NEW ENGLAND COTTONTAIL CONSERVATION PROGRESS

2/25/2015

2014 Annual Performance Report

Developed by:

Wildlife Management Institute, the U.S. Fish and Wildlife Service and the New England Cottontail Technical Committee

Approved by:

New England Cottontail Executive Committee on 2/25/2015

Citation:

Fuller, S. and A. Tur. 2015. New England Cottontail Conservation Progress.

Table of Contents

Executive Summary

The U.S. Fish and Wildlife Service (USFWS), the Natural Resources Conservation Service (NRCS), and states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York ratified by-laws to convene an Executive Committee to govern conservation of the New England cottontail (NEC) (*Sylvilagus transitionalis*) in February, 2011. A Technical Committee and six Work Groups were charged to develop and implement the Conservation Strategy for the New England cottontail, hereafter referred to as the Conservation Strategy and referenced as Fuller and Tur 2012. The Wildlife Management Institute was designated as the coordinating entity for the Executive Committee.

The primary purpose of this performance report is to document implementation progress and to evaluate the effectiveness of conservation actions prescribed in the Conservation Strategy to determine their impact on the status of the species. Based on parallel evaluations of species status and the performance of conservation actions, the secondary purpose of this report is to provide recommendations to modify and improve the Conservation Strategy and thereby support the prescribed adaptive management cycle.

This review includes all prior work and is the first full review since implementation of the Conservation Strategy began. Annually, the Technical Committee is convened in January to review the preceding year and further develop recommendations to modify the Conservation Strategy for approval by the Executive Committee, thus completing the annual cycle of adaptive management. [Note: This report will remain in draft until review and approval are complete in 2015.]

The Executive Committee has met annually since 2011, guiding development and implementation of the Conservation Strategy. The Committee spent an estimated $29,312,404 to date, and $32,809,256 through 2015, or 49% of the $66,270,353 estimated total cost for implementation through 2030.

Together, the Technical Committee, Wildlife Management Institute (WMI), and USFWS analyzed and ranked the status of NEC populations, habitat, and threats in each of 41 focus areas. The population status was estimated based on the best available information, including expert opinions and coarse model predictions about population levels. Focus areas were ranked according to progress toward and feasibility of attaining population goals. The range-wide population goal for the species is 13,500 animals, which must be configured in a network of populations meeting the following landscape criteria: 1 population of 2,500; 5 populations of 1,000; and 12 populations of 500. According to the rankings and best available information, 15 focus areas meet these criteria, and their goals total 10,500 rabbits. In 6 additional focus areas, we believe the population levels are approaching their individual goal levels, and that with ongoing conservation efforts, this combination of 21 focus areas will exceed the 13,500 goal and meet the population configuration requirements established by the USFWS. With ongoing conservation, we believe it is feasible for an additional 8 focus areas to reach their goals, further exceeding the Service population configuration requirements for a viable population of NEC. At this time it is not feasible for the remaining 12 focus areas to achieve a minimum viability standard of 500 animals.

