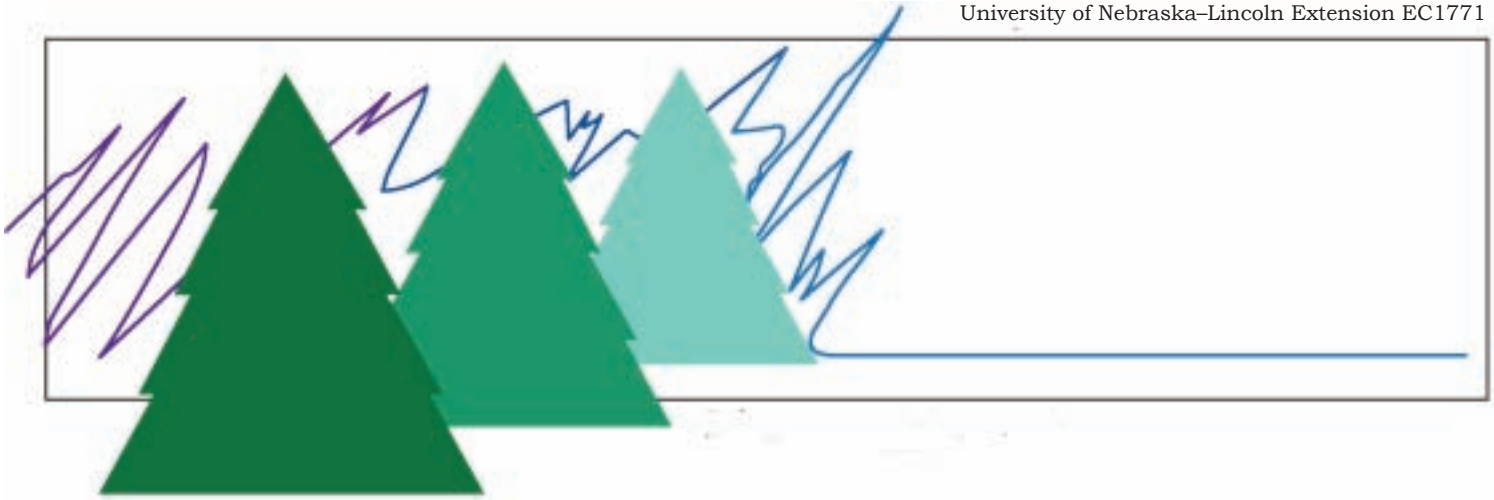

Windbreaks and Wildlife

For more windbreak publications see:

EC1763	How Windbreaks Work
EC1764	Windbreak Establishment
EC1766	Windbreaks for Livestock Operations
EC1767	Windbreaks for Rural Living
EC1768	Windbreak Management
EC1770	Windbreak for Snow Management
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Windbreaks and Wildlife

By Ron J. Johnson, Mary M. Beck and James R. Brandle,
University of Nebraska-Lincoln

Windbreaks can support wildlife that add beauty and pleasure to our lives. They also sustain birds that eat insect pests, improve hunting opportunities, and provide a focal point for family outdoor activities. The world around us would be less appealing without the stimulation — the color, sounds, tracks, and mystery — of wild creatures; windbreaks help wildlife and in some areas are essential to survival of the wildlife we enjoy. You can add wildlife benefits to windbreak plantings whether your main goal is to shelter crops, livestock, roads, or a home or farmstead.

This publication provides an overview of windbreaks and wildlife, and gives examples of trees, shrubs, and planting designs to consider. However, because adapted plant types and wildlife needs vary among areas, refer to local experts for details. Personnel from Cooperative Extension, state wildlife or forestry agencies, the Soil Conservation Service, and others can help or will know how to direct you to the needed information.

Nebraska Game and Parks Commission

Cardinals and other non-migratory birds benefit from dense conifers that provide protection from cold winter winds.

Why Include Wildlife in Windbreak Plans?

Insect-eaters. Many birds and predatory insects that live in windbreaks consume pest insects in the windbreak and in adjacent crop fields. One report estimates that birds consume about 260 pounds of insects per half-mile of windbreak each year. These insect-eaters are a natural biological control that may reduce crop losses and reliance on pesticides, aspects of possible economic significance for integrated agricultural systems.

