flocks flew within 5 m of the turbines.
- No collisions were observed, and 3.5% of all flocks within 100 m of turbines exhibited an apparent reaction to turbines:

Behavioral response to turbine	Number of flocks	Percent
None	2,522	96.5
Change direction	41	1.6
Change altitude	29	1.1
Change direction & altitude	21	0.8
Total	2,613	

- The response of vultures by distance category from turbines suggests that 4–5% more of the flocks react at 0–25 m than at further distances:

Behavioral response	0–25 m	26–50 m	51–75 m	76–100 m
None	1,245 (94.2%)	752 (98.9%)	221 (97.8%)	304 (99.7%)
Change direction	36 (2.7%)	4 (0.5%)	1 (0.4%)	0 (0.0%)
Change altitude	23 (1.7%)	3 (0.4%)	2 (0.9%)	1 (0.3%)
Change direction & alt.	18 (1.4%)	1 (0.1%)	2 (0.9%)	0 (0.0%)

- Preliminary data summaries suggest that the proportion of vultures reacting to turbines was not strongly influenced by either cloud cover or wind speed.



## Conclusions and Implications



- Combined with existing fatality data from other studies, the results of our study suggest that, although collisions sometimes occur, collision-avoidance rates at turbines are likely to be >99% for Griffon Vultures. Thus, collision fatality estimates for Griffon Vultures may be best modeled using  $\geq 99\%$  avoidance rates.
- Griffon Vultures are very similar in size and behavior to California Condors (*Gymnogyps californianus*; Snyder and Schmitt 2010 Birds of N. America Account No. 610), a federally-listed species in which nothing is known about flight behavior near wind turbines. Assuming that flight behavior of the two species also is very similar near turbines, our data suggest that although California Condors could sometimes collide with turbines, their collision-avoidance rates are likely to be high.



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