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# Best Management Practices

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## How to Make and Manage Habitat for the New England Cottontail

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A Regional Land Manager's Guide

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## **How to Make and Manage Habitat for the New England Cottontail**

### **A Regional Land Manager's Guide**

Developed by the NEC Regional Technical Committee, BMP Subcommittee, under the authority of the NEC Regional Executive Committee. These groups include representatives from U.S. Fish and Wildlife Service, U.S. Department of Agriculture Natural Resources Conservation Service, Wildlife Management Institute, and wildlife agencies from Connecticut, Massachusetts, Maine, New Hampshire, New York, and Rhode Island.

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This guide summarizes: 1) issues faced by the New England cottontail (NEC), 2) NEC habitat descriptions and needs, and 3) steps and actions to take towards creating and managing habitat for NEC. For more detailed information, please see page 26 for additional resources.

How to use this guide:

Best Management Practices (BMPs) can be used by a variety of people and entities who manage land: public land managers, consulting foresters, land trusts, fish and game clubs, private landowners, town and county conservation commissions, and others. These BMPs are designed to help restore habitat for NEC while minimizing harm to existing cottontail populations. This guide serves as a general starting point for making and maintaining suitable habitat. Managers can modify these guidelines based on the presence or the need to manage in favor of other wildlife species and natural resources. Professional staff from state and federal agencies may be able to help plan and carry out individual habitat projects.

In some states, NEC may be protected under state endangered species laws. In those states, habitat managers should work with state wildlife agencies to make sure management actions in occupied habitats are consistent with regulations.

Special thanks go to the CT Department of Energy and Environmental Protection and to Sarah Fournier for their time and effort spent reformatting the Best Management Practices into this user-friendly guide, and to Charles Fergus for contributing his editing expertise to the project. Many thanks also go to all who reviewed the guide and provided comments and critiques along the way.

\*Front Cover: All New England states and New York are participants in New England cottontail restoration/reintroduction efforts; excludes Vermont, where New England cottontail has been extirpated.

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## Introduction

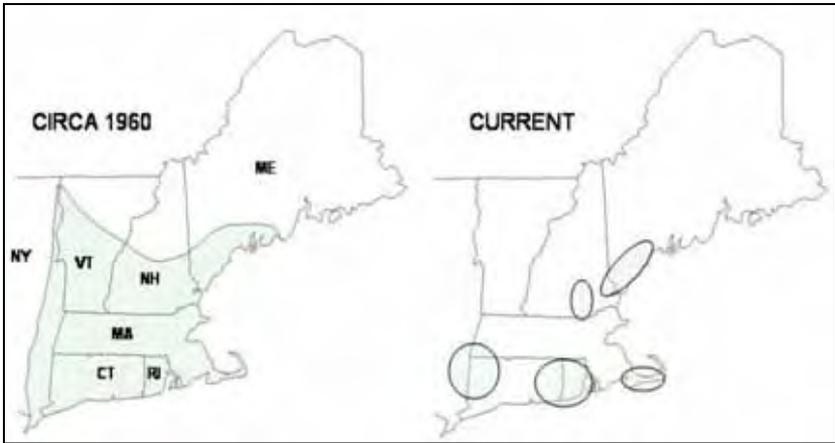
The New England cottontail (abbreviated as NEC), the region's only native cottontail rabbit, is dwindling because its habitat is disappearing. This fact may surprise many people, because at times, rabbits seem to be everywhere. But the cottontails seen most often are not native to our area. Two species of cottontail are found throughout most of the region: the NEC (native) and the eastern cottontail (introduced by humans). Historically, the NEC inhabited much of New England. In the early 1900s, state wildlife management agencies and private hunting clubs brought in and released large numbers of eastern cottontails to boost game numbers. Those introduced populations quickly expanded and became firmly established in all the New England states, except Maine, where the eastern cottontail has yet to be found.

Although similar in appearance, the NEC and eastern cottontail differ in their biology and their habitat needs. While the NEC requires large (10- to 25-acre) patches of dense, shrubby thicket, the eastern cottontail can use a much wider variety of habitats, including lawns, agricultural fields, and small brush patches. This ability to thrive in different—and smaller—habitats makes the eastern cottontail well suited to today's increasingly fragmented suburban landscape. The eastern cottontail has larger eyes than the NEC, which may help it detect and evade predators more easily than our native cottontail. Perhaps it is for these reasons that the eastern cottontail has displaced the NEC throughout much of its range. (Currently, there is no evidence that the two species interbreed.)

