

**Programmatic Candidate Conservation Agreement with Assurances
for the
New England Cottontail in Southern Maine
Between
The Maine Department of Inland Fisheries and Wildlife
and
The U.S. Fish and Wildlife Service**



With Support from



1. Introduction

This agreement between the Maine Department of Inland Fisheries and Wildlife (MDIFW) 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) of 1973, as amended. 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 only that resulting from activities covered in cooperative agreements between the MDIFW and non-Federal landowners (Cooperators) in southern Maine who are willing to engage in voluntary conservation actions for the NEC. Take authorization provided by the Permit will be extended to participating Cooperators through Certificates of Inclusion (CIs) issued by the MDIFW.

The “Conservation Strategy for the New England Cottontail” provides a discussion of the species’ biology, threats to its continued existence, conservation actions to address those threats, and coordination of a rangewide effort to implement those actions (Fuller and Tur 2012, <http://www.newenglandcottontail.org/>).

In August 2000, the Service received a petition to list the NEC as either threatened or endangered under the ESA. Subsequently, a rangewide 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 higher priority listing actions, and designated the NEC a “Candidate” for listing (71 FR 53756 [Sept. 12, 2006]). As a candidate species, the NEC is eligible for inclusion in CCAAs. In 2007, Maine's legislature approved MDIFW's recommendation to add NEC to the list of endangered species under Maine's Endangered Species Act.

2. Enrolled Lands

The MDIFW seeks to enroll up to 4,856 hectares (ha) (12,000 acres (ac)) of private and state-owned lands located throughout southern Maine for the purpose of implementing habitat management practices under this programmatic CCAA. The agreement area for this CCAA will encompass the historical range of the NEC within Maine in York, Cumberland, Androscoggin, Sagadahoc, Lincoln, Knox, Oxford, Kennebec, and Waldo Counties (Figure 1). Enrolled lands include: (1) any non-Federal lands for which the owner enters into a cooperative agreement with MDIFW pursuant to this CCAA; (2) state-owned lands managed in accordance with a property-specific agreement; and (3) lands under the same ownership that are adjacent to lands being managed for the benefit of NEC (hereafter referred to as “adjacent lands”). These three categories of lands will be enrolled under the procedures outlined herein and will then be considered “enrolled properties.” While any landowner meeting the CCAA requirement may be enrolled,

MDIFW will target lands for habitat management in approximately 0.2 percent of the nine counties within the agreement area.

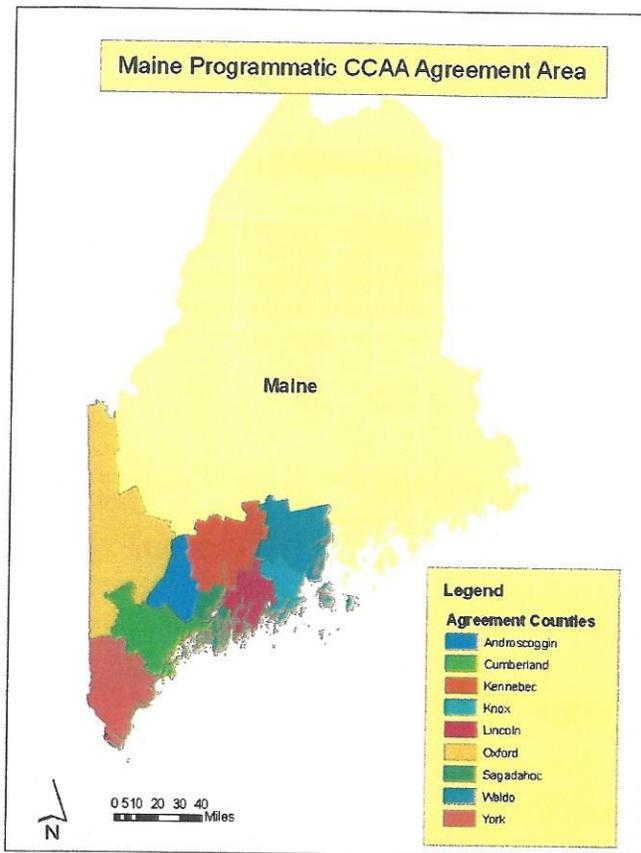


Figure 1. The Maine Programmatic CCAA Agreement Area covers the historical range of NEC in Maine, including York, Cumberland, Androscoggin, Sagadahoc, Lincoln, Knox, Oxford, Kennebec, and Waldo Counties.

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 NEC. Because resources for implementing conservation measures on enrolled lands are limited, sites with the highest potential value to NEC and anticipated conservation success will be prioritized for enrollment. Sites within Maine’s NEC focus areas (Figure 2) will be prioritized above sites outside of the focus areas, although it is understood that the boundaries of the focus areas

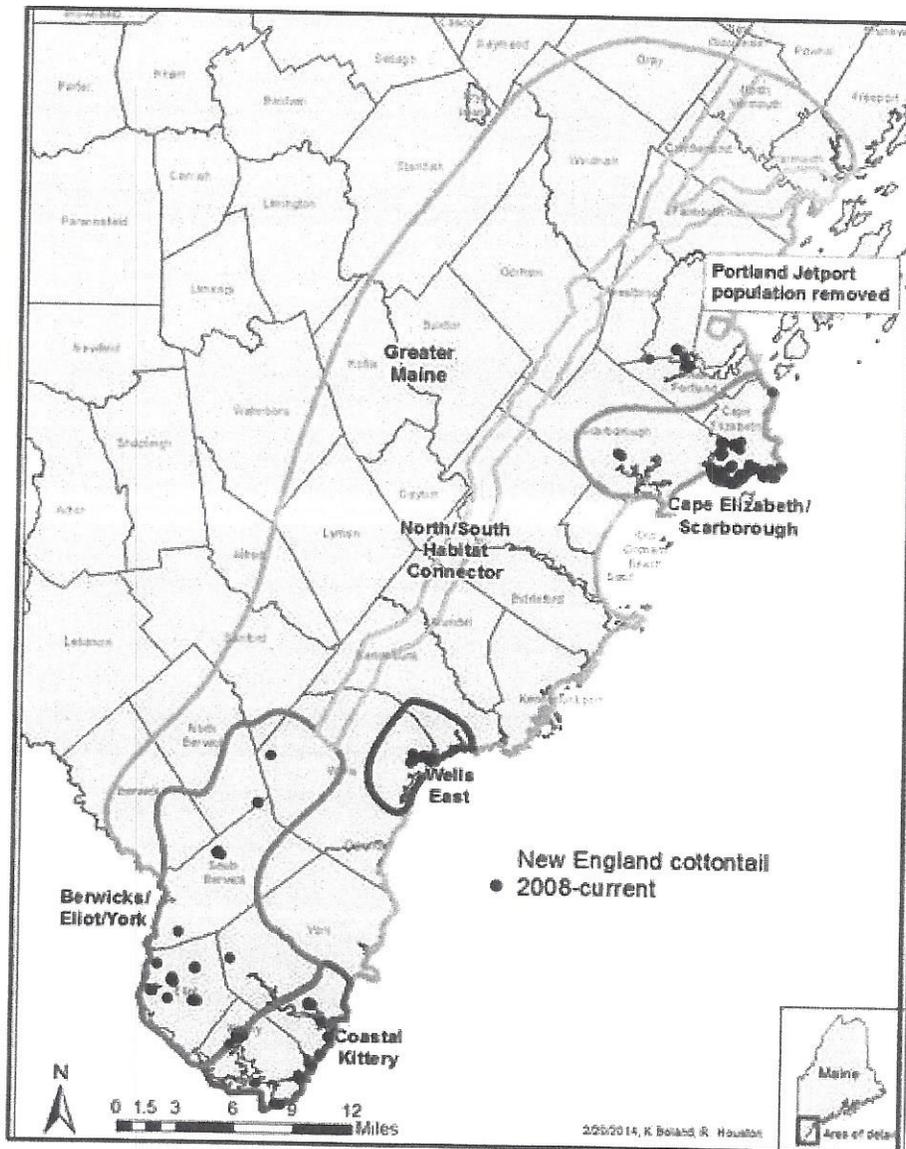
will evolve as new surveys are conducted and new information becomes available.