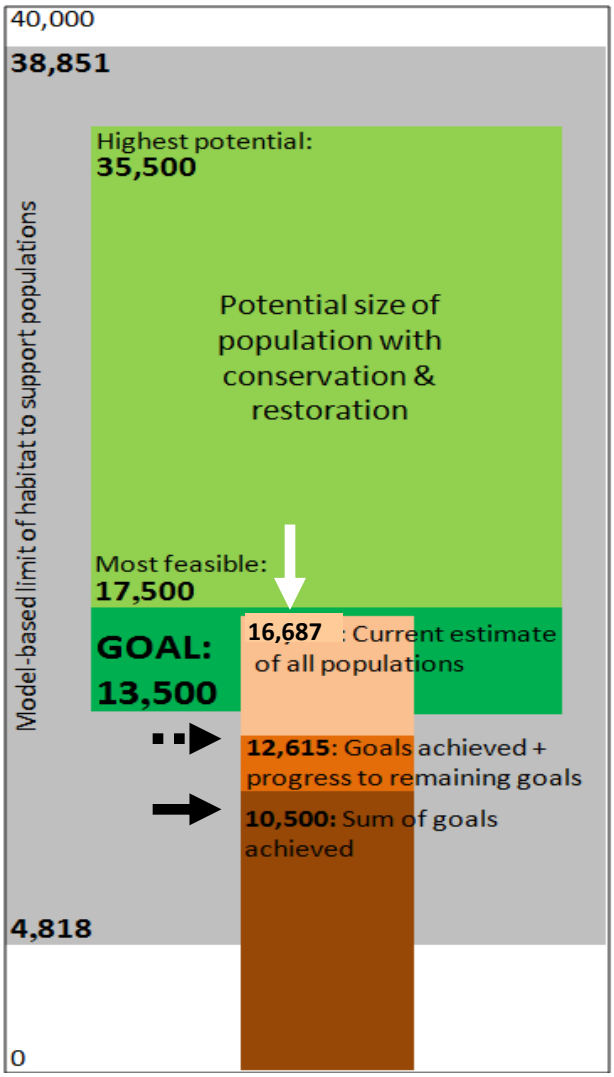


Figure 1. Diagram showing current status of populations, progress toward goals, and limits of potential conservation. The white arrow points to the total estimated population level, based on expert opinion, which exceeds goals because many small populations do not meet minimum population viability criteria. The black arrow points to the sum of population goals that have been met according to recent status rankings. The dashed arrow shows that the population level in other potentially viable populations will soon reach the range-wide goal of 13,500. The gray region shows estimated limits of the landscape capacity to support NEC, and the green region shows the potential range of populations with continued conservation.

Thus far the Technical Committee has implemented 79% of the 81 objectives identified in the Conservation Strategy, and these are either progressing on schedule toward their target levels or are complete. Of the remaining objectives, 8.5% are progressing at a rate below the prescribed target levels, 6% were delayed but are now progressing, 2.5% were delayed because of barriers to implementation, and 4% are inactive because they were intended to address potential emergent issues which have not yet required action.

The Information and Adaptive Management Work Group managed the flow of information to evaluate status and performance and identified uncertainties that might limit success of the effort. The group organized a Structured Decision Making Workshop and identified interactions between NEC and eastern cottontail as the highest uncertainty. With conservation partners, the group coordinated the development of data management systems to facilitate long-term tracking. The figures reported here were made available by using a combination of tools to gather information from management teams in each state. Every objective has a target level, and progress toward those levels is reported here as part of the annual adaptive management cycle.

State Land Management Teams are active in every state, and have identified 8,179 acres of land management that have been planned, initiated or completed. The land management effort will help sustain habitat which, over time, would mature and no longer benefit NEC. The teams use parcel analysis tools to identify the best candidate parcel for voluntary conservation actions. The tools allow

managers to project the amount and location of voluntary conservation needed. Of all the voluntary actions, 43% of the acreage was successfully achieved on the highest ranked parcels. In Maine and New Hampshire, USFWS is working with states to implement Candidate Conservation Agreements with Assurances to incentivize conservation.

The Population Management Work Group has the most challenging task—initiating captive breeding for a new species is an inherently uncertain and difficult business. The program has successfully bred NEC achieved offspring survival in a very short time, but it will take several years to achieve desired levels of productivity. Successes include establishing a captive facility at Roger Williams Park Zoo and 2 outdoor pens, one at Great Bay and one at Ninigret National Wildlife Refuges. In total, the facilities supported the release of 131 NEC to NH and Patience Island in RI.

Monitoring efforts have provided fairly complete coarse-scale mapping of the species distribution, and a protocol to detect population-level responses to conservation will be piloted in the winter of 2014-2015. The pilot will build on pellet-based NEC detection surveys to establish a baseline and incorporate occupancy modeling to detect population changes in future years. Early results from vegetation monitoring are beginning to demonstrate that land management efforts are producing the desired habitat conditions.

Research efforts are in place to study outstanding uncertainties in management. Responses of NEC and eastern cottontail to trapping and habitat management are being documented in CT. In several cases, NEC have increased in response to management experiments. In NY and CT, the interaction of the densities of the two species with different habitats is under study. Identifying natural habitats that are resistant to eastern cottontail invasion may influence the approach used to secure NEC.

The Outreach and Education Work completed a comprehensive Outreach Strategy, a website, and many other tools that are helping to educate the public and recruit landowners to participate in voluntary conservation actions. Hundreds of landowners have been reached directly or through planned events, and more than 20,000 individuals have been reached by publications and other media.

The Land Protection Work Group supported the managers of National Wildlife Refuges to develop a Preliminary Project Proposal (PPP) that was approved by the USFWS director, and now refuges are working on a detailed Land Protection Plan (LPP) that will outline resource protection needs, an implementation schedule and priorities, and the scope of proposed acquisition efforts. The LPP will include maps and a priority acquisition table identifying specific tracts.

