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# Effects of Exurban Development on Wildlife and Plant Communities

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# Effects of Exurban Development on Wildlife and Plant Communities

## Introduction

Exurban developments are low-density residential developments that occur beyond incorporated city limits. Houses in these developments are typically situated on lots from 10 to 40 acres in size, but some exurban developments have higher housing densities. Since 1950, the amount of land in this type of development has increased fivefold in the United States (Brown et al. 2005). In fact, exurban development now occupies about 25 percent of private land in the lower 48 states and is currently the fastest growing form of land use (Brown et al. 2005; Heimlich and Anderson 2001). Consequently, many lands that once were agricultural or natural areas are being converted to residential settlements (fig. 1).

The location of exurban developments on the landscape also is not random. They occur on private lands, which are often the most productive, well-watered, and hospitable places on the landscape (Scott et al. 2001). Furthermore, scenic private lands adjacent to national parks, national forests, wetlands, and streams often are preferred for development for their amenity values.

Landscapes that undergo this land-use conversion experience a dramatic increase in infrastructure (houses, roads, fences, power lines) and human influence as residents bring with them their cats, dogs, hobby livestock, night-lights, garbage, and ornamental landscaping (Mitchell, Knight, and Camp 2002) (fig. 2). Scientists are just beginning to understand the ecological effects of exurban development, but recent study results suggest that the consequences for natural resource conservation may be troublesome.

**Figure 1** Sign advertises rural subdivision


**Figure 2** Horses on exurban property

# Ecological effects

## Birds

Studies of birds on exurban developments indicate that species abundances differ from those seen on undeveloped lands. Human-adapted native species, such as the black-billed magpie and American robin, and exotic species, such as the European starling, reach significantly higher densities on exurban developments than on undeveloped areas (Hansen et al. 2005; Maestas, Knight, and Gilgert 2003; Odell and Knight 2001; Lenth, Knight, and Gilgert 2006). Conversely, native species of conservation concern, such as the orange-crowned warbler, dusky flycatcher, Brewer's sparrow, and vesper sparrow, have reduced densities on exurban developments when compared to undeveloped lands (Hansen et al. 2005; Maestas, Knight, and Gilgert 2003; Odell and Knight 2001; Lenth, Knight, and Gilgert 2006). In general, exurban developments favor common bird species that are able to cope with human disturbances while species of higher conservation concern tend to avoid these areas.

Bird reproduction and population growth also can be influenced by exurban developments. One study in Montana found that yellow warblers had lower nest success—a measure of chicks successfully raised—on exurban developments than on ranchlands (Hansen and Rotella 2002). Furthermore, warbler mortality rates exceeded birth rates, which meant that reproduction was insufficient to sustain a viable warbler population in the study area. The results of this study suggest that exurban developments actually functioned as a population sink by taking individuals away from the overall population while contributing very few.

## Mammals

Some literature indicates that native mammalian carnivores may be affected by exurban developments, as well. Foxes and coyotes have been shown to occur more frequently away from houses in developments (Odell and Knight 2001). Additionally, these species occur more frequently on undeveloped areas than on both high- and low-density exurban developments (Maestas, Knight, and Gilgert 2003; Odell and Knight 2001). A survey of exurban homeowners in central New Mexico indicated that bobcats were seen more frequently in undeveloped areas than near houses (Harrison 1998). A more detailed study of gray foxes in the same area showed that foxes avoided high-density exurban developments but used lower-density developments to some extent (Harrison 1997). This study also revealed that gray foxes were using exurban developments mostly at nighttime and undeveloped areas during the daytime. Results of these studies suggest both spatial and temporal avoidance of exurban developments by some mammals.

Domestic predators, such as dogs and cats, increase considerably across the landscape as it is subdivided. One study documented that dogs and cats were found frequently near houses in exurban developments, but these predators were almost nonexistent at points 330 meters from houses and in undeveloped areas (Odell and Knight 2001). In a study of different rural land uses (ranches, protected areas, and exurban developments), dogs and cats were pervasive on lands used for exurban development and largely absent or undetectable on protected areas or intact ranches (Maestas, Knight, and Gilgert 2003). Sampling points were located throughout the developments in this study, not just near the houses, which indicates that many pets were free roaming. Dogs and cats are known to harass and kill wildlife, and their presence on the landscape extends the realm of human influence and can expedite the local extinction of some species (Miller, Knight, and Miller 2001; Crooks and Soulé 1999). In the United States alone, it is estimated that domestic cats kill hundreds of millions of birds, small mammals, reptiles, and amphibians each year (American Bird Conservancy 2006).