Prioritization will occur at two scales—the parcel level and the landscape level—and will be evaluated through a model that ranks parcels according to a variety of metrics, including but not limited to: proximity to an occupied NEC site, potential habitat within parcel, current NEC habitat within parcel, and proximity to corridors. Other factors such as perceived cost of management, dispersal barriers, and neighboring land use may also be considered when prioritizing sites for enrollment.

Adjacent lands are also eligible for enrollment under this CCAA. These adjacent lands include areas where otherwise lawful ongoing and future activities (e.g., hay production) may result in inadvertent take of NEC. Although the amount of adjacent acreage that a Cooperator will enroll under this CCAA will depend on the circumstances specific to the property and property owner, the estimated amount of adjacent lands that the typical Cooperator will enroll is expected to be approximately equal to five times the area of the lands actively managed for NEC. Therefore, about 24,000 ha (60,000 ac) of adjacent lands are associated with the 4,856 ha (12,000 ac) targeted for NEC habitat management. If the targeted amount of managed lands reaches 4,856 ha (12,000 ac) under this CCAA,

the estimated amount enrolled under this CCAA will reach a total of about 29,000 ha (72,000 ac).

Figure 2. Maine's six focus areas and 2008 to 2013 New England cottontail locations.



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, Appendix 1) 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 Cooperator is authorized through an enhancement of survival Permit that is issued in association with the CCAA to take the covered species on the enrolled lands 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 Cooperators. 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 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, and to take such steps as may be appropriate to achieve the purposes of "...treaties and conventions..." 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. Maine Department of Inland Fisheries and Wildlife

The Maine Endangered Species Act (MESA) prohibits the export, take, and possession of State species that have been identified as endangered or threatened (12 MRS § 12801-12810). However, the Commissioner of the MDIFW may permit certain activities, including those that enhance the survival of the species and those that result in incidental take of the species.

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

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

3.2 Purpose

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

The Parties are employing a programmatic approach to ensure consistent biological performance standards for all Cooperators, to gain efficiency in administering conservation with multiple Cooperators, and to best utilize the capabilities of the MDIFW for NEC conservation. The biological performance standards are stated in section 5 of this CCAA. The Parties to this CCAA are compelled to use 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 Cooperators by identifying expectations, establishing roles and responsibilities, and removing regulatory disincentives.

4. Description of Existing Conditions

4.1 Description of the NEC

The NEC is the only endemic cottontail in New England (Probert and Litvaitis 1996, p. 289). The NEC is a medium-sized cottontail rabbit that may reach 1,000 grams (2.2 pounds) in weight. Like the congeneric (separate species of the same genus) eastern cottontail (*Sylvilagus floridanus*), the NEC can be distinguished from the snowshoe hare by its lack of seasonal variation in pelage (a mammal's coat consisting of fur or hair) coloration and distinctly smaller hind (back) foot. New England and eastern cottontails can be difficult to distinguish in the field by external characteristics (Chapman and Ceballos 1990, p. 106). However, features such as body mass, pelage characteristics and ear length can be used by trained experts to differentiate the two species in the field (Litvaitis *et al.* 1991). Also, cranial (referring to the skull) differences, specifically the length of the supraorbital process (elongated bony structure located posterior (behind) to the eye) and the pattern of the nasal frontal suture (the junction between the nasal and frontal bones), 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 three to eight) and females, which provide little parental care, may have two to three 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), and is expected to be similar in Maine and throughout the NEC's range. Initiation of nesting is closely associated with the spring green-up (Chapman, Hockman and Edwards 1982, p. 94) when food becomes more nutritious. 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 that prohibits researcher access and discovery (T. Goodie, pers. comm.). Female NEC 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 cottontail rabbit populations to persist in spite of a high predation rate, provided ample food and cover that prevents excessive predation is available (Chapman, Hockman and Edwards 1982, pp. 105 and 106).

The historical 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 (km²) (34,750 square miles (mi²)) (Litvaitis *et al.* 2006, p. 1191).

The NECs are 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 greater than 50,000 stem-cover units/ha (20,234 stem cover units/ac). 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 important to thicket-dependent wildlife, and have provided substantial NEC habitat in Maine.

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 to 15 years), a condition providing favorable habitat for the cottontail (Lorimer and White 2003, pp. 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 km² (34,750 mi²) encompassed in the estimated historical range, the current estimated range covers 12,180 km² (4,700 mi²) (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 NEC occupancy. 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 NEC (Litvaitis *et al.* 2006, pp. 1190-1197). Litvaitis *et al.* (2006, p. 1193) reported that NEC were absent from 93 percent of the 2,333 habitat patches searched within the recent historical range (1990 to present). 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 (updated in the 2013 Candidate Notice of Review (CNOR) (77 FR 70103)) 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.

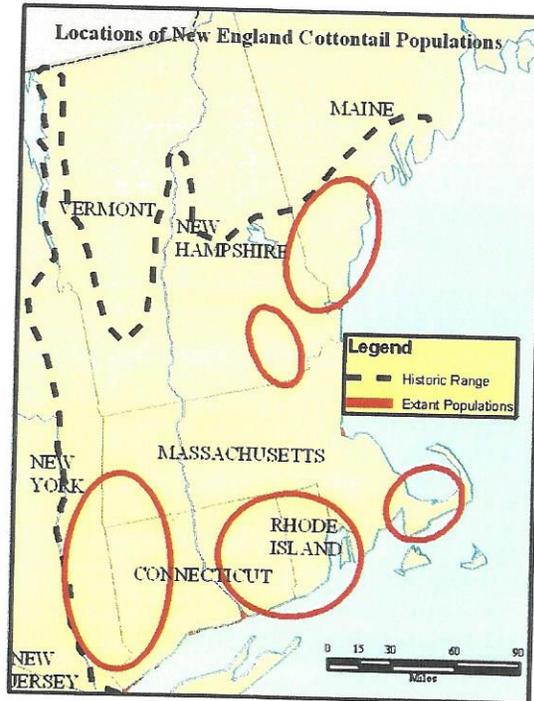


Figure 3. Distribution of Five Extant NEC Populations within the Species' Historical Range (adapted from Nelson 1909; Litvaitis and Litvaitis 1996, p. 725).

(A) The present or threatened destruction, modification, or curtailment of its habitat or range. 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 numerical population trend data is not available (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. In general, the overall range of the NEC has contracted by 80 percent or more since 1960 (Litvaitis *et al.* 2006, p. 1191). Land uses throughout the species' range indicate that the rate of change, about two percent range loss per year, will continue (Litvaitis and Johnson 2002, pp. 3–4). In a survey conducted in the early 2000s, 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 (Figure 3). 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. Natural processes (e.g., wildfire) that once established early successional habitat are not balancing this loss of habitat through forest succession. Habitat loss is further accelerated by destruction and fragmentation 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.

