

# The impacts of dogs on wildlife and water quality: A literature review

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## SUMMARY

Any human related activity can disturb wildlife. In order to meet The Nature Institute's dual goals of protecting natural resources and providing access to nature, TNI has tried to strategically locate trails in less sensitive habitat and to ensure that human activity is as non-disruptive as possible. Part of that strategy has been to allow public access, while limiting certain activities such as bringing dogs into natural areas.

The evidence that dogs negatively impact wildlife is overwhelming. It is clear that people with dogs – on leash or off – are much more detrimental to wildlife than people without dogs. Dogs (*Canis lupus familiaris*) are considered to be a subspecies of wolves (*Canis lupus*), and wildlife perceive dogs as predators. (30) Impacts include:

1. **Physical and temporal displacement** – The presence of dogs causes wildlife to move away, temporarily or permanently reducing the amount of available habitat in which to feed, breed and rest. Animals become less active during the day to avoid dog interactions. Furthermore, the scent of dogs repels wildlife and the effects remain after the dogs are gone.
2. **Disturbance and stress response** – Animals are alarmed and cease their routine activities. This increases the amount of energy they use, while simultaneously reducing their opportunities to feed. Repeated stress causes long-term impacts on wildlife including reduced reproduction and growth, suppressed immune system and increased vulnerability to disease and parasites.
3. **Indirect and direct mortality** – Dogs transmit diseases (such as canine distemper and rabies) to and from wildlife. Loose dogs kill wildlife.
4. **Human disease and water quality impacts** - Dog waste pollutes water and transmits harmful parasites and diseases to people.

## INTRODUCTION

The Nature Institute owns 450 acres of natural areas, most of which is designated Illinois Nature Preserve and does not allow dogs or other pets on these lands. Exceptions include service animals. The mission of the Illinois Nature Preserves Commission (INPC) is to assist private and public landowners in protecting high quality natural areas and habitats of endangered and threatened species; in perpetuity, through voluntary dedication or registration of such lands into the Illinois Nature Preserves System. The Commission promotes the preservation of these significant lands and provides leadership in their stewardship, management and protection.

Portland Metro Parks staff examined 54 peerreviewed scientific journal articles and several research reports relating to the impacts of dogs in natural areas, including numerous literature reviews on the impacts of various types of recreation on wildlife and habitat. (10, 28, 42,54,61,63, 65,68,71,73,77) The

Nature Institute is sharing this literature review with the purpose of educating our users on the reason for policies that are in place. The results of the literature review are summarized below.

## **PHYSICAL AND TEMPORAL DISPLACEMENT**

Displacement may be the most significant impact due to the amount of habitat affected. The presence of dogs causes most wildlife to move away from an area, which temporarily or permanently reduces the amount of functionally available habitat to wildlife. The research is clear that people with dogs disturb wildlife more than humans alone.(5,10,33,38,39,41,44,61,68,69) These effects reduce a natural area's carrying capacity for wildlife, and also reduces wildlife viewing experiences for visitors.

Studies on a variety of wildlife in many countries and settings demonstrate that dogs along trails and in natural areas significantly alter wildlife behavior. (9,33,39,41,49,53,58) A 2011 literature review found negative dog effects in all 11 papers that examined such effects.(65) Studies demonstrate dog-specific impacts on reptiles,(29,31,48) shorebirds and waterfowl,(24,32,51,69) songbirds,(5,9,10) small mammals,(33,39,56) deer, elk and bighorn sheep,(4,36,38,44,49,59,63) and carnivores.(22,33,52,58)

A study in France found that two hikers disturbed an area of 3.7 hectares walking near wild sheep, whereas two hikers with dogs disturbed 7.5 hectares around the sheep.(41) In Chicago, migratory songbirds were less abundant in yards with dogs.(9) Dog walking in Australian woodlands led to a 35% reduction in bird diversity and a 41% reduction in the overall number of birds.(5) The same study showed some disturbance of birds by humans, but typically less than half that induced by dogs.

Studies in California and Colorado showed that bobcats avoided areas where dogs were present, including spatial displacement(22,33,52) and temporal displacement in which bobcats switched to night time for most activities.(22) The Colorado study also demonstrated significantly lower deer activity near trails specifically in areas that allowed dogs, and this effect extended at least 100 meters off-trail.(33) This negative effect was also true for small mammals including squirrels, rabbits, chipmunks and mice, with the impact extending at least 50 meters off-trail.

