Programmatic Candidate Conservation Agreement with Assurances for the New England Cottontail in Southern New Hampshire

Between

The New Hampshire Fish and Game Department

and

The U.S. Fish and Wildlife Service

January 28, 2011

With Support from

1. Introduction

This agreement between the New Hampshire Fish and Game Department (NHFGD) and the U.S. Fish and Wildlife Service (Service) (jointly: the Parties) is a programmatic Candidate Conservation Agreement with Assurances (CCAA) for the New England cottontail (Sylvilagus transitionalis, NEC) and is part of an application for an Enhancement of Survival Permit (Permit) under section 10(a)(1)(A) of the Federal Endangered Species Act (ESA). The Permit will authorize take of the NEC, should it become listed as endangered or threatened under the ESA during the 50-year period of this CCAA. The permitted take will be that resulting from activities covered in cooperative agreements between the NHFGD and non-Federal landowners in southern New Hampshire who are willing to engage in voluntary conservation actions for the NEC. Take authorization provided by the Permit will be extended to participating non-Federal landowners through Certificates of Inclusion issued by the NHFGD.

The "Landowners Guide to New England Cottontail Habitat Management" provides a brief discussion of the species' biology, threats to its continued existence, potential management tools, and sources of assistance in implementing habitat management (Arbuthnot 2008, www.edf.org/cottontail).

In August 2000, the Service received a petition to list the NEC as either threatened or endangered under the ESA. Subsequently, a range-wide survey was conducted and followed by a status assessment. In 2006, based on this assessment, the Service concluded that listing the NEC was warranted, but precluded by other listing actions, and designated the NEC a "Candidate" for listing (71 F.R. 53756, 53757-58 (Sept. 12, 2006)). As a candidate species, the NEC is eligible for inclusion in CCAAs. In 2008, NHFGD amended its list of state threatened and endangered wildlife. As part of the revision, the NEC was state-listed as endangered within New Hampshire.

2. Enrolled Lands

NHFGD seeks to enroll 3,000 to 5,000 acres of private and state-owned lands located throughout southern New Hampshire for the purpose of implementing habitat management practices under this programmatic CCAA. The agreement area for this CCAA will include all of Hillsborough, Rockingham, Merrimack, Cheshire, and Strafford Counties (Figure 1). Lands to be enrolled include any non-Federal lands for which the owner enters into a cooperative agreement with NHFGD pursuant to this CCAA. They may also include state-owned lands managed in accordance with a property-specific agreement. These lands will be enrolled under the procedures outlined herein and will then be considered "enrolled properties." The area targeted for habitat management will constitute about 0.2% of the five counties within the agreement area.

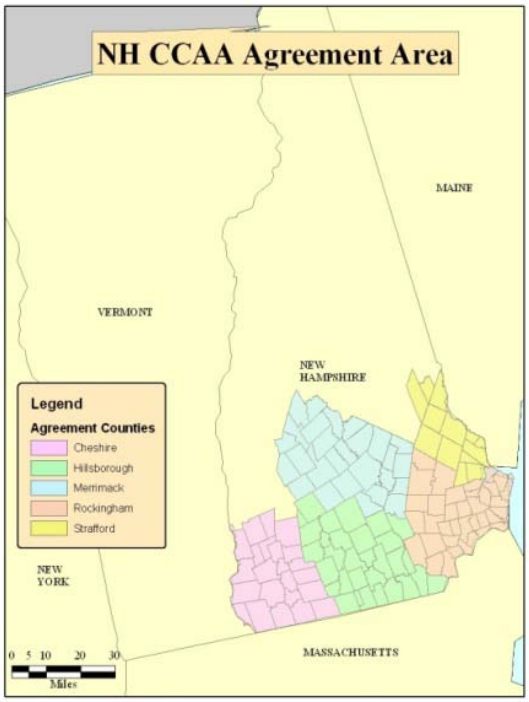

Figure 1. New Hampshire Candidate Conservation Agreement with Assurances Priority Areas Likely to Provide Conservation Benefits to the New England Cottontail that May be Enrolled in this CCAA.

Lands targeted for NEC habitat management are generally those for which the current land use maintains or is capable of maintaining suitable NEC habitat with minimal take of NECs. Site potential for enrolled lands will be evaluated through a Habitat Suitability Index (HSI) model described in section 5. Proximity to existing occupied sites will be used to rank priorities, along with various habitat parameters. Because resources for implementing conservation measures on enrolled lands are limited, sites with the highest potential value will be prioritized for enrollment. Also eligible for enrollment under this CCAA are those lands under the same ownership that are adjacent to lands being managed for the benefit of NEC (hereafter referred to as "adjacent lands"). These adjacent lands include areas where ongoing and future activities (e.g., hay production) may result in inadvertent take of NEC. Although the amount of adjacent acreage that a property owner will enroll under this CCAA will depend on the circumstances specific to the property and property owner, we estimate that the typical property owner will enroll an area of adjacent lands about equal to twice the area of the lands managed for NEC. Therefore, about 10,000 acres of adjacent lands are associated with the 5,000 acres targeted for NEC habitat management. If we were to reach our target of 5,000 acres managed for NEC under this CCAA, then we estimate a total of about 15,000 acres would be enrolled under this CCAA.

3. Authority and Purpose

3.1 Authority

3.1.a. U.S. Fish and Wildlife Service

The Service's Final Policy for Candidate Conservation Agreements with Assurances (CCAA Policy) (USFWS and NMFS 1999) (64 FR 32726) is intended to facilitate the conservation of proposed and candidate species and species that are likely to become candidates, by giving non-Federal property owners incentives to implement conservation measures. The incentive to a property owner provided through a CCAA is that the Service will impose no further land, water, or resource use restrictions beyond those agreed to in the CCAA should the species later become listed under the ESA. If the

species does become listed, the property owner is authorized through an Enhancement of Survival Permit that is issued in association with the CCAA to take the covered species as long as the level of take is consistent with the level identified and agreed upon in the CCAA. The CCAA Policy considers that all CCAAs will provide benefits to covered species through implementation of voluntary conservation measures that are agreed to and implemented by property owners. Before entering into a CCAA, however, the Service must determine that the benefits of the conservation measures to be implemented, when combined with the benefits that would be achieved if it is assumed that conservation measures will also be implemented on other necessary properties, would preclude or remove any need to list the covered species.

Sections 2, 6, 7, and 10 of the ESA allow implementation of the CCAA Policy. Section 2(a)(5) of the ESA states that encouraging parties, through Federal financial assistance and a system of incentives, to develop and maintain conservation programs is a key to safeguarding the nation's heritage in fish, wildlife, and plants. Section 2(b) of the ESA states that "the purposes of this Act are to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species." Section 2(c)(1) states that "all Federal departments and agencies shall seek to conserve endangered and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

Section 6 of the ESA provides for the cooperation with the states in endangered species conservation, including matching Federal funding and delegation of permitting authority. Collaborative stewardship with state agencies is important in the development of CCAAs, given the statutory role of state agencies and their traditional conservation responsibilities and authorities for resident species.

Section 7 of the ESA requires the Service to review programs it administers and to utilize those programs to further the purposes of the ESA. In establishing the CCAA Policy, the Service is utilizing its Candidate Conservation program to further conservation of fish and wildlife. By providing assurances to private landowners who are willing to conserve species and their habitats, the Service is helping to conserve the ecosystems upon which endangered and threatened species depend.

Section 10(a)(1)(A) of the ESA allows the Service to issue permits for acts that would otherwise be prohibited by section 9 if such acts are expected to enhance the propagation or survival of the affected species. A well-designed conservation agreement, such as a CCAA, should enhance the survival of the covered species by increasing and improving suitable habitat. Therefore, the Service has determined that a section 10(a)(1)(A) enhancement of survival Permit provides the best method for permitting take under a CCAA. The take that is authorized by such a Permit can assume many forms, but it must be in compliance with the CCAA.

This CCAA is entered into pursuant to the Service's CCAA Policy (64 Federal Register 32726) and the implementing regulations for CCAAs at 50 CFR 17.22(d) and 50 CFR

17.32(d), and implements the intent of the Parties to follow the procedural and substantive requirements of section 10(a)(1)(A) of the ESA. By entering into this CCAA, the Service is utilizing its Candidate Conservation Program to further the conservation of the nation's fish, wildlife, and plants.

3.1.b. New Hampshire Fish and Game Department

The Endangered Species Conservation Act (ESCA) of New Hampshire prohibits the export, take, and possession of state species that have been identified as endangered or threatened (Revised Statutes Annotated [RSA] 212-A:7). However, the executive director of NHFGD may permit certain activities, including those that enhance the survival of the species. Penalties for violations of RSA 212 A:7 of the ESCA are identified (RSA 212-A:10, II).

By entering into this CCAA, the Service will provide an enhancement of survival permit to NHFGD in accordance with section 10(a)(1)(A) of the ESA. In addition, the NHFGD will be authorized to extend this coverage to private landowners through a "Certificate of Inclusion" upon finalization of a cooperative agreement that meets the CCAA standard.

This CCAA constitutes the implementing agreement for the Service to ensure that NHFGD has direct control of the cooperating landowners through the Cooperative Agreements and Certificates of Inclusion, pursuant to 50 CFR 13.25 (e)(2).

3.2 Purpose

The purpose of this CCAA is for the Service to join with NHFGD and those non-Federal property owners who choose to become Cooperators to implement conservation measures for the NEC. The conservation measures to be implemented pursuant to this CCAA are intended to maintain or improve habitat for this species. Translocation of NEC to newly-created, unoccupied habitat may also be undertaken to help recover the species. These actions, if similarly applied throughout the species' range, would be expected to remove the need to list this species under the ESA.

A programmatic approach is being employed to ensure consistent biological performance standards for all participating landowners, to gain efficiency in administering conservation with multiple landowners, and to best utilize the capabilities of NHFGD for NEC conservation. The biological performance standards are stated in section 5 of this CCAA. The Parties to this CCAA have an interest in using existing programs and partnerships throughout the covered area to advance the purposes of this CCAA and to provide financial and technical assistance to interested landowners willing to conduct voluntary conservation measures for the NEC. Additionally, this CCAA will facilitate collaboration between the Parties and participating landowners by identifying expectations, establishing roles and responsibilities, and removing regulatory disincentives.