(B) Overutilization for commercial, recreational, scientific, or educational purposes. The NEC is considered a small game animal by 4 of the 6 state wildlife agencies in the northeastern states. It is legally hunted within season and bag limitations in New York, Connecticut, Massachusetts, and Rhode Island. However, New Hampshire has modified its hunting regulations to prohibit the take of cottontails in those portions of the State where the NEC is known to occur (NHFG 2004), and Maine has closed the cottontail season (MDIFW 2004).

Rabbits may be regarded as pests and killed by gardeners and farmers. However, because of differences in habitat preference of the two cottontail species, most farmers and homeowners are more likely to encounter eastern cottontails, which occur in the more open habitats of farms and residential lawns, than NECs.

(C) Disease or predation. 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. However, 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, pp. 325 and 326). NEC are more vulnerable to predation in small habitat patches because small patches offer fewer opportunities for NEC to feed in the close proximity of cover and food sources under cover may become exhausted from heavy use. If NEC are forced to find food away from cover they will be vulnerable to predation. A highly fragmented landscape compounds this situation by supporting populations of generalist predators and reducing NEC colonization success. Consequently, predation, as exacerbated by habitat fragmentation and the small size of many of the remaining suitable patches of habitat, and poses a threat to the species.

To complete its 2006 status review, the Service reviewed the best scientific and commercial data available and found no evidence that disease was a threat to the NEC (<http://www.fws.gov/ecos/ajax/speciesProfile/profile/speciesProfile.action?spcode=A09B>). The 2013 CNOR (77 FR 70103) update likewise determined that disease is still not a threat to the NEC.

(D) The inadequacy of existing regulatory mechanisms. Most remaining habitat is on private land that is not managed for NEC preferred habitat conditions, and is not subject to regulatory mechanisms that would require such management. Within the five population clusters (Figure 3), the Service estimated that less than one-third of the populations occur on state, Federal, or private conservation land, and only a fraction of

that habitat, perhaps ten percent, is managed for habitat conditions needed by the species. In its 2006 status review and 2013 CNOR, the Service determined that existing regulatory mechanisms are not sufficient to address the continued destruction and modification of habitat through conversion to other land uses and fragmentation associated with expanding human populations; accordingly, the Service concluded that existing regulatory mechanisms were inadequate to protect the NEC.

(E) Other natural or manmade factors affecting its continued existence. Other natural or manmade factors are also a threat to the continued existence of the species. Specifically, within portions of 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 (Litvaitis *et al.* 2006, p. 1193). The eastern cottontail, having more generalized requirements that allow it to exist in a wider array of habitats and being less vulnerable to predation, can displace the NEC where their ranges overlap. Eastern cottontail populations are not known to occur in Maine and are therefore not currently considered a threat to the NEC in Maine, though the range of the eastern cottontail could potentially expand into Maine within the foreseeable future. Over browsing by white-tailed deer (*Odocoileus virginianus*) may reduce vegetative cover; thereby, increasing the vulnerability of NEC to predation, increase the ratio of invasive to native plants, and decrease the availability of preferred browse species.

4.2 Description of Existing Conditions within the Covered Area

Based on historical records and archaeological evidence, the NEC's historical range is thought to have encompassed most of southern Maine, including York, Cumberland, Androscoggin, Sagadahoc, Lincoln, Knox, Kennebec, Waldo, and Oxford Counties (Figure 4). The geographic range of NEC in Maine is thought to have contracted by at least 83 percent, from 9,400 km² (5,840 mi²) in the early 1970s to 1,600 km² (994 mi²) (Litvaitis *et al.* 2003, pp. 879–881). Continued development in the Northeast is expected to result in an additional NEC range loss of 2 percent per year, especially in Maine where urbanization is expected to increase over the next 50 years in areas occupied by NEC (Litvaitis and Johnson 2002, pp. 3-4; Litvaitis and Jakubas 2004, p. 29). All known NEC occurrences are located within York and Cumberland Counties, where young forest habitats have declined significantly in recent decades. In 1971, young forest habitat made up 38.9 percent of the landscape; however, by 2010, only 3% of the landscape was comprised of young forest habitat (Fig. 4 and 5).

(Figure 4). *Figure 4. Historic range of NEC in Maine. Adapted from Litvaitis et al. 2003, p. 882.*

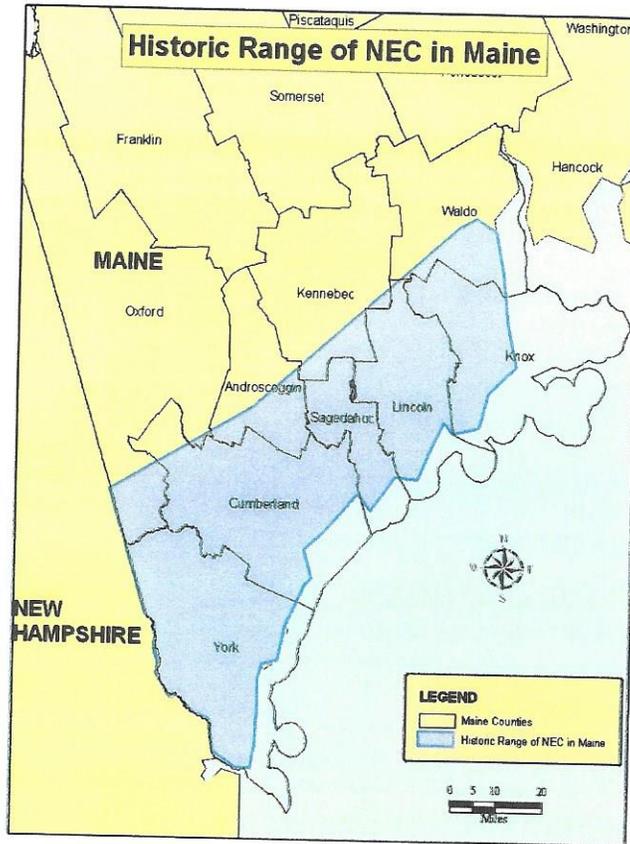
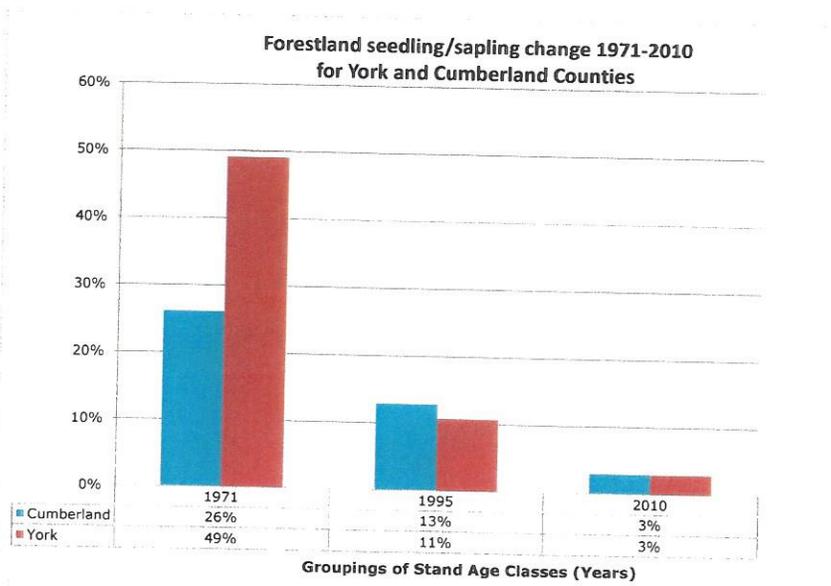
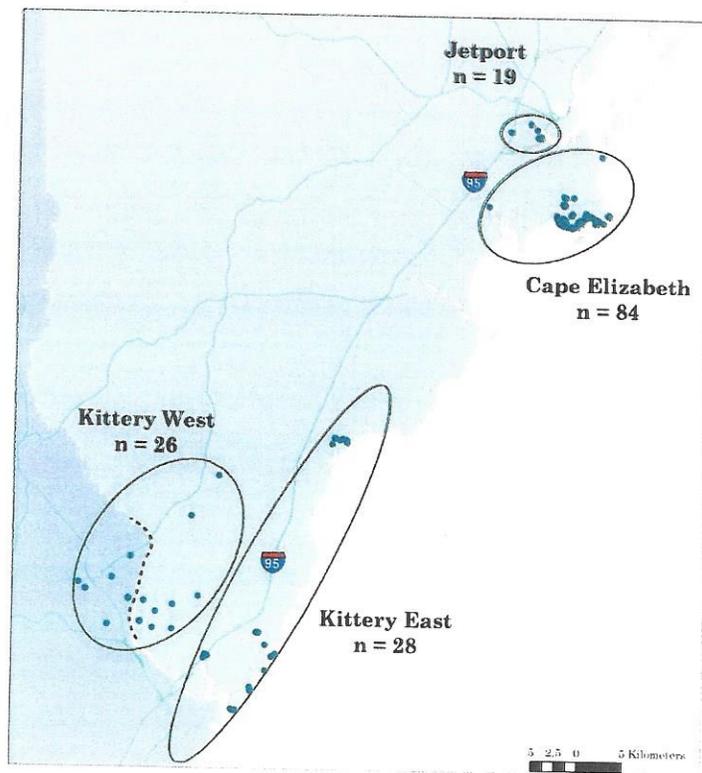


