

Attracting and Managing for Wildlife*

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1. Introduction

The urban and suburban forests of the Northeast fulfill many functions that people value, not the least of which is providing habitat for wildlife. Forests, woodlots, parks, and backyard trees all support wildlife and provide the basis for wildlife management.

The principles of wildlife management may be applied at the backyard, local, and community levels to enrich the quality of our daily living environment, as well as to enhance regional wildlife habitat. Living near and viewing wildlife enhances quality of life in often subtle but real ways, providing a sense of connection with nature and respite from everyday life. Research shows that nearly one third of residents in the Northeast participated in watching wildlife in 1996 (US Fish and Wildlife Service, 1997). Most citizens watch wildlife in their own yards, as well as traveling to view wildlife. An estimated \$6.4 billion was spent in 1996 on wildlife feeding, photography, and traveling to view wildlife by Northeast residents alone (US Fish and Wildlife Service, 1997). Many homeowners go further than feeding birds by improving the habitat of their yards for wildlife (National Wildlife Federation, 1997). The idea of managing urban and suburban communities for wildlife also has gained popularity, but is usually a side effect of management with other goals, such as watershed protection and greenways.

While local wildlife management benefits enthusiasts, it also helps sustain regional populations for many species, particularly migratory birds. Migratory birds are especially capable of exploiting patchy habitats, fragmented and smaller natural areas, which are typical of urban–suburban habitats. Here they seek food and cover to carry them through the stressful migration period. In a study of passerine (songbird)

*This Chapter is dedicated to my father.

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migration along the Atlantic flyway, McCann *et al.* (1993) concluded that patchy habitats in suburban and coastal plain communities can help support the migration. They stressed, however, that conservation of the migration requires a mosaic of habitats and conserved natural areas, in addition to enhanced “backyard” habitat management.

2. Attitudes Toward Wildlife

The concept of managing vegetation to attract wildlife assumes that people in the community value wildlife as part of their environment. Conversely, the need to control or discourage problem wildlife also suggests that there are negative associations. In general, it is recognized that wildlife is considered an important element of people’s quality of life and valued as part of their living environment.

In the Northeast, more than elsewhere in the United States, wildlife has been the focus of both good and bad perceptions. Here the interface of human and natural environments is large in impact and geography, and interactions with wildlife happen on both positive and negative levels. This is especially evident in suburban residential areas where species like white-tailed deer find refuge and food and in the process exceed the normal “carrying capacity” of the area. While many community residents value seeing deer, others suffer from increased incidence of deer–car collisions and lose valuable trees and shrubs to deer foraging. How residents value deer in this situation will tend to change as they personally experience the negative impacts of too many deer.

There are many positive experiences with wildlife in Northeast communities, as evidenced by widespread bird feeding, wildlife photography, and the increasing popularity of wildlife landscaping. In general, popular species are those that pose no threat to people’s homes and yards and are not usually found in overabundance. Even lesser-recognized wildlife, such as frogs, salamanders, butterflies, and dragonflies, is being popularized by identification and management guides (e.g., Stokes and Stokes, 1991; Glassberg, 1993; Stein, 1997). Still, birds tend to reign in popularity because they are highly visible, colorful, and occur in great variety, especially during migration.

3. Elements of Wildlife Habitat

Wildlife habitat can be broken down to its components of cover, food, and water, and can be managed correspondingly. The best-quality habitat has all elements in proper proportions and proximity to each other. The design of the habitat, that is, the type and placement of vegetation, thereby serves to encourage some species and discourage others, providing the basis of management for wildlife.

3.1. Cover

Cover is vegetation that supplies shelter from weather, protection from predators, and places for nesting. The structure of vegetation, its height, density, and texture is

often more important than species composition in providing cover and overall habitat for wildlife (DeGraff and Witman, 1979; Ehrlich *et al.*, 1988: 541).

