

Early Successional Habitat

Introduction

Change is a characteristic of all natural systems. Directional change in the make-up and appearance of natural communities over time is commonly known as ecological succession. This change begins with a disturbance to the existing community, followed by plant colonization or regrowth. Materials (snags, soils, and disturbance-adapted seeds and other organisms) that are left behind after a disruptive event serve as biological legacies; that is, potential reservoirs of life, facilitating the recovery of the habitat and biological community.

Through complex interactions, the disturbances, climate, and soils of an ecological site are reflected in a plant community that is unique to that site. In a healthy ecosystem, the plant community is in a state of dynamic (or ever changing) equilibrium exhibiting variability in species composition and successional stages following disturbance. This variability creates valuable wildlife habitat because different wildlife species are adapted to different plant species and successional stages. Over evolutionary time, plants and animals have developed traits that allow them to survive, exploit, and even depend on disturbances. For example, some plants require fire to produce seeds or flowers, and some fish depend on regular flooding to create and maintain their streambed habitat.

Fully functioning ecosystems have a natural resistance and resilience to disturbances. Resistance refers to the ecosystem's ability to retain its plant and animal communities during and after a disturbance. Resilience refers to the magnitude of disturbance an ecosystem can withstand and regain its original function after the disturbance. As an ecosystem is degraded, its resistance and resilience to disturbance weaken. In these cases, a disturbance can push an ecosystem past a certain threshold. Once that threshold is reached, ecosystem processes change, resulting in changes in the plant and animal communities. As these changes occur, the ecosystem is in a transition from its original state to a new state.



NRCS

Early successional habitats are highly dynamic, highly productive seral stages with uniquely adapted animal communities.

Early successional habitats form soon after a disturbance. Early successional plants are generally herbaceous annuals and perennials that quickly occupy disturbed sites. They reproduce seeds that are disturbance adapted or can be widely dispersed by wind, water, or animals. Early successional communities are characterized by high productivity and provide habitat for many disturbance-adapted wildlife species. Early successional habitats are highly ephemeral. In the absence of further disturbance, the attractiveness and productivity of many wildlife habitats declines.

The objectives of this leaflet are to increase awareness of early successional habitats and associated wildlife and provide tools for maintaining or re-establishing early successional habitats.

Historical land use changes and availability of early successional habitat

Before European settlement of North America, the eastern half of the continent was dominated by forests subject to natural disturbances such as fire, wind,

and flooding, as well as land clearing for agriculture and burning by American Indians. The type, frequency, and intensity of disturbance regimes determined the extent and composition of early successional communities. In some portions of this pre-settlement landscape, regular fires maintained open grasslands or herbaceous ground cover beneath a canopy of old growth trees. These forested savannas were common in the Southeast Coastal Plain and portions of the Midsouth. Upon European settlement, the landscape of the United States was significantly altered by conversion of grasslands and forests to agricultural purposes. However, farmers in the East could not continue to compete with more productive farms in the Midwest and subsequently abandoned their agricultural land uses during the late 1800s and early 1900s. Because of the abandonment of these areas by agriculture and the suppression of disturbance, much of the converted forest land has reverted to second growth or mid-successional forests. Mid-successional forests now account for more than three-quarters of forested land in New England and half of forested land in the Mid-Atlantic region, making early successional habitats critically scarce in much of the eastern United States.

Wildlife use

Many groups of animals dependent on invertebrates (especially butterflies and moths) are often dependent on specific hosts or forage plants that are found only in early successional plant communities. Terrestrial vertebrates tend to be habitat generalists. Nonetheless, 56 of the 60 mammal species commonly found in the Northeastern United States use early successional habitat. In early successional communities, annual plants produce an abundance of seeds that are eaten by granivorous birds and small mammals. Forbs, legumes, and shrubs provide highly nutritious forage for herbivores and browsers like the white-tailed deer. Additionally, the low herbaceous vegetation provides cover for birds and small mammals that prefer open habitats. The lack of a closed canopy allows light and heat to penetrate to the ground, an essential habitat feature for reptiles that depend on heat sources outside their body for temperature regulation.

Populations of many wildlife species that are dependent on early successional habitats are in decline (table 1). For example, New England cottontail (*Sylvilagus transitionalis*) populations have declined significantly in parts of its range due to the reduction of early successional habitat. In response to the species decline, the World Conservation Union has listed this as a vulnerable species. The decline in

cottontail numbers has contributed to the decline in bobcats (*Felis rufus*), an important predator on cottontails. Northern bobwhite quail have declined 65 percent over the last 20 years, primarily due to loss of early successional habitat on which it relies. Many species of migratory passerines have also been affected by the reduction of early successional areas. Analyses of breeding bird survey data gathered since 1965 show declines in most species associated with early successional habitat.