Figure 5. Change of the amount of young forest land in York and Cumberland Counties in Maine over time. Data are from the US Forest Service Forest Inventory and Assessment (Personal Communication, Ken Laustsen, Maine Forest Service; from Miles 2010).



Surveys from winters 1999-2000 and 2000-2001 suggest that most (68 percent) habitat patches occupied by NEC are smaller than 2.5 ha (6 ac), and the average distance between an occupied patch and a vacant patch is 2.6 km (1.6 mi) (Litvaitis *et al.* 2003, p. 884). Surveys conducted in Maine from 2007 to 2009 suggest that the NEC can no longer be found in 9 of the 19 towns in which they were found during the 2001 to 2004 surveys (K. O'Brien and K. Boland, pers. comm., 2009). A 2010 genetic study that investigated fine-scale genetic structuring in Maine's NEC revealed three distinct populations, geographically distributed: (1) in a cluster in Cape Elizabeth and extending southward through Scarborough (Cape Elizabeth); (2) east of I-95 in Wells, York and Kittery (Kittery East); and (3) west of I-95 in Eliot and North and South Berwick and west to Durham and Dover New Hampshire (Kittery West) (Figure 6; Fenderson *et al.* 2014). Additional structuring was identified in the Kittery West population, as evidenced by slight genetic difference between NEC populations on either side of the rivers that form the geopolitical boundary between Maine and New Hampshire (Figure 6). There is currently little evidence of gene flow among these three populations, which suggests that NEC populations within Maine have been fragmented for some time, most likely as a result of land use conversion (Fenderson *et al.* 2014).

Figure 6. Genetic clusters (and number of individuals sampled in each population) of New England cottontails in southern Maine and Seacoast New Hampshire. The Jetport population was moved as part of a mitigation effort for an expansion of the Portland International Jetport to Stage Island, Maine. None of the 15 rabbits captured at the jetport survived more than 1 year on the island. IFW has no evidence to suggest this population still exists.



5. Conservation Measures

High value NEC conservation focus areas within the Maine CCAA Agreement Area were identified and ranked using information including, but not limited to, proximity to occupied NEC site(s), potential habitat within parcel, current NEC habitat within parcel, and proximity to corridors (Figure 2). These areas will be the primary focus of the NEC conservation effort in Maine.

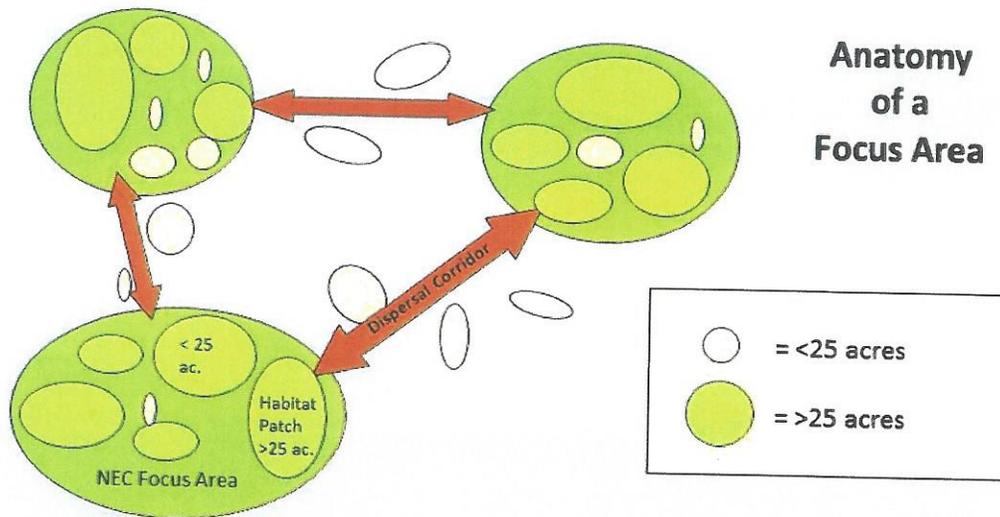
However, focus area boundaries may change as information improves. For example, discovery of unknown populations within the Agreement Area may warrant an expansion of conservation efforts into new areas outside the current focus area boundaries.

The implementation goal for this CCAA is to create several landscapes capable of supporting self-sustaining populations of NEC containing 500 or more individuals. 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 10 ha (25 ac) or greater in size, and situated within dispersal distance (within 1 to 3 km or 0.6 to 1.8 ha) to other patches of suitable habitat. In addition, the Service recommends that landscape planning efforts should take into account the habitat matrix, since areas with numerous anthropogenic (human made) features or substantial natural barriers are likely to be highly fragmented, form barriers to dispersal, and may otherwise encumber conservation efforts.

To achieve the implementation goal, MDIFW and its conservation partners will need to recruit private landowners interested in creating or sustaining NEC habitat on their property, create additional NEC habitat on state lands, and acquire additional properties for conservation/restoration in key locations. The objective will be to create landscape that provides a minimum of 404 ha (1,000 ac) of habitat in patches that are located within dispersal distance (within one to three km or 0.6 to 1.9 mi) of each other. Landscapes providing this amount of habitat should be capable of sustaining 500 or more NECs. These landscapes will be created around known occurrences of NEC or in areas where NEC translocations have been planned.

An additional objective under the implementation goal will be to establish habitat connectivity and management programs that will sustain a matrix of early successional habitats capable of supporting a NEC population (Figure 7). Each NEC landscape will be comprised of multiple habitat patches, several of which will be greater than 10 ha (25 ac) in size. Because most properties in southern Maine are small, it is unlikely that enough NEC habitat will be made available on any single property to reach the landscape habitat objective. Instead, it is anticipated that the establishment of a NEC landscape will require multiple properties to achieve the desired amount of habitat needed to support a population of 500 rabbits. These goals and objectives are provided to describe the conservation approach and do not imply criteria to determine eligibility of a property for CCAA inclusion.