Windbreaks as an Investment in Recreation. Studies in the Great Plains show that hunting pheasants or quail is usually more successful in areas with woody windbreak plantings. Windbreaks also benefit other game animals including cottontails, mourning doves, squirrels, and white-tailed deer. A 1985 survey by the U. S. Fish and Wildlife Service showed that, in the United States, adults spend about $55 billion each year on wildlife-related recreation. In Kansas, researchers attribute more than $30 million annually to hunting activities associated with windbreaks. The demand for outdoor recreation opportunities, such as hunting, wildlife observation, camping, photography, and hiking, is likely to continue to increase. Windbreaks can enhance these outdoor recreational opportunities.

Kathleen E. Clement

Windbreaks provide opportunities for family outdoor activities.

Families and Windbreaks. Windbreaks on a farm or acreage can become a focal point for outdoor family activities. They provide aesthetic beauty to enhance the home or farm; a quiet setting for walks, bird watching, or overnight camp-outs together; a route for hayrack rides with wildlife to be seen; and a place for hunting or wildlife educational activities. An evening of television is soon forgotten but the memories of family adventures by the windbreak will last a lifetime.

How Windbreaks Benefit Wildlife

A Place to Nest. Shelterbelts provide nesting habitat for a wide variety of birds (Table 1) and other wildlife species. At least 57 kinds of birds have been recorded using windbreaks in the United States during the breeding season. Mourning doves nest and call in windbreak trees but forage nearby for the seeds that they eat. Some birds such as the black-billed cuckoo ("rain bird"), house wren, gray catbird, and northern oriole conduct nearly all their activities within the windbreak. American robins, kingbirds, brown thrashers, and American goldfinchs sing and nest in windbreaks but forage both in and out of them. Other species, including squirrels and cottontail rabbits, nest in windbreaks, and white-tailed deer with fawns use them for cover.

Food and Foraging sites. Windbreaks provide food for wildlife as well as protective cover when they forage in adjacent areas. Foods potentially available in windbreaks include fruits, nuts, acorns, seeds, foliage, and insects or other invertebrates. Availability of these foods varies seasonally and depends largely on what's planted or growing in the windbreak. Trees and shrubs produce fruits and some hold them into winter, a time when food is often critical for survival but generally less available. Acorns, nuts, and other seeds from trees such as elm, maple, and ash are used by wild turkeys, pheasants, quail, squirrels, deer, and songbirds. Seeds may also be available from grasses or herbaceous plants growing in the windbreak or from wildlife food plots planted within or adjacent to the woody vegetation. Foliage such as leaves or other plant parts may provide food for browsing animals such as deer. Insects and other invertebrates are important foods for many birds, particularly during nesting periods, and for various small field mice and shrews. Windbreaks provide foraging sites that would otherwise be unavailable. For example, chickadees glean along branches, peeking in and under crevices in the bark looking for insects to eat. Windbreak species such as hackberry, hawthorn, black cherry, autumn olive, honeysuckle, and others serve as nectar sources and habitat for butterflies, honey bees, and hummingbirds.

Food availability near shelterbelts is also important for many species. In fact, pheasants generally don't use windbreaks, especially in winter, unless there is a nearby food source. Croplands, such as cornfields, that have waste grains, interspersed weed seeds, and insects are used by ring-necked pheasants, northern bobwhites, mourning doves, and others. Avoid autumn plowing of such croplands where possible and consider using cropping systems such as no-tillage that leave ground cover. Oldfield habitats or water sources near windbreaks can provide habitat requirements for some species.