4. Description of Existing Conditions

4.1 Description of the New England Cottontail

The NEC is the only endemic cottontail in New England (Probert and Litvaitis 1996, p. 289). The NEC is a medium-large cottontail rabbit that may reach 1,000 grams (2.2 pounds) in weight. Like the conspecific eastern cottontail (Sylvilagus floridanus), the NEC can be distinguished from the snowshoe hare by its lack of seasonal variation in pelage coloration and distinctly smaller hind foot. New England and eastern cottontails can be difficult to distinguish in the field by external characteristics (Chapman and Ceballos 1990, p. 106). However, cranial differences, specifically the length of the supraorbital process and the pattern of the nasal frontal suture, are a reliable means of distinguishing the two cottontail species (Johnston 1972, pp. 6-11).

The NEC, like all cottontails, is short lived and reproduces at an early age with some juveniles probably breeding in their first season. Litter size is typically five young (range 3-8) and females, which provide little parental care, may have 2-3 litters per year. The breeding season lasts from mid-March to mid-September in Connecticut (Dalke 1942 in Chapman, Hockman and Edwards 1982, p. 93). Initiation of nesting is closely associated with the spring green-up (Chapman, Hockman and Edwards 1982, p. 94). Several attempts have been made to document NEC nesting habitat, however locating nests has proven to be very difficult because nests are concealed in extremely dense vegetation, prohibiting researcher access and discovery (T. Goodie, pers. comm.). Female NECs have a high incidence of postpartum breeding, demonstrate density independent breeding response, and have a rapid rate of maturity (approximately 40 days from conception to parental freedom) (Chapman and Ceballos 1990, p. 108). These characteristics allow a species to thrive in spite of a high predation rate, provided ample resources are available (Chapman, Hockman and Edwards 1982, p. 105). In the case of cottontail rabbits, these principal resources include ample food and habitat that is free from interspecific competition and provides security from excessive predation (Chapman, Hockman and Edwards 1982, p. 106).

The historic range of the species likely spanned southeastern New York (east of the Hudson River including Long Island) north through the Champlain Valley, southern Vermont, the southern half of New Hampshire, southern Maine, and statewide in Massachusetts, Connecticut and Rhode Island (Nelson 1909; Litvaitis and Litvaitis 1996, p. 725). The historical range encompassed an estimated 90,000 square kilometers (km^2) (34,750 square miles (mi^2) (Litvaitis et al. 2006, p. 1191).

NECs are considered habitat specialists, insofar as they are dependent upon early-successional habitats, frequently described as thickets (Litvaitis 2001, p. 466). Barbour and Litvaitis (1993, p. 324) demonstrated a relationship with microhabitats containing >50,000 stem-cover units/ha (20,234 stem cover units/acre). Historically, thicket-dependent species like the NEC may have persisted in core habitats associated with frost pockets, barrens, and the shrubby interface between wetlands and upland forests (Litvaitis 2003, p. 120). Soil conditions, fire or other disturbances limited forest canopy

closure in many shrublands (Lorimer and White 2003, p. 41; Latham 2003, p. 34; Brooks 2003, p. 65). From these more persistent core habitats, thicket-dependent species such as the NEC could have dispersed opportunistically to occupy smaller, disturbance-generated patches of suitable habitat (Litvaitis 2003, p. 120). Stable coastal shrub communities are often overlooked for their importance to thicket-dependent wildlife, yet these habitats may have provided a substantial amount of this habitat type.

Although the amount of shrubland and early successional habitat in the pre-Columbian landscape of the Northeast is not well known, it is generally accepted that these habitats were probably never naturally abundant prior to European settlement (Brooks 2003, p. 65). Fires set by Native Americans set back forest succession and maintained areas of suitable habitat (Bromley 1935, p. 64; Cronon 1983, p. 49). In addition, periodic wild fires and coastal storms such as hurricanes, resulted in an estimated 10 to 31 percent of coastal, pine-oak forests in the seedling-sapling stage (age 1-15 years), a condition providing favorable habitat for the cottontail (Lorimer and White 2003, p. 45 and 46). In inland forests, where fires were less frequent, beaver activity and cyclical insect outbreaks set back forest succession. Of the inland forests, about six percent of the landscape is estimated to have been in an early successional stage capable of providing suitable habitat for the NEC (Litvaitis 2003, p. 117). Another model for inland forests suggests that stand regenerating disturbances were very rare and most early successional forest patches were the result of tree-falls (gap phase replacement) in an otherwise broadly-distributed climax forest (Lorimer 1977 in Brooks 2003, p. 70).

The distribution of the NEC has declined substantially and occurrences have become increasingly disjunct. Overall, in comparison to the 90,000 km^2 (34,750 mi^2) encompassed in the estimated historical range, the current estimated range covers 12,180 km^2 (4,700 mi^2) (Litvaitis et al. 2006, p. 1192).

The presence of otherwise suitable habitat, that is, habitat containing appropriate vegetation structure, does not necessarily mean that it is suitable for sustained occupancy by the NEC. Instead, occupancy of individual habitat patches is dictated by patch specific parameters relating to habitat quantity and quality, as well as the spatial distribution of patches at a landscape scale. This was illustrated by a multi-state, regional inventory to determine the distribution of NECs (Litvaitis et al. 2006, pp. 1190-1197). Litvaitis et al. (2006, p. 1193) reported that NEC were absent from 93 percent of 2,333 habitat patches within the recent historical range (1990 to present) that were searched for the presence of the species. Many of the unoccupied patches were considered of inadequate size or lower habitat quality due to succession or were occupied by eastern cottontails (J. Litvaitis, pers. comm.).

In 2006, the Service completed a Status Assessment and Listing Priority Assignment for the NEC (USFWS 2006). The Status Assessment assesses the threats to the species in terms of the ESA's five listing factors:

> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;

(B) overutilization for commercial, recreational, scientific, or educational purposes;
(C) disease or predation;
(D) the inadequacy of existing regulatory mechanisms; and
(E) other natural or manmade factors affecting its continued existence.

Populations of the NEC are still present in most states in the historical range, but the species' habitat and range have undergone significant decline. Although we do not have numerical population trend data (and it would be extremely difficult to obtain), it is reasonable to conclude that the significant reduction in the range and habitat of the species has been accompanied by a population decline.

The decline in range is most severe in Vermont, where the species is believed to be extirpated, and least severe in Rhode Island, where about 25 percent of the historical range is occupied. In general, the range of the NEC has contracted by 80 percent or more since 1960 (Litvaitis et al. 2006, p. 1191). Current land uses in the region indicate that the rate of change, about two percent range loss per year, will continue (Litvaitis and Johnson 2002, pp. 3-4). In a recent survey, the species was found at only about 153 of 2,333 (7 percent) habitat patches (thickets) within areas occupied since 1960 (Litvaitis et al. 2006). Furthermore, the current distribution of NEC has been fragmented into five population clusters that may be functioning as metapopulations (Figure 2, Litvaitis and Villafuerte 1996, pg. 687). In a recent landscape genetics study, researchers found evidence that populations of NEC are fragmented at regional and local scales (Fenderson 2010). Forest inventory data document the decline of suitable habitat and curtailment and fragmentation of NEC range.

Habitat for the cottontail is being slowly degraded and eliminated as a result of natural succession processes that lead to forest maturation. This loss of habitat though forest succession is not being balanced by natural processes (e.g., wildfire) that once established early successional habitat. Habitat loss is further accelerated by destruction and modification of habitat associated with a variety of human uses of the landscape. The present and threatened destruction, modification, and curtailment of NEC habitat and range are a threat to the persistence of the species.

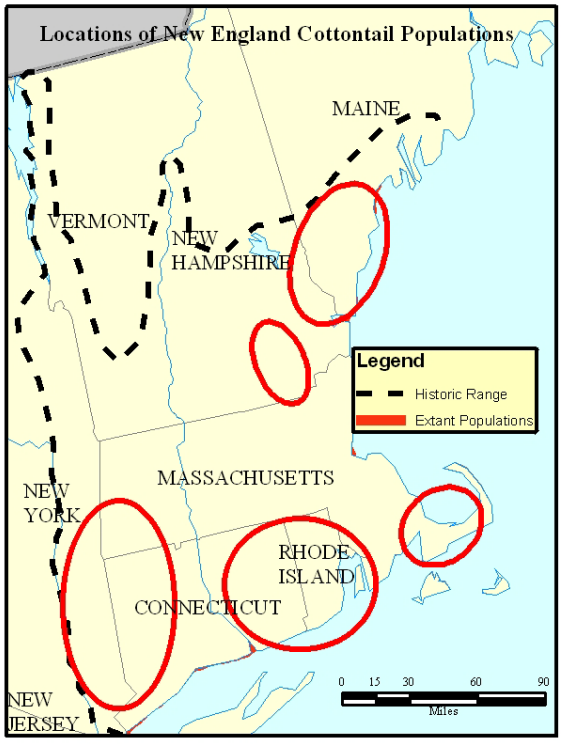

Figure 2. Distribution of Five Extant New England Cottontail Populations within the Species' Historical Range (adapted from Nelson 1909; Litvaitis and Litvaitis 1996, p. 725).

Although predation is not normally a threat to most species and there is no reason to believe it is a threat to the NEC under natural conditions, the alteration of habitat has resulted in conditions that heighten the vulnerability of the NEC to predators. Cottontails dispersing from relatively large patches of habitat may occupy smaller patches where they are more vulnerable to predation (Barbour and Litvaitis 1993, p. 325 and 326) and they may not survive long enough to reproduce and have young recruited into the population. The absence of NECs in so many patches of habitat is attributed to predation, particularly in small habitat patches, and to barriers to cottontail dispersal such as developed areas, roads, and other unsuitable habitats. This situation is compounded by increased populations of generalist predators. Consequently, predation, as exacerbated by habitat fragmentation and the small size of many of the remaining suitable patches of habitat, poses a threat to the species. During our status review, we found no evidence that disease was a threat to the NEC (http://www.fws.gov/ecos/ajax/speciesProfile/profile/speciesProfile.action?spcode=A09B).