With funding provided by the National Fish and Wildlife Foundation, assistance was provided to develop land protection projects, resulting in 584 acres of habitat protected through multiple funding sources in in ME and NH. This met the total land protection goal set forth in the NFWF Business Plans developed for the two states.

Purpose

The U.S. Fish and Wildlife Service (USFWS), the Natural Resources Conservation Service (NRCS), and the states of Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, and New York formed the New England Cottontail Regional Initiative consisting of Executive and Technical Committees in 2011 to govern conservation of the New England cottontail. In 2012, the Executive Committee adopted the *Conservation Strategy for the New England Cottontail* (*Sylvilagus transitionalis*), hereafter referred to as the Conservation Strategy and referenced as Fuller and Tur 2012 (available on the Web at www.newenglandcottontail.org.) By so doing, the Executive Committee agreed to implement the actions set forth in the Conservation Strategy. In 2012, the Technical Committee composed of wildlife biologists and representatives of state and federal agencies began implementing the Conservation Strategy. Since that time, representatives of the Technical Committee have documented progress in carrying out the Conservation Strategy and are determining the status of NEC across the species' six-state range as part of an annual cycle of review and adaptive management. The current 2014 review includes prior work and is the first full review since implementation of the Conservation Strategy. Each January the Technical Committee meets to review the preceding year and develop recommendations to modify the Conservation Strategy for approval by the Executive Committee, thus completing the annual cycle of adaptive management. [Note: This report will remain in draft until review and approval are complete in 2015.]

The primary purpose of this performance report is to explain how partners in the NEC Regional Initiative are implementing the Conservation Strategy, and to evaluate the effectiveness of conservation actions prescribed in the Conservation Strategy to determine if they are having a positive impact on NEC habitat and populations. A secondary purpose of the report is to make recommendations to modify and improve the Conservation Strategy and thereby support the adaptive management cycle upon which the Conservation Strategy is based.

Reporting Approach

The organization of this performance report reflects that of the Conservation Strategy. Section 4.0 of the Conservation Strategy presents nine groups of coded objectives categorized by type of conservation action: 000 Administration, 100 Information Management, 200 Monitoring, 300 Landowner Recruitment, 400 Population Management, 500 Habitat Management, 600 Research, 700 Outreach and Education, and 800 Land Protection. Beginning on page 15 of this report, a narrative serves to update the corresponding objectives from the Conservation Strategy, including a brief description on the status of each objective, actions taken to meet the objective, and other important supporting information. Finally, summary information is reported in tabular form for a total of 81 objectives. Each objective may be evaluated by comparing an estimate of the current level of progress to the target level. This report summarizes key points for each aspect of the Conservation Strategy with regard to outstanding uncertainties, adapting implementation, or modifying the Conservation Strategy itself.

With regard to evaluation, we differentiate between goals and target levels. Goals pertain to the status of populations and habitats, and target levels refer to actions taken to achieve the objectives set forth in the Conservation Strategy. In both cases, our understanding of an appropriate level may change over time. For example, we used coarse rules of thumb to prescribe population and habitat goals for achieving viable populations of NEC, because species-specific information regarding population parameters that would lead to population persistence is limited (Fuller and Tur 2012, pp. 37-40). In the future, an improved scientific understanding of the metrics needed to ensure self-sustaining NEC populations may result in the need to achieve higher or lower numbers. Similarly, target levels for created habitat (Objectives 501 to 513) may change as naturally occurring habitats are recognized and quantified (Objectives 201 and 604). In our recommendations, we distinguish between prescribed changes in conservation actions or approaches, and changes in prescribed goals or target levels.

The Conservation Strategy identifies key uncertainties and presents approaches or specific research and monitoring objectives to address them. Many of the research and monitoring efforts are not yet ready to provide data to help conservationists evaluate their efforts; in the future, and in combination with our assessment of populations and habitats and our record of implementation, we will use research and monitoring to evaluate the most uncertain conservation actions.

Adaptive Management

The Conservation Strategy is built on a framework for adaptive management: it outlines a clear process for future modifications, if necessary, in light of any new and relevant information. The first component of the adaptive management framework specified in the Conservation Strategy is Objective 003, Annual Review of Species Status. Using the best available information regarding NEC status, along with threats and conservation actions that affect the species, natural resource professionals analyzed each of 40 conservation focus areas, with results summarized under Objective 003. The second component of adaptive management specified in the Conservation Strategy is Objective 004, Annual Review of Performance. Progress toward target levels prescribed in the Conservation Strategy is summarized for every objective in both text and tabular form. The final component of adaptive management, Objective 005, Annual Review of Conservation Strategy Adaptations, specifies an annual evaluation of modifications to the Conservation Strategy. We provide recommendations throughout this document that will adapt the Conservation Strategy to deliver the best results for NEC.