	Reported shelterbelt uses		
Bird species	**Feeding**	**Nesting season**	**Resting/Loafing**
Gray partridge			•
Ring-necked pheasant		•	•
Northern bobwhite	•	•	•
Mourning dove		•	•
Black-billed cuckoo	•	•	•
Red-headed woodpecker	•	•	•
Downy woodpecker	•	•	•
Northern flicker	•	•	•
Eastern wood-pewee	•	•	•
Least flycatcher	•	•	
Western and Eastern kingbirds	•	•	•
Black-capped chickadee	•	•	•
American robin	•	•	•
Gray catbird	•	•	•
Brown thrasher	•	•	•
Warbling vireo	•	•	•
Indigo bunting	•	•	•
Dark-eyed junco	•	•	•
Common grackle	•	•	•
Northern oriole	•	•	•
American goldfinch	•	•	•
American kestrel		•	•
Sharp-tailed grouse	•		•
Hairy woodpecker			•
House wren	•	•	•
Eastern bluebird		•	
Northern mockingbird			•
Cedar waxwing	•	•	•
Yellow warbler	•	•	•
American redstart	•		•
Common yellowthroat	•	•	•
Yellow-breasted chat			•
Northern cardinal	•		•
Rose-breasted grosbeak	•	•	•
Rufous-sided towhee			•
Lark sparrow		•	
White-throated sparrow			•
Brown-headed cowbird			•
Orchard oriole	•	•	•

Table 1. Examples of birds that benefit from shelterbelts in the United States.

Shelter From Predation - Escape Cover. Windbreaks provide escape cover and refuge for many wildlife species. Pheasants often stay near windbreak cover while feeding in adjacent areas, and, during midday loafing periods, the woody vegetation offers refuge from people and overhead predators. In general, wider shelterbelts with a good vegetation layer near the ground offer better escape cover than do those that are more narrow and open. When planning wildlife escape cover, consider the surrounding land use. Be aware that in areas with no trees or other perches, tall deciduous windbreak trees may attract avian predators. In most situations, hawks and owls are welcome because they eat pest rodents and inspire joy and awe in many who watch them. However, in areas where no other perches exist and where enhancing pheasants, quail, or partridge is the primary wildlife goal, shrubs or moderately-sized trees may be better alternatives.

Shelter from weather. Shelter from the wind is a critical aspect of wildlife survival in winter. An animal maintains warmth by avoiding exposure to the wind, ideally in a warm sunny spot, and by fluffing feathers or fur coats. Food is vital because it is the basic source of all body heat. An animal must balance the needs of finding food against the increased exposure to wind when foraging.

Windbreaks can provide both shelter and food. Shrubs and ground cover on the lee side allow animals to perch or rest out of the wind and, with many windbreaks, the lee side will have exposure to the sun. When food is available in or near the shelter, wildlife can find food without long exposure to cold wind. The combination of wind protection, food, and sun exposure can be a life saver for wildlife during critical winter times.

The quality of a windbreak for protection from weather extremes relates to several factors, including the wildlife species involved; severity of the weather; age, size (length and width), density, orientation, location, and vegetation composition of the windbreak; and food availability in or near the shelter. Animals in colder climates may require larger, especially wider, plantings.