Figure 7. Conceptual Model for the Conservation of the New England Cottontail. This diagram depicts one possible configuration of habitat networks or metapopulations.



Each Focus Area should:

- Contain at least 404 ha (1000 ac) of habitat to support 500 NEC;
- Consist of one or more metapopulations separated by less than 5 km(3 mi), each containing 15 or more habitat patches (fewer when patches are greater than 50 acres), several of which should be 10 ha (25 ac) or greater in size; and
- Have each habitat patch within 3 km (1.9 mi) or less of one or more other patches (within reasonable dispersal distance for individual NEC).

It is best, although not necessary, for connectivity to exist or be established between metapopulations and focus areas, although that may not be feasible within the five geographic areas currently known to have NEC.

At a local scale, NEC populations are believed to function as a metapopulation (a set of local populations which interact via individuals moving between local populations) (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 rangewide NEC conservation goals (Fuller and Tur 2012, entire) based upon the conservation principles of metapopulations (Hanski and Gaggiotti 2004, entire). The following conservation goals need to be achieved throughout the species' range within Maine to ensure NEC persistence.

- 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.

This CCAA framework initiates a program to implement the above measures within the state of Maine. However, 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 rangewide NEC conservation goals because it seeks to create several landscapes, each capable of supporting 500 cottontails. 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. Prescribed conservation measures will be dependent on site-specific conditions and may not necessarily match the examples listed here.

In the future, new information may assist in identifying additional threats, as well as new or improved management techniques, necessitating modification of conservation measures specified in a cooperative agreement or through implementation of additional conservation measures. In this event, changes will be made in accordance with sections 9 and 14 of this CCAA.

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 are present, prescriptions must include measures to reduce take.	Improved habitat quality, in particular better food and cover value. Increase carrying capacity for NEC.

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
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 are unlikely to occur in these areas where this prescription is applied, no take is anticipated. Establishment of shrubs. This can be achieved by planting seeds and seedlings or by ceasing to mow old fields, allowing them to revert naturally to shrublands.	Increased habitat quality and quantity to enhance persistence of NEC.

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
<p>Habitat conversion to a structure or use (e.g., row crops) with no habitat value for NEC. This conversion may include alteration of hydrology.</p>	<p>Lack of suitable habitat and lack of rabbits.</p>	<p>Habitat restoration or creation. Since NEC are 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.</p>	<p>Increase in habitat available for NEC. Increased carrying capacity for NEC.</p>
<p>Dispersal barriers between occupied or suitable patches prevent or reduce metapopulation functions.</p>	<p>Absence of habitat corridors linking patches of suitable habitat. NEC becomes extirpated in some patches.</p>	<p>Create or restore habitat linkages (e.g., hedgerow management or old field conversion to thickets). Since NEC are unlikely to occur in these areas where this prescription is applied, no take is anticipated.</p>	<p>Increased NEC movement among and between habitat patches – fewer long-term extirpations from patches.</p>

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
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 promote rather than destroy suitable shrub habitats. If NEC are present, prescriptions must include measures to reduce take.	Creation of stable or appropriately managed 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 <i>may</i> result in poor 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 stem density below currently accepted MDIFW standards) of mechanical, chemical, and prescribed grazing to control non-native plants and planting of native shrubs will be conducted.	Improved habitat quality without sacrificing NEC cover quality. Increased carrying capacity for NEC.

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
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 carrying capacity for NEC.
Alteration of Disturbance Regimes			
Beaver management and beaver flowage management.	Abandoned beaver flowages succeed into shrub thickets that provide NEC habitat.	Manage beaver flowages in a manner that allows for succession into thicket habitat over time. Prevent existing meadows from being flooded by beaver activity. 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 carrying capacity for NEC.

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
Recreation			
<p>NEC harassment or incidental take due to hunting for other species.</p>	<p>Dogs utilized in sport hunting activities pursuing rabbits.</p>	<p>Post informational signs alerting hunters to the NEC's presence and protected status under Maine law. In the event that a dog pursues a rabbit, the dog shall be brought under control.</p>	<p>Reduce harassment and incidental take.</p>
Predation			
<p>Excessive mortality due to predation.</p>	<p>NEC population decline.</p>	<p>Increase habitat quality or quantity to build resiliency of local populations to predation. Develop a predator management plan. Reduce secondary food sources available to predators (e.g., proper disposal of dead livestock). Prior to the initiation of predator management, develop and implement protocols that minimize take of NEC.</p>	<p>Decrease predator densities. Increased NEC survival and numbers.</p>

Threat	As evidenced by...	Conservation Measure	Expected Conservation Benefit of Implementation of the Conservation Measure
Competition			
Occupancy of habitat by eastern cottontails. The eastern cottontail is not known to occur in Maine; however, this threat is included in the event that it becomes established within the agreement area.	Replacement or establishment of eastern cottontail in a patch that would otherwise be suitable for NEC.	Use of live traps to facilitate the removal of eastern cottontail. 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 eastern cottontail removal, protocols that minimize take of NEC must be developed and implemented.	Occupancy of additional habitats by NEC.

Additional Conservation Measures to Avoid Impacts to the northern long-eared bat (*Myotis septentrionalis*)

The northern long-eared bat is known to occur in southern Maine. White-nose syndrome (WNS) has caused a precipitous population decline in this species throughout the Northeast. In Maine, it is estimated that the NLEB population has declined by 99% because of WNS (MDIFW, state listing documentation). Currently, the species is proposed for listing under the federal Endangered Species Act and is also being considered for listing under Maine's Endangered Species Act.

During the summer, the northern long-eared bat forages in forested habitats by night and by day they roost in trees, buildings and other suitable locations that provide ample warmth and security. These roosting habitats also provide maternity sites where multiple females congregate to raise their young. In New Hampshire, prior to the outbreak of WNS in North America, trees used for maternity roosts by the northern long-eared bat averaged 10.8 individuals per tree (Sasse 1995, p. 34). Females with young may switch roost trees every two days and use two to seven different trees while they are nursing to obtain suitable temperatures and rearing conditions (Foster and Kurta 1999, p. 665). In

the Northeast, maternity roosts are more likely to be in deciduous than coniferous trees (Broder and Forbes 2004, p. 605), and are often located in the largest available snags (dead standing trees) within any given stand (mean Diameter at Breast Height [DBH] 40.9 centimeters [cm] or 16.1 inches [in.] in Sasse 1995, p. 23-25; mean DBH 41 cm [16 in.] in Garroway and Broders 2008, p. 91). Northern long-eared bats prefer roosting in trees that have sufficient structure, such as sloughing bark, crevices, and holes. If this structure is available they will use both live trees and snags, with a preference for snags in mid-decay (sloughing bark present; Lacki and Schwierjohann 2001, p. 482; Broders and Forbes 2004, p. 604; Sasse 1995, p. 23). Forest stands where maternity roost are located generally contain tall, shade tolerant, deciduous trees; a significant number of snags; a relatively open tree canopy; and contain a diversity of tree size classes (Sasse 1995, entire; Lacki and Schwierjohann 2001, entire; Broders and Forbes 2004, entire; Garroway and Broders 2008, entire). In late summer and early fall, northern long-eared bat migrate to areas with caves, mines, or other underground voids where they will hibernate through the winter season.