Habitat loss appears to be the main cause of the NEC's decline. As a habitat patch decreases in size and quality, individual NEC may need to venture away from cover, leaving them vulnerable to a variety of mortality factors. The early successional habitat that they need has



been disappearing as old, brushy fields naturally mature into closed-canopy forest and as other prime cottontail habitat has been eliminated or fragmented due to intense development pressure. Some 86 percent of the historic NEC range has already been lost, and scientists believe that ongoing development will result in another 2 percent range loss each year. As humans expand their development, we work to suppress natural disturbances, such as wildfires, beaver activities, and flooding, that once created ample early successional habitat on the landscape.



The NEC’s falling population numbers have worried biologists, conservationists, and sportsmen for more than a decade. In 2006, the U.S. Fish and Wildlife Service (USFWS) designated NEC a Candidate for Threatened or Endangered status. State and federal biologists began organizing a conservation effort; and in 2011 the Regional NEC Initiative was formally established with support from state and federal agencies, universities, and non-profit organizations. A Conservation Strategy outlining specific habitat and population goals, funding sources, and planned actions has been submitted to the USFWS. In the future, that agency will make a “listing determination” based on their evaluation of the Strategy and the likelihood of its success.

To bring back the NEC, biologists have used field surveys and computer modeling to identify focus areas having excellent potential for restoring populations. Forty-seven focus areas have been delineated in the region, with the capacity to support 80 metapopulations of NEC. Each focus area will have a number of habitat patches, with patch sizes ideally 25 acres or larger. The USFWS has set a regional habitat restoration goal of 27,000 acres of habitat to

support 13,500 NEC. The cooperating states have also developed habitat goals that, in total, exceed those set by the USFWS. Decisions on where to create and renew patches of early successional habitat will be based on location within the designated focus areas and, in some cases, on the proximity to existing NEC populations.

While conservationists can work to restore NEC on public lands, most of New England is privately owned, therefore, private landowners will play a key role in saving this species. By managing some of their land as young forest or shrubland, landowners can provide cottontails with the food and cover they need to evade predators and to survive harsh, cold winters. Habitat suitable for NEC also benefits 137 other wildlife Species of Greatest Conservation Need in the states where NEC exist.



Top Left: American woodcock  
Top Right: Hognose snake  
Bottom Left: Leopard frog  
Bottom Right: Slender clearwing sphinx moth

## NEC Habitat Needs

Good habitat for NEC must meet the year-round life history requirements of the rabbit. The best habitat condition for NEC provides them with well-distributed protective cover, sufficient year-round food, and an ability to reach other patches of habitat.

## Goals and Considerations

### Site-Specific Patch Characteristics:

Site-specific habitat management is aimed at creating optimal conditions for NECs: dense horizontal and vertical woody cover 3 to 15 feet high, with multiple layers of vegetation and having a minimum stem density of 20,000 stems per acre. Such thick habitat ideally is an extensive tangle of saplings, vines, shrubs, and weeds interrupted by openings where rabbits can feed on grasses and other herbaceous plants. While low hanging coniferous branches may be used for cover, regenerating deciduous tree and shrub species are preferred. NECs also need well-drained areas for nesting and thick cover in which to hide from predators.

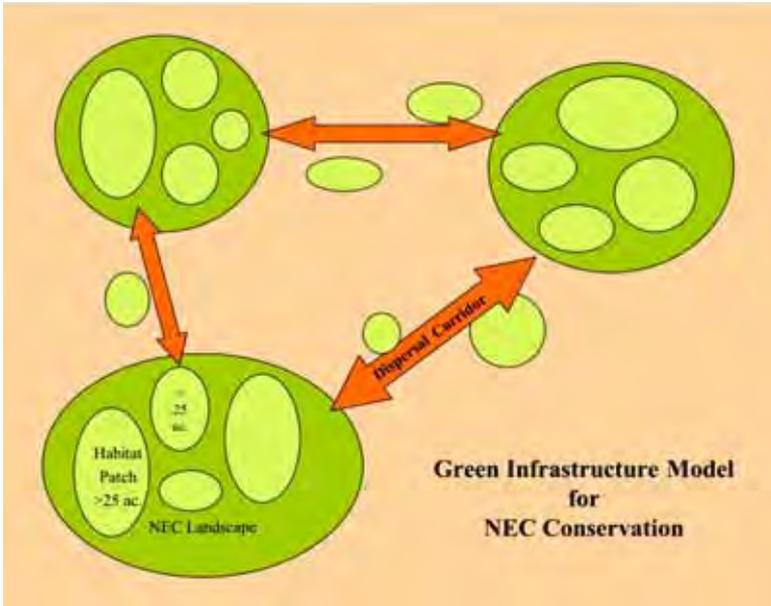


Above: Multiple layers of vegetation provide levels of protection from aerial and ground predators and a diversity of forage