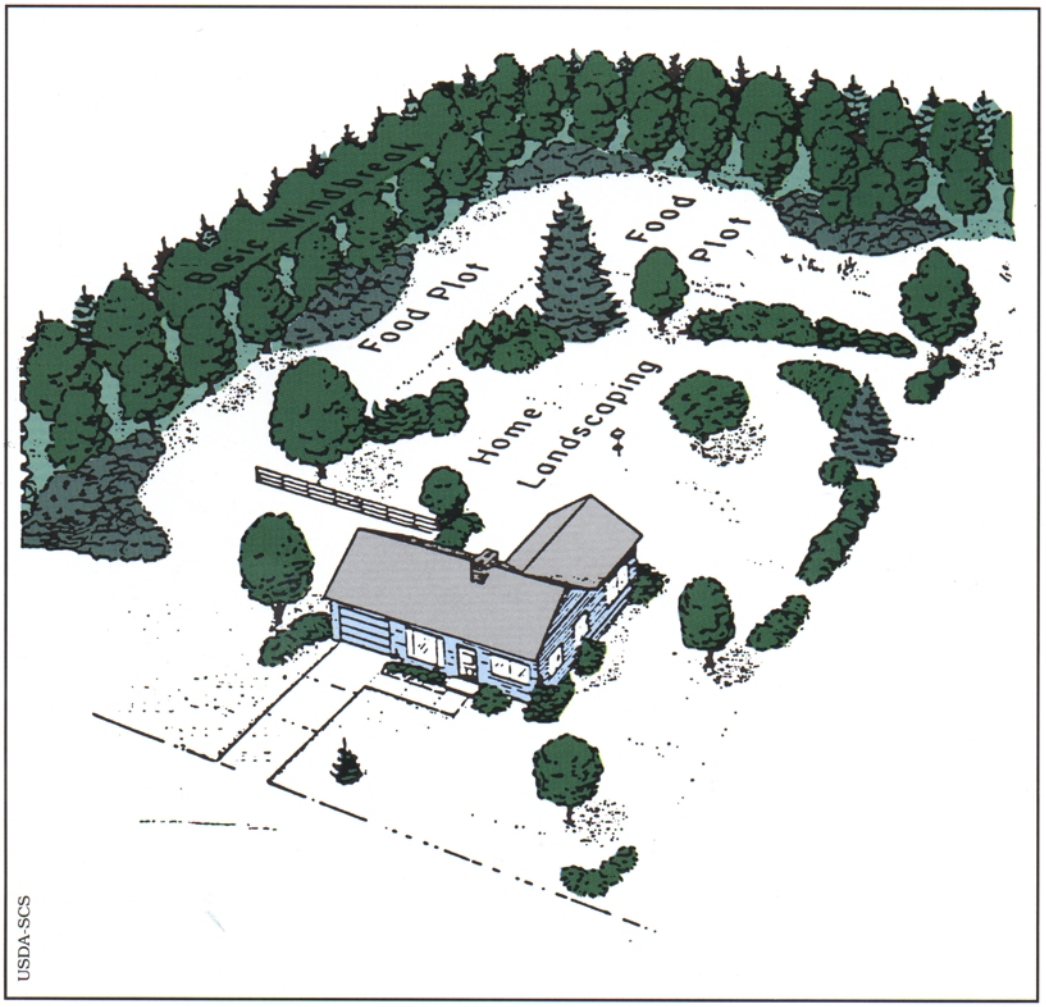


Figure 1. Planting food plots or fruit-bearing shrubs on the lee side of windbreaks provides food in an area protected from wind and possibly warmed by the sun, points that are particularly important in cold months.

Pheasants like the shade and microclimate at ground level in woody cover - during winter for daytime loafing or resting, and, in spring, for protection from heavy rains. Reports that windbreaks become winter "death traps" for pheasants because of blowing snow have largely been discounted. The problem is not windbreaks, but lack of sufficient ground cover anywhere, in or out of the windbreak. Studies have found that pheasants generally leave deciduous shelterbelts in response to high winds and heavy snow, but during winter they may roost in coniferous windbreaks. The key for winter pheasant protection is a wide windbreak with enough space for snow storage, adequate shelter near the ground, and a nearby food source.

Travel Lanes. Wildlife need to move about to find necessary food and other resources. The long, linear nature of windbreaks provides safe routes from one habitat to another. Species such as quail, pheasants, songbirds, rabbits, squirrels, and deer may use windbreaks as travel lanes between feeding sites, as protected cover at feeding sites, and as routes for safe dispersal. On a broader scale, they function as stopover points for migrating songbirds heading north for the summer or south for the winter, to the southern United States or even to South America.

A Note of Caution for Grassland Wildlife

Some native grassland birds need large unbroken areas of grass habitat with few trees and shrubs. Examples include western meadowlarks, bobolinks, dickcissels, lark buntings, grasshopper sparrows, upland sandpipers, and greater prairie chickens. Although not as familiar as some species, these are important parts of grassland ecosystems, and some are in trouble, with significant declines. Although reasons for the declines are unclear, studies do show that, near woody cover, grassland birds can be at greater risk from predation by various bird and mammal predators and from brood parasitism by brown-headed cowbirds. Other prairie animals, such as the pronghorn antelope, also may be affected. Planting windbreaks in large unbroken areas of grasslands, although helping some wildlife species, may hinder others, so plant where needed but keep in mind the possible wildlife trade-offs.

What to Plant

In choosing what to plant, think about what factors make a windbreak attractive to wildlife. For example, one Minnesota study of farmstead windbreaks found that most bird species primarily used the vegetation layer within two feet of the ground. The ground layer is critical in providing winter wind protection and is especially important for species that nest or feed on or near the ground. The canopy or upper layer provides many birds with sites for nesting; singing; and foraging for insects, tree seeds, and fruits.