Table 1 Species inhabiting early successional habitats that are exhibiting population declines

Early successional species in decline	
Common name	Scientific name
Birds	
Red-cockaded woodpecker	<i>Picoides borealis</i>
Northern bobwhite	<i>Colinus virginianus</i>
Common yellowthroat	<i>Geothlypis trichas</i>
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>
Veery	<i>Catharus fuscescens</i>
American woodcock	<i>Scolopax minor</i>
Eastern loggerhead shrike	<i>Lanius ludovicianus migrans</i>
Yellow-breasted chat	<i>Icteria virens</i>
Summer tanager	<i>Piranga rubra</i>
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>
Prairie warbler	<i>Dendroica discolor</i>
Ruffed grouse	<i>Bonasa umbellus</i>
Mammals	
New England cottontail	<i>Sylvilagus transitionalis</i>
Bobcat	<i>Felis rufus</i>
Least shrew	<i>Cryptotis parva</i>
Appalachian cottontails	<i>Sylvilagus obscurus</i>
Invertebrates	
Edward's hairstreak	<i>Satyrrium edwardsii</i>
Northern cloudy-wing	<i>Thorybes pylades</i>
Swarthy skipper	<i>Nastra lherminier</i>
Frosted elfin butterfly	<i>Callophrys irus</i>
Karner blue butterfly	<i>Lycaeides melissa samuelis</i>
Amphibians and reptiles	
Eastern hognose snake	<i>Heterodon platyrhinos</i>
Black racer	<i>Coluber constrictor</i>
Bog turtle	<i>Clemmys mühlenbergii</i>
Gopher tortoise	<i>Gopherus polyphemus</i>
Indigo snake	<i>Drymarchon corais couperi</i>
Pine snake	<i>Pituophis melanoleucus</i>



R. Denome

The vulnerable New England cottontail requires early successional habitat for survival.

Early successional habitats

Natural systems

Currently, forest land covers a third of the United States and is an important source of early successional habitat for many species. Forest stands can naturally include both early and late successional stages. Early successional habitat occurs in a forest after a disturbance such as a fallen tree, wind, or fire. This stage in forest land lasts only briefly; however, as the canopy, without management, will close, and the early successional vegetation will disappear in favor of a more mature forest.

Early successional riparian areas surrounding standing water are characterized by brushy, woody plants typically with multiple trunks not growing above 20 feet in height. These wetlands come in many types. In northern regions or higher elevations, shrub bogs and alder swamps are common. Bogs are nutrient-poor, acidic wetlands typically surrounded by shrubby willows, dogwoods, arrowwoods, highbush blueberries, buttonbush, swamp rose, and saplings of trees such as red maple. Shallow depressional wetlands found in the Northern Great Plains (potholes) are highly dynamic productive systems. These areas are characterized by few trees, warm, dry climatic conditions, and the dominating prairie plants. Filled by runoff from snowmelt, watersheds in potholes typically are high-est in spring and gradually recede through the sum-

mer. Pothole vegetation is a reflection of the flooding regime with plants most tolerant of flood inundation at the center of the basin and flood-intolerant species at the margins. In response to seasonal and long-term changes in flooding areas and herbivory by muskrats (*Ondatra zibethicus*), the appearance of potholes ranges from closed stands of emergent vegetables early in the hydrologic cycle to open water late in the cycle.

Early successional riparian areas along waterways are characterized by large native shrubs and grasses adapted to high moisture levels and frequent flooding. Common riparian species include willow (*Salix* spp.) and cottonwoods (*Populus* spp.). Species in early successional riparian habitat may benefit from the greater availability of water.

Temperate grasslands, or savanna, are characterized as having grasses as the dominant vegetation. Trees are generally absent, but shrubs may naturally occur in areas protected from disturbance or subjected to low-intensity disturbance. The seasonal drought, occasional fires, and grazing by large mammals all prevent woody shrubs and trees from entering and becoming established, maintaining the early successional habitat.

Prairie systems are dominated by a mixture of native perennial grasses and wildflowers with some low-growing shrubs. In general, prairies thrive by occasional influence of grazing and fire. Today, prairies are



NRCS

Prairie potholes are depressional wetlands found mostly in the Northern Great Plains and include early successional habitat.

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National Aeronautics and Space Administration

Grasslands are kept in early successional states by seasonal droughts, occasional fires, and grazing.

fragmented and isolated from each other. Such fragmentation prevents the natural free flow of seeds, animals, and other genetic from one prairie to another.