Right: Green briar growing over woody shrubs and debris

## Patch Size and Proximity Considerations:

Patch sizes should be at least 10 to 25 acres and located within a half to two miles of each other. Smaller patches may also help, if they are next to or near other suitable habitat and connected to such habitat by brushy corridors. Building habitat off of existing shrubland, such as that growing in powerlines or old fields, is an efficient way to increase acreage. Connected and adjacent patches should total 10 to 25 acres. Because the canopies of nearby trees can keep sunlight from reaching the ground and stimulating the growth of vegetation, patches smaller than 5 acres may not yield the vines, shrubs and herbaceous plants that NEC need for foraging. In consideration of some avian species, powerline right-of-ways to be managed as a stand-alone habitat patch should be maintained at a width of 150 feet or greater. However, corridors to be managed for NEC dispersal may be maintained at a minimum width of 50 feet.



## Rotational Considerations:

A rule of thumb for large properties (those greater than 100 acres) is to keep 10 percent of the forest in regenerating seedlings or saplings at all times, while always retaining the minimum of 10 to 25 acres of suitable NEC habitat. On parcels smaller than 100 acres, look for opportunities to create a rotation with adjacent lands to provide 25 acres of habitat in the immediate area.

# Best Management Practices (BMPs)

The following management practices maximize benefits to NEC while avoiding or minimizing potential harm to any existing NEC populations. Managers may wish to modify these guidelines to favor other species of young-forest wildlife or other natural resources.

Work areas should be treated as if they may be occupied by NEC, and as if the potential for incidental take through management actions exists. (If there is clear evidence that no NEC are present, management can be conducted using standard environmental considerations.) On occupied or potentially occupied sites, management should take place in phases. Such incremental management ensures that some suitable habitat will remain for any local NEC while work operations are completed on nearby or adjoining habitat.

Making NEC habitat often involves cutting down trees or shrubs that may have become barely thick enough to provide food and cover for cottontails. Cutting causes the shrubs and trees to grow back more thickly, providing much better habitat that offers the kind of food and cover that NEC need. When deciding what percentage of a potential habitat to cut, managers should consider the quality and extent of adjacent suitable habitat. Where possible, at least 25 acres of good NEC habitat should remain in a local area at all times.

In areas occupied by NEC, or where they may live, avoid carrying out management operations during the rabbits' breeding and nesting season, from mid-March through the end of August. Winter is often a good time to conduct management. If trees are cut in late winter, tree crowns (branches) left on the site will provide cover and browse for cottontails during critical times.

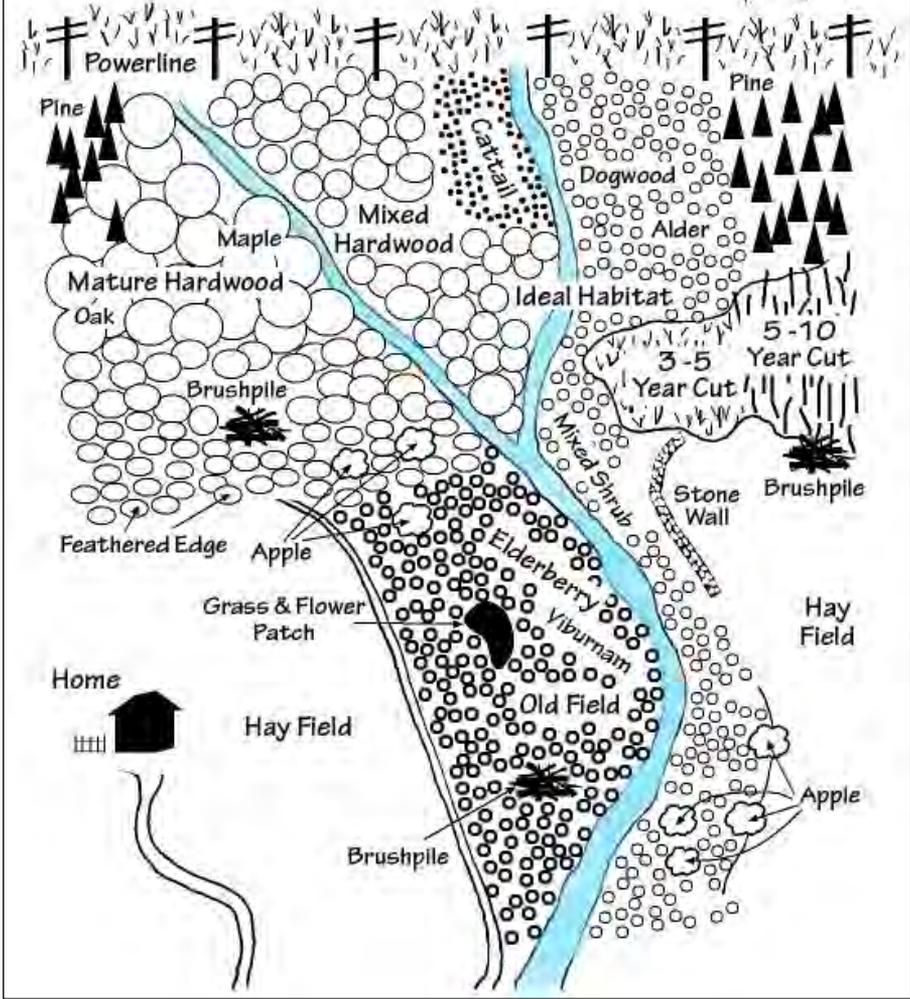
Throughout the remaining pages, the BMPs are organized by broad prescription headings (e.g., Forest Regeneration Cuts, Treating Invasive Plants, etc.), then are broken down into specific management practices. Although each practice may be used on many of the general habitat types listed on the following page, specific recommendations are, in some cases, provided for certain habitat types specified by their associated habitat number. Unique plant communities not discussed here, such as coastal scrub, mountain laurel thickets, and alder stands, may call for more specific management prescriptions, which can be provided by a technical expert.