For the best wildlife benefits, a shelterbelt should have a developed tree canopy, and an understory that includes shrubs and herbaceous plants that provide both food and cover. Grasses, especially sod-forming ones, compete with young trees and should be 3-4 feet away from them during the first five years after planting. However, during establishment, planting between rows, 3-4 feet from trees, a mixture of short- to mid-height bunch grasses, milo, or similar cover provides wildlife benefits and protection for soil and young trees.

Choice of specific plant types will vary among locations because of climate, soil, and other factors. Think about selection because some plant species provide more wildlife benefits than others, and a variety of species is necessary to provide the range of habitat needs of most wildlife.

Planting a variety of deciduous tree and shrub species will provide a habitat structure with a large selection of vertical and horizontal nesting and foraging sites. Oaks provide habitat structure and acorns produced are a top food choice for many game birds and mammals. Hackberry has branching characteristics that are preferred by many songbirds for nesting and foraging. Siberian elm is also a preferred tree for songbirds but is not a good choice for windbreaks. Crabapples are excellent nesting sites, and planting several varieties can provide both late summer and winter food. Some ash, cottonwood, maple, pine, and oak species, when mature, can provide sites for cavity nesters. Tall deciduous trees such as eastern cottonwood, maple, and ash are used by northern flickers, warbling vireos, and others for nesting, foraging, and singing. Tatarian and amur honeysuckle, chokecherry, plum, autumn olive, and other shrubs are used by American robins, brown thrashers, gray catbirds, and cardinals for nesting and feeding.

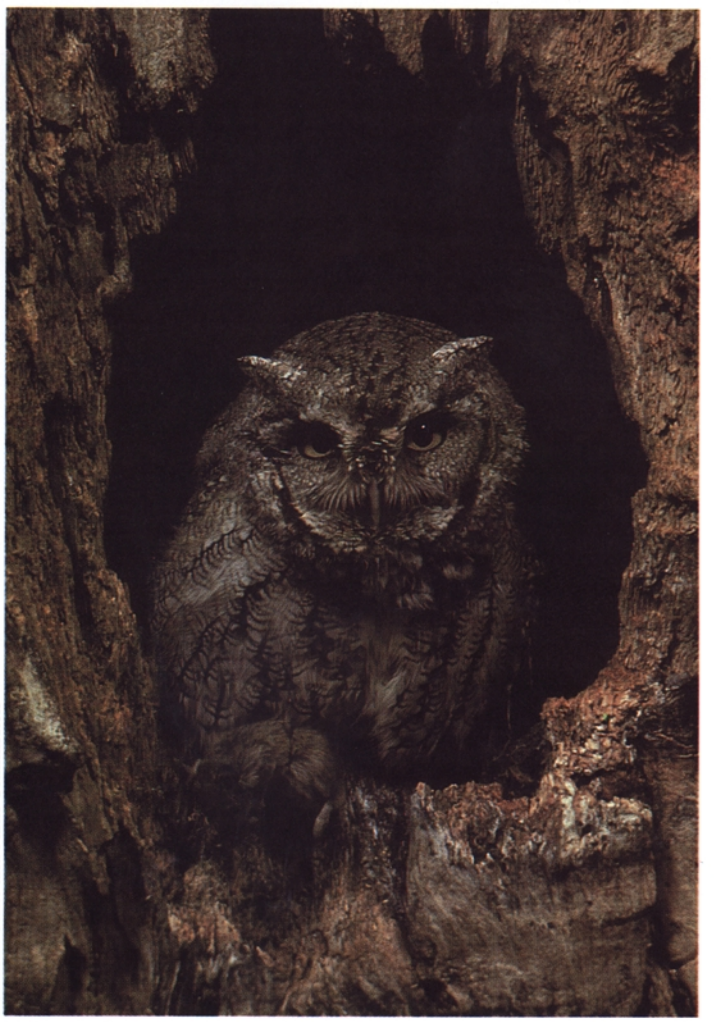
Conifers provide protected sites for early spring nesters, shelter for migrating songbirds, and winter roosting and loafing sites for pheasants. The fruits on eastern redcedar and Rocky Mountain juniper also provide a winter food source for songbirds and gamebirds, and the foliage provides browse for pronghorn antelope and deer. Features of possible concern in some situations include the thorns on hawthorn and buffaloberry, and possible house sparrow use of eastern redcedar, Rocky Mountain juniper, and maples if planted next to farm buildings. Blackbirds and starlings may roost in urban windbreaks in certain regions of the United States, especially in coniferous trees, but they are less likely to do so in open rural areas.