3.1.1. Shelter and Escape Cover

All wildlife needs cover in which to sleep and escape from predators. Good cover also reduces thermal stress during harsh winter weather. Vertical structure of vegetation provides a variety of locations for different species. For many birds, cover is provided by evergreen trees and shrubs or thick deciduous vegetation that also serves to camouflage their body outlines. For mammals, such as raccoons and opossums, shelter is found in tree cavities or stumps, while small mammals (mice and voles) find cover in tall and dense grasses. White-tailed deer often rely on dense conifer stands for both shelter and food.

3.1.2. Nesting/Breeding Cover

Cover for nesting and breeding differs among species. Birds use a great variety of nest sites, ranging from conifers, tall deciduous trees, and shrubs, to ground nests found in heavy and light understory. In the urban–suburban regions, common species are well served with a range of evergreen and deciduous trees and shrubs. Developed in clumps, they offer cover and some protection from ground predators such as cats. Birds that are cavity nesters require older trees, or can be accommodated by nest boxes placed in specifications (Hassinger, 1997). Mammals, such as raccoons, tend to find breeding cover in cavities formed in older trees and stumps and in man-made structures like barns. Deer use cover provided in woodlots and often use high grass to hide new fawns.

3.2. Food

Wildlife food sources are as varied as animal species themselves. Native wildlife have evolved with native trees and shrubs, which provide a seasonal variety of food. Food plants supply fruits, seeds, and nectar as well as foliage in the form of trees, shrubs, vines, and herbaceous plants. Many birds, bats, and small mammals rely on insects, which in turn may be associated with specific host plants and trees. A variety of plants producing food in all seasons will support the greatest variety of wildlife, although winter and early spring is usually the time when food is most limited.

3.3. Water

Water is essential to all wildlife and can be the limiting factor in the distribution of wildlife in an area. Many species require a source of open water on a daily basis. In urban–suburban habitats that are often geographically patchy, access to water can be limiting. In managing to attract wildlife, water can be simple to provide. The types of water systems range from a bird bath to ponds, circulating pools, and misters. Resident wildlife learn the locations of water sources, but migrating birds are often

attracted by the sound of moving water. Ponds and artificial pools are essential to attract water-dependent wildlife such as amphibians (frogs, toads, salamanders) and dragonflies.

3.4. Arrangement of Elements in the Landscape

The proximity of cover to food and water is key to high-quality wildlife habitat for nearly all species. This is most evident in animals having small territories, or home ranges, such as amphibians and reptiles, and “neighborhood” birds like robins and blue jays. For animals with small home ranges, the elements of cover, food, and water must be found in a relatively small area. Most amphibians are limited by availability of water and do not occur more than 1 km from it. For more mobile species, like deer and many birds, the elements may be farther apart, but their home range is consequently larger to meet their needs. For example, deer will forage on grains in agricultural fields, yet seek shelter in woodlots usually adjacent to those fields. While there is no specific maximum distance between food, water, and cover for a group of species, the closer the elements are, the greater the diversity of wildlife tends to be.

4. Wildlife in Urban and Suburban Landscapes

A key to attracting and managing for wildlife in urban and suburban areas is the concept of scale. While the size of the yard, woodlot, or park will always be fundamental to the type of management, so is its place within the landscape. The yard or neighborhood may be too small to support white-tailed deer, but deer may visit, for foraging, from the larger landscape area. If the landscape does not support the population, the animals may not be available to the smaller parcels. Managing habitat for wildlife works at the backyard or local level; the types and variety of wildlife that subsequently use the habitat are determined by the surrounding habitats, movement corridors, and animals’ mobility.

In the face of continued habitat loss, the larger forests and parks of the northeast are essential to support wildlife populations on a larger scale, especially for area-sensitive species (those with large size requirements). These larger forests tend to be strongholds for “neotropical” songbirds—those that breed in North America and winter in Central and South America. Many species of this class of birds are in serious population declines (Robbins *et al.*, 1986). These and other songbirds may use the larger forests for nesting, but they rely on good quality habitat for food and cover during migration. The proximity of large forested areas to population centers of Northeast cities also makes these forests popular for wildlife-oriented recreation.