## Habitat Types to be Managed

Habitat Type		Definition
1	Forest* (>20 years old) Native understory	Closed canopy forest with trees greater than 6" DBH with an understory of primarily native shrubs and seedlings that may be providing food. Has minor to no invasive understory component. <b>Potentially occupied by NEC.</b>
2	Forest* (>20 years old) Invasive understory	Closed canopy forest with trees greater than 6" DBH with an understory of primarily invasive shrubs and seedlings that may be providing food and cover. <b>Potentially occupied by NEC.</b>
3	Forest* (>20 years old) Sparse understory	Closed canopy forest with trees greater than 6" DBH with little understory; providing no or poor habitat. <b>Unlikely to be occupied by NEC.</b>
4	Successional Forest* Trees 3" to 6" DBH	Area is dominated by trees between 3" and 6" DBH. This is no longer ideal habitat due to canopy closure and decline in stem density. <b>Potentially occupied by NEC.</b>
5	Seedling-Sapling Forest* (Good Habitat)	Area is dominated by trees less than or equal to 3" DBH and less than or equal to 15 feet in height. <b>Potentially occupied by NEC.</b>
6	Shrubland Mostly native shrubs (Ideal Habitat)	Area is dominated by multi-stemmed woody shrubs and seedling/sapling trees, including alders, viburnums, blueberries, etc. <b>Potentially occupied by NEC.</b>
7	Shrubland Mostly invasive shrubs	Area is dominated by invasive shrubs, such as bush honeysuckle, Japanese barberry, or multi-flora rose, and young seedling or sapling trees less than 15 feet in height. <b>Potentially occupied by NEC.</b>
8	Old Field	Transitional areas dominated by grasses and forbs, with some shrubs and small trees. The vegetative makeup varies with the area's management history and length of time since abandonment. <b>Potentially occupied by NEC.</b>
9	Grassland/Meadow/Wet Meadow	Area is dominated by broad-leaved herbs, grasses, sedges, and other herbaceous vegetation, with or without a very small woody component. <b>Potentially occupied by NEC.</b>

\*Typically deciduous forests are desired; however, mixed forest stands and small patches of conifers can be beneficial to NEC habitat management.

# New England Cottontail Working Landscape



This illustration depicts the incorporation of ideal NEC habitat into a working landscape. Landowners can still retain habitats such as mature trees, conifers and active agriculture while making a positive contribution to NEC restoration.

## Forest Regeneration Cuts

### *Tree/Shrub Removal Using Handheld Equipment*

Although cutting by hand may not be feasible for clearing larger areas, it can be useful for gradually expanding an area of existing habitat. Remove, or kill by girdling, all trees greater than 3" DBH as well as overmature, leggy shrubs. Apple trees, scrub oak, low-branching conifers, evergreen shrubs, or other trees of exceptional value may be left. If they are present, leave a few decadent, shallow-rooted, buttressed trees for escape cover. In an area such as habitat type 3 (depicted in photo), occupation by NEC is not a concern, so precautionary measures are not needed. However, to minimize disturbance to other wildlife and to maximize cover regeneration, cutting in all habitat types is best done in winter.