We considered whether tree clearing conducted under the CCAA will result in harm to the northern long-eared bat through significant habitat modification or degradation that result in death or injury to the species. In addition, we considered whether tree clearing would significantly impair key behavioral activities such as breeding, feeding, or sheltering. Forest inventory analysis estimates that the Programmatic CCAA Agreement Area contains approximately 1.4 million ha (3.5 million ac) of forested habitat (McCaskill *et al.* 2005, p. 121). Based on current information regarding the implementation of forestry operations to enhance NEC habitat in Maine, we expect that each NEC habitat enhancement site will rarely exceed 50 acres in size. We also calculate that the total amount of forest that will potentially be managed for the benefit of NEC through this CCAA (4,856 ha or 12,000 ac) represents 0.3 percent of the forested habitat available for northern long-eared bat within the agreement area. Because the extent of forests impacted for NEC habitat enhancement sites is small compared with the amount of potential northern long-eared bat available in the area, and because the northern long-eared bat is known to be resilient to relatively large amounts of forest fragmentation (i.e., watershed scale disturbance) (Johnson *et al.* 2014, pp. 229), we do not expect the CCAA to result in significant impacts to northern long-eared bat through reduction in foraging habitats. We also anticipate that the inadvertent loss of any potential roost trees resulting from activities associated with this CCAA will not excessively limit abundance of roost trees for bats that have not succumbed to WNS. Consequently, we conclude that cutting of roost trees during the hibernation season is not likely to adversely affect northern long-eared bat, and no conservation measures to avoid harm will be required.

Next we considered whether tree clearing conducted under the CCAA will result in take of the northern long-eared bat through removal of roost trees during the summer roosting period. Due to their rarity and the extent of forest clearing conducted through this CCAA, there is minimal probability that tree clearing during the maternity season will adversely affect northern long-eared bat. In the rare instances when take does occur, we expect it to occur as a result of tree clearing during the maternity season when northern

long-eared bat pups are present and most likely to be killed or injured if the maternity roost is cut. To further minimize the potential effects of tree cutting on northern long-eared bat, landowner agreements under this CCAA will stipulate that forest cutting for NEC habitat restoration on enrolled lands should not occur between June 1 and August 15, which coincides with the period of the northern long-eared bat maternity season and when pups are expected to be present and vulnerable. A delay of forest cutting until after August 15 should allow adequate time for young northern long-eared bat to wean and become volant. This cutting restriction would not apply to trees less than 7.6 cm (3 in.) in diameter at breast height (DBH). However, because a natural forest structure (e.g., the number of deciduous trees greater than 2m (6.5 feet) in height [Garroway and Broders 2008, p. 91]) is considered important to northern long-eared bat site selection in Acadian forests, understory trees less than 7.6 cm (3 in.) DBH in a mixed age forest will not be cut during the maternity period for northern long-eared bat. This cutting restriction only applies to lands enrolled under this CCAA for which NEC habitat management activities will be applied and does not apply to adjacent lands. Other forestry activities or tree cutting activities that the landowner may wish to conduct on adjacent lands do not require adherence to the June 1 to August 15 cutting restriction.

In summary, to minimize adverse effects to NLEB resulting from NEC habitat management activities:

- Trees that are 7.6 cm (3 in.) DBH or greater will not be cut for the purpose of NEC habitat management during the maternity season defined for Maine, which extends from June 1 to August 15; and
- Understory trees less than 7.6 cm (3 in.) DBH in a mixed age forest will not be cut from June 1 to August 15.

Based on incorporation of these measures, we conclude that the CCAA is not likely to adversely affect the northern long-eared bat, because effects are extremely unlikely to occur.

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, minor construction activities (e.g., construction of a tractor shed), and silviculture.

Activities within occupied suitable habitat are expected to expose NEC to the greatest amount of risk for take. For an activity to be covered under this CCAA, the property owner must provide sufficient detail in their Agreement 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, and the level of take can be reasonably estimated. This information must be included in the cooperative agreement so that it can be reviewed by the MDIFW and the Service to determine compliance with the ESA, regulations, and CCAA policy. Specifically, covered activities will be reviewed to determine if the conservation measures implemented adequately offset take resulting from the covered activities. Higher impact activities that are not adequately offset by the proposed conservation efforts are not covered because take is not offset to the degree necessary to meet the CCAA standard. Such activities are beyond the scope of analysis for this CCAA.

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 Covered Activities and Take Minimization Measures.

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 greater than 20 feet) in occupied habitat. If conducted during late winter and tree tops are left on the ground, this practice could provide valuable food and cover resources that would likely benefit resident NEC individuals. Inspect the treatment area (area immediately adjacent to the target) for NEC nestlings prior to treatment. If present, forego treatment.
Covered Activity	Relative Amount of Potential Take	Type of Take	Minimization Measure
Mowing	Minimal	Killing, harassment, or harm.	Mowing of occupied habitat 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 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, and could include rotational

			treatments of small patches at a time or treatments that maintain currently accepted MDIFW standards for stem density at all times.
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.
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, the Service anticipates a net increase in the amount of NEC habitat on the enrolled lands by as much as 12,000 acres. Based on an estimated mean density of 1.6 rabbits per hectare (0.66 rabbits per ac; Barbour and Litvaitis 1993), such an increase in available habitat is expected to support up to 7,900 NEC in southern Maine. These benefits will significantly contribute to conservation of NEC. The MDIFW 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 anticipates that some NEC are likely to be incidentally taken.

In the rare instances when take does occur, the Parties to this agreement 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 the NEC is a habitat specialist that is infrequently found outside dense thicket habitat, take will generally occur only in the limited instances when activities are conducted within occupied suitable habitat. For example, when invasive shrub removal is carried out within occupied thickets, NEC 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 NEC is unknown. During dispersal events, NEC may strike out through grasslands, 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 NEC through immediate killing or injuring, or indirectly, through taking of the nursing female.

The NEC spends a considerable amount of time feeding, and because predation pressure is high, any rabbit that is injured by a covered activity will experience a great survival disadvantage. Although some NEC may recover from injury, it is expected that, for almost all injured NEC, injury will eventually lead to death. Therefore, for purposes of this take analysis, the Service assumed 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 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 expected that some take will occur each year.

In addition, NEC 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 is extremely difficult in the case of NEC where few population data exist. As a result of limited data, the ability to assess or quantify an accurate level of take is impeded and remains challenging. Nonetheless, this effort was undertaken using the best available science, reliable anecdotal information, technical expertise, and through consultation with NEC experts. The Service consulted individuals familiar with NEC biology and habitat. These experts were asked to independently review the process for estimating annual take and provide individual recommendations if they thought the process was not accurate; all individuals concurred that the process used was appropriate (S. Fuller, pers. comm., 2010; W. Jakubas, pers. comm., 2012). As a result, using best available science and species expertise, an estimate of the annual take of NEC occurring under this CCAA was determined to be one rabbit harassed, harmed, or killed per 100 acres each year on enrolled lands managed for the NEC, and one rabbit per 500 acres each year on adjacent, enrolled lands. Therefore, the maximum permitted total annual take each year will be based on the 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 (12,000 acres managed for NEC and 60,000 acres of adjacent lands), its estimated amount of annual take would be 240 NEC and occur as a result of killing, harassment, and harm as described in section 8.1 above.