Identifying Key Uncertainties

The Information and Adaptive Management Work Group (IAMWG) reviewed a comprehensive list of potential management actions and associated uncertainties, then further screened uncertainties through a Structured Decision Making process that evaluated different approaches to increasing NEC on the landscape. The Conservation Strategy incorporates a systematic approach to create feedback loops that integrate scientific knowledge into environmental decision-making. We allocated key uncertainties to one of two approaches to adaptive management: active research to reduce uncertainty and test

assumptions before implementing management actions; and monitoring the outcomes of management actions to provide feedback for improving decision-making in the future. (Chapter 4.0 of the Conservation Strategy provides more information on conservation approaches.)

An example of how we use outcome monitoring to address uncertainty is shown by the way conservationists are resolving uncertainty related to the presence of non-native eastern cottontails (*Sylvilagus floridanus*) in NEC habitat. Conservation agencies and private individuals introduced eastern cottontails into parts of the NEC range during the twentieth century, and the eastern cottontail has become abundant in many areas (Fuller and Tur 2012, p. 24). Structured decision making results suggest that removing eastern cottontails from existing habitat may be more cost-effective than creating new habitat and may reduce the time lag between habitat management actions and the availability of habitat for NEC. Reducing the time needed to meet NEC recovery goals could result in additional cost savings not identified in this analysis. To this end, conservationists identified research objectives in section 4.6 of the Conservation Strategy to actively test these assumptions. Next, the IAMWG developed a proposal in partnership with the U.S. Geological Survey to create a sophisticated model that incorporates additional uncertainties, such as assessing the effectiveness of various habitat management techniques while measuring population response in both NEC and eastern cottontails.

Determining the best approach for adaptive management includes evaluating the benefits of the information being gained. Costs include the number of trials, monitoring, analysis of information, and the impact on the target resource. To identify critical uncertainties that may require assumption testing, the IAMWG reviewed potential management actions and outcomes to determine the scope of the issue (i.e., focus area, state, or rangewide) as well as the severity and level of uncertainty (high, medium, or low) associated with the issue. After identifying key uncertainties (those with high risk and potential large-scale impacts), the IAMWG is working with the NEC Research and Monitoring Work Group to resolve those uncertainties, either through monitoring or formal research projects.

Key Uncertainties for New England Cottontail Conservation

1. Efficacy of management techniques for creating good-quality NEC habitat.

   A fundamental question is whether naturally self-sustaining shrub habitats, such as pitch-pine and scrub-oak barrens or mountain laurel thickets, represent productive NEC habitat, as these can be maintained at a fraction of the cost of creating and periodically renewing other more-ephemeral habitats. Cost, time lag between management actions and regrowth of vegetation, and the potential risk of inadvertently increasing eastern cottontail numbers are all uncertainties associated with habitat management that could affect the Conservation Strategy's success. Conservation actions may include vegetation management (through timber harvesting, chipping, or brontosaurus mowing), establishing shrublands (by seeding or transplanting), and converting invasive-shrub-dominated to native-shrub-dominated shrublands (through selective herbicide application, mowing, and planting). On a subset of managed habitat areas, researchers have collected data to measure habitat and rabbit population responses to various management techniques, letting conservationists improve efficiency and outcomes of future management actions. Data include pre- and post-

treatment vegetative stem counts; NEC and eastern cottontail presence or absence in habitat patches, as well as trends across the NEC range; habitat management cost; and time elapsed until habitat is suitable for NEC.

Approach: Monitor vegetation and population responses to habitat management.

2. Survival of NEC in augmented and reintroduced populations.

Captive breeding and reintroduction into the wild are resource-intensive actions sometimes used in species recovery programs. Examples from reintroduction of other species, including other rabbits, suggest that small variations in release protocols (such as the use of a hardening pen, soft-release techniques, predator control, reducing competition, supplementing nutrition, and the quality of habitat into which individuals are released) may substantially increase the growth rate of a population. Monitoring NEC after their release includes evaluating survival, mortality factors, habitat use, individual body condition, and reproduction.

Approach: Monitor released NEC to document survival, health, and reproduction.