4.1. Typical Species

In the Northeast, most wildlife in the urban–suburban landscape are birds, whose mobility allows them to access good quality habitat “patches,” and mammals that have adapted to human structures and habitats. The urban–suburban habitats, however, have a heightened importance to migratory birds. Highly mobile and

dependent on food and cover all along the migration pathway, migrating birds will take seasonal advantage of good habitat wherever it occurs.

4.1.1. Urban Landscape

In most Northeast cities, large parks form the reservoir of wildlife species to be found, except perhaps for rock doves (or pigeons) (see Table 1 for species' names). Typical species tend to be those most adapted to the human environment, including

Table 1. Species Names Referenced in Text and Typical Habitats^a

Common name	Latin name	Habitat type
<i>Birds</i>		
Red-tailed hawk	<i>Buteo jamaicensis</i>	Woodlands, fields
Northern bobwhite	<i>Colinus virginianus</i>	Pastures, fields
Rock dove	<i>Columba livia</i>	Cities, suburbs, farms
Mourning dove	<i>Zenaida macroura</i>	Woodland and suburban edges
Great horned owl	<i>Bubo virginianus</i>	Woodlands, field edges
Northern flicker	<i>Colaptes auratus</i>	Wood edges, suburbia
Downy woodpecker	<i>Picoides pubescens</i>	Open woodland, wood edges
Tree swallow	<i>Tachycineta bicolor</i>	Fields, wood edges
Blue jay	<i>Cyanocitta cristata</i>	Woods, edges, suburbs
Black-capped chickadee	<i>Parus atricapillus</i>	Woods, edges, parks
Tufted titmouse	<i>Parus bicolor</i>	Woodland, parks
House wren	<i>Troglodytes aedon</i>	Woods, thickets
Eastern bluebird	<i>Sialia sialis</i>	Forest edge, field with scattered trees
Northern mockingbird	<i>Mimus polyglottus</i>	Parks, suburbs, shrub-field
Gray catbird	<i>Dumetella carolinensis</i>	Thickets, hedges
American robin	<i>Turdus migratorius</i>	Parks, suburbs, woodland
European starling	<i>Sturnus vulgaris</i>	Cities, suburbs, farms
Eastern meadowlark	<i>Sturnella magna</i>	Pastures, hayfields
Northern oriole	<i>Icterus galbula</i>	Open woodlands, edges
Common grackle	<i>Quiscalus quiscula</i>	Parks, shade trees
Red-winged blackbird	<i>Agelaius phoeniceus</i>	Marshes, fields
Brown-headed cowbird	<i>Molothrus ater</i>	Open woods, edges
Northern cardinal	<i>Cardinalis cardinalis</i>	Thickets, suburbia
Purple finch	<i>Carpodacus purpureus</i>	Coniferous woods, edges
House finch	<i>Carpodacus mexicanus</i>	Cities, towns, farms
American goldfinch	<i>Carduelis tristis</i>	Weedy fields, open woodland
Chipping sparrow	<i>Spizella passerina</i>	Pine woods, edges
Field sparrow	<i>Spizella pusilla</i>	Brushy fields, edges
House sparrow	<i>Passer domesticus</i>	Cities, suburbs, farms
Song sparrow	<i>Melospiza melodia</i>	Thickets, shrubbery
<i>Mammals</i>		
White-tailed deer	<i>Odocoileus virginianus</i>	Woodlands and fields
Woodchuck, groundhog	<i>Marmota mona</i>	Upland woods, fields
Cottontail rabbit	<i>Sylvilagus floridanus</i>	Farmland, thickets
Raccoon	<i>Procyon lotor</i>	Woods, swamps, suburbs
Opossum	<i>Didelphis virginiana</i>	Woodlands

(continued)

Table 1. (Continued)