Evidence suggests that some wildlife species can habituate to certain predictable, non-threatening disturbances such as people walking on a trail in a natural area; this effectively lowers the stress response. Part of this adaptation may be due to wildlife learning what is and isn't a threat, and also avoidance of hunters.(19,55,63,70) Habituated animals still react, but amount of habitat affected is not as large.(55,56,63,70) However, dogs – especially off-leash dogs – may prevent wildlife habituation because wildlife consistently see them as predators. Dog-specific disturbance has been studied for birds, with no evidence of habituation even with leashed dogs, even where dog-walking was frequent; this effect was much weaker for people without dogs.(5)

Even the scent of dog urine or feces can trigger wildlife to avoid an area. Therefore, the impacts of dog presence can linger long after the dog is gone, even days later. One literature review found that predator odors caused escape, avoidance, freezing, and altered behavior in a large suite of wildlife species including scores of amphibian, reptile, bird, and mammal species from other studies.(30) The scent of domestic dogs has been shown to repel American beaver (*Castor Canadensis*), mountain beaver

(*Aplodontia rufa*), deer (*Odocoileus* species), elk (*Cervus elaphus*), and a wide variety of wildlife native to other countries.(20,30) Mountain beaver cause economic damage to young tree stands in the Pacific Northwest, and foresters are considering using dog urine as a repellent.(20) An experimental study demonstrated that dog feces are an effective repellent for sheep, with no habituation observed over seven successive days. (1)

One Colorado study showed mixed effects of dogs on wildlife.(44) The study compared effects of pedestrians alone, pedestrians with leashed dogs and unleashed dogs alone on grassland birds. Vesper Sparrows (*Pooecetes gramineus*) and Western Meadowlarks (*Sturnella neglecta*) waited until dogs were closest to flush – that is, they fly or run away. This could be an attempt to remain undetected against the greatest threat, but could also mean that these bird species perceive humans as a greater threat than dogs. However, the same study found strong dog-specific impacts on mule deer in woodlands. A literature review found that ungulates (deer, elk and sheep) had stronger flight responses in open habitats compared to forested habitats.(63) Unlike small ground-nesting songbirds, larger animals would have no cover and could easily be seen in open habitats. The disturbance effects of off-leash dogs are stronger than on-leash and substantially expand the amount of wildlife habitat affected, (32,59,63,69) and the unpredictability of off-leash dogs may prevent wildlife habituation in large areas of habitat. (5,10,32,61,69) The negative effects are increased even further when dogs and people venture off-trail, probably because their behavior is less predictable.(44,67) Offleash dogs are likely to reduce the number and types of wildlife in large areas of habitat. A Colorado study found off-leash dogs ventured up to 85 meters from the trail, although this result was from 1 square meter plots covering a very small percentage of the area. (33) Remote cameras in another study documented the same dog 1.5 miles apart in the same day. (61) In Utah, mule deer showed a 96% probability of flushing within 100 meters of recreationists located off trails; their probability of flushing did not drop to 70% until the deer were 390 meters from the recreationists.(67) A California shorebird study found that off-leash dogs were a disproportionate source of disturbance, and that plovers did not habituate to disturbance; birds were disturbed once every 27 minutes on weekends.(32)

To illustrate the potential of dogs to displace wildlife Metro staff explored two well-known local park examples that allow dogs on leash. Forest Park is one of the largest urban parks in the U.S. and was always intended to connect urban dwellers with nature; people have been walking their dogs there since before the park's 1948 dedication. Forest Park covers 5,172 acres of forest, including approximately 80 miles of trails and service. Using a very conservative 25-meter buffer around mapped trails to represent the "human + dog on leash" area of disturbance and assuming 100% compliance with leash rules, the area affected would be 1,406 acres – that's 28% of the entire park. In 651-acre Tryon Creek Natural Area, 207 acres of land (32%) is within 25 meters of a trail.

## **DISTURBANCE AND STRESS RESPONSE**

Stress response is the functional response of an animal to an external stressor, such as seasonal changes in temperature and food availability or sudden disturbance. (3) Specific stress hormones are released to enable the animal to physically respond to the stressor. Acute stress response, when an animal reacts to an immediate situation, can benefit an animal by triggering it to respond appropriately to a threat.

However, chronic stress such as repeated disturbances over time may reduce wildlife health, reproduction, growth, impair the immune system and increase vulnerability to parasites and diseases.(16,27,75)

Dogs cause wildlife to be more alert, which reduces feeding, sleeping, grooming and breeding activities and wastes vital energy stores that may mean life or death when resources are low, such as during winter or reproduction.(8,32,40,41,69) Animals release stress hormones and their heart rates elevate in response.( 3,27,37,38) When stress becomes too high, animals may flush, freeze, or hide. (26,30)

Several studies document that disturbance reduces reproductive success for some wildlife species. (11,35,40,50,63) Numerous studies found that female deer and elk, and deer and elk groups with young offspring, show greater flight responses to human disturbances than other groups.(63) Stress hormones may cause male songbirds to reduce their territorial defense, females to reduce feeding of their young, nestlings to have reduced weight and poor immune systems, and adult birds to abandon nests.(11,34,35,76) A Colorado study showed that elk repeatedly approached by humans had fewer young. (50) Although research is lacking on whether dogs specifically reduce the reproductive success of wildlife, the fact that humans with dogs create much stronger disturbance effects than without dogs (5,33,38,41,44,61,68,69) implies that these stress effects would be magnified if people had dogs with them.

