

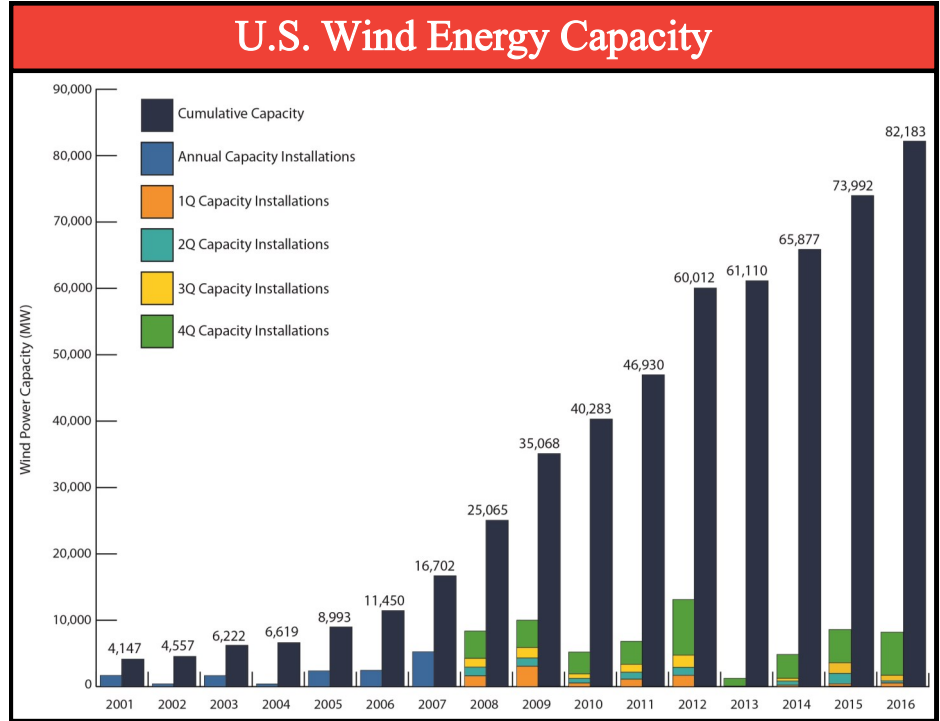


Effects of Wind Energy Development on Wildlife

Wind energy has become an important source of renewable energy in North America. As of 2016, the United States has a total installed wind energy capacity of **82,183 Megawatts**; enough to power approximately **24 million homes** annually.¹ This represents an increase in capacity of over 70,000 Megawatts (**618% growth**) since 2006.¹



Wind turbines in the U.S. produce over 82,000 Megawatts of energy every year¹ (Credit: Portland General Electric).



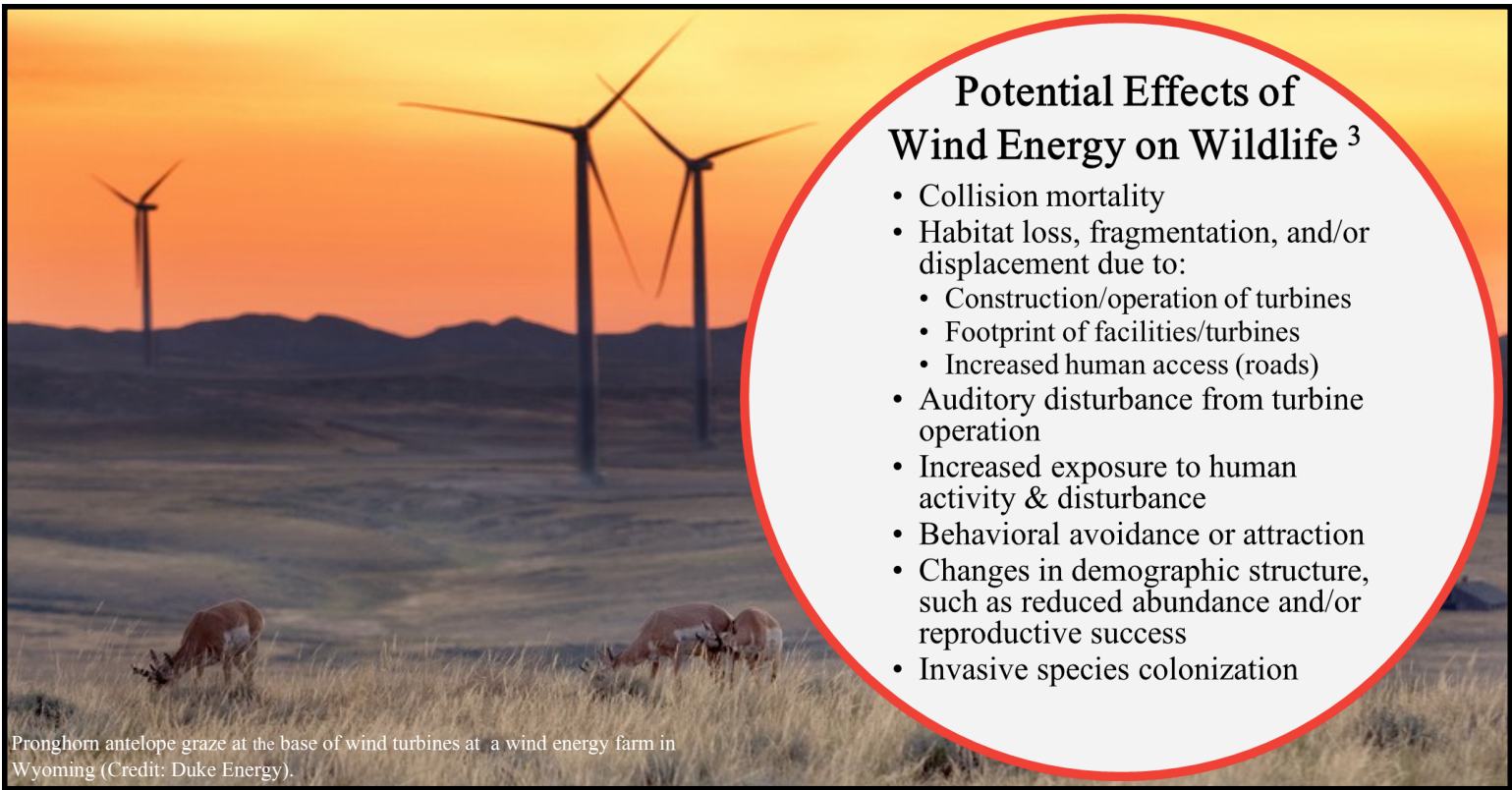
Over \$143 billion in new investments in the past decade has fueled remarkable growth in total wind energy capacity in the United States (Credit: American Wind Energy Association).¹