Planting Designs With Wildlife in Mind

Windbreaks are planted to protect farmsteads, livestock, roads, or crops. The additional goal of providing wildlife benefits can be added without compromising the primary purpose. In developing a plan, select a design, plant materials, and location that meet your specific windbreak needs but include factors that benefit wildlife. Below are some designs with tips on improving them for wildlife.

Overall Guidelines.

- Choose trees and shrubs that have wildlife benefits, but that are adapted to the local climate. Generally, native species are the best bet because they are adapted and familiar to wildlife (Table 2).



Nebraska Game and Parks Commission

Older and wider windbreaks provide homes for cavity-nesters such as this screech owl. Hawks and owls are predators that help keep nature's abundance in balance.

Plants[1,2]	Overall wildlife value	Nesting	Songbirds		Gamebirds		Fur & game mammals	
			Food	Cover	Food	Cover	Food	Cover
Conifers (Excellent winter cover, food, and nesting sites)								
Eastern redcedar	Excellent	•	**W**	**SW**	W	**SW**	B	**SW**
Rocky Mtn. juniper	Excellent	•	**W**	**SW**	W	**SW**	B	**SW**
Arborvitae	Good -Excel	•		**SW**		**SW**	B	**SW**
Spruce	Good	•		**SW**		**SW**		**SW**
Pine	Good - Excel	••	S	**SW**	S	**SW**	B	**SW**
Fir	Fair	•		**SW**		**SW**		**SW**
Deciduous trees (Nesting and foraging sites, food, canopy and habitat structure)								
Oaks	Excellent	•	W	S	**W**	S	**W**B	S
Osageorange	Excellent	••		**S**		S		S
Hackberry	Excellent	••	SW	**S**	W	S	B	S
Pecan	Fair		W	S	W	S	W	S
Black walnut	Fair		W	S		S	W	S
Mulberry	Fair	•	**S**	S	S	S	**S**	S
Ash	Good	•	W	S	W	S	B	S
Maple	Good	•	S	S	S	S	B	S
Siberian elm	Excellent	••	S	**S**		S		S
Cottonwood/poplar	Fair	•		S		S	B	S
Black cherry	Excellent	•	**S**	S	**S**	S	SB	S
Flowering crabapples	Excellent	••	**W**	**S**	**W**	S	WB	S
Hickory	Fair		W	S	W	S	W	S
Hawthorn	Good	••	W	**S**	W	S	B	S
Serviceberry	Good	•	S	S	S	S	B	S
Tall shrubs (Nesting sites, food, cover near ground)								
Russian olive	Good	•	W	S	W	S	W	S
Autumn olive	Excellent	•	W	SW	W	SW	W	SW
Honeysuckles	Excellent	••	W	**S**W	W	SW	WB	SW
Viburnums	Excellent	•	W	SW	W	SW	WB	SW
Shrub dogwoods	Excellent	•	S	SW	S	SW	B	S
Buffaloberry	Good		W	SW	W	SW		SW
Staghorn & smooth sumacs	Good		W	S	W	S	B	S
Short shrubs (Nesting sites, food, cover near ground)								
Fragrant sumac	Excellent	•	W	SW	W	SW	B	SW
American plum	Excellent	••	S	SW	S	SW	S	SW
Common chokecherry	Excellent	••	**S**	SW	**S**	SW	SB	SW
Chickasaw plum	Excellent	•	S	SW	S	SW	S	SW
Sargent crabapple	Excellent	•	W	S	W	S	WB	S
Cotoneaster	Good		S	S	S	S	S	S
Amur maple	Excellent	•	S	S	S	S	B	S
Coralberry & snowberries	Good - Excel		W	SW	W	SW	B	SW

[1]Bold letters or two dots indicate an especially good wildlife feature.
[2]Several plants in this list have a variety of species or cultivars, and some may have features that differ from those indicated. Also, there may be good plant selections for your area that are not included.

Table 2. Examples of windbreak plants that benefit wildlife and their primary wildlife values, which occur mostly during summer and fall (S), fall and winter (W), or include browse (B).