Most remaining habitat is on private land that is not being managed for habitat conditions needed by the NEC and is not now subject to regulatory mechanisms that would require such management. Within the five population clusters, the Service estimated that less than one-third of the NEC populations occur on state, Federal, or private conservation land, and only a fraction of that habitat, perhaps ten percent, is being managed for habitat conditions needed by the species. Existing regulatory mechanisms are not sufficient to address the continued destruction and modification of habitat through habitat conversion and fragmentation associated with expanding human populations. The Service concluded that existing regulatory mechanisms are inadequate to protect the species, particularly with regard to destruction and modification of the habitat and range of the NEC.

Other natural or manmade factors are also a threat to the continued existence of the species. Specifically, within its historical range, the NEC is being replaced by introduced eastern cottontails, which are now five times more likely to be encountered within the Northeast than the native NEC. Having more generalized requirements that allow it to exist in a wider array of habitats, and being less vulnerable to predation, the eastern cottontail can outcompete and displace the NEC where their ranges overlap. Also, a potential effect from burgeoning white-tailed deer (Odocoileus virginianus) populations is competition for food, and an indirect adverse effect is the reduction in cover due to overbrowsing by deer, which may contribute to increased vulnerability of cottontails to predators.

4.2 Description of Existing Conditions within the Covered Area

In the 1950s, the distribution of NEC extended south from Lancaster, through the Connecticut River Valley, then south of the White Mountains through the Lakes Region to the Maine border. A 2002 and 2003 regional inventory of the species identified only 23 occurrences in New Hampshire. These occurrences were restricted to two disjunct areas in Strafford County and the Merrimack River Valley south of Concord (Litvaitis et al. 2003, unpublished data; Litvaitis et al. 2006, pp. 1190-1197). By late summer 2008,

many of these patches of habitat had been converted to other land uses or lost to forest maturation or alteration through vegetation management. As a result, a fairly extensive survey of these two NEC occupied areas was able to document the presence of rabbits in only seven patches of habitat. The current population estimate for New Hampshire is fewer than 50 animals.

5. Conservation Measures

The NHFGD recently completed a modeling exercise (S. Fuller, unpublished data, 2010) to better understand the distribution of the NEC. Based on the results of that effort, NEC records are highly correlated with landscape features frequently described as wet flats, dry flats, and toe slope areas. Generally, these areas can be characterized by high water tables, nutrient rich soils, limited topographic relief, and areas immediately adjacent to such locations. With this information, habitats were ranked in terms of their ability to provide suitable NEC habitat, and high value "Focus Areas for New England Cottontail Conservation in New Hampshire" were identified (Figure 3). These areas will be the primary focus of the candidate conservation effort.

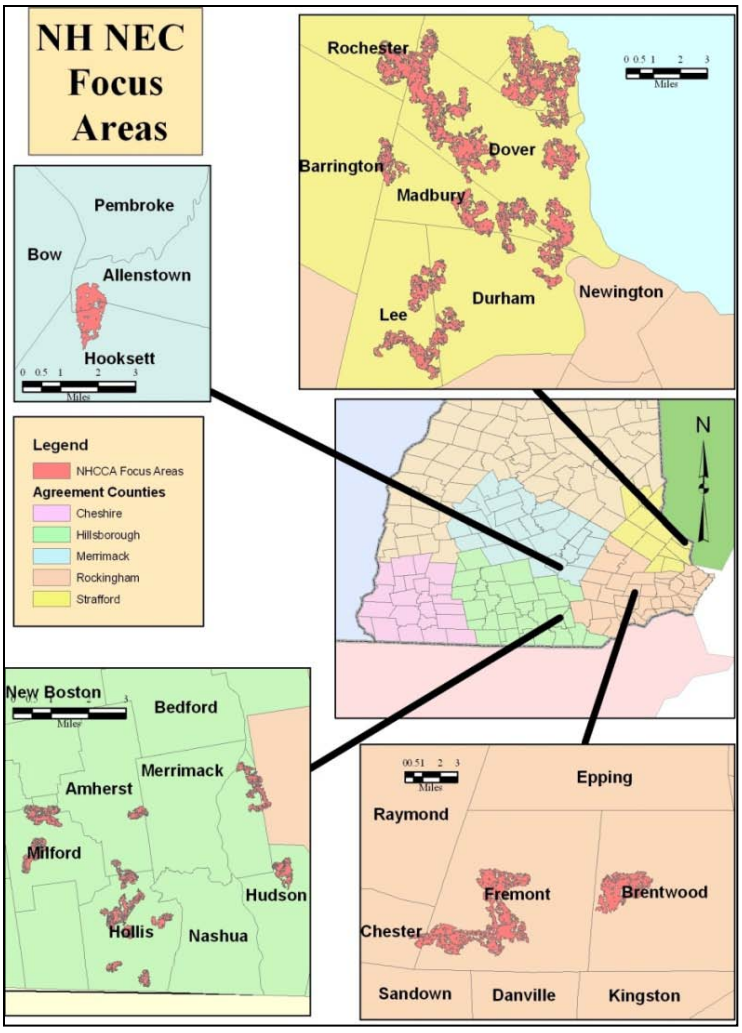

Figure 3. Location of Focus Areas for New England Cottontail Habitat Management, as Indicated Through a Habitat Suitability Model (HSI) (S. Fuller, unpublished data, 2010).

However, since the identification of these priority areas is based on an HSI model, on-the-ground investigations may reveal conditions that would alter the ranking of specific locations. For example, a field investigation may provide evidence of altered hydrology. Restoration of hydrology at that particular site may result in the reestablishment of abiotic factors that promote a stable shrubland community. In addition, rediscovery of unknown populations within the Agreement Area may warrant an expansion of conservation efforts into new

areas. As new information becomes available, it may be necessary for conservation planners to reevaluate these Focal Areas and make modifications, as appropriate.

The implementation goal for this CCAA is to create several landscapes capable of supporting a self-sustaining population of NEC. Each of these landscapes will contain a minimum of 500 acres of habitat that is occupied or located within dispersal distance (within 1 km) of known NEC occurrences. Conservation actions implemented through this CCAA will establish habitat connectivity and a management program that will sustain a shifting matrix of early-successional habitats. An infrastructure model provides a description of our approach (Figure 4). Each NEC landscape will comprise multiple habitat patches, several of which should be greater than 25 acres in size. These blocks should be located within 1 km of an adjacent patch of suitable habitat, and there should be no barriers to dispersal between patches (e.g., a major highway, large river, or urban development). We anticipate that each enrolled property is unlikely to provide enough NEC habitat to reach our NEC landscape goal of 500 acres, or more. Instead, we anticipate that the establishment of a NEC landscape will require participation by multiple properties in the conservation effort. Therefore, these goals are provided to describe the conservation approach and do not imply criteria to determine eligibility of a property for CCAA inclusion.

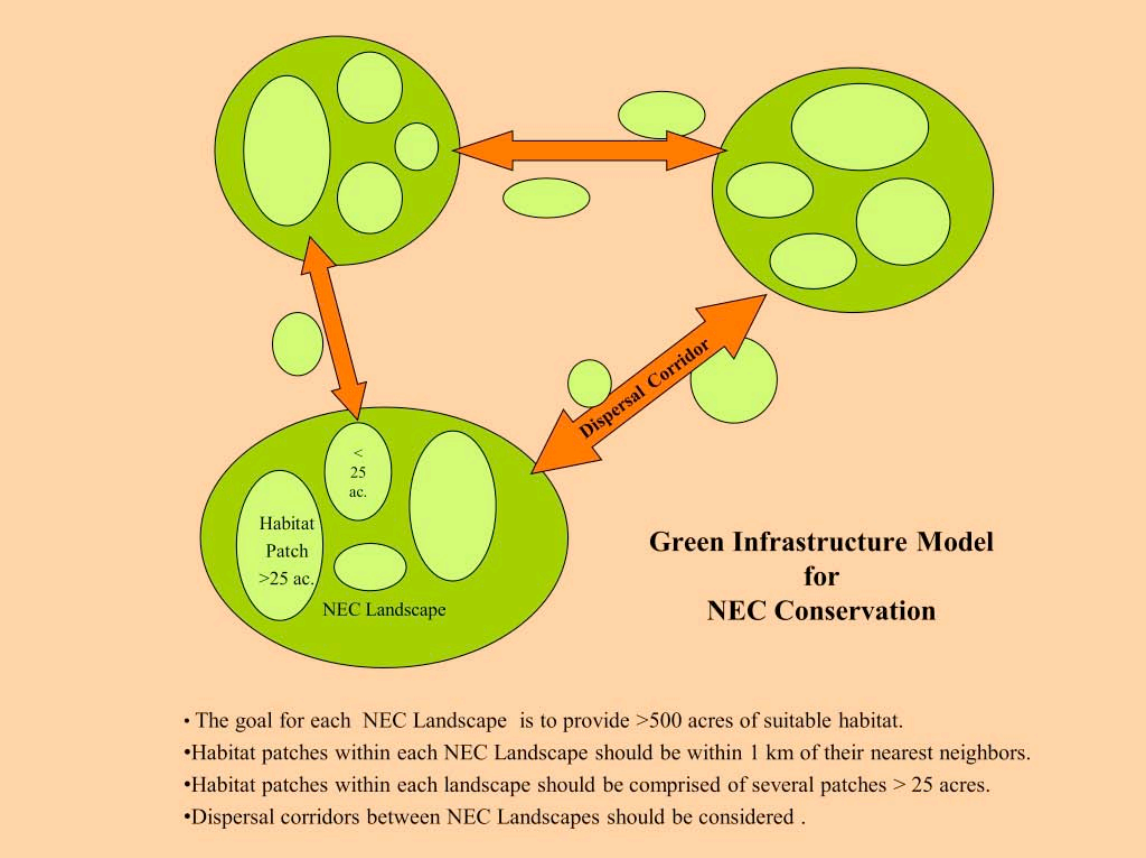

Figure 4. Conceptual Model for the Conservation of New England Cottontail.