#### **INDIRECT AND DIRECT MORTALITY**

Dogs chase and kill many wildlife species including reptiles, small mammals, deer and foxes.(12,13,29,31,48,58,62) A Canadian study found that domestic dogs were one of the top three predators that killed white-tailed deer fawns.(4) In northern Idaho winter deer grounds, an Idaho Fish and Game conservation officer witnessed or received reports of 39 incidents of dogs chasing deer, directly resulting in the deaths of at least 12 animals.(36) A study in southern Chile revealed that domestic dogs preyed on most of the mammal species present in the study area.(60) A 2014 literature review of dogs in parks identified 19 studies that investigated the effects of dogs preying on wildlife.(73) Of these, 13 reported observing or finding strong evidence of dog predation on wildlife. The Audubon Society of Portland's Wildlife Care Center took in 1,681 known "dog-caught" injured animals from 1987 through March 2016. (2)

Dogs transmit diseases to wildlife and vice versa including rabies, Giardia, distemper and parvovirus. (18,23,66,74) A Mexico City study concluded that feral dogs continually transmitted parvovirus, toxoplasmosis and rabies to wildlife including opossums, ringtails, skunks, weasels and squirrels.(66) Large carnivores such as cougars are especially vulnerable to domestic dog diseases including canine distemper.(74)

#### **HUMAN DISEASE AND WATER QUALITY IMPACTS**

Feces are often delivered to waterways through stormwater. (57) The average dog produces ½ to ¾ pound of fecal matter each day – a hundred dogs can produce more than 500 pounds of waste per week. (45) The Oregon Department of Environmental Quality identifies pet waste as a significant

contributor to one of the region's most ubiquitous and serious pollutants, E. coli bacteria. Contact with E. coli-polluted water can make people sick. Because dog waste can be a relatively simple source to reduce or eliminate exposure to E. coli, DEQ considers reducing or eliminating dog waste an important action item in jurisdictions' clean water implementation plans for the Willamette Basin watershed.(47)

Humans can catch parasites and diseases such as hookworms (causes rash), roundworms (may cause vision loss in small children, rash, fever, or cough) and salmonella (causes gastrointestinal illness) from dog waste. (7,57) Aside from potential illnesses, dog waste can negatively affect visitors' experience in a natural area.

Several examples illustrate local dog impacts. A Clean Water Services DNA study found that dog waste alone accounts for an average of 13% of fecal bacteria in stream study sites in the Tualatin River Basin.(17) Off-leash dog walking is documented to cause erosion in Portland's Marshall Park, creating sediment problems in stream water. (15) In 2014 Portland school administrators expressed concern because playgrounds had become "a minefield for animal waste" from people using school grounds as after hours, off-leash dog parks, threatening the health of school children.(21) The City of Gresham found extremely high levels of E. coli bacteria in water quality samples of a very specific stretch of a stream, where dog feces were found along stream banks behind several yards with dogs.

### **BELIEF, BEHAVIOR AND REALITY**

People do not always take responsibility for their impacts on wildlife. Several studies demonstrate that natural area visitors, including dog owners, often don't believe they are having much of an effect on wildlife, or assign blame to different user groups rather than accepting responsibility themselves. (6,64,67,68) Some natural area visitors assume that when they see wildlife, it means that they are not disturbing the animals – or worse, that because they didn't see any wildlife, they didn't disturb any. (64)

For example, in Utah, about half of recreational visitors surveyed did not believe that recreation was having a negative impact on wildlife; of those that did, each user group blamed other groups for the strongest impacts.(67) In Austria, 56% of people surveyed at a national park agreed that wildlife is in general disturbed by human activity.(64) However, only 12% believed that they had disturbed wildlife in their visit that day, and dog-walkers ranked their activities as less disturbing than other user groups' activities. When asking different user groups to rate the impacts of overall human disturbance on wildlife, dog-walkers rated the impacts the lowest, at 2.6 out of 5 possible impact points.

Surveys indicate that many dog owners desire fewer restrictions, while non-dog owners often feel the opposite.(72,73) However dog owners don't always follow the rules, and some dog owners allow their dogs to run free in leash-only natural areas.(32,52,73) In a Santa Barbara study, only 21% of dogs were leashed despite posted leash requirements. (32) And despite regulations and claims to the contrary, dog owners often don't pick up their dog's waste. (6,32) An English study revealed that although 95% of visitors claimed to pick up their dog's waste only 19-46% actually did so, depending on location within the park.(6)

## **DISCUSSION**

In summary, people and their dogs disturb wildlife, and people are not always aware of or willing to acknowledge the significance of their own impacts. Wildlife perceive dogs as predators. Dogs subject wildlife to physical and temporal displacement from habitat, and dog scent repels wildlife with lingering impacts. Dogs disturb wildlife which can induce long-term stress, impact animals' immune system and reduce reproduction. Dogs spread disease to and outright kill wildlife. People with dogs are much more detrimental to wildlife than people alone; off-leash dogs are worse; and off-trail impacts are the highest (Figure 1).

Urban wildlife is subjected to many human-induced stressors including habitat loss, degraded and fragmented habitat, impacts from a variety of user groups, roads, trails, infrastructure, noise and light pollution.(26) These stressors will increase with population size.

The Nature Institute upholds the no pet policy, because scientific research shows that domestic animals have an impact on wildlife. There are many places in the Metro East area where dogs are welcome on the trails. The Nature Institute and the wildlife that live here thank you for abiding by this unpopular policy.

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