

## **Visual perception of wind turbines by birds: focus on vultures and raptors.**

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Birds, particularly vultures, are highly vulnerable to collisions with wind turbines. Various factors seem to play a role in these collisions, such as the location of the wind farms or the type of flight, but there are few explanations for the reasons behind bird collisions. We present here experiments performed on several bird species, to put forward three hypotheses based on our studies on birds' perception of wind turbines to explain collisions. First, birds may have difficulty seeing wind turbines because of low sensitivity to achromatic contrasts. Second, when birds are able to discern wind turbines, they may not detect the rotative movement of blades. Third, even though birds are able to see that the blades are rotating, they may still take the risk of crossing the area swept by the blades. The automatic detection systems currently installed on wind turbines generally trigger a slowdown of the blades at 2-5 rotations per minute (instead of a true stop) when a bird approaches a turbine. In order to reduce collisions, it would be necessary to have a truly fast blade stop. Improving the visibility of wind turbines for birds by painting the blades black and white would also help to reduce collisions.