

Ecological Impact of Fireworks

Administration completed a preliminary review of scientific literature evaluating the impacts of fireworks on wildlife. The effects of fireworks on wild animals vary depending on the biology of each species. Most studies evaluated impacts on birds and domestic dogs, and demonstrate that recreational noise pollution can affect wildlife in a variety of ways including their habitat use, communication, biology/physiology, reproduction and behavior¹.

Studies looking at the impacts on avian species were completed in Europe around firework events during the summer festival months and on New Year's Eve^{1,3}. The unpredictability of fireworks poses a specific threat to wildlife and domestic animals living in urban environments as the intermittent loud noises limit their ability to adapt to a certain noise level.

Wildlife behavioral changes as a result of noise pollutants have been classified into four categories²:

- Changes in temporal patterns (sleep, routines, activity)
- Modification of spatial distribution or movements
- Links to increased vigilance and anti-predator behavior
- Changes in mate attraction and/or territorial defense

These behavioural changes could impact species' breeding success as a result of a reduction in parental care leading to reduced juvenile productivity due to noise pollution. As a result of fireworks, mass death events of birds have been recorded³. While the effects on all species are not well known, the negative effects of noise pollution on domestic dogs include elevated heart rates and anxiety, which showcases the impact such unpredictable noises have on animal populations.

In addition to the noise pollution produced from fireworks, smoke from fireworks contains toxic chemicals that pollute the air and water. Air pollution in the form of increased levels of particulate matter including concentrations of aerosols, PM10

¹ Bernat-Ponce, E., Gil-Delgado, J. A., & López-Iborra, G. M. (2021). Recreational noise pollution of traditional festivals reduces the juvenile productivity of an avian urban bioindicator. *Environmental Pollution* (1987), 286, 117247–117247. <https://doi.org/10.1016/j.envpol.2021.117247>

² Francis, C.D. & Barber, J.R. (2013). A framework for understanding noise impacts on wildlife: an urgent conservation priority. *Frontiers in Ecology and the Environment*. 11, 305–313. <https://doi.org/10.1890/120183>.

³ Shamoun-Baranes, J., Dokter, A., van Gasteren, H., van Loon, E., van Leijnse, H., & Bouten, W. (2011). Birds flee en mass from New Year's Eve fireworks. *Behavioral Ecology*, 22(6), 1173–1177. <https://doi.org/10.1093/beheco/arr102>

Attachment 4

and PM2.5, are associated with massive firework celebrations and are known for posing health and environmental concerns. Increases in particulate matter in the atmosphere can affect wildlife health.

Controlling the timing and volume of fireworks detonated each year within city boundaries may limit the detrimental effects of noise and air pollutant impacts on wildlife and the environment. In addition, concentrating fireworks in one location, rather than several smaller locations, allows animals to relocate to a safer location and remain undisturbed, rather than fleeing noises coming from several directions. Reducing the total number of fireworks events will also decrease overall exposure to noise events and particulate matter.