Human-altered systems

Some land uses require that areas be maintained in early successional styles. Rights-of-way (ROW) are public or private areas that allow for passage of people or goods. These areas include freeways, power lines, streets, bicycle paths, alleys, trails, and walkways. A public ROW is dedicated to the public for use under the control of a public agency. Utility companies have transmission and distribution lines that traverse hundreds, sometimes thousands, of miles across rural, suburban, and urban landscapes. Generally, because ROWs tend to have utilitarian purposes, habitats are managed frequently to prevent interference by the stand and, therefore, have the potential to become quality early successional habitat.

Old field habitat is the stage of plant successional between cultivated fields and forest and is found on abandoned pastureland and retired crop fields. The old field habitat has two distinct successional stages, meadow and scrub, both of which are considered early successional. Meadows consist mostly of various native grasses and forbs (broad-leaved flowering plants). As succession progresses, the meadow may become increasingly dominated by woody plants (shrub stage). If woody plants larger than 4 inches in diameter constitute more than 50 percent of the canopy, the cover is classified as early woodland habitat, not early successional or old field.

Vegetated fence rows, farm lanes, field borders, roadsides, ditch banks, shelter belts, and other linear features of the rural landscape can provide key habitat for many species of wildlife. These strip-type covers often lie between agricultural land and aquatic or up-

land habitat. They can dampen harmful edge effects and provide secure travel lanes between unconnected habitats. Many species use these areas for shelter, nesting, and feeding.



Preservation Society for Spring Creek Forests

ROWs, if well managed, can be valuable early successional habitat for many species.



Washington Department of Fish and Wildlife

Meadows consist mostly of various native grasses and forbs, gradually including more woody species as succession continues.



USDA

Early successional riparian vegetation is a mixture of woody species and grasses.

Early successional habitat management

Early successional habitat is one of the most endangered ecosystems in the United States, and it is important that landowners take an active role in managing these habitats for the variety of plants and animals that inhabit them. Using the Natural Resources Conservation Service (NRCS) planning process to begin an early successional habitat project will ensure that plans protect, conserve, and enhance natural resources. This planning process involves nine steps to better identify opportunities, determine objectives, and make decisions. For further information and more details regarding this planning process, refer to the NRCS Web site at www.nrcs.usda.gov. Management options for forests, grasslands, and wetlands include the use of clearcutting, windrows, disking, prescribed burning, rotational mowing, prescribed grazing, herbicides, haying, field border management, and flooding. A summary of management options is provided in table 2, and additional information can be found in *A Guide to Managing Grasslands, Shrublands, and Young Forest Habitats for Wildlife in the Northeast* by Oehler et al. (in press).

Management considerations

The purpose of habitat management is to maintain or re-establish the attractiveness and productivity of systems as reflected on healthy wildlife systems.

Before creation or management of early successional habitats can begin, there are some basic management considerations that will assist in maintaining the quality of habitat in the area:

- Managing habitats in relation to other species must be taken into account to ensure the health and sustainability of each ecosystem.
- Retaining coarse woody material, both standing and down, will enhance and maintain favorable habitat conditions for cavity nesting and predatory birds, small mammals, amphibians, and reptiles.
- Focusing creation on existing edges clustering these types of activities near existing openings, old fields, power lines, and ROWs; frost pockets, old burns, and nonstocked sites will reduce the risks of fragmenting larger tracts of mature forest land.
- Ensure minimal disturbance of cover during primary nesting period of grassland species, May 1–August 1.

- Take into consideration individual species requirements (both animal and plant) when creating management plans.
- Use multiple techniques together to provide greater benefits.

Clearcutting

Clearcutting implies removing all woody species from a given area of forest. While generally thought of as a negative approach to forest management, clearcutting in moderation, in fact, allows for the creation of new habitat that can support a wide variety of wildlife and vegetation. By simulating a natural disturbance and creating early successional habitat, species reduced in abundance immediately following a clearcut will likely increase in abundance later in the rotation. Clearcutting has been shown to be successful in increasing the number of bird species, even neotropical migrants. In New Hampshire, one study revealed that 53 species of the resident birds preferred early successional habitat, compared to 33 species that preferred late successional habitat. Additionally, it was found that the 33 species that preferred late successional habitat were still found in early successional at some point during the breeding season, demonstrating the importance of this habitat.

Clearcutting is used most frequently in pine and hardwood forests that require full sunlight for growth. When considering clearcutting, there are some management considerations to ensure the well being of other species requiring mature forest growth.