Common name	Latin name	Habitat type
Gray squirrel	<i>Sciurus carolinensis</i>	Woodlands, suburbs
Flying squirrel	<i>Glaucomys volans</i>	Woodlands
Eastern chipmunk	<i>Tamias striatus</i>	Hardwood forests, rock walls
Eastern mole	<i>Scalopus aquaticus</i>	Fields, gardens, lawns
White-footed mouse	<i>Peromyscus leucopus</i>	Woodlands, thickets
Meadow vole	<i>Microtus pennsylvanicus</i>	Fields
<i>Reptiles</i>		
Black rat snake	<i>Elaphe obsoleta</i>	Field, edges, open woods
Eastern Garter snake	<i>Thamnophis sirtalis</i>	Fields, roadsides, gardens
Box turtle	<i>Terrapene carolina</i>	Open woodlands, fields

^aHarper and Row (1981), Conant (1991), Ehrlich *et al.* (1988).

rock doves, house sparrows, starlings, cowbirds, house finches, and mammals such as raccoons, opossums, and white-footed mice. The more mobile birds tend to move daily or seasonally into smaller lots in search of water or food from seed- or fruit-bearing herbaceous, shrub, or tree vegetation. It is not uncommon for migrating birds to use urban parks, lots, and even window box feeders during spring and fall migration periods.

4.1.2. Suburban–Residential Landscape

The suburban–residential landscape is common in the Northeast, created by a predominance of single-family houses on parcels less than 1 to 2 acres. When these housing developments are created, most existing native vegetation is removed. New trees and shrubs may be placed by homeowners, but the landscape generally is changed significantly. The process of revegetation may resemble natural succession, growing from simple herbaceous plant communities to more complex communities of a varied structure and species composition. Over time, these landscapes become valuable to wildlife once more, as trees mature and shrubs develop into understory providing cover.

Typical wildlife species found in this landscape will also change if the vegetation is allowed to mature. In early succession types of neighborhoods, with grass lawns and some trees, common species may be American robins, blue jays, house sparrows, house wrens, Northern mockingbird, mourning doves, cardinals, and gray squirrels. As trees and shrubs develop to create a varied-structure of cover and food, a greater variety of species may occur, including Northern flicker, downy woodpecker, black-capped chickadee, tufted tit-mouse, gray catbird, Northern oriole, cottontail rabbit, raccoon, opossum, and chipmunk. Other ground dwellers like small snakes and salamanders occur with the addition of brush piles, old logs, and other ground cover. In general, as vegetation grows in complexity of species and structure across neighborhoods, a greater variety of wildlife will be supported and attracted from adjacent habitats.

4.1.3. Suburban–Farmland Landscape

The suburban–farmland landscape is composed of the intersection of suburban–residential “habitat” and adjacent agricultural lands. This type of landscape has been a common element in recent years partly because farmland is aesthetically attractive and easily developed for housing. The agricultural landscape thus has been declining, giving way to suburban residential development. Still, where it exists near suburban areas, farmland is a rich reservoir of wildlife. Smaller farms, more common in the Northeast than elsewhere, tend to have a variety of cover types—field, hedgerow, woodlot—in close proximity, which is beneficial to many species. Suburban habitats, however, must be developed for wildlife to maximize the benefit of adjacent farmland. Typical species that may “spill over” between agricultural and residential areas are white-tailed deer, woodchuck, cottontail rabbits, a number of voles, shrews, and mice, and resident and migratory bats. Among the birds, red-winged blackbird, seed-eating sparrows (song, chipping, field) and finches (goldfinch, purple finch), Eastern meadowlark, tree swallow, bluebird, red-tailed hawk, great horned owl, and even bobwhite might be added to the more common birds of suburban areas. Further, a large variety of migratory birds, including warblers, sparrows, and hawks, will frequent this landscape.

4.2. Benefits

A rich variety of wildlife near one’s residence provides benefits that are difficult to quantify. The sight of a deer or unusual bird often alerts us to the outside natural world and refocuses our attention away from the human-structured environment. This might be described as an aesthetic or spiritual value of wildlife. This ethereal value, however, may often translate to an economic level. Homes in urban–suburban neighborhoods may achieve higher market values when they incorporate trees (Ebenreck, 1989) or are integrated into natural areas that support wildlife (Leedy *et al.*, 1978).