- Include a variety of trees and shrubs in the windbreak planting. This gives a more natural landscape appearance, improves wildlife values for more species, and reduces the chances of disease or insect pest problems.

- Where appropriate, select a site that connects to a larger habitat block such as a river corridor, woodlot, wetland, woody draw, or similar area.

- Consider planting a wildlife food plot or leaving grain fields unplowed. The cover reduces soil erosion and, on the lee side of windbreaks, wildlife have a food source in a sheltered spot.

- Consider planting or leaving herbaceous vegetation such as a mixture of grasses and legumes, grain, or stubble as a border, 20-50 feet wide, along the edges of windbreaks, but avoid competition with new plantings by keeping a clear area next to the trees. This provides nesting, loafing, and foraging cover for pheasants, quail, meadowlarks, and others. On the windward side, such cover also improves wind protection and shields newly-planted trees from desiccation and abrasion caused by blowing soil. Mowing, if needed, should be late in the season to avoid nesting wildlife (e.g. August) and limited to every 3-4 years to maintain standing cover for early-nesters.

- Consider adding a row of shrubs to the windward side to trap snow before it gets to the main windbreak and to improve wind protection near the ground.

Field Windbreaks. These windbreaks are often planted across productive cropland to reduce wind erosion, distribute snow, conserve soil moisture, and increase net crop yields. They can provide benefits as travel lanes and as feeding, loafing, and/or nesting sites for birds such as pheasants, quail, mourning doves, and songbirds. To enhance the value of field windbreaks for wildlife:

- Choose a variety of trees adapted to the site and that have wildlife benefits, and plant them so there is a mix of tree types within and among rows.

- Alternate trees and shrubs within the row, or consider adding a shrub row immediately next to the tree row on the leeward side. Stagger the tree and shrub rows to better fill gaps. Shrubs will provide critical ground cover and add foraging and nesting sites near the ground.

- Where possible, add a row of shrubs around the field edges to connect the windbreak rows. These provide safe travel lanes plus additional foraging and nesting sites.

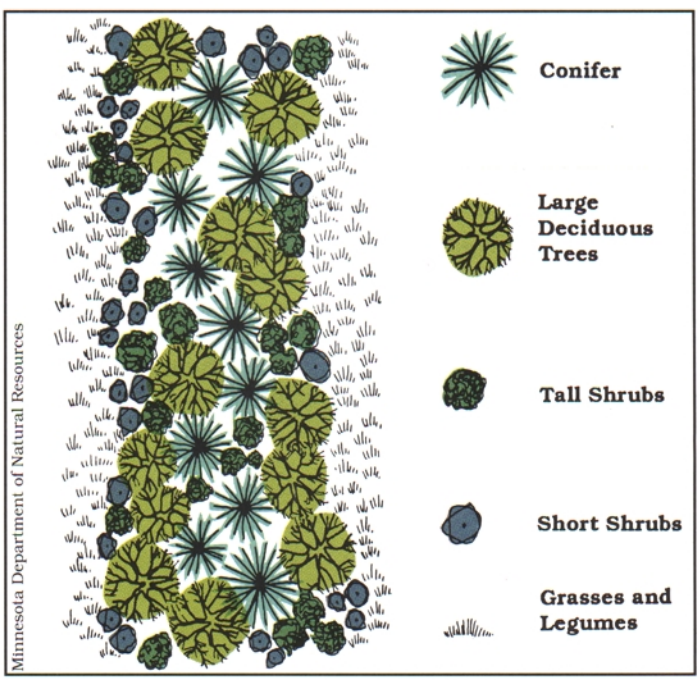
Farmstead and Livestock Windbreaks. Windbreaks with four or five rows are commonly used to protect farmsteads or livestock. Greater width may be necessary for wildlife protection in winter in northern climates. For example, eight-row windbreaks have been recommended for wildlife protection in Minnesota, and more than eight rows may be needed to provide ample winter protection in Manitoba and North Dakota.

In contrast, one- to three-row windbreaks are commonly used farther south in areas such as the Texas panhandle. In general, greater width provides better winter protection. An ample ground cover layer, availability of food resources, and connections with larger blocks of protective cover are also critical factors in winter survival for pheasants, quail, and other wildlife. If an established windbreak fills with snow or otherwise does not offer adequate winter habitat, consider adding the needed plantings to improve it. Below are some design tips for a five-row windbreak.