- Large areas of mature forest can be maintained with uneven aged management (or no cut zones). These forms of clearcutting limit disturbance and forest fragmentation, while still retaining early successional habitat in some areas. For more information, see Fish and Wildlife Habitat Management Leaflet Number 18: *Managing Forests for Fish and Wildlife*.
- Clustering clearcuts around selected centers rather than dispersing them throughout a forest will reduce the edge and road effects associated with scatter cuts, increasing the likelihood of sustaining early successional species and not harming interior forest species.

When using clearcutting as an early successional management tool, the amount of total acreage of the tract should determine the size of the cut. It has been found that species richness in a clearcut tends to increase with larger openings; however, if the size of mature forest is compromised or it becomes significantly fragmented, the populations of many species that rely

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Table 2 Summary of management practices to create, enhance, or manage early successional habitat for wildlife

Management practice	Wildlife habitat enhanced	Favored wildlife
Forest harvests		
Clearcutting	An area of forest in which all mature trees have been harvested. The site remaining is an early successional forest that favors grass, herb, and shrub growth	Benefits small mammals, ground-nesting/feeding birds, and other wildlife such as ruffed grouse, doves, yellow warblers, chestnut-sided warblers, rabbits, quail, rodents, reptiles, wild turkey, kestrel, woodcocks, deer, moose, elk, and black bear
Seedtree	Removes the majority of mature trees, leaving those needed to produce seed and provide shelter for regenerating a new forest	Favors the same wildlife as clearcuts. Provides some habitat for tree-dependent wildlife species such as forest roosting bats
Site preparation		
Mechanical	Intensive methods temporarily increase grasses and herbs valuable for wildlife. Less intensive methods favor fruit-producing trees and shrubs. Time of year will also influence plant responses after site preparation	Intensive methods benefit small mammals and ground-nesting birds. Less intensive methods favor deer and aboveground nesting birds
Herbicides	Selective herbicide use may control undesirable vegetation. Plant response varies depending on the herbicide, time of application, rate and forest conditions. Consult a herbicide specialist for creating desired wildlife habitats with herbicides	Small mammals and ground-feeding wildlife such as quail and dove. Deer benefit from increased browse from a combination of herbicides and burning
Windrows	Provides cover and travel corridors for wildlife across newly harvested timber stands. Accumulation of debris and seeds quickly produces herbs and woody plants valuable for wildlife food and cover	Small mammals, reptiles, amphibians, deer, and many bird species
Improvement practices		
Prescribed burning	Greatly enhances habitat diversity across the landscape by stimulating growth of grasses and herbs valuable to wildlife. Also increases insect abundances, a primary source of food for many wildlife species	Benefits a wide array of wildlife such as small mammals, quail, deer, turkey, and a variety of songbirds. Combined with timber thinning, burning is a primary habitat management tool in the Southeast for the endangered red-cockaded woodpecker
Mowing/haying	Stimulates growth of native grasses and herbs. In a forest, mowing can increase habitat diversity	Seeds and forage are important to a variety of ground-feeding mammals and birds such as rabbits, quail, wild turkey, and deer
Field border management	Provides habitat for species that require early successional habitat in areas that are less productive.	Benefits terrestrial wildlife
Flooding	Kills perennial plants in wetlands and allows annuals to grow. Establishes open wet areas for dabbling ducks and other water birds. Stimulates germination of early successional moist soil plants	Water birds, many insects and species of water plants
Prescribed grazing	Strengthens root systems in desirable plants and can kill less desirable plants if rotation is done appropriately	A variety of upland and wetland species benefit from grazing

on old growth forest will decline. On small tracts of land less than 500 acres, no more than 20 acres should be cut in one area. On tracts of 500 acres or more, clearcuts of 50 to 100 acres yield excellent early successional habitat while still protecting interior forest species. Other methods of clearcutting are:

- seed-tree cutting—may offer an alternative to the traditional clearcuts. Seed-tree cutting is similar to clearcutting except instead of removing all the mature vegetation in a selected area, a few trees are left in the initial harvest. These trees remain to provide a seed source and shelter for regenerating stands. Once regeneration is established, remaining trees are harvested. This method provides abundant forage for deer and other big game species.
- shelterwood cutting—clears trees in two or three cuts over several years, resulting in a stand of trees that are nearly the same age. This simulates a moderate natural disturbance. Regeneration of shade-tolerant species is possible when a shelter is left to protect them. Shelterwood methods provide cover for wildlife, as well as early successional food. Some shade-loving species, including northern red oak and American beech, are excellent sources of food for wildlife.