Areas successfully managed for wildlife usually have the effect of enhancing the regional ecology. Good habitat promotes development of more complex food “webs,” including beneficial insects, less visible reptiles and amphibians, and small mammals. As the system becomes more complex in diversity of species, certain pest problems tend to take care of themselves. Infestations of Japanese beetles or tent caterpillars can be solved by birds or other insects in an ecological balancing act. A single yard managed to promote wildlife can be an island, but an entire neighborhood can work as an ecosystem. In a healthy ecosystem (or neighborhood) the need for costly chemicals and maintenance is reduced.

4.3. Problems and Nuisance Wildlife

Some wildlife species can become pests when they occur in some places or in over-abundance. In Northeast urban and suburban areas, typical problems include the following:

- White-tailed deer involved in deer–car collisions
- White-tailed deer foraging on residential shrubbery

- Black bears raiding bird feeders, beehives, or garage containers
- Interaction of rabid wildlife with people or domestic animals
- Canada geese overpopulating suburban areas
- Raccoons inhabiting yards, feeding on garbage
- Beavers causing flooding of properties
- Squirrels or bats inhabiting attics
- Moles causing damage to lawns
- Woodpeckers affecting houses
- Snakes in backyards

Many of these problems arise when high populations of wildlife occur in suburban–open space interfaces, often where wildlife find refuge from hunting pressure. This is often the case with white-tailed deer and Canada geese, which are two of the major problem species in the Northeast. The incidence of rabies in wildlife is a concern, but usually perceived to be a greater threat than it actually is. County or municipal health departments usually address local rabies occurrence with emphasis on pet vaccinations and educating the public. Deer are part of the life cycle of the spirochete that causes Lyme disease. While there is not a clear cause-and-effect relationship between high suburban deer populations and incidence of Lyme disease in people, this may be the public's perception. Other problems, such as woodpeckers, squirrels, bats, and moles, may be occasional and temporary inconveniences, treatable with the help or advice of professionals. Some problems may be more a matter of perception than real problems: snakes occur widely and do not normally pose a threat to people, yet they are not well tolerated when observed in yards.

5. Managing for Wildlife

Managing habitat for wildlife centers on creating cover, food, and water in close proximity, to meet the daily and seasonal needs of desired wildlife. In the urban–suburban landscape, small-scale habitats can be enhanced using trees and shrubs that provide superior cover and food (Fig. 1). In addition, an examination of the larger landscape may reveal elements that are missing or in short supply; by providing the elements in short supply, we meet wildlife needs for the area. Local and regional planners can enhance habitat by promoting conservation of native vegetation in construction projects and along streams and wetlands, and developing open spaces and parks with wildlife habitat in mind (Leedy and Adams, 1984).

5.1. Attracting Birds

Birds are among the easiest wildlife to attract into small-scale habitats like backyards; birds thereby can serve as “umbrella” species. Managing successfully for birds tends to promote other wildlife as well. The mobility of birds allows them to exploit good habitat, sometimes regardless of size, to find seasonal foods. Bird species most likely to find a new site may depend on the type and size of local natural habitats: forests and fields will support populations that can colonize smaller habitats. Nesting



FIGURE 1. Development of habitat from simple, individual trees (left) to complex vegetative structure that benefits wildlife (right).

birds must find all elements for survival within a nesting territory and defend it against others. Major migrations of songbirds and hawks occur in the Northeast in April–May (northbound) and in September–November (southbound). Migrating birds are not constrained by territorial behavior and have acute needs for quality foods and escape cover. Birds need food in the form of seeds, nuts, insects, catkins, nectar, and fruit. The greater variety of food-producing shrubs and trees in the area, the more birds it may support.