At a local scale, NEC populations are believed to function as a metapopulation (Litvaitis and Villafuerte 1996, p. 686). Persistence of these populations is governed by the quality, quantity, and connectivity of the habitat patches they occupy. While there have been no investigations into the specific metapopulation dynamics of the NEC, the Service has developed range-wide NEC conservation goals (Appendix A) based upon the conservation principles of metapopulations (Hanski and Gaggiotti 2004). At present, the Service believes that the following conservation goals would need to be achieved throughout the species' range to ensure the persistence of the NEC:

- Avoid further loss and fragmentation of existing populations;
- Implement conservation actions that increase patch quality, quantity, and connectivity;
- Establish management agreements to ensure that large, source populations remain viable and their habitats remain suitable;
- Implement conservation actions, throughout the range, to establish:
    - 1 NEC landscape capable of supporting 2,500 or more individuals;
    - 5 landscapes each capable of supporting 1,000 or more individuals; and
    - 12 landscapes each capable of supporting 500 or more individuals;
- Evaluate the role of eastern cottontails as a non-native competitor and implement conservation actions that address this threat, as appropriate.

The Service has defined a NEC landscape as an area consisting of a network of 15 or more habitat patches, several of which should be 25 acres or greater in size, and situated within dispersal distance (less than 1 km) to other patches of suitable habitat. Landscape planning efforts should take into account the habitat matrix, since areas with numerous anthropogenic features or substantial natural barriers are likely to be highly fragmented, form barriers to dispersal and may otherwise encumber conservation efforts.

This CCAA establishes a framework that will make possible the initiation of a program to implement the above measures within the state of New Hampshire. It is recognized that this CCAA alone will not be able to meet all the necessary rangewide conservation goals identified above. This CCAA contributes to the achievement of the broader NEC conservation goals because it seeks to create several landscapes, each capable of supporting a viable population of cottontails containing a minimum of 500 acres of habitat, thereby meeting the CCAA standard. Additional actions in other portions of the species' range must be implemented to preclude the need to list the NEC.

Table 1 identifies the potential threats the NEC faces, the processes by which those threats are manifested, conservation measures that will address the threats, and the expected conservation benefit of the implemented conservation measure. During the development of each cooperative agreement, specific threats to the NEC on the enrolled property will be identified. In cooperation with the landowner, a plan will be developed that specifies the conservation measures necessary to address the threats on that enrolled property and to contribute to the NEC conservation goals.

Table 1. Summary of Threats, Conservation Measures and Expected Conservation Benefits.

Threat	**As evidenced by…**	**Conservation Measure**	**Expected Conservation Benefit of Implementation of the Conservation Measure**
Habitat Loss			
Habitat maturation and succession.	Maturation of forests at local and regional scales, leading to reduction in habitat quantity and quality, ultimately leading to contraction of the species' distribution.	Selective cutting or other silvicultural practices that increase stem density by promoting shrub and sapling establishment. Regenerative cuts may also be utilized to increase vigor of decadent shrublands. Treatment consists of timber harvesting and other vegetative management using standard equipment such as chainsaws, brontosaurus, and hydro-ax. Targeted stump, bark or foliar treatment with herbicides may also be used. If NEC is present, prescriptions must include measures to reduce take.	Improved habitat quality, in particular better food and cover value. Increase carrying capacity (CC) for NEC.

Lack of sufficient habitat.	The lack of adequate habitat of sufficient size and quality.	Removal of forest canopy to generate a vegetative response by understory shrubs or resprouting response. This activity will result in increased sun exposure to understory vegetation, thereby increasing the vigor of shrubs. Treatment consists of timber harvesting using standard equipment such as chainsaws and skidders. Since NEC is unlikely to occur in these areas where this prescription is applied, no take is anticipated.	Increased habitat quality and quantity to enhance persistence of NEC.
Habitat conversion to a structure or use (e.g., row crops) with no habitat value for NEC. This conversion may include alteration of hydrology.	Lack of suitable habitat and lack of rabbits.	Habitat restoration or creation. Since NEC is unlikely to occur in these areas where this prescription is applied, no take is anticipated. Treatment could include shallow tilling of the soil in areas with a history of plowing. Establishment of shrubs may include planting of seeds and seedlings.	Increase in habitat present and new area occupied by NEC. Increased CC for NEC.

Dispersal barriers between occupied or suitable patches prevent or reduce metapopulation functions.	Absence of habitat corridors linking patches of suitable habitat NEC becomes extirpated in some patches.	Create or restore habitat linkages, e.g., hedgerow management or old field conversion to thickets. Since NEC is unlikely to occur in these areas where this prescription is applied, no take is anticipated.	Increased NEC movement among and between habitat patches – fewer long term extirpations from patches.
Removal of existing shrubland cover. May be associated with vegetation management on existing utility rights-of-way (ROW) or other access ways	Clearing of shrublands resulting in the complete elimination of suitable habitat. If conducted during the summer nesting season the action may result in take of nestling rabbits.	Implement ROW vegetation management techniques that will create a stable shrubland community to discourage invasion of trees into the ROWs. If NEC is present, prescriptions must include measures to reduce take.	Creation of stable shrublands that may provide suitable habitat conditions and foster enhanced dispersal of NEC.
Habitat Degradation			
Reduced habitat quality due to proliferation of non-native plants. Additional information is needed to understand the impact of this potential threat.	Presence of Japanese barberry, honeysuckle, multiflora rose or other non-native invasive shrubs. These habitats tend to lack diversity and may result in poorer quality NEC habitat.	Since NEC may occupy these sites, surveys will be performed to determine occupancy. If NEC are present, selective use (not to reduce stems density below 20,000 stems per acre in an occupied patch) of mechanical, chemical, and prescribed grazing to control non-native plants and planting of native shrubs will be conducted.	Improved habitat quality without sacrificing cover quality. Increased CC for NEC.

Excessive deer browsing reduces habitat quality.	Poor forest regeneration, reduction in stem density and low plant diversity.	Reduce deer density through hunting, reduce supplemental food availability (e.g., fencing to keep deer out of orchards/gardens, etc.). No take of NEC is expected to result from this activity.	Increased diversity and stem density of plant community. Improved cover and food quality. Increased CC for NEC.
Alteration of Disturbance Regimes			
Inappropriate beaver management and beaver flowage management.	Beaver flowages succeed into shrub thickets that provide NEC habitat. Beaver removal prevents the creation of these habitats. Stabilization of high water levels prevents succession of flowages into shrub thickets.	Manage beavers and flowages in a manner that allows for succession into thicket habitat over time. No take of NEC is expected to result from this activity.	Provides a natural disturbance regime that will create shrub thicket habitats in scattered locations across the landscape. Increased CC for NEC.
Recreation			
NEC harassment or incidental take due to hunting for other species.	Dogs utilized in sport hunting activities pursuing rabbits.	Post informational signs alerting hunters to the NEC's presence and protected status under state law. In the event that a dog pursues a rabbit, the dog shall be brought under control or removed.	Reduce harassment and incidental take.

Predation			
Excessive mortality due to predation.	NEC population decline.	Increase habitat quality or quantity to build resiliency of local populations to predation. Remove predator perches or dens. Open land to trapping. Reduce secondary food sources available to predators (e.g., dropped apples, proper disposal of dead livestock). No take of NEC is expected to result from this activity.	Decrease predator densities. Increased NEC survival and numbers
Competition			
Occupancy of habitat by eastern cottontails (EC).	Replacement or establishment of EC in a patch that would otherwise be suitable for NEC.	Use of live traps to facilitate the removal of EC. Following this activity NEC may be transported to the site for release or allowed to colonize through natural dispersal processes. Prior to the initiation of EC removal, protocols that minimize take of NEC must be developed and implemented.	Occupancy of additional habitats by NEC.

In the future, new information may identify additional threats, necessitating modification of conservation measures specified in a cooperative agreement or implementation of additional conservation measures. In this event, changes will be made in accordance with sections 9 and 14 of this CCAA.

6. Covered Activities

Activities considered for coverage under this CCAA are those activities that are reasonably likely to result in take (specifically death or injury) of NEC. These activities include:

- Implementation of conservation measures specifically for the benefit of the NEC such as tree removal, invasive species control, and hydrologic restoration.
- Activities that are carried out on areas of an enrolled property managed for the benefit of the NEC and that facilitate, or are compatible with, the creation, improvement, and maintenance of NEC suitable habitat. Potentially compatible activities include utility right-of-way maintenance, access way use and maintenance, hunting (except rabbit hunting), fishing, use of recreational vehicles, horseback riding, camping, and hiking.
- Certain activities that are carried out on areas of an enrolled property adjacent to areas managed for the benefit of the NEC and that are not beneficial to NEC. Activities on areas adjacent to occupied habitat that may be covered include, but are not limited to farming and silviculture.

Minor construction activities associated with existing land uses (e.g., construction of a tractor shed) that are conducted on areas adjacent to lands managed for NEC and that cause no more than minimal impacts may be covered. Development activities causing more than minimal impacts to NEC are specifically omitted from coverage. These higher impact activities are not covered because it is unlikely that take could be offset to the degree necessary to meet the CCAA standard. Such activities are beyond the scope of analysis for this CCAA.

Activities within occupied suitable habitat are expected to expose NEC to the greatest amount of risk for take. For an activity in occupied habitat to be covered under this CCAA, appropriate take minimization measures must be implemented. The specific take minimization measures appropriate for an activity will depend on the specific circumstances associated with each property and will be identified by NHFGD and the Service during development of the cooperative agreement.