To prevent problems with species not associated with early successional habitat, it is recommended that clearcutting only be performed after consulting with a local or state wildlife professionals.

Windrows

Primarily used in pine plantations in the Southern United States, windrows are created by bulldozing dead wood and some soil in long mounded rows. The subsequent vegetation is not typical of surrounding pine plantations because of the added organic material, and windrows can reduce the productivity of surrounding pine forest because of the loss of nutrients and soil. However, windrows do provide cover for some small mammals such as woodrats, harvest mice and golden mice, and some species of birds including yellow-breasted chats, Carolina wrens, brown thrashers, and mockingbirds.

Disking

Areas with light disking can provide food for wildlife from annual plants that grow in the place of the disked perennials. Disking involves the use of a rotating blade that disturbs the upper levels of soil to expose rootstalks and rhizomes of plants in the treated area. The effect is to kill or setback perennial vegetation and allow annual plants in the seedbank to emerge.

Disks are commonly used on farms to level and smooth crop fields. Disks come in various sizes, from those 30 inches wide pulled by a riding lawnmower, 4-wheeler, or small garden tractor, to those 15 feet wide or wider that are pulled by the largest 4-wheel drive diesel tractors. Disks are made in three basic styles: pick-up disk—raised or lowered by the 3-point con-



USDA

Careful clearcutting can produce valuable early successional habitat.



Nevada Division of Environmental Defense

Windrows can provide habitat for birds and small mammals.

nection to the tractor; wheeled disk—equipped to ride on tires and is raised by hydraulic cylinders attached to those wheels; and drag disk—cannot be picked up off the ground. Though the cutting depth and angle of a drag disk may be adjusted, transportation of the disk is an issue because of the limited range of lift.

When choosing what size and style of disk to use, keep in mind where and how it will be used. Disks smaller than 6 feet may not be heavy enough to cut through thick grass and into the soil, and disks wider than 8 feet may be difficult to transport along narrow farm lanes and woodland trails. If habitat management work is your goal, a suitable setup is a 3-point hitch pick-up disk, 6 to 8 feet wide which can be pulled by a 20- to 40-horsepower tractor. The purchase of a tractor is not necessary to get underway with habitat improvement; equipment can be rented from a local farm supply store, contracted, or borrowed from a friend.

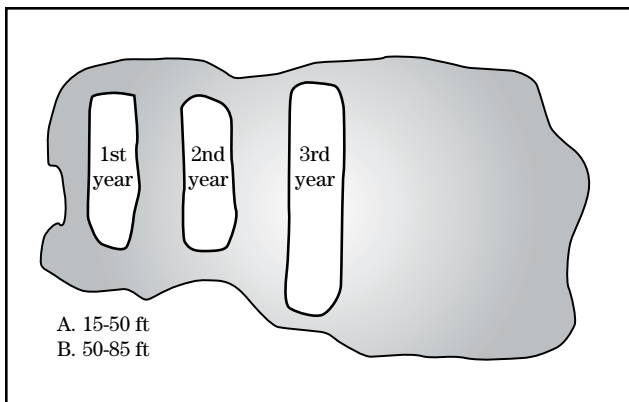
Disking should be performed to a depth of 4 to 6 inches in existing stands between January and March, though fall disking is appropriate in some areas. Only a third of the field should be disked at a time, and rotated in every year. Adjacent strips 10 to 20 feet wide and no less than 100 feet long should be disked rotationally along woodlots, grassy fields, or fence rows. Buffer strips (two times the disked width) should be in between disked strips. Disked areas should provide approximately 50 percent bare ground, leaving 50 percent residue to prevent soil erosion and promote vegetation regeneration.

Rotational mowing

Mowing entire stands of grasses reduces plant diversity and residual cover available for wildlife and is, therefore, not recommended. However, rotational mowing can be used to maintain grassland communities in various stages of growth and vegetative diversity promoting the use of this habitat for wildlife. This management option is conducted by dividing an area into 15- to 25-foot-wide strips (depending on the area's size) that are separated from one another by 50 to 85 feet. Wider strips can be established to provide larger habitat blocks, as well. A single strip is mown to a height of 4 to 8 inches either once or twice a year, depending on the wildlife present in that area. Smaller areas can be divided into three strips; mow one strip in early spring (mid-March to mid-April, depending on the region) before nesting birds commence nesting activities and again in late summer after nesting activities are completed. The following year, the second strip would be mowed in the same months. The third strip would be mowed in year three, and the process begins again in year four. Larger areas evenly divided into six or more strips can be rotationally mown in pairs so that strip one is worked with strip four, strip two with strip five, strip three with strip six, and so forth.