- On the windward side, often the north or west side, use two rows of evergreen trees such as eastern redcedar, Rocky Mountain juniper, or other native conifer species. Spruce and fir are recommended for more northern sites. Stagger the trees in the two rows so that all spaces are better occupied.

- For the middle row (or middle two rows), use tall deciduous trees such as those in Table 2. A variety of deciduous trees mixed through these rows provides more benefits to more wildlife species.

- Add a row of tall shrubs and a row of short shrubs on the leeward side. Planting a variety of shrub species with high wildlife values is the best approach (examples in Table 2).



Windbreaks can be given a more naturalistic look and still provide excellent wildlife habitat and wind protection.

Ron J. Johnson

Windbreaks provide habitat for game animals such as rabbits, quail and pheasants.

How big should a windbreak be? Larger windbreaks benefit more wildlife than do smaller ones, and some birds need a certain minimum size windbreak before they will use it. For example, insect-eaters such as brown thrashers, black-capped chickadees, least flycatchers, gray catbirds, and yellow warblers have size requirements for nesting territories — several rows in width and at least 1-3 acres. For mammals, little information is available on specific size needs in relation to territory or behavior, but they may not be quite as critical. Where wildlife winter shelter is a specific purpose of a windbreak, the size needed, especially width, will be greater than for other purposes. For example, shelterbelts in northern-most states may need as many as 20 rows of woody plants or be up to 300 feet wide and have adequate ground cover to ensure pheasant protection. Less width will suffice in the mid to southern states. Several windbreaks that are close together or are connected to larger habitat areas become larger overall and may meet minimum size needs.

Older Windbreaks

As a windbreak grows, it will gradually become more complex in structure, with a well-developed understory and a variety of types and shapes of plants. Most wildlife will accept windbreaks after they are at least five years old; those over 40 years old are more likely to be accepted by hawks, owls, and cavity nesting birds. Throughout the life of a windbreak, maintaining good wind protection and cover near the ground are important characteristics for variety and abundance of wildlife, especially for pheasants, quail, and many songbirds.

Wildlife Helpers. With established windbreaks, consider adding rows of shrubs to benefit wildlife along the leeward edge or planting additional conifers or shrubs along the windward side. Other options include adding an adjacent herbaceous strip to provide nesting cover and additional shelter near the ground, or adding length to connect the windbreak to existing woodlots, river corridors, wetlands, or similar places used by wildlife.

Snags. Snags are trees that have died and possibly lost limbs or tops but are still standing. Snags are great for wildlife. If they're not where they pose a safety hazard and there is no other reason to remove them, consider saving them for wildlife; owls, woodpeckers, and chickadees use them as nesting and foraging sites. Another option is to top the snag, leaving a stump about 15 feet high to provide wildlife benefits yet allow sunlight through to other trees and understory plants.

Nest Boxes. Adding nest boxes to younger windbreaks will bring cavity nesters sooner and also will help in more mature windbreaks. Nest boxes attract and provide nesting sites for many desirable cavity nesters such as chickadees, woodpeckers, house wrens, American kestrels (sparrow hawks), and bluebirds.

Be a Windbreak Detective

There is much we need to learn about wildlife in windbreaks and about how people interact with wildlife in relation to windbreaks. Your observations or notes of what you've seen and done may become important to you and to others interested in windbreaks. Here's a challenge: write yourself a windbreak wildlife notebook. You might note when the windbreak was established, what wildlife are seen in or near the windbreak, what they were doing, how wildlife use changes over the years, and how you and your family use the windbreak. If you can't see the wildlife, such as nighttime animals, look for tracks and possibly make plaster of Paris casts. Or listen for the many bird, insect, and other sounds in the windbreak. If you have a food plot, waste grain in a crop field, or other food source next to the windbreak, jot down what wildlife use it. You might also note what you think about wildlife in the windbreak. For example, are there obstacles or concerns that need new solutions? Are there fun, educational, or family experiences that others interested in windbreaks should be aware of? Use your wildlife windbreak notebook ideas for fair displays, speeches, or show-and-tell; and write the authors so we can improve future windbreak information.