For an activity conducted within an area where suitable habitat is not present, the property owner must provide sufficient detail regarding current land use practices, existing conditions, and expected land use changes. The information provided must adequately describe the nature of the activity such that the effects can be sufficiently analyzed, appropriate take minimization measures can be developed, the level of take can be reasonably estimated, and a finding of compliance with the ESA, regulations, and CCAA Policy can be made.

Table 2 describes covered activities that may result in take within areas designated for NEC habitat management. The table also presents the take minimization measures that will typically be implemented when NEC are present.

Table 2. Summary of Several Covered Activities and Take Minimization Measures. Additional activities may be covered, provided they are adequately described in the Cooperative Agreements.

Covered Activity	**Relative Amount of Potential Take**	**Type of Take**	**Minimization Measure**
Habitat Maintenance	Minimal	Harassment or killing	Use of hand operated equipment to selectively remove tree species (height at maturity >20 feet) in occupied habitat. If conducted during late winter, this practice could provide valuable food and cover resources that would likely benefit resident individuals. Inspect the treatment area (area immediately adjacent to the target) for NEC nestlings prior to treatment. If present, forego treatment.
Mowing	Minimal	Killing, harassment, or harm	Mowing of occupied habitat will be permitted during August, September, and October. During all other times, this activity will be designed with measures to reduce take.
Invasive Species Control	Minimal to locally extensive	Harassment or harm through loss of habitat	Special consideration must be given to maintain adequate cover (>20,000 stems per acre) for resident NEC. Prescriptions must consider site conditions, NEC use patterns, invasive species being controlled, and the desired future condition. Site specific prescriptions to minimize take will be developed for each cooperative agreement or as identified in section 9.

Dogs, (including all on and off leash activities)	Minimal	Harassment or killing	In the event that a dog pursues a rabbit, the dog shall be brought under control or removed.
Removal of eastern cottontail	Minimal	Non-target capture of NEC resulting in injury or death	Specific, mandatory protocols will be developed in consultation with the Service.

7. Expected Benefits

Over the 50-year period of this CCAA, there will be a net increase in the amount of NEC habitat on the enrolled lands from the current estimate of approximately 200 acres to as much as 5,000 acres. Based on a mean density of 0.6 rabbits per acre (Barbour and Litvaitis 1993), such an increase in available habitat is expected to support up to 3,000 NEC in southern New Hampshire. The NHFGD will maintain a parcel database to track the total beneficial effects from habitat enhancement activities resulting from this program.

8. Type/Amount of Take/Impacts

8.1 Type of Take

There are no published or unpublished studies examining whether NEC are likely to be killed or injured during routine land management activities. Accordingly, the Service is relying on information on the life history and habitat preferences for the species, personal observation of NEC, and familiarity with the land management activities that promote early successional habitat to assess the type and amount of take. The take minimization measures (Table 2) described in section 6 are expected to preclude the take of NEC for most covered activities in most situations. However, across all enrolled acres and over the 50-year term of this CCAA, the Service believes that NECs are likely to be incidentally taken.

In the rare instances when take does occur, we expect it will be in the form of killing (e.g., accidental crushing by farm machinery or felling of trees), harassment (e.g., flushing of NEC into less secure habitat exposing them to increased risks of predation and exposure to the elements), and harm (e.g., habitat modification that reduces cover and exposes rabbits to increased risks of predation or exposure to the elements). With implementation of the take minimization measures (Table 2) the covered activities in most situations are expected to result in only minor disturbance to NEC that does not cause death or injury and therefore does not constitute take under the ESA.

Because NEC is an extreme habitat specialist that is infrequently found outside dense thicket habitat, take will generally occur only in the limited instances when activities are conducted within suitable habitat. For example, when invasive shrub removal is carried

out within occupied thickets, NECs may be displaced to less suitable habitats and become exposed to an increased risk of predation. Haying on lands adjacent to suitable habitat, on the other hand, will rarely cause take of NEC because hayfields are not suitable habitat and NEC typically do not occupy these areas.

Dispersal behavior of NECs is poorly understood. During dispersal events, NECs may strike out through haylands, wood lots, or other areas that expose them to a risk of take from farming, silviculture operations, and other activities. Although covered activities that occur at these locations may result in take, this is expected to be a rare occurrence because dispersing NEC are moving through these areas and not occupying them for long periods of time

In the development of cooperative agreements, the design of NEC conservation measures and the incorporation of take minimization measures for all covered activities will preclude several forms of take. For example, time of year restrictions for certain activities to avoid the nesting season will prevent the direct take of nestling NECs through immediate killing or injuring, or indirectly, through taking of the mother.

Because NEC must spend a considerable amount of time feeding and because predation pressure is high, a NEC that is injured by a covered activity will experience a great survival disadvantage. Although some NEC may recover from injury, we expect that, for almost all injured NEC, injury will eventually lead to death. Therefore, for purposes of this take analysis, we assume a worst case scenario that all take will be in the form of death.

8.2 Amount of Take

The amount of take that will occur under this CCAA is difficult to determine because there are no studies examining the short-term deleterious effects of land management activities on NEC. In addition, the detection of NEC mortality is made difficult by the thicket habitat in which they occur and the anticipated rapid removal of carcasses by predators and scavengers. The analysis below explains that the likelihood that any individual property owner will cause take of NEC in any given year will typically be very low. However, considering all enrollees together, it is reasonably certain that some take will occur each year.

In addition, NECs that do occur on adjacent lands are expected to be found in close proximity to areas of suitable habitat and will seek refuge in this dense thicket habitat when disturbed. Nonetheless, a property owner may choose to enroll a large area of adjacent lands or even the entire property under this CCAA. Although the likelihood of take will not be the same across the entire area of adjacent lands, for simplicity our take analysis assumes that it is the same.

Enrollment under this CCAA for all property owners will not occur immediately after finalization of this CCAA and issuance of the Permit. Rather, property owners will be enrolled over time. Also, the amount of take authorized by the Permit accompanying this

CCAA is only the take that occurs after listing of the NEC under the ESA if listing becomes necessary.

Determining a precise amount of take has been made extremely difficult in the case of NEC where few population data exist. As a result of meager research the ability to assess or quantify an accurate level of take is impeded and remains challenging. Nonetheless we undertook this effort using the best available science, anecdotal information, and technical expertise and through consultation with species experts. We consulted with individuals familiar with NEC biology and habitat management in New Hampshire, and enlisted their review of our process for estimating annual take and received their concurrence (S. Fuller, pers. comm., 2010). As a result, using best available science and species expertise we estimate the annual take of NEC occurring under this CCAA to be one rabbit harassed, harmed, or killed per 100 acres each year on enrolled lands managed for NEC and one rabbit per 500 acres each year on adjacent, enrolled lands.

The total annual take authorized under this CCAA and the associated Permit will be based on the total acreage of managed and adjacent lands that are enrolled in the program. For example, if the total acreage covered under cooperative agreements reaches the acreage targeted for enrollment (5,000 acres managed for NEC and 10,000 acres of adjacent lands), we estimate the annual take of 70 NECs and anticipate that this take will most likely occur in the form of killing, harassment, and harm as described in section 8.1 above. If any NEC are determined to have been incidentally taken within enrolled lands during any calendar year, the Agencies and the participating property owner will identify and consider the need for and feasibility of additional protective measures to minimize any further incidental take.

We estimated this low amount of take because:

a) NEC does not occupy most of the properties to be enrolled under this CCAA, so initial habitat creation, restoration, and enhancement will not cause any take.
b) NEC management activities will be focused on lower quality habitats, and, where the species occurs in lower quality habitats, it occurs in low densities.
c) Activities resulting in the permanent loss of NEC habitat generally will not be covered under this CCAA.
d) NEC is adept at avoiding people, pets, and machinery by retreating into thicket refugia (A. Tur, pers. obs., 2009; Steve Fuller, pers. comm., 2010).
e) Few NECs will be located on lands adjacent to areas managed for the NEC (see discussion of dispersal, section 8.1, above).
f) Each cooperative agreement will specify conservation measures and take minimization measures that eliminate or substantially reduce the likelihood that take will occur. For example, in areas of currently occupied habitat, habitat maintenance measures will be developed that improve habitat conditions while minimizing or avoiding temporary degradation of habitat. These activities may result in the temporary displacement of individual rabbits, but it is expected that these individuals will return to these areas shortly after completion of management activities.

8.3 Impact of Take

The NEC is an early successional habitat specialist. As a consequence of these highly specialized requirements, relatively frequent habitat disturbances are required so that new habitats are available. Throughout New England, the natural processes that were responsible for generating habitat for this species, have been altered through suppression of wild fire, control of floods along rivers, stemming of forest insect outbreaks, and other actions. As a result, available habitat for this species has decreased, and habitat management is now required to create and maintain viable populations of the NEC. As a consequence of being disturbance-dependent, some impacts to NECs are a necessary consequence of management actions to benefit the species as a whole. The authorization to take up to 70 NEC per year under this CCAA depending on the enrolled acreage is inconsequential in light of the overall plan to create up to 5,000 acres of managed habitat, which should be capable of supporting 3,000 NEC per year at a density of 0.6 NEC/acre. Therefore, we conclude that this CCAA will provide significant benefits to the species.

9. Assurances Provided

Upon approval of this CCAA, and satisfaction of all other applicable legal requirements, the Service will issue a Permit in accordance with section 10(a)(1)(A) of the ESA to the NHFGD. If the Service lists the NEC as a threatened or endangered species, the permit will authorize incidental take of NECs by NHFGD and its Cooperators resulting from otherwise-lawful activities on the enrolled lands. The Permit will authorize both incidental take resulting from conservation measures benefitting NEC and from covered, non-conservation activities as described in, and in accordance with, the Permit, this CCAA, and the cooperative agreements.