Not Environmentally Neutral

Atmospheric carbon dioxide (CO₂) concentrations have increased from roughly 290 parts per million (ppm) at the start of the twentieth century to over **400 ppm** today.² As a well-documented **greenhouse gas** capable of altering global climate, this increase in atmospheric CO₂ will likely have **significant and far-reaching effects on all of Earth's biota**.³

Development of renewable energy sources, like wind power, offer promising opportunity to meet growing energy needs while simultaneously reducing carbon emissions. As a result, renewable resources are the **fastest growing energy source** in the world, with much of the growth coming from wind power.⁴ However, **wind energy is not environmentally neutral**.³

Wind energy development and operation can pose **biologically significant, and potentially unrealized, cumulative threats to wildlife**.³ When developing wind power as a source of "green energy," its effects to wildlife and habitats—both direct and indirect—should not be overlooked. Future wind energy development must take steps to **avoid, minimize, and mitigate** any harmful effects to wildlife by establishing a scientific basis for decision-making and by working closely with wildlife professionals when siting and operating turbines.⁵



Pronghorn antelope graze at the base of wind turbines at a wind energy farm in Wyoming (Credit: Duke Energy).

Potential Effects of Wind Energy on Wildlife ³

- Collision mortality
- Habitat loss, fragmentation, and/or displacement due to:
 - Construction/operation of turbines
 - Footprint of facilities/turbines
 - Increased human access (roads)
- Auditory disturbance from turbine operation
- Increased exposure to human activity & disturbance
- Behavioral avoidance or attraction
- Changes in demographic structure, such as reduced abundance and/or reproductive success
- Invasive species colonization

Opportunities to Reduce Threats to Wildlife

Avoiding Wildlife Collisions

Research has found that bat species most threatened by wind turbines tend to be active in low wind weather; before and after storms; and during fall migration.⁶ One study found nearly **90% of fatalities** occur from mid-July to late-September during fall migration⁷ and on low wind nights.⁸ Bat mortality can be **substantially reduced** if wind turbines are turned off at these high risk times.⁹ To reduce bird mortality, turbines can be placed in areas of lower abundance **outside migratory pathways**. Raptor mortality was much lower at certain wind farms with lower abundance of birds than at farms with large populations.¹⁰ More consistent, longer-term pre- and post-construction studies are needed to further elucidate patterns of bird and bat fatality and test hypotheses regarding possible solutions and efficacy of mitigation measures.³

Avoiding Habitat Degradation

Strategic landscape level planning is essential to reduce the effect of wind energy development on wildlife populations. Wind farms can be placed to avoid critical habitat such as sage grouse leks or migratory pathways.³ Developers can also find ways to build turbines using the least amount of roads, transmission lines, and other infrastructure to reduce fragmentation effects.¹¹ The **best option** is often to site turbines on land that is already developed to make use of existing infrastructure and avoid disturbing intact habitat areas.¹¹ It is imperative that developers of wind energy, scientists, and natural resource agency specialists **cooperate** in developing and testing methods to minimize harm to wildlife.⁵

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