Prescribed or rotational grazing

Grazing livestock requires close supervision to ensure that a site is not overgrazed; however, grazing can manipulate plant succession and reduce ground litter, be-



This mowing configuration will provide an assortment of different early successional habitat types for wildlife.



NRCS

Prescribed grazing can effectively manage early successional plant communities.

coming a very effective management tool. For example, in wetlands, extensive root systems of plants are literally shredded by hooves, and species like smart weeds, burreed, barnyard grass, spikerush, and other desirables can flourish where undesirables will be killed or injured. Generally, native warm-season grasses should be grazed over only once per season (leaving grass to be maintained at the height of 8 to 10 inches) before the herd is moved. Grazing over only once per season encourages plants to make a wider root system, ultimately strengthening desirable plants. However, in some areas, such as the South, grazing can occur several times during a season, as long as plant height is monitored. Additional grazing requires plants to put energy into creating leaves, thus weakening root systems. Rangelands can be maintained in good condition, providing quality forage and suitable grassland habitat for many species by practicing the following measures:

- Provide 30 to 50 days of rest between grazing periods in each location.
- Defer grazing in some nesting areas until late in the nesting season.
- Restrict livestock from grazing in sensitive nesting areas.
- Graze entire pasture at a light rate all summer, and put the entire herd on just a half of pasture during the late season.
- Avoid heavy continuous grazing.
- Rotationally graze cool-season grasses in spring and fall and warm-season grasses in midsummer to maximize productivity while minimizing habitat disturbance.

Prescribed burning

The occurrence of fire to manage and create early successional habitat is a natural phenomenon. Historically, fire caused by lightning strikes, sparks from falling rocks, or even spontaneous combustion of organic plant material had successfully maintained portions of the landscape in a natural state of early succession. Unfortunately, human suppression of fire during the last century has reduced its effects on most ecosystems, even though the results can significantly improve existing habitats. For example, prescribed burns have been shown to enhance berry production for black bears (*Ursus americanus*) and can help create den sites by scarring bases of large trees. In the Southeastern United States, burning is the primary method used in managing the endangered red-cockaded woodpecker (*Picoides borealis*). Burning, in the Western and Southern United States, often im-

proves the quality of the site for big game by reducing the depth of slash, stimulates the growth of palatable forage plants, and increases forage for small mammals, therefore, providing additional food resources for carnivores. Additionally, prescribed burns can control pests and disease, return nutrients to the soil, aid in plant germination, and serve as a natural cleaning agent, removing pollutants from the soil, water, and air.

Prescribed burn frequency varies among forest lands, wetlands, grasslands, and shrublands. In general, however, burns should be conducted on a 4- to 5-year (2- to 3-year in the Southeast) rotational basis in late winter or early spring (February–April depending on the region). Dividing the burn area into strips or plots can leave undisturbed escape and nesting cover for wildlife adjacent to burned plots. Disked firebreaks should be created around burn areas to maintain control of prescribed burns. In wetlands, burning alone can actually increase the growth of unwanted canarygrass and does little on river bulrush or cattails. However, in combination with other practices, such as disking or grazing, it can be very a useful management option. Six common methods of prescribed burns are detailed in table 3. For more information on burning techniques, visit <http://www.bugwood.org/pfire/techniques.html>.



U.S. Fish & Wildlife Service

A managed burn can effectively bring vegetation back to an early successional state.

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Table 3 Prescribed management options

Type	Description	
Back fire	Set at a 90-degree angle to wind direction (only when wind speed is no more than 6–10 mph) so fire burns against wind. This method is safest and recommended for beginning wildlife managers. At night, backfires generally move 66 feet per hour	
Strip-heading fire	In strip-head burns, a series of fire lines are set progressively upwind of a firebreak in such a manner that no individual line of fire can develop to a high energy level before it reaches either a firebreak or another line of fire. A backing fire is used to secure the base line and the remainder of the area then treated with strip-heading fires. Strips are often set 1 to 3 chains apart	
Flank fire	Set directly into the wind and burns slowly at right angles to the wind. It may also be used on the flanks of any fire to secure them as the fire progresses. Flank fires burn hotter than backfires and cooler than head-fires. It is used in medium fuels or in larger timber, usually in winter, to speed up the job or to supplement some other burning method	
Point source fire	Timing and spacing of the individual ignition spots are the keys to the successful application of this method. A line backing fire is ignited across the downwind side of the block and allowed to back 10 to 20 feet into the block to increase the effective width of the control line. A line of spots is then ignited at some specified distance upwind of the backing fire and the process continued until the whole block has been ignited	
Center and ring fire	The downwind control line is the first line to be ignited. Once the base line is secured, the entire perimeter of the area is ignited and the flame fronts allowed to converge. One or more spot fires are often ignited near the center of the area and allowed to develop before the perimeter of the block is ignited. This firing method can generally be used in any season, and weather conditions are not as critical	
Aerial ignition	When ground ignition techniques are used, the downwind spots will usually coalesce and burn out before the whole block has been ignited. In contrast, aerial firing permits ignition of a block to be completed before the downwind spots have burned out. Current aerial ignition techniques can be separated into two major types: Delayed Aerial Ignition Device, or ping-pong ball system, and helitorch or flying driptorch system. Both types of aerial ignition dramatically reduce the time needed for an area to burn out. Although roughly the same amount of smoke is produced, it is emitted over a shorter period and more of it is entrained in the convection column	