The Service provides Cooperators the ESA regulatory assurances found at 50 CFR 17.22(d)(5), 17.32(d)(5). Consistent with the Service's CCAA Final Policy (64 FR 32726), conservation measures, take minimization measures, and land, water, or resource use restrictions that are in addition to the measures and restrictions described in this CCAA and the cooperative agreement will not be imposed with respect to the covered land use activities on the Cooperator's enrolled land should the NEC become listed under the ESA in the future. In the event of unforeseen circumstances, the Service will not require the commitment of additional land, water, or other natural resources beyond the level agreed to in this CCAA and the cooperative agreement. These assurances are limited by the permit suspension and revocation provisions under section 18 of this Agreement.

9.1 Changed Circumstances

"Changed circumstances" are those changes in circumstances that can reasonably be anticipated and planned for in the CCAA.

(1) Changed circumstances provided for in a cooperative agreement. Cooperative agreements will address the following changed circumstances: arrival of the eastern

cottontail on a Cooperator's property, establishment of invasive plants on a Cooperator's property, and extirpation of NEC on a Cooperator's property. Cooperative agreements will include the following statements to address these changed circumstances;

(A) Arrival of eastern cottontail. Beginning in the late 1800s, the eastern cottontail was introduced to areas east of the Hudson River. The gradual replacement of the NEC by the eastern cottontail was noted by researchers throughout the early 1900s. By the mid- 1900s, the eastern cottontail had replaced the NEC in many areas and had established itself as the most abundant cottontail rabbit throughout southern New England. Because eastern cottontails are not native to New England, they are considered an invasive species. Executive Order 13112 of February 3, 1999, directs Federal agencies to prevent the introduction of invasive species and provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause. In light of this Order and in the event that eastern cottontails arrive on enrolled lands covered under the cooperative agreement, the Cooperator will allow the Parties to this CCAA to implement removal measures that minimize the impacts to NEC (see also Conservation Measures in Table 2).

(B) Establishment of invasive plants. Many occupied NEC habitats contain invasive, non-native shrub species such as honeysuckle (Lonicera sp.), multi-flora rose (Rosa multiflora), autumn olive (*Eleaganus umbellate*), Japanese barberry (Berberis thunbergii), and other such species. Throughout the species range, there are numerous examples where NEC occupies habitat patches that are dominated by these invasive plants. Although the value of these and other invasive species for providing high quality NEC habitat has not been assessed, the importance of these habitats for supporting populations must be considered and measures to maintain suitable habitat conditions while controlling invasive shrubs, as described in Table 1, should be taken. In light of the Order referenced above, if invasive plants become established on enrolled lands and the Service and NHFGD determine that control of invasive plants, beyond the habitat management measures already included in the cooperative agreement, is necessary to achieve the goals of the cooperative agreement, the Cooperator will allow the Parties to this CCAA to implement control measures that minimize the deleterious impacts of invasive plants.

(C) Absence or Extirpation of NEC. With prior notification, the Cooperator will allow the Parties to this CCAA, or their agents, access to the enrolled property to restore the NEC, if in the judgment of NHFGD and the Service, it is determined that the species is absent or has become extirpated on the enrolled property and suitable habitat is available to support a reintroduction.

(D) Beaver. Beavers may become established in areas that are being managed for the benefit of NEC. If control of beavers (or water levels in beaver ponds) is necessary to achieve the goals of the cooperative agreement, the Cooperator will

allow the Parties to this CCAA to implement control measures that minimize the deleterious impacts of beavers.

(2) Changed circumstances not provided for in the cooperative agreement. If a cooperative agreement is being properly implemented and additional conservation measures not provided for in the cooperative agreement are necessary to respond to changed circumstances, NHFGD and the Service will not require any conservation measures in addition to those provided for in the cooperative agreement without the consent of the Cooperator.

9.2 Unforeseen Circumstances

"Unforeseen circumstances" are those circumstances affecting the NEC that could not have been reasonably anticipated by the NHFGD and the Service when the CCAA and a cooperative agreement were signed, and that result in a substantial and adverse change in the status of the NEC.

(A) If additional conservation measures are necessary to respond to unforeseen circumstances, the Service may require additional measures of the Cooperator where the cooperative agreement is being properly implemented, but only if such measures are limited to modifications within the CCAA's conservation strategy, and only if those measures maintain the original terms of the CCAA to the maximum extent possible. Additional measures may be included in cooperative agreements entered into after the Service gives NHFGD notice of the need for such additional measures. For cooperative agreements entered into prior to such notice, the Service may not require, without the consent of the Cooperator, additional conservation measures that involve the commitment of additional land, water, or financial compensation, or additional restrictions on the use of land, water, or other natural resources available for development or use under the original terms of the cooperative agreement.

(B) The Service will have the burden of demonstrating that unforeseen circumstances that require additional conservation measures exist, using the best scientific and commercial data available. These findings must be clearly documented and based upon reliable technical information regarding the status and habitat requirements of the NEC. The Service will consider, but not be limited to, the following factors:

(1) Size of the current range of the affected species;
(2) Percentage of range adversely affected by the CCAA;
(3) Percentage of range conserved by the CCAA;
(4) Ecological significance of that portion of the range affected by the CCAA;
(5) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the CCAA; and
(6) Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

10. Monitoring and Reporting

10.1 Monitoring

Following notification to the landowner, the NHFGD, the Service, or their agents may access the enrolled properties to conduct compliance and biological monitoring. Further, the Parties will cooperate to survey a sample of enrolled properties every three years. On each sample property monitoring will be conducted to provide data on: (a) presence/absence or density of NEC; (b) the status of any implemented conservation measures; and (c) current habitat condition and extent. The Parties will cooperate to share data, and NHFGD will update the database and provide updated data to the Service by September 1 of each survey year. Biological monitoring methodology will be determined by available funding. In the event that the NEC is added to the Federal list of threatened and endangered wildlife, then NHFGD shall on an annual basis, monitor the amount of take on each enrolled property. The monitoring of the amount of take shall be in terms of the acreage of lands managed for NEC and the acreage of adjacent, enrolled lands, and in terms of rabbits observed by the Cooperator or NHDFG to have been actually taken.

10.2 Reporting

Monitoring and compliance will be tracked by parcel. The NHFGD will maintain a parcel database that will provide a precise measure of the total beneficial effect of habitat enhancement resulting from the project. The database will include all enrolled lands and will be updated annually to track biological and compliance data for enrolled properties. The database will include the following data fields: (a) date of last biological survey; (b) number of NEC observed to be taken; (c) description of unforeseen or changed circumstances; (d) present/absent/unknown status of NEC in last year; (e) last known compliance status; (f) acres enrolled to be managed for NEC; (g) extent of acres of habitat managed for NEC in last year; (h) last estimate of habitat condition; and, (i) last estimate of habitat extent. NHFGD agrees to provide the Service access to parcel data and will provide annual updates by September 1. Annual updates will include a data summary table for the fields agreed upon by the Parties.

11. Responsibilities

11.1 Cooperator

The responsibilities of the Cooperators will be detailed in each cooperative agreement.

11.2 New Hampshire Fish and Game Department

The NHFGD agrees to encourage and assist property owners in the State of New Hampshire (a) to become Cooperators pursuant to this CCAA and (b) to implement management measures beneficial to the conservation of the NEC. The NHFGD agrees to enter into cooperative agreements with property owners who choose to become

Cooperators, to monitor and report periodically to the Service on the status of such cooperative agreements, and generally to assist the Service in implementing and administering this CCAA. The NHFGD agrees to develop cooperative agreements in accordance with the standards of this CCAA.

Prior to entering into each cooperative agreement and issuing an associated Certificate of Inclusion (CI), NHFGD agrees to confer with the Service in the development of the cooperative agreement and CI, and to make a good faith effort to resolve any differences with the Service prior to issuance.

The NHFGD agrees to work with the Service to address changed and unforeseen circumstances, and to implement any conservation measures assigned to NHFGD in any cooperative agreement.

The NHFGD agrees to monitor, confer with the Service, and timely suspend or revoke the CI of any Cooperator that does not carry out the terms of the cooperative agreement.

For lands under NHFGD ownership or easement, on which NHFGD intends to voluntarily implement conservation measures for NEC, and for which NHFGD requests authorization for take of NEC under the Permit, NHFGD agrees to develop a property-specific agreement under the same requirements that apply for cooperative agreements. The NHFGD agrees to confer with the Service in the development of this property-specific agreement and to comply with the monitoring and reporting requirements for these agreements as specified in Section 10 above.

11.3 U.S. Fish and Wildlife Service

The Service agrees to issue NHFGD a Permit under section 10(a)(1)(A) of the ESA, 50 CFR §§ 17.22(d), 17.32(d), and the Service's CCAA Policy. Such permit, and the Certificate of Inclusion that NHFGD will issue to each Cooperator upon entering into a cooperative agreement, shall extend to Cooperators specified rights with respect to the incidental taking of the NEC.

The Service will confer with NHFGD during the development of the cooperative agreement and CI, and to make a good faith effort to resolve any differences with the NHFGD prior to issuance.

The Service agrees to work with NHFGD to address changed and unforeseen circumstances.

The Service agrees to review the status of the NEC during the 50-year term of this CCAA. If persistence of the species has been achieved as measured by the goals outlined in section 5, the Service may, with consent of NHFGD, terminate this CCAA and its associated CIs, and cooperative agreement. For example, if the NEC becomes recovered or extinct (and removed from either the Candidate list or list of threatened and endangered wildlife, as appropriate), the CCAA and its associated CIs and cooperative agreements may be terminated.

12. Notification of Take

Each cooperative agreement will identify those actions (conservation measures and covered activities) that are expected to result in take of NEC and for which the Cooperator will be required to give notice and provide an opportunity for the NHFGD, the Service, or their agents to relocate NECs prior to the action. Such notice will be provided at least 60 days in advance of the action.

13. Duration of CCAA, Permit, Cooperative Agreements, and Certificates of Inclusion

The CCAA will continue in effect for 50 years from the date of the last signature below. The section 10(a)(1)(A) Permit authorizing take of the NEC will become effective on the effective date of the final rule listing it as a threatened or endangered species under the ESA and will expire when this CCAA expires or is otherwise suspended or terminated. The permit and CCAA may be extended beyond the specified terms prior to Permit expiration through the permit renewal process and with agreement of the Parties. Cooperative agreements and CIs may not extend past the expiration date of the CCAA and Permit. In addition, each Cooperator must agree to maintain and manage suitable habitat for the NEC in accordance with the plan set forth in his/her cooperative agreement, for a period of at least 10 years from the date of the agreement.