Double girdle of poplar

## ***Heavy-Duty Mulching and Mowing***

Heavy-duty mulching and mowing can be used to maintain suitable structure and density of woody vegetation, remove encroaching woody vegetation, and create brushy transitional zones at field edges. This practice is a preferred method for restoring large areas of overmature or undesirable shrubs in the 3-6" DBH size class, with potential removal rates of up to 1 acre per day. It also permits precision cutting and minimizes environmental impacts. In habitat types 1 and 2, mulching and mowing equipment are not feasible for removing large hardwoods but may be used to eliminate invasive or otherwise undesirable understory plants. For example, mowing an invasive understory followed by herbicide application will help suppress invasives prior to a tree harvest. Mow invasives in winter, apply herbicide during the next growing season, and harvest trees the following winter.

### ***Considerations:***

In occupied or potentially occupied NEC sites, this technique can be used in incremental stages. Apple trees, scrub oak, low-branching conifers, evergreen shrubs or other trees of exceptional value may be left. In habitat type 8, old fields should contain no more than 25 percent woody cover smaller than or equal to 3" DBH.



Brontosaurus

## ***Forest Harvesting – Commercial or Non-Commercial***

This practice is generally applied to habitat types 1-3 using a skidder, forwarder, feller buncher, etc., to harvest all trees greater than 3" DBH. Leave slash (tree parts up to 6" in diameter) on the ground to provide cover and winter food for NEC, replenish soil nutrients, and discourage deer from browsing the regrowing trees. Tops should be lopped not to exceed 4' in height. Leave one to three brush piles per acre (see Brush Pile Practice on p. 23).

Following harvest, assess the site within the first growing season for potential treatment of invasive shrubs and within 10 years for possible re-cutting of trees. Plan harvest rotations to maintain at least 10 to 25 acres in the less-than-15-year-old age class at all times. Apple trees, scrub oak, low-branching conifers, evergreen shrubs, or other trees of exceptional value may be left. Leave a few old, shallow-rooted, buttressed trees for escape cover.



Above: Harvester/processor cutting in habitat type 3  
Left: Grapple Skidder hauling trees

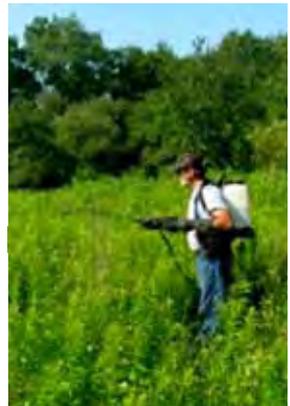
## Treating Invasive Plants

On a site by site basis, consideration is given to whether it is appropriate to treat existing invasive plants. While invasive plants displace native species and may limit floral diversity, they also provide structure and cover that's beneficial to NEC. On sites where the land is overwhelmingly dominated by invasives, managing the invasive species as habitat may be the best option.

### *Chemical Treatment*

In areas where trees will be harvested, such as habitat types 1, 3, and 4, within one year after harvest the area should be assessed for any invasives that may have become established; and these undesirable plants should be removed or killed. On a site such as habitat type 2, where trees will be harvested and there already exists an invasive understory, it's best to remove the invasives in stages to minimize harm to NEC that may already occupy the site. While chemical treatment may be done following a timber harvest, we recommend that it be done before the harvest to prevent an explosive release of invasives that likely will follow the removal of the forest canopy. For shrubland (habitat type 7) made up mostly of invasive species, conversion to native plants is preferred but not always practicable. As mentioned above, treatment should be done in stages if NEC occupy the area.

In the years following initial assessment and/or herbicide treatment of invasives,



Above: Skeletons of sprayed invasives  
Top Right: Backpack sprayer  
Bottom Right: Mounted mist sprayer

continue with annual assessments and treat as required. Treatment is best done in August and September; however, treatments may also take place in the spring, since many invasive shrubs leaf out earlier than native shrubs. Herbicide selection (broad-spectrum or selective) and method of application (foliar, cut-stem, or basal bark) will depend on the target species, the size of the shrubs, and the desired vegetation outcome. Skeletons of dead standing invasive shrubs can be left to provide temporary winter cover for NEC.

### ***Mechanical Treatment***

Mechanical methods to treat invasives include using chainsaws, Fecon mowers, and Brontosaurus machines. These devices can restore large areas grown up with overmature shrubs or infested with invasive species; removal rates can be as high as 2 acres per day when a Fecon mower is used. In the future, all treated areas should be assessed annually and selectively retreated as needed.