5.1.1. Landscape Elements and Tree–Shrub Species

An urban or suburban habitat for birds should include tall trees, both deciduous and evergreen, for cover and nesting. Excellent tree species are Eastern red cedar, white pine, black cherry, oaks, maples, sweet gum, and black gum, among others. Deciduous and evergreen shrubs, as understory and massed with trees, help create a multilayered or tiered structure excellent for cover and necessary for some species' nesting. Recommended shrubs include bayberry, viburnum, sumac, elderberry, sweet pepperbush, butterfly bush, cotoneasters, and blueberry (Table 2), but native shrubs and trees will volunteer or seed naturally in many cases. In most urban–suburban neighborhoods, tree–shrub structure is usually limited, so its addition provides the greatest early benefit to birds. Grass lawns provide almost no benefit to wildlife but can serve as backdrop for bird activity along native shrub borders or hedgerows. In otherwise suitable habitat, nest boxes can substitute for natural tree cavities to accommodate bird and squirrel nesting and bat roosting (Hassinger, 1997).

Table 2. Some Trees, Shrubs, and Vines Beneficial to Wildlife^a

Species	Latin name	Benefit
<i>Trees</i>		
American holly	<i>Ilex opaca</i>	Food (winter berries), cover
Ash	<i>Fraxinus</i> spp.	Food (seeds)
Beech	<i>Fagus</i> spp.	Food (nuts)
Birch	<i>Betula</i> spp.	Food (catkins, insects)
Black gum	<i>Nyssa sylvatica</i>	Food (fruits)
Black cherry	<i>Prunus serotina</i>	Food (fruits)
Chokecherry	<i>Prunus virginiana</i>	Food (fruits, insects)
Crab apple	<i>Malus</i> spp.	Food (fruits)
Eastern hackberry	<i>Celtis occidentalis</i>	Food (berries, insects)
Eastern hemlock	<i>Tsuga canadensis</i>	Cover, nesting, food
Eastern red cedar	<i>Juniperus virginiana</i>	Cover, nesting, food
Flowering dogwood	<i>Cornus florida</i>	Food (fruit)
Hawthorn	<i>Crataegus</i> spp.	Food (winter berries)
Maple	<i>Acer</i> spp.	Food (seeds), cover, nesting
Mulberry	<i>Morus</i> spp.	Food (berries), cover
Oak	<i>Quercus</i> spp.	Food (nuts), cover, nesting
Persimmon	<i>Diospyros virginiana</i>	Food (fruit, insects)
Sassafras	<i>Sassafras albidum</i>	Food (seeds, insects)
Serviceberry (shadbush)	<i>Amelanchier laevis</i>	Food (fruit)
Shagbark hickory	<i>Carya ovata</i>	Food (nuts), nesting
Spruce	<i>Picea</i> spp.	Cover, food
Sweet gum	<i>Liquidambar styraciflua</i>	Food (fruit)
Tulip tree (tulip poplar)	<i>Liriodendron tulipifera</i>	Food (seeds)
White pine	<i>Pinus strobus</i>	Cover, food (seed)
<i>Shrubs</i>		
Alders	<i>Alnus</i> spp.	Food (seeds)
Bayberry	<i>Myrica pensylvanica</i>	Food (fruit), cover
Butterfly bush	<i>Buddleia davidii</i>	Food (nectar)
Common spicebush	<i>Lindera benzoin</i>	Food (fruit)
Cotoneaster	<i>Cotoneaster</i> spp.	Food (winter fruit), cover
Elderberry	<i>Sambucus canadensis</i>	Food (fruit, insects)
Firethorn	<i>Pyracantha coccinea</i>	Food (winter berries), cover
Juniper	<i>Juniperus</i> spp.	Food (berries), cover
Red osier dogwood	<i>Cornus stolonifera</i>	Food (berries)
Sumac	<i>Rhus</i> spp.	Food (winter berries)
Sweet pepperbush	<i>Clethra alnifolia</i>	Food (fruit)
Tartarian honeysuckle	<i>Lonicera</i> spp.	Food (nectar), cover
Viburnum	<i>Viburnum</i> spp.	Food (fruit), cover
<i>Vines</i>		
English ivy	<i>Hedera helix</i>	Cover, food (insects)
Grape	<i>Vitis</i> spp.	Food (fruits), cover
Trumpet vine	<i>Campsis radicans</i>	Food (nectar)
Virginia creeper	<i>Parthenocissus quinquefolia</i>	Food (berries, foliage), cover

^aNational Wildlife Federation (1974), Degraff and Witman (1979), Harrison (1979), Ernst (1987), Sutton (1989), Cox (1991).