14. Modification of the CCAA and Cooperative Agreements

Either Party may propose modifications to this CCAA by providing written notice to, and obtaining the written concurrence of, the other Party. Such notice shall include a statement of the proposed modification, the reason for it, and its expected results. The Parties will use their best efforts to respond to proposed modifications within 60 days of receipt of such notice. Proposed modifications will become effective upon completion of any required environmental and other analyses and the other Party's written concurrence. Similarly, individual cooperative agreements enrolled under this CCAA may be proposed to be modified by either Party or the Cooperator. Notice of the proposed modification to the cooperative agreement must be made in writing and will become effective upon written concurrence of both Parties and the Cooperator.

15. Amendment of the Permit

Subject to sections 9.1 and 9.2 above, the Permit may be amended to accommodate changed circumstances in accordance with all applicable legal requirements, including but not limited to the ESA, the NEPA, and the Service's permit regulations at 50 CFR 13 and 50 CFR 17. The party proposing the amendment shall provide a statement describing the proposed amendment and the reasons for it.

16. Termination of Agreements

16.1.1 Termination of Cooperative Agreements by Cooperators

As provided for in Part 8 of the Service's CCAA Policy (64 FR 32726, June 17, 1999), a Cooperator may, for good cause, terminate implementation of a cooperative agreement's voluntary management actions prior to the cooperative agreement's expiration date, even if the expected benefits have not been realized. If a Cooperator terminates his/her cooperative agreement, the Certificate of Inclusion is terminated at the same time, thus relinquishing the Cooperator's take authorization (if the NEC has become listed) and the assurances granted by the Permit. The Cooperator is required to give 60 days written notice to NHFGD of its intent to terminate the cooperative agreement, and must give NHFGD, the Service, or their agents the opportunity to relocate affected NECs within 60 days of the notice.

16.2 Termination of Cooperative Agreements by the Parties

Either Party has the right to cancel any cooperative agreement and the associated Certificate of Inclusion where the Cooperator or his/her successor(s) is found to be in non-compliance with the terms and conditions of his/her cooperative agreement. If a Cooperator is found to be in non-compliance, NHFGD will issue a written letter of non-compliance to the Cooperator. The Cooperator shall have sixty (60) days from receipt of the letter to rectify the non-compliance issue(s). If the issue(s) is not resolved to the satisfaction of the Parties by mutual consent by the end of the 60-day period, the cooperative agreement shall be declared null and void. At that point, the cooperative agreement and associated Certificate of Inclusion shall cease to be in effect. The Service reserves the right to utilize the provisions of this part at its discretion to review and/or terminate a Cooperator's cooperative agreement and Certificate of Inclusion.

16.3 Termination of the CCAA by NHFGD

NHFGD, for good cause, may terminate this Agreement prior to its expiration date by giving at least 90 days prior written notice to FWS and to all cooperating landowners holding a certificate of inclusion. During this notice period NHFGD will make good faith efforts and pursue all appropriate options with FWS to either:

a. locate a suitable transferee to assume the rights and responsibilities of NHFGD under this Agreement and the Permit pursuant to 50 C.F.R. 13.24(c), 13.25(c), or

b. assist all cooperating landowners holding a certificate of inclusion who desire to do so in obtaining individual permits pursuant to 50 C.F.R. 17.22(b), 17.32(b), 17.22(d), or 17.32(d), as appropriate.

In the event that the Parties are unable to locate a suitable transferee within the 90-day notice period, or any extension to which the parties may agree in writing, then upon the termination of this Agreement, NHFGD will surrender the Permit to FWS for cancellation pursuant to 50 C.F.R. 13.26.

17. Suspension or Revocation of the Cooperative Agreement by the NHFGD

NHFGD hereby commits to monitor, confer with the Service, and timely suspend or revoke the Certificate of Inclusion of any Cooperator that does not carry out the terms of the cooperative agreement.

18. Permit Suspension or Revocation

The Service may suspend or revoke the NHFGD's Permit for cause in accordance with the laws and regulations in force at the time of such suspension or revocation (see 50 CFR 13.28(a)). The Service will give NHFGD notice of its intention to suspend or revoke the Permit and an opportunity for NHFGD to terminate its cooperative agreements and Certificates of Inclusion. The Service may, as a last resort, revoke the Permit if continuation of permitted activities would likely jeopardize the continued existence of the NEC (50 CFR 17.22(d)(7)/17.32(d)(7)). The Service will revoke because of jeopardy concerns only after first implementing all practicable measures to remedy the situation.

19. Remedies

Each Party shall have all remedies otherwise available to enforce the terms of the CCAA and the Permit. Neither Party shall be liable for damages for any breach of this CCAA, any performance or failure to perform an obligation under this CCAA, or any other cause of action arising from this CCAA.

20. Dispute Resolution

The Parties agree to work together in good faith to resolve any disputes between the Parties and between the NHFGD and Cooperators, using dispute resolution procedures agreed upon by both Parties.

21. Succession and Transfer of Cooperative Agreements

Cooperative agreements entered into pursuant to this CCAA shall be binding on and shall inure to the benefit of the Cooperators and their participating successors and transferees (i.e., new owners) in accordance with applicable regulations (50 CFR 13.24 and 13.25). The rights and obligations under a cooperative agreement may be transferred with the ownership of the enrolled property and are transferable to subsequent non-Federal property owners pursuant to 50 CFR 13.25. The Certificate of Inclusion issued to the property owner is also transferable to the new owner(s) pursuant to 50 CFR 13.25. If a Certificate of Inclusion is transferred, the new owner(s) will have the same rights and

obligations with respect to the enrolled property as the original owner. The new owner(s) also will have the option of receiving CCAA assurances by signing a new cooperative agreement instead of assuming the existing one. Each cooperative agreement shall require the Cooperator to notify NHFGD in writing of any transfer of ownership, so that NHFGD can attempt to contact the new owner, explain the conservation measures applicable to the property and the assurances, and seek to interest the new owner in signing the existing cooperative agreement or a new one. Assignment or transfer of the Certificate of Inclusion shall be governed by Service regulations in force at the time.

22. Availability of Funds

Implementation of this CCAA is subject to the requirements of the Anti-Deficiency Act and the availability of appropriated funds. Nothing in this CCAA will be construed by the Parties to require the obligation, appropriation, or expenditure of any funds from the U.S. Treasury. The Parties acknowledge that the Service will not be required under this CCAA to expend any Federal agency's appropriated funds unless and until an authorized official of that agency affirmatively acts to commit to such expenditures as evidenced in writing. Nothing in this CCAA will be construed by the Parties to require the obligation, appropriation, or expenditure of any funds by the NHFGD, or to obligate the NHFGD to enter a cooperative agreement or issue a certificate of inclusion to any landowner.

23. No Third-Party Beneficiaries

This CCAA does not create any new right or interest in any member of the public as a third-party beneficiary, nor shall it authorize anyone to maintain any suit, including without limitation, any suit for personal injuries or damages.

24. Notices and Reports

Any notices and reports, including monitoring and annual reports, required by this CCAA shall be delivered to the persons listed below, as appropriate:

Program Coordinator
New England Cottontail CCAA
Nongame and Endangered Species Program
New Hampshire Fish and Game Department
11 Hazen Drive
Concord, NH 03301-6500

Agreement Administrator
New England Cottontail Candidate Conservation Agreement with Assurances
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, New Hampshire 03301

This agreement shall be implemented in conformance with all applicable laws and regulations of the United States and with all consistent laws and regulations of the State of New Hampshire. If any provision of this agreement is held unlawful, it may be severed and the remaining provisions will continue in force, consistent with the overall purpose to provide improved habitat quality and quantity for the NEC.

This document constitutes the entire agreement between the Parties and no modification shall be effective unless it is in writing and signed by the authorized representatives of both Parties.

IN WITNESS WHEREOF, THE PARTIES HERETO have, as of the last signature date below, executed this CCAA to be in effect as of the date that the Service issues the Permit.

_____

Glenn Normandeau Date
Executive Director
New Hampshire Fish and Game Department

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Marvin Moriarty Date
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Appendix A. Range-wide New England Cottontail Conservation Goals

When developing goals for species in need of conservation, ecologists must consider species-specific life history traits. These traits include morphological, developmental, or behavioral characteristics, including, for instance, body size, growth patterns, size and age at maturity, reproductive effort, mating success, number, size, and sex of offspring, and rate of senescence (Ronce and Olivieri 2004, p. 227).

Given the life history characteristics of the New England cottontail (Sylvilagus transitionalis, NEC), we believe that the key to viability is to ensure that the species is provided with ample resources. In addressing the resource needs of the NEC, we considered factors that address habitat quality and quantity. In addition, we also recognize that the landscape level alterations that have occurred throughout the species' range have fragmented NEC populations. As a consequence, NEC populations are believed to function as a metapopulation; that is, a set of local populations which interact via individuals moving between local populations (Hanski and Gilpin 1991, p. 7; Litvaitis and Villafuerte 1996, p. 686). Therefore, we also consider the spatial structure of these populations in addition to the species' life history characteristics in formulating management systems that seek to ensure viability of the species (Hanski 1998, p. 41).

Life History Considerations

The NEC, like all cottontails, is short lived and reproduces at an early age with some juveniles probably breeding in their first season. Litter size is typically five young (range 3-8), and females, which provide little parental care, may have 2-3 litters per year. Female NECs have a high incidence of postpartum breeding, demonstrate density independent breeding response, and have a rapid rate of maturity (approximately 40 days from conception to parental freedom) (Chapman and Ceballos 1990, p. 108). These characteristics allow a species to thrive in spite of a high predation rate, provided ample resources are available (Chapman, Hockman and Edwards 1982, p. 105). In the case of cottontail rabbits, these principal resources consist of ample, nutritious food and habitat that is free from interspecific competition and provides security from excessive predation (Chapman, Hockman and Edwards 1982, p. 106). We believe that a focused effort to increase food, cover, and sheltering resources for this species will achieve long-term viability.