In habitat type 2, areas dominated by tall and very dense invasive plants (e.g., multiflora rose and bush honeysuckle), machines can be used to reduce the overall biomass of invasives and to stress target plants before applying herbicides. To keep invasives from rapidly regenerating, treatment should take place before the tree canopy is removed. For habitat types 1 and 3, if post-harvest invasive plants have grown so large that it is difficult to treat them with chemicals alone, use machines to reduce plant size and vigor prior to applying herbicides. To get rid of undesirable tree species, such as tree of heaven, first girdle or cut the stem, then follow with herbicide application.

In habitat type 4, using mechanical equipment to remove invasives in a young



forest is likely to be impractical. The way to restore this size class of forest to a seedling/sapling stage is by mowing the whole area. However, it can be effective to attack individual problem plants

Fecon 'forestry' Mower

with handheld tools such as saws and weed wrenches. In habitat type 5, cutting individual invasive plants or mowing down patches of such vegetation, followed by herbicide application, may be more practical, depending on stem densities.

### ***Additional Treatment Methods***

#### **Weed pulling/wrenching**

Weed pulling and wrenching are most effective at removing invasives growing in moist soil.

#### **Flame torches**

Flame torching has been shown to be effective on barberry.

#### **Girdling**

Undesirable individual trees like black locust or tree of heaven can effectively be controlled by girdling them. When girdling, include a herbicide treatment to up the odds of killing the plant.



Weed wrench

Since they are labor intensive, these techniques are best applied on small acreages or in areas where sensitive natural resources need to be protected. On large parcels, treatment is suitable where invasives are minimal. For habitat



types 6 and 7, it is not practical to apply broad-scale control in dense shrubby vegetation; however, selective treatment may be effective. For all habitat types, assess annually and selectively treat invasives as needed.

Flame Torch

## Natural Regeneration/Succession

Natural regeneration/succession is the main process by which a managed habitat will grow back to the desired density of 20,000 stems per acre (habitat types 1-7). Because habitat has been dwindling rapidly for NEC and other young-forest wildlife, it may make sense to let native shrubs and trees expand and dominate largely open areas, such as habitat types 8 and 9. If you decide to let regeneration take place, follow up with treatments such as brush mowing, herbiciding, or prescribed burning to control invasives. The site should be cut or mowed as stem density decreases past the point of usefulness; typically when trees are greater than 15 to 20 feet in height. In some instances, managing and utilizing the invasive species as habitat may be warranted where the site and adjacent lands are overwhelmingly dominated by invasives.



Aspen regeneration 2 years post mowing



Alder regeneration 3 years post mowing

# Planting and Seeding

## *Planting Shrubs*

The main objective is to establish shrubs and other woody vegetation to make or improve thicket habitat. Secondary objectives may include controlling invasive species, stabilizing soils, and improving soil and water quality.

During spring or fall, plant clumps of 25 to 100 shrubs (containerized or balled; 1-2 gallon sizes) per tenth acre (400 square feet) in cleared sites, with the plants spaced about every 2 to 4 feet. Bare-root stock or whips should be planted in spring at greater densities: about one per square foot. Wattles (bundles of dormant season cuttings from certain shrubs) may be planted in shallow trenches in spring to quickly create multi-stemmed structure. You may

need to use temporary fencing to protect plants from deer or other animals' browsing. Plant post-timber harvest and following any invasive-plant control measures to fill in gaps with desirable shrubs. When revegetating large open areas, intersperse shrub clusters with existing cover, stone walls, foundations, and brush piles. Control weeds with herbicides prior to planting shrubs. After planting, apply mulch, such as fabric or wood chips. To convert fields to shrublands, plant shrubs approximately every 4 feet for about 2,700 plants per acre.



### ***Considerations:***

When assessing a site for

Top: Planting containerized shrubs  
Bottom: Installing silky dogwood wattles in a trench

planting, consider the site conditions (including soil conditions and drainage) and what species of shrubs may already be growing to determine whether planting is really necessary. Plant stock may be containerized, bare-root, or whips. Pick species that root-sucker or expand and grow rapidly, such as willow, sumac, chokeberry, alder, and aspen. Other good choices include field juniper, greenbriar, blueberries, native roses, winterberry, silky dogwood, and blackberry. Wattles are commercially available from many riparian-restoration nurseries.

### ***Seeding Shrubs***

Suitable for habitat types 8 and 9, this technique can create field buffers and small or large thickets. Site preparation includes mowing, herbiciding, tilling, and planting. When seeding, the best approach is to prepare the site in summer and plant in the fall, either by broadcasting or drilling. Use 5 to 7 pounds of seed per acre when planting sumac, blueberries, roses, winterberry, silky dogwood, blackberry, and chokeberry. (Consider site conditions when deciding which species to use.)