Although beneficial, prescribed burning is a highly regulated activity and should only be conducted in cooperation with State fish and wildlife agencies and with assistance from certified prescribe burn managers. These agencies and individuals can help in the development of a burn plan; provide necessary tools, equipment, and supervision; and assist in obtaining all required permits.

Herbicides

Herbicide application is a relatively common practice in pine hardwood forests after clearcutting to remove plants that compete with young trees in the first years of growth. Applications of herbicides to young forest (4 to 6 years old) have been shown to improve conditions for birds, such as mourning doves and northern bobwhites, that forage on the ground. Killing of the stems of relatively unpalatable shrubs induces sprouting of more palatable shrubs for big game species such as elk and white-tailed deer. Strip spraying less than 50 feet or spot spraying should be done to improve plant succession and wildlife habitat. For additional information on application and use of herbicides, see Fish and Wildlife Management Habitat Leaflet Number 24: Wildlife and Integrated Pest Management (IPM). It is recommended that before an herbicide is applied, the local, Federal, or State wildlife agency be contacted for assistance with selecting an herbicide, as well as determining the appropriate rates and timing of application.

Field border management

By taking out of production up to 50 feet of field edge adjacent to permanent cover (such as a woodlot, tree line, or hedgerow), farmers can significantly increase the amount of habitat for wildlife. These areas generally have low crop productivity because of root competition and shading from adjacent woody growth. Advantages of field border management include:

- reducing planting time and costs
- providing turn rows and convenient field access
- reducing or eliminating equipment damage from overhead limbs
- creating a pesticide-free buffer in the area used by upland wildlife

To create and manage a field border, 50 feet of untilled field along any edge adjacent to woody growth should be cut. Every 3 years, this border should be mowed and lightly disked to prevent invasion by saplings and brush. Another option is to treat a third of the border each year, rotating strips every 3 years.



Virginia Department of Game and Fisheries

Field borders provide valuable habitat for many wildlife species.

Field border management can make a dramatic difference in wildlife use of fields, and nonmigratory upland wildlife will flourish in these areas where their year round habitat needs are met. While this type of management can favor many species, birds are the biggest benefactor of field border management. One study found that dickcissels and indigo buntings were twice as common in areas with field borders than areas without. Wintering sparrows (such as the song sparrow and swamp sparrow) and northern bobwhites also increased as borders provided forage and shelter from early successional plants.

Haying

Haying, like burning, removes all plant species at once. This method will kill invading tree species and remove heavy thatch layers, creating fire breaks for future fires. Ideally, haying activities should be delayed until early August to allow grassland birds to complete most nesting activities. However, in many situations this is not feasible for farmers who need to harvest high quality forage. In these circumstances, birds nesting in the cover provided by the hay crop lose their nest or are killed by hay-mowing operations. However, the following measures can be taken to minimize impacts on birds nesting in production hay fields.

- Hay fields should be mowed from the field center outwards to provide cover that allows fledgling birds to escape to the edge of the field.
- Fields can be broken into subunits and mowed on a rotational basis to allow for some usable habitat to be available at all times.
- Adult nesting birds and roosting individuals are less likely to flush from cover during night; therefore, night mowing should be avoided to prevent adult bird mortality.