It is estimated that a low amount of take will occur because:

- a) The NEC does not occupy most of the properties to be enrolled under this CCAA, therefore initial habitat creation, restoration, and enhancement will not cause any take.
- b) The 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) The NEC is adept at avoiding people and machinery by retreating into thicket refugia (J. Greene, pers. comm.; A. Tur, personal observation; Steve Fuller, pers. comm., 2010).
- e) Few NEC 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 wildfire, 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 NEC populations. As a consequence of being disturbance-dependent, some impacts to NEC are a necessary consequence of management actions to benefit the species as a whole. The authorization to take up to 240 NEC per year under this CCAA, depending on the enrolled acreage, is inconsequential in light of the overall plan to create up to 12,000 acres of managed habitat, which should be capable of supporting 7,900 NEC per year at a density of 0.66 NEC/acre. Therefore, the Parties 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 MDIFW. If the Service federally lists the NEC as a threatened or endangered species, the Permit will authorize incidental take of NEC by the MDIFW 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) and 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 federally listed. 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, absence or extirpation of NEC on a Cooperator's property, and changes in beaver activity 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 (*Eleagnus umbellata*), 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 Executive Order referenced above, if invasive plants become established on enrolled lands and the Service and the MDIFW 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, if desired, the Cooperator can 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 the MDIFW 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 activity affecting habitat. Beavers may become established in areas that are being managed for the benefit of NEC. If control of beavers (or water levels in beaver flowages) is necessary to achieve the goals of the cooperative agreement, the Cooperator will, with prior notification, 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, the MDIFW 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 MDIFW 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.

(1) 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 the MDIFW 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.

(2) 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:

- (A) Size of the current range of the affected species;
- (B) Percentage of range adversely affected by the CCAA;
- (C) Percentage of range conserved by the CCAA;
- (D) Ecological significance of that portion of the range affected by the CCAA;
- (E) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the CCAA; and
- (F) 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 Cooperator, the MDIFW, 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 3 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. Additional data may be collected as determined necessary by the Parties. The Parties will cooperate to share data, and the MDIFW will update the parcel database (described in more detail in section 10.2) 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, the MDIFW 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 actual rabbits observed by the Cooperator or the MDIFW to have been taken.

10.2 Reporting

Monitoring and compliance will be tracked by parcel. The MDIFW or designee 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 since last biological survey; (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) acres of habitat managed for NEC in last year; (h) last estimate of

habitat condition; and, (i) last estimate of habitat extent. The MDIFW 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 Maine Department of Inland Fisheries and Wildlife

The MDIFW agrees to encourage and assist property owners in the State of Maine to (a) become Cooperators pursuant to this CCAA and (b) implement management measures beneficial to the conservation of the NEC. The MDIFW 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 MDIFW agrees to develop cooperative agreements in accordance with the standards of this CCAA.

Prior to entering into each cooperative agreement and issuing an associated CI, the MDIFW 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 MDIFW agrees to work with the Service to address changed and unforeseen circumstances, and to implement any conservation measures assigned to the MDIFW in any cooperative agreement.

The MDIFW 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 MDIFW ownership or easement, on which the MDIFW intends to voluntarily implement conservation measures for NEC, and for which the MDIFW requests authorization for take of NEC under the Permit, the MDIFW agrees to develop a property-specific agreement under the same requirements that apply for cooperative agreements. The MDIFW 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 the MDIFW 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 CI that the MDIFW 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 the MDIFW during the development of the cooperative agreements and CI, and to make a good faith effort to resolve any differences with the MDIFW prior to issuance.

The Service agrees to work with the MDIFW 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 conservation of the species has been achieved as measured by the goals outlined in section 5, the Service may, with written consent of the MDIFW, terminate this CCAA and its associated CIs, and cooperative agreements. For example, if the NEC becomes recovered or extinct (and removed from the informal species of concern list, 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 reasonably expected to result in take of NEC and for which the Cooperator will be required to give notice and provide an opportunity for the MDIFW, the Service, or their agents to relocate NEC 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 written 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 cooperative 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 National Environmental Policy Act, and the Service's permit regulations at 50 CFR 13 and 50 CFR 17. The Party proposing the amendment shall provide a written statement describing the proposed amendment and the reasons for it.

16. Termination of Agreements

16.1 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 CI 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 a 60-day written notice to the MDIFW of its intent to terminate the cooperative agreement, and must give the MDIFW, the Service, or their agents the opportunity to relocate affected NEC 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 CI 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, the MDIFW will issue a written letter of non-compliance to the Cooperator. The Cooperator shall have a 60-day period, beginning upon 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 CI 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 CI.

16.3 Termination of the CCAA by the MDIFW

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

- A. Locate a suitable transferee to assume the rights and responsibilities of the MDIFW under this Agreement and the Permit pursuant to 50 CFR 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 CFR 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, the MDIFW will surrender the Permit to the Service for cancellation pursuant to 50 CFR 13.26.

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

The MDIFW hereby commits 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.

18. Permit Suspension or Revocation

The Service may suspend or revoke the MDIFW'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 the MDIFW a 90-day notice of its intention to suspend or revoke the Permit and an opportunity for the MDIFW to terminate its cooperative agreements and CIs. 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 MDIFW 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 CI issued to the property owner is also transferable to the new owner(s) pursuant to 50 CFR 13.25. If a CI 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 the MDIFW in writing of any transfer of ownership, so that the MDIFW 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 CI 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 MDIFW, or to obligate the MDIFW to enter into a cooperative agreement with and issue a CI 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:

Wildlife Division Director
Maine Department of Inland Fisheries and Wildlife
284 State Street
State House Station #41
Augusta, Maine 04333

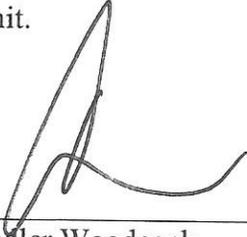
Agreement Administrator
New England Cottontail Candidate Conservation Agreement with Assurances
Maine Field Office, Ecological Services
U. S. Fish and Wildlife Service
17 Godfrey Drive, Suite 2
Orono, Maine 04473

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 Maine. 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.

October 29, 2014

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.



Chandler Woodcock
Commissioner
Maine Department of Inland Fisheries and Wildlife

3-3-15

Date

Acting

Paul R. Phifer

Paul R. Phifer, Ph.D.
Northeast Assistant Regional Director, Ecological Services
U.S. Fish and Wildlife Service