**Note:** Shrub-seeding is considered an experimental practice. After planting, it may take 8 to 10 years to see benefits. Additional management actions may be needed to reduce competition from invasive shrubs and herbaceous plants. Once shrubs sprout, they may need to be protected against deer browsing. In Maine, seeding has proven more successful in wet areas than in dry.



No-till seeder

## ***Seeding With Grasses and Other Herbaceous Plants***

To provide forage for NEC, seed small areas within a habitat patch using a cool season grass mix (orchard grass, timothy, clovers) at 40 pounds per acre or as recommended by the supplier. Fertilize and lime as soil tests indicate. Mow every two years to keep down woody vegetation, avoiding May-through-August NEC nesting season. Treat invasives as necessary.

After a timber harvest on habitat types 1-3, broadcast seeds on log landings, skid trails, and day lit roads in spring and/or fall. Following mowing or mulching operations on habitat types 4 and 7, seed small patches and access roads where there is exposed soil. For small areas, such as a 1/4-acre foraging area, hand-scattering seeds may be sufficient.



Wildlife foraging mix three months after spring seeding

## ***Strip Disking***

This practice can enhance the availability and variety of food plants. To stimulate forbs growing in fields, conduct light strip disking during late fall after seed set. Disks should run parallel, or nearly so, to the direction of travel and at a depth of only 2 to 4 inches. Do not use light disking on sites where invasive or noxious plant species are present unless those plants have been controlled. Avoid disking areas that have never been plowed or have high erosion potential.

# Brush Management/ Man-Made Cover

## *Slash Management*

When working in forested areas, such as habitat types 1-3, leave slash on the ground to provide winter cover and forage for rabbits, replenish soil nutrients, and to discourage deer from browsing the regenerating trees and shrubs. If re-entry is needed to manage the site in the future (such as for herbiciding invasive shrubs), or if aesthetics are a consideration, slash down to 3" in diameter can be removed.



Track-mounted Harvester

## *Brush Mowing*

For habitat types 6-8, this is a valuable technique for restoring large areas of overmature, sprawling shrubs in the 3" or smaller DBH size class, with removal rates of up to 2 acres per day possible. Brush mowing can be done in incremental stages, if NEC are present. In habitat type 8, old fields should contain no more than 25 percent woody cover up to 3" DBH. Periodic brush mowing of log landings and skid trails will extend the life of herbaceous forage plants on those habitat features. Brush mowing can also maintain suitable structure and composition of woody vegetation, and can be used to create thick transitional zones at field edges. Apple trees, scrub oak, low-branching conifers, evergreen shrubs, and other trees of exceptional value may be left.



Skid steer with Fecon attachment

## ***Brush Piles, Stone Walls/Foundations, Rock Piles and Constructed Burrows***

This management technique can be used on a variety of habitat types. Managers can build brush piles before or after timber harvests and after mowing or mulching operations. Plan on one to three brush piles per acre. Each should be 6-20' on a side and 4-8' high, with the bottom layer of logs spaced 10-12" apart; the second layer is the same size but oriented perpendicular to the first layer. Top the brush pile with smaller limbs and branches. Add new limbs and branches periodically to extend the life of the pile. Brush piles can be located along field edges to provide important escape cover.

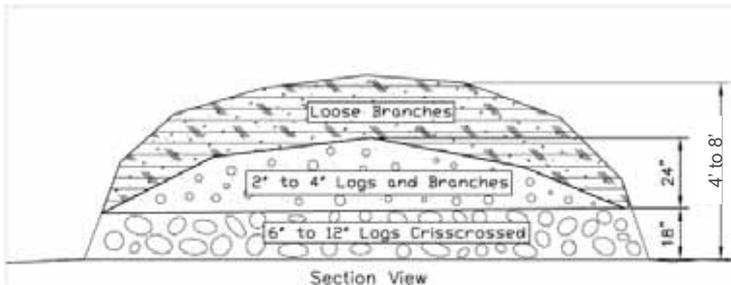
If no natural burrows exist on a site, consider building artificial ones out of corrugated plastic drainage pipe. Maintain or build stone walls or rock piles with plenty of crevices and interior spaces where rabbits can hide. During timber harvests, avoid damaging stone walls.

Greenbriar or wild grape planted near these structures will provide extra protection. Brush piles, stone walls/foundations, rock piles, and planted shrub clusters should be spaced to minimize the distance NEC are exposed to predators when traveling between sources of shelter.