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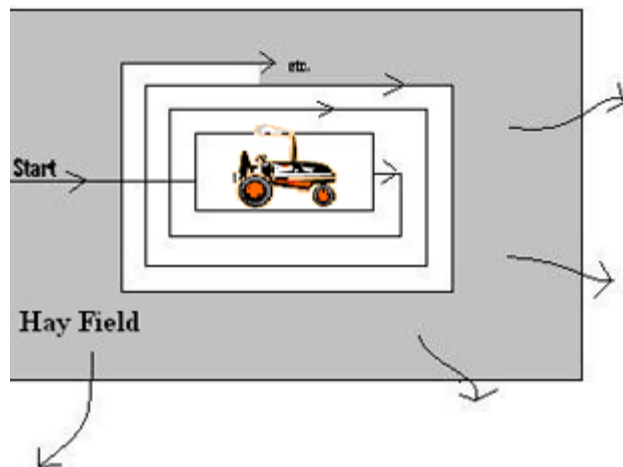
- Flushing bars should be mounted on harvesting equipment to minimize bird mortality during mowing operations.
- Strip cover and similar herbaceous cover should be left undisturbed until well after the nesting season (mid- to late August) to allow birds that failed to successfully nest in active hay fields the opportunity to successfully re-nest in the alternative adjacent habitats.

Flooding

Changing water levels are characteristic of most wetland systems. Under stable flooding regimes, the productivity of wetlands and their attractiveness to wildlife will decline. Restoration of wetland hydrology and re-establishment of the historic flooding regime, including periodic drying/drawdowns, are essential for maintaining vital wetland functions.

Assistance available

Landowners interested in making their individual efforts more valuable to the community can work with the Wildlife Habitat Council and NRCS to involve school, scout, and community groups and their families, as well as State and Federal fish and wildlife agency personnel, in habitat projects when possible.



Hay fields should be mowed from the center outward to allow the animals to escape.

Onsite education programs demonstrating the necessity of early successional habitat management can also greatly increase the value of an individual management project. Corporate landowners should encourage interested employees to become involved. There are many programs available to assist with technical and financial support in creating wildlife habitat on private lands (table 4).

Conclusion

Early successional habitat is very important for the survival of many species. Due to the abandonment of farms and suppression of natural disturbances, much of the historical early successional land in the United States has grown into mid- and late-successional forests. There are many methods to manage for early successional habitat including cutting, windrows, disking, mowing, prescribed grazing, prescribed burns, herbicide use, and field border management. When these techniques are applied, areas can be brought back to an early successional state to the benefit of many species.



Ducks Unlimited, Canada

Tractor equipped with flushing bar designed to minimize mortality during haying operations

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Table 4 Programs to assist landowners in wildlife habitat creation

Program	Land eligibility	Type of assistance	Contact
Conservation Reserve Program (CRP)	Highly erodible land, wetland, and certain other lands with cropping history. Streamside areas in pasture land	50% cost-share for establishing permanent cover and conservation practices and annual rental payments for land enrolled in 10- to 15-year contracts. Additional financial incentives are available for some practices	NRCS or FSA State or local office
Conservation of Private Grazing Land (CPGL)	Private grazing lands	Technical assistance on managing grazing lands for natural resource protection, as well as economic and community benefits	NRCS State or local office
Environmental Quality Incentives Program (EQIP)	Cropland, range, grazing land, and other agricultural land in need of treatment	Up to 75% cost-share for conservation practices in accordance with 5- to 10-year contracts. Incentive payments for certain management practices	NRCS State or local office
Grassland Reserve Program (GRP)	Restored, improved or natural grassland, rangeland, pastureland, and prairie	Financial incentives to landowners who restore and protect grasslands	NRCS State or local office
Partners for Fish and Wildlife Program (PFW)	Most degraded fish and/or wildlife habitat	Up to 100% financial and technical assistance to restore wildlife habitat under minimum 10-year cooperative agreements	Local office of the U.S. Fish & Wildlife Service
Waterways for Wildlife	Private land	Technical and program development assistance to coalesce habitat efforts of corporations and private landowners to meet common watershed level goals	Wildlife Habitat Council
Wildlife at Work	Corporate land	Technical assistance on developing habitat projects into a program that will allow companies to involve employees and the community	Wildlife Habitat Council
Wildlife Habitat Incentives Program (WHIP)	High-priority fish and wildlife habitats	Up to 75% cost-share for conservation practices under 5- to 10-year contracts	NRCS State or local office

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Early Successional Habitat

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The Natural Resources Conservation Service provides leadership in a partnership effort to help people conserve, maintain, and improve our natural resources and environment.



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The mission of the Wildlife Habitat Council is to increase the amount of quality wildlife habitat on corporate, private, and public land. WHC engages corporations, public agencies, and private, nonprofit organizations on a voluntary basis as one team for the recovery, development, and preservation of wildlife habitat worldwide.



www.wildlifehc.org

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