4-10-15

Date

LITERATURE CITED

- Barbour, M.S. and J.A. Litvaitis. 1993. Niche dimensions of New England cottontails in relation to habitat patch size. *Oecologia* 95:321-327.
- Broders, H.G., and G.J. Forbes. 2004. Interspecific and intersexual variation in roost-site selection of northern long-eared and little brown bats in the Greater Fundy National Park ecosystem. *Journal of Wildlife Management*. 68:602-610.
- Broders, H.G., G.J. Forbes, S. Woodley, and I.D. Thompson. 2006. Range extent and stand selection for roosting and foraging in forest-dwelling northern long-eared bats and little brown bats in the greater Fundy ecosystem, New Brunswick. *Journal of Wildlife Management* 70:1174-1184.
- Bromley, S. W. 1935. The original forest types of southern New England. *Ecol. Monographs* 5:23-32.
- Brooks, R.T. 2003. Abundance, distribution, trends and ownership patterns of early-successional forests and native shrublands in the northeastern United States. *Forest Ecology and Management*. 185:65-74.
- Chapman, J.A., J.G. Hockman and W.R. Edwards. 1982. Cottontails (*Sylvilagus floridanus* and Allies). Pp. 83-123 in J.A. Chapman and G.A. Feldhamer, editors. *Wild Mammals of North America*. The John Hopkins University Press, Baltimore, Maryland, USA.
- Chapman, J.A. and G. Ceballos. 1990. Chapter 5: The Cottontails In Rabbits, hares, and pikas -- status survey and conservation action plan. pp. 95-110. Ed. by J.A. Chapman and J.E.C. Flux. International Union of Conservation and Nature, Gland, Switzerland.
- Cronon, W. 1983. *Changes in the Land. Indians, Colonists and Ecology of New England*. McGraw-Hill Ryerson Ltd., Toronto. 241 pp.
- Fenderson, L.E. 2010. Landscape genetics of the New England cottontail: effects of habitat fragmentation on population genetic structure and dispersal. MS thesis, University of New Hampshire, Durham, NH. 169 pp.
- Fenderson, L. E., A. I. Kovach, J. A. Litvaitis, K. M. O'Brien, K. M. Boland, and W. J. Jakubas. 2014. A multiscale analysis of gene flow for the New England cottontail, an imperiled habitat specialist in a fragmented landscape. *Ecology and Evolution* 4:1853-1875.
- Foster, R.W, and A. Kurta. 1999. Roosting ecology of the northern bat (*Myotis septentrionalis*) and comparisons with the endangered Indiana bat (*Myotis sodalis*). *Journal of Mammology* 80:659-672.

- Fuller, S. and A. Tur. 2012. Conservation Strategy for the New England cottontail (*Sylvilagus transitionalis*).
- Garroway, C.J. and H.G. Broders. 2008. Day roost characteristics of northern long-eared bats (*Myotis septentrionalis*) in relation to female reproductive status. *Ecoscience* 15:89-93.
- Hanski, I. and O.E. Gaggiotti. 2004. Ecology, Genetics, and Evolution of Metapopulations. Elsevier Academic Press, Amsterdam.
- Johnson, J. B., Roberts, J. H., King, T. L., Edwards, J. W., Ford, W. M., and Ray, D. A. 2014. Genetic structuring of northern myotis (*Myotis septentrionalis*) at multiple spatial scales. *Acta Theriologica*, 59(2), 223-231.
- Johnston, J.E. 1972. Identification and distribution of cottontail rabbits in southern New England. MS thesis, University of Connecticut, Storrs. 70 pp.
- Kovach, A. and L. Fenderson. 2010. Final report to Maine Outdoor Heritage Fund. Project title: Geographic Structure and Landscape Connectivity of New England Cottontail Populations in Maine. Unpublished report. University of New Hampshire, Durham. 16 pp.
- Lacki, M.J., and J. H. Schwierjohann. 2001. Day-roost characteristics of northern bats in mixed mesophytic forest. *Journal of Wildlife Management* 65:482-488.
- Latham, R.E. 2003. Shrubland longevity and rare plant species in northeastern United States. *Forest Ecology and Management*. 185:21-39.
- Litvaitis, J.A., D.L. Verbyla and M.K. Litvaitis. 1991. A field method to differentiate New England and eastern cottontails. *Transactions of the Northeast Section of the Wildlife Society*. 48:11-14.
- Litvaitis, M.K. and J.A. Litvaitis. 1996. Using mitochondrial DNA to inventory the distribution of remnant populations of New England cottontails. *Wildl. Soc. Bull.* 24:725-730.
- Litvaitis, J.A. and R. Villafuerte. 1996. Factors affecting the persistence of New England cottontail metapopulations: the role of habitat management. *Wildl. Soc. Bull.* 24:686-693.
- Litvaitis, J.A. 2001. Importance of early successional habitats to mammals in eastern forests. *Wildlife Society Bulletin*. 29:466-473.
- Litvaitis, J.A. and B. Johnson. 2002. Distribution, status, and monitoring of New England cottontails in Maine. Final report to Maine Dept. of Inland Fish. and

- Wildl., Dept. of Natural Resources, University of New Hampshire, Durham. 69 pp.
- Litvaitis, J.A. 2003. Are pre-Columbian conditions relevant baselines for managed forests in the northeast United States? *Forest Ecology and Management*. 185:113-126.
- Litvaitis, J.A., B. Johnson, W. Jakubas and K. Morris. 2003. Distribution and habitat features associated with remnant populations of New England cottontails in Maine. *Can. J. Zool.* 81: 877-887.
- Litvaitis, J.A. and W.J. Jakubas. 2004. New England cottontail (*Sylvilagus transitionalis*) Assessment 2004. 59 pp.
- Litvaitis, J.A., J.P. Tash, M.K. Litvaitis, M.N. Marchand, A.I. Kovach and R. Innes. 2006. A range-wide survey to determine the current distribution of New England cottontails. *Wildlife Society Bulletin*. 34(4):1190-1197.
- Lorimer, C.G. and A.S. White. 2003. Scale and frequency of natural disturbances in the northeastern US: implications for early successional forest habitats and regional distributions. *Forest Ecology and Management*. 185: 41-64.
- McWilliams, W. H., B. J. Butler, L. E. Caldwell, D. M. Griffith, M. L. Hoppus, K. M. Laustsen, A. J. Lister, T. W. Lister, J. W. Metzler, R. S. Morin, S. A. Sader, L. B. Stewart, J. R. Steinman, J. A. Westfall, D. A. Williams, A. Whitman, and C. W. Woodall. 2005. The forests of Maine: 2003. U.S. Forest Service Northeastern Research Station, Resource Bulletin. NE-164, Newtown Square, Pennsylvania, USA.
- Miles, P.D. 2010. Forest Inventory EVALIDator web-application version 1.6.0.01. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Northern Research Station. [Available only on internet: <http://apps.fs.fed.us/Evalidator/evalidator.jsp>].
- Nelson, E.W. 1909. North American Fauna: The rabbits of North America. U.S. Department of Agriculture, Bureau of Biological Survey. No. 29.
- Probert, B.P. and J.A. Litvaitis. 1996. Behavioral interactions between invading and endemic lagomorphs: implications for conserving a declining species. *Biol. Cons.* 76:289-295.
- Sasse, D.B. 1995. Summer roosting ecology of cavity-dwelling bats in the White Mountain National Forest. MS thesis, University of New Hampshire, Durham, NH. 65pp.

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U.S. Department of the Interior. 1999. U.S. Fish and Wildlife Service and National Marine Fisheries Service. Announcement of Final Policy for Candidate Conservation Agreements with Assurances. Federal Register 64(116):32726-32736.

USFWS. 2006. United States Fish and Wildlife Service. Endangered and threatened wildlife and plants; review of native species that are candidates or proposed for listing as endangered or threatened; annual notice of findings on resubmitted petitions; annual description of progress on listing actions. Federal Register 71(176):53755-53835. (Updated 2009). Federal Register 74(215):57804-57878.

- Silvis, A., W.M. Ford, E.R. Britzke, and J.B. Johnson. 2014. Association, roost use, and simulated disruption of *Myotis septentrionalis* maternity colonies. *Behavioral Processes*. 103: 283-290.
- Tracy, R.S. 1995. Distribution and comparative metabolic physiology of the eastern cottontail (*Sylvilagus floridanus*) and the New England cottontail (*S. transitionalis*) – Implications for a declining species. Ms. of Science thesis. Univ. of Conn., Storrs. 105 pp.
- Young, A.G. and G.M. Clarke, editors. 2000. *Genetics, Demography and Viability of Fragmented Populations*. Cambridge University Press, Cambridge, UK. 438 pp.