## Plants

Plants are less well studied on exurban developments than wildlife. One study in northern Colorado compared plant communities between exurban developments, ranchlands, and protected areas (Maestas, Knight, and Gilgert 2002, 2003). In this study, native plant species richness—an indicator of site health that measures the number of species present—was higher on ranchlands than on exurban developments. Conversely, nonnative plants were more common on exurban developments than undeveloped lands. Alarmingly, there were over twice as many introduced plant species documented on exurban developments as on ranchlands, with eight of the nonnative species on exurban areas found there and nowhere else. Two of these eight species, spotted knapweed and leafy spurge, are considered to be noxious weeds in the study area. Although these invasive plants are known to occur on ranchlands elsewhere, they were not encountered on ranches in this study, which suggests that these species were either absent on these ranches or at least less pervasive on ranches than on exurban developments. Exurban developments also had a higher percentage of bare ground at sampling points than did protected areas.

Researchers in another study compared plant communities between exurban developments and undeveloped natural areas and found a similar pattern (Lenth, Knight, and Gilgert 2006). Nonnative plant species were more common, and natives less common, on exurban developments with dispersed or clustered housing than on undeveloped areas (Lenth, Knight, and Gilgert 2006).

Although limited data exists, these two studies indicate that exurban developments may serve as sources of new invasive or nonnative plant species and contribute to increased soil erosion (fig. 3).

## Conclusions

The few ecological studies that have been conducted on exurban development suggest that its impacts on biodiversity may be significant, both in the immediate vicinity of homes and on nearby public and private lands (Hansen et al. 2005). The long-term result of continued land conversion to exurban development could be an increasing number of conservation problems, as desirable species begin to show population declines and less desirable, opportunistic species increase in abundance and colonize new areas.

Private lands are often critically important for wildlife during at least some portion of their life cycle. Many rare or declining species depend upon private lands to persist. In the western United States, private lands are often located on productive soils at middle to lower elevations with abundant springs and riparian areas, which make them disproportionately important to wildlife.

**Figure 3** On this ranchette, a horse corral located on a steep slope adjacent to a stream accelerates soil erosion and nonpoint source water pollution.

As exurban developments become a larger component of the landscape, conservationists will find it increasingly difficult not only to maintain native species populations, but also to manage adjacent lands. For example, fire is a natural ecological process that is critical to the health of most ecosystems, but traditional land management tools, such as prescribed burning, may no longer be available because of liability concerns. Wildfires will also be aggressively put out, which may further degrade the ecological health of the land. Additionally, noxious weeds will become more problematic as new invasive plants grow more abundant and move across property boundaries and throughout the watershed.

Conservation planners can help minimize the effects of exurban development by working with landowners and local land use decisionmakers. Protecting farms, ranches, and open spaces with conservation easements is one effective method for maintaining intact landscapes. Government and nongovernment organizations offer a number of programs to compensate landowners for the development value of their land while allowing the landowner to retain ownership. Planners aware of these programs can assist producers in realizing some of financial value of their land without having to subdivide. Local government land-use planning processes may provide another opportunity for conservationists to guide exurban development. Zoning or other land use planning tools can be used to steer development away from lands that may be ecologically sensitive or critically important for natural resource conservation.

If exurban development is unavoidable, clustered housing developments may be a desirable alternative to minimize negative ecological effects (Odell, Theobald, and Knight 2003). In contrast to traditional exurban developments where houses are dispersed throughout a large parcel of land, clustered developments concentrate roughly the same number of houses on a small portion of the land, leaving the remaining area undeveloped and protected by a conservation easement or similar restriction. Clustering houses reduces the landscape fragmentation caused by houses, roads, and other features and potentially reduces the zone of human influence (Odell, Theobald, and Knight 2003). However, these changes alone may not be sufficient to protect species of conservation concern (Lenth, Knight, and Gilgert 2006). It may be necessary to further improve the conservation value of clustered developments by grouping houses closer together, requiring larger protected outlots, restricting recreational use to certain portions of the property, keeping open space contiguous, providing better stewardship of protected outlots, and incorporating other ecological considerations into clustered development designs (Lenth, Knight, and Gilgert 2006).

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