Native vegetation on site should be encouraged or incorporated into landscape design, with additions of food-producing shrubs and trees (Table 2). Shrubs should be selected to provide food year round ideally, requiring some evaluation of what is currently available in the area as well as plants' seasonality. Trees also provide food for birds in seeds, catkins, and the insects they support. Older trees and dead limbs should be left, where feasible, since they provide for woodpeckers and cavity-nesting birds.

The simplest method of providing water for birds is a bird bath, about 1 m high and 1 to 2 m from shrubs. More complex water sources, including ponds and circulating pools, will attract birds as well as other wildlife. Retention and detention ponds provide water for wildlife and can be improved for this purpose by allowing native vegetation to grow around their banks and avoiding use of fertilizers.

5.2. Attracting Other Wildlife

Managing for species such as mammals, butterflies, dragonflies, amphibians, or reptiles follows the same principles of providing the animal's requirements. Large mammals are generally limited by the size of habitat and availability of wooded corridors for moving between habitats. In the urban-suburban area, large- and medium-size mammals, such as deer and raccoons, if present at all, may easily become pests. They have adapted to human structures and food sources, making them difficult to control, however, smaller wildlife can be promoted in small habitats with less likelihood for problems.

5.2.1. Landscape Elements and Tree-Shrub Species

Small mammals, such as chipmunks and squirrels, may inhabit small habitats that have some connection to population centers in larger habitats. Both eat seeds and nuts available from oaks, maples, hickories, and grasses and other herbs. Gray squirrels require tall deciduous trees for breeding and cover, flying squirrels require tree cavities, while chipmunks are ground dwellers, using fallen logs, rock walls, and other ground cover. Other small mammals, primarily mice and meadow voles, inhabit dense herbaceous vegetation that serves both as cover and their seed-food source. Many small mammals obtain water through their food or moist vegetation.

Reptiles, including garter snakes, black rat snakes, and box turtles, can be common but unseen in suburban habitats. They do best as part of a healthy ecosystem, relying on insects and/or fruits found in varied habitats of trees, shrubs, and grasses. Managing for the larger area, following suggestions for bird management, usually meets their needs.

Amphibians are an interesting group of species united by their dependence on a reliable source of water. They include a wide variety of frogs, toads, and salamanders, some of which can inhabit smaller habitats that include water (at ground level) and cover. A shallow pond that does not support fish is necessary, along with ground cover in which they can move. Cover varies by species: treefrogs require trees near ponds, while frogs and salamanders do well with forest floor vegetation like leaf layers and decomposing logs. Within live (usually herbaceous) and decomposing vegetation they

forage on insects. It is best to allow these species to colonize a pond naturally rather than introduce them; the species for which the habitat is suitable will find it.

5.3. Managing to Discourage “Problem” Wildlife

Wildlife can become out of balance with natural systems when they adapt well to the human landscape and learn to find food and cover in residential areas. Human food sources or refuge provided by suburban areas can artificially elevate the natural carrying capacity, creating an imbalance. Problems occur when these animals take up residence in homes, attics, or garages, interact with domestic pets, or damage landscaped yards (Cummings, 1979). Some problems can be diminished with habitat management that brings about greater ecological balance, but some are related to high regional populations and require solutions at the population level (within the jurisdiction of state wildlife agencies). It is important to understand, however, that wildlife live where there is suitable habitat: snakes may be perceived as problems in some cases, but actually are part of a system involving food (insects, rodents) and cover. Insect problems may be resolved using integrated pest management (IPM) (see Chapter 18, this volume), available through agricultural extension services. Successful wildlife management helps restore a system of multiple ecological levels.

