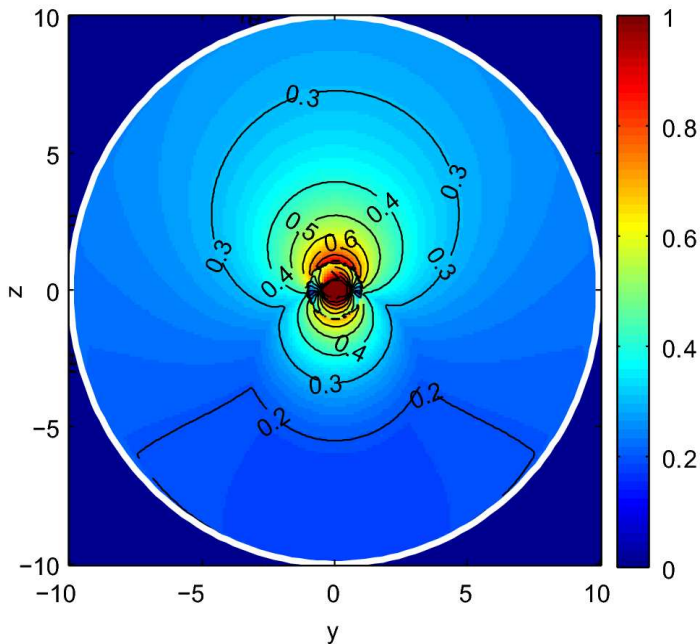
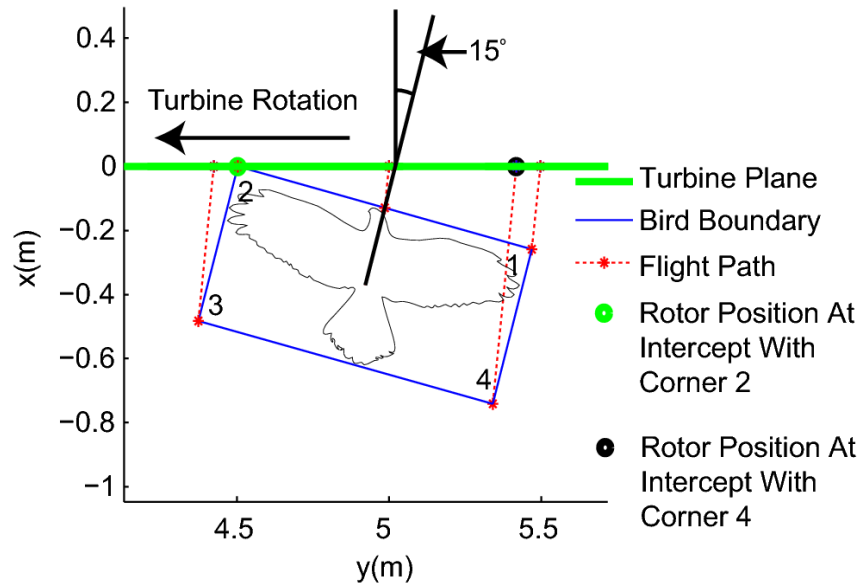




### APPLICATIONS FOR PROPOSED AND EXISTING WIND POWER PROJECTS

Wind power is quickly becoming an attractive renewable energy source, resulting in exponential growth in the number of wind turbines deployed across the globe. However, wind turbines have been shown to pose a threat to bird populations resulting from collisions with rotor blades and turbine towers.

Due to the potential impact on endangered and protected bird species, it is becoming common to assess the risk of collision of local and migratory bird populations resulting from wind resource areas prior to their construction.

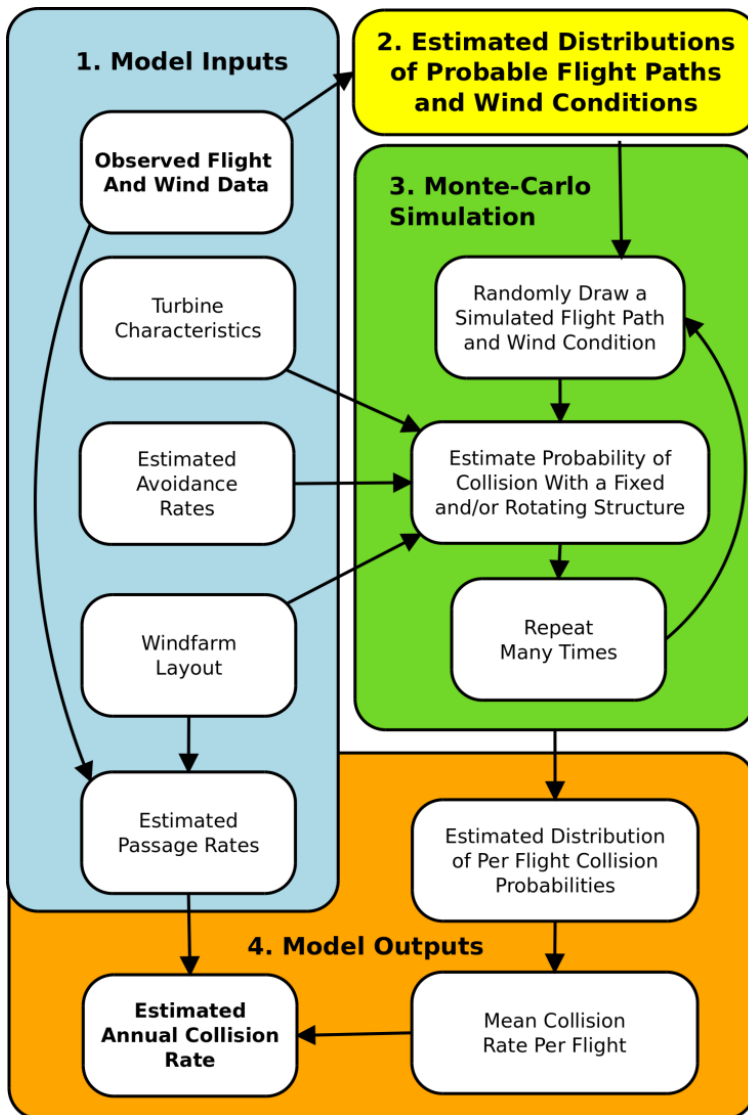


Hamer Environmental has developed a model based approach for the estimation of this risk of collision. Our model was developed by Ph.D. level biologists and modeling experts and is designed to account for a number of inputs that have a significant effect on bird mortality, including observed flight and wind data, turbine characteristics, wind farm layout, and estimated avoidance rates.





Using site specific avian data collected with modified marine radar technology and audio visual survey techniques, we iteratively simulate the passage of individual birds through the modeled wind resource area under typical wind conditions. Each flight path is analyzed for possible interactions with either the stationary components (tower and nacelle) or the rotor planes of the wind turbines.



For flight paths that intersect the rotor planes, we use a kinematic model to estimate the probability of collision with a moving rotor which accounts for arbitrary angles of avian approach (relative to downwind) in addition to the shape, pitch, and angular velocity of the 3-D rotors.

Using Monte Carlo sampling techniques, we simulate a large number (> 1 million) of flight paths to estimate the mean collision probability of individual birds. This is then used in conjunction with observed passage rates to estimate the annual risk of collision.

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