NECs are considered habitat specialists, insofar as they are dependent upon early-successional habitats, frequently described as thickets (Litvaitis 2001, p. 466). Barbour and Litvaitis (1993, p. 324) demonstrated a relationship with microhabitats containing >50,000 stem-cover units/ha (20,234 stem cover units/acre). It was also determined that New England cottontails occupying small patches of habitat less than or equal to 2.5 hectares (ha) (about 6 acres) were predominantly males, had lower body mass, consumed lower quality forage, and had to feed farther from protective cover than rabbits in larger patches ($\geq$ 5 ha or 12+ acres) (Barbour and Litvaitis 1993, p. 321). This study also demonstrated that NECs in the smaller patches had only half the survival rate of those in the larger patches due to increased mortality from predation.

Environmental conditions are known to impact survival. Specifically, winter severity, measured by persistence of snow cover, is known to affect NEC survival because it increases their vulnerability to predation, particularly in low quality habitat patches (i.e., small size and low stem density) (Brown and Litvaitis 1995, pp. 1005-1011). Barbour and Litvaitis (1993, p. 321) state that the skewed sex ratios (or single occupant) and low survival among rabbits on small patches may effectively prevent reproduction from occurring on small patches. Due to skewed sex ratios and low survival rates, the presence of NEC in these small patches is dependent on immigration through the dispersal of individuals from source populations (Barbour and Litvaitis 1993, p. 326). Litvaitis et al. (2007, p. 179) and Barbour and Litvaitis (1993, p. 321) view these small patches as sink habitats.

Interspecific Competition

To insure that the NEC receives maximum benefit from the new food, cover and shelter resources that are provided through a conservation program, those resources should occur in an environment that is free from interspecific competition. The NEC is largely sympatric with the eastern cottontail (Sylvilagus floridanus), which was introduced into much of the range of the NEC. The introduction and spread of eastern cottontails has been a factor in reducing the occurrence of the NEC within its historical range (Johnston 1972, p. 17). Tens of thousands of individuals of four or five different subspecies of eastern cottontail were introduced to the Northeast, beginning on Nantucket Island, Massachusetts in 1899 (Johnston 1972, p. 3). The historical range of the eastern cottontail extended Northeast only as far as the lower Hudson Valley and possibly, extreme western Connecticut (Nelson 1909, pp. 20-25, 160-161, 170-171, 194-199; Goodwin 1935 in Chapman and Stauffer 1981, p. 980). Large-scale introductions of eastern cottontails to Connecticut (Nelson 1909 and Dalke 1942 in Chapman and Stauffer 1981, p. 980), Rhode Island (Johnston 1972, p. 6), Massachusetts (Johnston 1972, pp. 4-5) and possibly Vermont (C. M. Kilpatrick, in litt. 2002) have firmly established the eastern cottontail in all of New England except Maine. Introductions usually have been conducted by states and private hunting clubs. The eastern cottontail is both larger (1,300 gm or 2.9 lb) and more fecund than the NEC.

In states where researchers and state wildlife agencies reported the NEC had been the predominant or the only cottontail encountered during the early-to-mid-1900s, by the latter half of the century the eastern cottontail had become by far the most common rabbit (Johnston 1972, pp. 1-70, Tracy 1995, pp. 1-49, Cardoza in litt. 1999). Maine, where the eastern cottontail is not known to occur, is the only exception to this pattern. Johnston (1972, pp. 17), in summarizing the history of eastern cottontail introductions, reported that this occupation of new areas by the eastern cottontail seems to be at the expense of NEC.

Probert and Litvaitis (1996, p. 289) found that eastern cottontails, though larger, were not physically dominant over NEC. Later, Smith and Litvaitis (1999) reported that the eastern cottontail had a larger exposed surface area of the eye and consequently had a

greater reaction distance to a simulated owl than did NEC. In this way, eastern cottontails have the ability to use a wider range of habitats including relatively open areas such as meadows and residential back yards, compared to the NEC. Through "prior rights" (Litvaitis et al. 2007) eastern cottontails are thereby able to exploit newly created habitats sooner than NEC. Once established, the highly fecund eastern cottontails are not readily displaced by NECs (Probert and Litvaitis 1996, p. 292, Litvaitis et al. 2007). If our conservation approach is to be successful, then the role of the eastern cottontail as a non-native, invasive competitor must be addressed.

Demographic and Environmental Stochasticity

In metapopulations, population extinction and colonization at the patch specific scale are recurrent rather than unique events (Hanksi 1998, p. 42). As with many metapopulations, local extinction events in NEC are likely to be the result of demographic, environmental, and genetic stochasticity. While there are no examples of genetic stochasticity that have led to inbreeding depression or other adverse effects in NECs, there are indications that demographic and environmental stochasticity play a role in the persistence of NEC populations. For example, small patch size affects survivability and sex ratio, resulting in demographic stochasticity and local extinctions. Winter snow depth and persistence is another example of a stochastic environmental factor that could cause a local extinction. However, we recognize that winter severity operates at a regional scale and, therefore, addressing the effects of environmental processes at the patch-specific scale will be difficult. To guard against the risk of local extinctions caused by environmental stochasticity, conservation efforts should be distributed across the species' range. In addition, although there are no published studies regarding genetic stochasticity that inform our conservation approach for the NEC, a strategy that preserves all genetic heterozygosity within the species should be considered.

Extrapolating Patch-Specific Considerations to a Regional Scale

The two familiar forms of stochasticity affecting local populations, demographic and environmental stochasticity, have exact counterparts at the metapopulation level in extinction-colonization (also called immigration-extinction) and regional stochasticities (Hanski 1991, p. 31). Extinction-colonization dynamics in metapopulations consisting of small extinction-prone local populations can only persist regionally when extinction and colonization are balanced or when colonization exceeds extinction (Hanski 1998, p. 43). Thus, the fate of metapopulations is generally determined by the strength of source populations, as well as the dispersal ability of the organism in question. When localized extinction occurs, the area may become reoccupied by dispersing individuals from other source habitats. This requisite reoccupation is dependent upon the strength and distribution of source populations and the species' dispersal capability. However, with small patch sizes, declining habitat base and relatively low dispersal ability, the NEC is considered vulnerable to continued reductions in numbers and distribution (Dalke 1937, p. 542, Litvaitis and Jakubas 2004, p. 41).

Although information relating to colonization is required to fully understand the factors leading to regional persistence, dispersal and colonization rates in NEC populations are unknown. Nonetheless, the colonization ability of the NEC was considered in the construction of a computer simulation model of NEC metapopulations (Litvaitis and Villafuerte 1996, p. 689). In this model, the authors relied upon information extrapolated from other mammals, especially snowshoe hare. Based on their analysis, they determined that dispersal of NEC fit a geometric distribution, with a maximum distance of 3 km.

Towards the Development of a Conservation Strategy

The metapopulation framework recognizes and provides a conceptual model for evaluating the interactions of within- (e.g., birth, death, competition) and among-population processes (e.g., dispersal, gene flow, colonization and extinction) (Thrall et al. 2000, pg. 75). In practical terms, metapopulation extinction is a function of the number, size, quality, and connectivity of habitat patches within the system (Drechsler and Wissel 1998). This approach has been useful in formulating other management strategies, such as that developed for the northern spotted owl (Thrall et al. 2000, pg. 87). Therefore, a metapopulation approach may provide a useful tool for the development of a management strategy for the NEC because it addresses genetic, demographic, and environmental effects of fragmentation (Thrall et al. 2000, pg. 75).

In their computer simulation model, Litvaitis and Villafuerte (1996, p. 686-693) analyzed various population scenarios and developed management guidelines for the NEC. Based upon their analysis, they suggest that a network of suitable habitat patches, each 15-75 ha (38 to 185 acres) in size and totaling 150 ha, may be sufficient to sustain local populations of NECs, where the carrying capacity of a patch was 1 rabbit / 0.5 hectares (p. 688). A conservation network of this size would be expected to result in a maximum local population size of 150 rabbits. Conservation biologists now recommend population thresholds of 500 individuals at the local level and 5000 individuals for ensuring viability (Traill et al. 2010, p. 33). In addition, 15 - 20 habitat patches are considered to be desirable to reduce the probability of metapopulation extinction (Hanski 1998, p. 48).

Summary

In developing the conservation goals for the NEC, we recognize that the science of conservation biology is “as broad as biology itself” and acknowledges that the formulation of conservation solutions involves all aspects of biology, from molecular biology to population biology (Soule and Wilcox, 1980 in Young and Clarke 2000, pg. 1). In the development of our conservation goals, we acknowledge that new information regarding the NEC may require us to re-evaluate our goals. In the meantime, uncertainty regarding our conservation targets should not distract or delay positive efforts to address the conservation needs of the NEC. To achieve viability for the cottontail, we plan to:

- avoid further loss and fragmentation of existing populations;

- implement conservation actions that increase patch quality, quantity, and connectivity;
- establish management agreements to ensure that large, source populations remain viable and their habitats remain suitable;
- implement conservation actions, throughout the range, to establish:
    - 1 NEC landscape capable of supporting 2,500 or more individuals;
    - 5 landscapes each capable of supporting 1,000 or more individuals; and
    - 12 landscapes each capable of supporting 500 or more individuals;
- evaluate the role of eastern cottontails as a non-native competitor and implement conservation actions that address this threat, as appropriate.

The Service has defined a NEC landscape as an area consisting of a network of 15 or more habitat patches, each 25 acres or greater in size, and situated within dispersal distance (less than 1 km) to other patches of suitable habitat. Landscape planning efforts should take into account the habitat matrix, because areas with numerous anthropogenic features or substantial natural barriers are likely to be highly fragmented and form barriers to dispersal and may otherwise encumber conservation efforts.

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