5.3.1. Landscape Design

The arrangement of trees and shrubs can be managed to reduce wildlife problems. Most wildlife require cover in which to move about or seek out specific foods. By reducing the connectiveness of vegetative corridors, some species, such as rodents that are reluctant to cross open areas, will be reduced or limited in range. In cases of small mammals entering houses, foundation plantings might be changed to woody shrubs that reduce ground cover and seed production. Food left outside for dogs and cats will attract nuisance animals such as raccoons, skunks, and opossums and therefore should be avoided. Squirrels and small mammals but not birds are deterred from bird feeders when capsaicinoid pepper is mixed with the seed.

Animals with known food preferences may be discouraged by limiting preferred foods. White-tailed deer have a wide diet of herbaceous plants and woody “browse,” including many trees in the sapling stage. In many areas of the Northeast, deer have a strong influence on habitat: they can reduce shrub and tree understory and prevent forest regeneration. Where deer are abundant, local habitat development must employ tree and shrub species that deer usually do not eat (e.g., box elder, cotoneaster, English ivy, holly; consult an agricultural extension agent). Canada geese problems flourish at sites with short grass adjacent to ponds or lakes and are easily solved by replacing grass with wildflower meadow or long grass. Long grass management, mowing only once per year, is recommended for deterring Canada geese and gulls at airports (Blokpoel, 1976).

5.3.2. Mechanical and Chemical Controls

Wildlife problems can be prevented or reduced using physical means that are preferable to chemical methods when promoting wildlife habitat. Physically sealing

holes and cracks in foundations and screening attic ventilation holes will exclude animals like raccoons, squirrels, and bats that seek nest or roost sites. Animals that do gain entry can be trapped and removed by the homeowner or a pest control company; bats will leave after dusk, then holes can be sealed to prevent their reentry (one should be sure there are not breeding bats with young). Heavy-duty screening can be used on chimneys to prevent access by raccoons, squirrels, and birds, and tree branches should be at least 2 m away from roofs to prevent animals from reaching the house. If animals take up residence under out-buildings or in crawl spaces, ammonia-soaked rags often discourage them. Fencing around vegetable gardens will prevent foraging by deer, rabbits, and woodchucks. Woodchucks will also burrow, so submerged galvanized wire fence will prevent them from residing under decks. Valuable shrubbery can be protected from browsing deer by covering with nylon netting, especially during winter and early spring when deer forage is low. The lower (0.5 m) stems of small trees can be wrapped with screening to prevent mice and rabbits from damaging bark. Woodpeckers pecking on houses can be a sign of insect infestation, which should be investigated first; otherwise, pecking can be discouraged by covering particular areas with wire mesh (US Department of interior, 1978) or hanging Mylar balloons or tape; some pecking is done as part of territorial advertising and is unrelated to food. Trash cans and bird and grass seed should be stored securely to prevent access by bears, raccoons, and mice. Most wildlife are protected from lethal controls without proper permits; state wildlife agencies should be consulted for regulations applicable to nuisance wildlife.

Chemicals can be used to interrupt wildlife problems and provide short-term fixes, but are usually not a long-term solution. Chemical repellents (e.g., Hinder—Shield-Brite, Inc., Magic Circle—J. C. Ehrlich) can be effective on small areas in reducing damage to shrubs and trees caused by deer and rabbits and is available from garden supply stores. Gas cartridges are available in garden centers to kill moles in lawns, but will not prevent other moles from moving in where food (especially grubs) remains available. Woodpeckers can be discouraged from wood-sided houses by application of wood preservative to the siding; wood should be free of insects before application. Most chemical controls must be used repetitively unless other steps are taken to eliminate food or cover resources locally.

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Further information can be obtained from:

1. State wildlife agencies.
2. Cooperative wildlife research units associated with state universities.
3. National Institute for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, MD 21044.
4. National Wildlife Federation, Backyard Wildlife Habitat Program, 8925 Leesburg Pike, Vienna, VA 22184-0001.
5. US Department of Agriculture, Animal and Plant Health Inspection Service-Animal Damage Control, National Wildlife Research Center, 1201 Oak Ridge Drive, Fort Collins, CO 80225.