Stonewall

Brush pile



Cross-sectional diagram of a brush pile

## **Additional Management Options**

### ***Prescribed Burns***

Managers can use controlled or prescribed burning to maintain or improve a variety of early successional habitats, including grasslands, shrublands, and rare plant communities such as pitch pine/scrub oak barrens. Use burning as a stand-alone practice, or in combination with techniques such as mowing, disking, and herbiciding. The timing of the burn is important: Burning in the early spring, or when the plants are dormant in the fall, will help maintain the current vegetative state by top-killing young trees and shrubs, which allows them to resprout. When planning a burn, contact your state forestry agency concerning applicable laws, liability, and permit requirements.



### ***Corridor Management (Including Right-of-Ways)***

Forest stands next to shrub corridors are high-priority areas for creating 25-acre habitat patches. Maintain corridor habitat stem density by treating trees or shrubs in the 3" DBH size class or larger through herbiciding and/or mechanical methods. As a general rule of thumb, dispersal corridors should be maintained at a minimum width of 50 feet and right-of-ways used as stand-alone habitat should be maintained at a minimum width of 150 feet.

### ***Field Mowing***

This practice is most commonly conducted on habitat types 8 and 9. The primary value of open-field habitat for NEC is as a spring and summer food source. NEC feeding habits depend on plant availability; and in spring and

summer, tender herbaceous vegetation is in abundant supply. Plants growing on such sites may include warm- and cool-season grasses, sedges, rushes, clover, goldenrod, wild strawberry, chickweed, cinquefoils, and violets. Mow fields every two to five years to maintain grasses, forbs, and small woody plants.



### ***Edge Enhancement***

Wildlife, including cottontails, often live in or travel through the brushy cover that grows where forest habitats meet fallow fields, farmed fields, and powerlines. Along field margins, cut a swath a minimum of 50 feet wide to encourage the growth of shrubs, young trees, vines, and other plants. Such edges can also be created through plantings or by letting natural regeneration take place. A tiered approach provides a variety of structure: shorter to taller vegetation grading from field to forest.

### ***Establishment of Stable Shrublands***

By using techniques similar to those that some power companies employ to manage their right-of-ways, land managers can establish and maintain stable shrublands. Selectively cut trees, then use herbicide on resprouting trees of species that can grow taller than 12 feet. Leave shrubs in place. It can take a lot of effort to develop shrublands using this technique, but the result can be a habitat that remains stable for decades, with the thick shrub cover preventing new trees from coming in.

These BMPs are based on the current state of knowledge; we recognize that periodic revisions may be needed based on new research, monitoring, and habitat practices being developed and used throughout the NEC's range. This booklet can be helpful to managers trying to decide which habitat prescriptions to use for different projects. For additional recommendations, or for more information on specific resource concerns, contact local habitat professionals, including personnel working for state and federal wildlife and conservation agencies and the Wildlife Management Institute.

### **Useful Resources:**

<http://www.newenglandcottontail.org/>

<http://extension.unh.edu/FWT/NECrabbits.htm>

<http://timberdoodle.org/>

<http://www.youngforest.org/>

<http://www.ct.gov/deep/youngforestinitiative>

### **References**

- Arbuthnot, M. 2008. Landowner's guide to New England cottontail habitat management. Environmental Defense Fund. 36 pp.
- Barbour, M. and J. A. Litvaitis. 1993. Niche dimensions of New England cottontails in relation to habitat patch size. *Oecologia* 95: 321-327.
- Fuller, S. and A. Tur. 2012. Conservation Strategy for the New England Cottontail (*Sylvilagus transitionalis*). US Fish & Wildlife Publications. Paper 320.
- King, D.I., R.B. Chandler, J.M. Collins, W.R. Petersen and T.E. Lautzenheiser. 2009. Effects of width, edge and habitat on the abundance and nesting success of scrub-shrub birds in powerline corridors. *Biological Conservation* 142: 2673-2680
- New Hampshire Fish and Game Department and US Fish and Wildlife Service. 2011. Programmatic candidate conservation agreement with assurances for the New England cottontail in southern New Hampshire. 42pp.
- Oehler, J.D., D.F. Covell, S. Capel and B. Long (Eds). 2006. Managing grasslands, shrublands and young forest habitat for wildlife - A guide for the Northeast. Northeast Habitat Technical Committee, MA Division of Fisheries & Wildlife. 148 pp.

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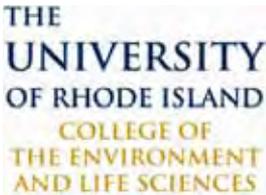
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# New England Cottontail Initiative Regional Partners



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