3. Competition with eastern cottontails.

The interaction between eastern cottontails and NEC in the wild is poorly understood. Eastern cottontails may have some competitive advantages over NEC that we may accidentally enhance through our management actions. Scientists have yet to determine ways of managing habitat to help NEC without simultaneously boosting populations of eastern cottontails. The response of both species to timing, quantity, and types of management remains uncertain. Our ability to remove eastern cottontails from an area, the successful reintroduction of NEC to the landscape, and the migration of eastern cottontails into managed areas are also unknown. To address these uncertainties, we must assess species abundance trends, responses to management actions, and interactions between the two species. Monitoring may include determining the distribution of NEC and eastern cottontails across the NEC range and designing experiments that will reveal the responses of both species to different population- and habitat-management scenarios.

Approach: Study the effects of eastern cottontail removal to better understand potential interactions between eastern cottontails and NEC in managed habitat.

4. Productivity of captive breeding.

Efficient captive breeding will depend on effectively controlling disease, feeding high-quality forage, assuring successful mating, managing the genetics of captive populations, and promoting the survival of offspring. Basic life-history characteristics of NEC are known, but scientists need to gather more accurate information to help captive-breeding specialists produce in a timely manner the greatest number of healthy, robust individuals that can successfully be reintroduced into the wild.

Approach: Monitor captive populations to determine genetic and individual health and reproductive output.

5. Landscape-scale response by NEC to the conservation effort.

Biologists have begun monitoring NEC across the landscape to learn whether the habitat system created within each focus area effectively supports a functioning, persistent metapopulation. Monitoring could include quality and quantity of habitat available throughout the year; percentage of habitat patches occupied by NEC; rates of dispersal between patches; and trends in eastern cottontail abundance. This information will help conservationists determine the cumulative effectiveness of management actions and provide frequent status updates at the metapopulation level to inform future management decisions.

Approach: Monitor NEC occupancy and abundance in habitats across the species' range.

6. Genetic monitoring and management of NEC populations.

As the NEC population has fallen, it has also become fragmented. Because fragmentation can lead to genetic changes that affect the viability of small populations, conservationists should seek to detect, prevent, and remedy adverse genetic changes. Captive breeding and reintroduction can also give rise to deleterious genetic variation. Ways of managing genetic variation include minimizing reductions in effective population size; maximizing gene flow between populations by creating habitat corridors between them; preventing the loss of small populations; and supporting environmental processes that create and maintain suitable habitat.

Approach: Monitor and manage wild and captive NEC populations to detect and prevent the loss of genetic variation.

Organizational Framework

Adaptive management is structured in the objectives described in chapter 4.0 of the Conservation Strategy, which lists desired outcomes, performance measures, and target levels in the objectives table for each aspect of the Conservation Strategy and indicates whether adaptive management will be used to achieve the different objectives. We expect trouble-shooting problems to be an integral part of meeting the objectives.

Because of its broad scale, evaluating the NEC conservation effort in its entirety is difficult. The Information Management objectives in section 4.1 of the Conservation Strategy provide for continued collecting and organizing of data needed to achieve measurable objectives, evaluate the status of the species, and generate reports characterizing the effectiveness of the conservation effort. Partners are using information provided through NEC status monitoring, performance measurement, and scientific research to address uncertainties that may call for changes in the Conservation Strategy. In Figure 1, we show how adaptive management incorporates new information. Assessment and adaptation will be needed annually, especially during the Conservation Strategy's early years. Reports detailing progress of the conservation effort (see sections 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, and 4.8 of the Conservation Strategy), as well as new scientific information (section 4.6), will be reviewed each year by the Information and

Adaptive Management Work Group, which will evaluate the conservation design and recommend any changes in the Conservation Strategy to the NEC Technical and Executive Committees. If approved, such changes will be incorporated into the Conservation Strategy.

The adaptive management process has seven phases, linked to specific objectives; conservation partners have made significant progress in all seven phases:

1. Technical coordination
Objective 002: Convene NEC Technical Committee to coordinate work groups and all phases of adaptive management and ensure integration of new or modified objectives.

2. Status monitoring and assumption testing
Objective 007: Coordinate Research and Monitoring Work Group (RMWG) to ensure collection of new data. Monitoring will provide information to assess species status and the Conservation Strategy's overall effectiveness. Key uncertainties will be tested through specific research projects.

3. Performance monitoring
The performance evaluation phase collects information on implemented actions from work groups:
Objective 008: Coordinate NEC Land Management Team (NECLMT) in Each State
Objective 009: Coordinate Population Management Work Group (PMWG)
Objective 010: Coordinate Outreach Work Group (OWG)
Objective 011: Coordinate Land Protection Work Group (LPWG)

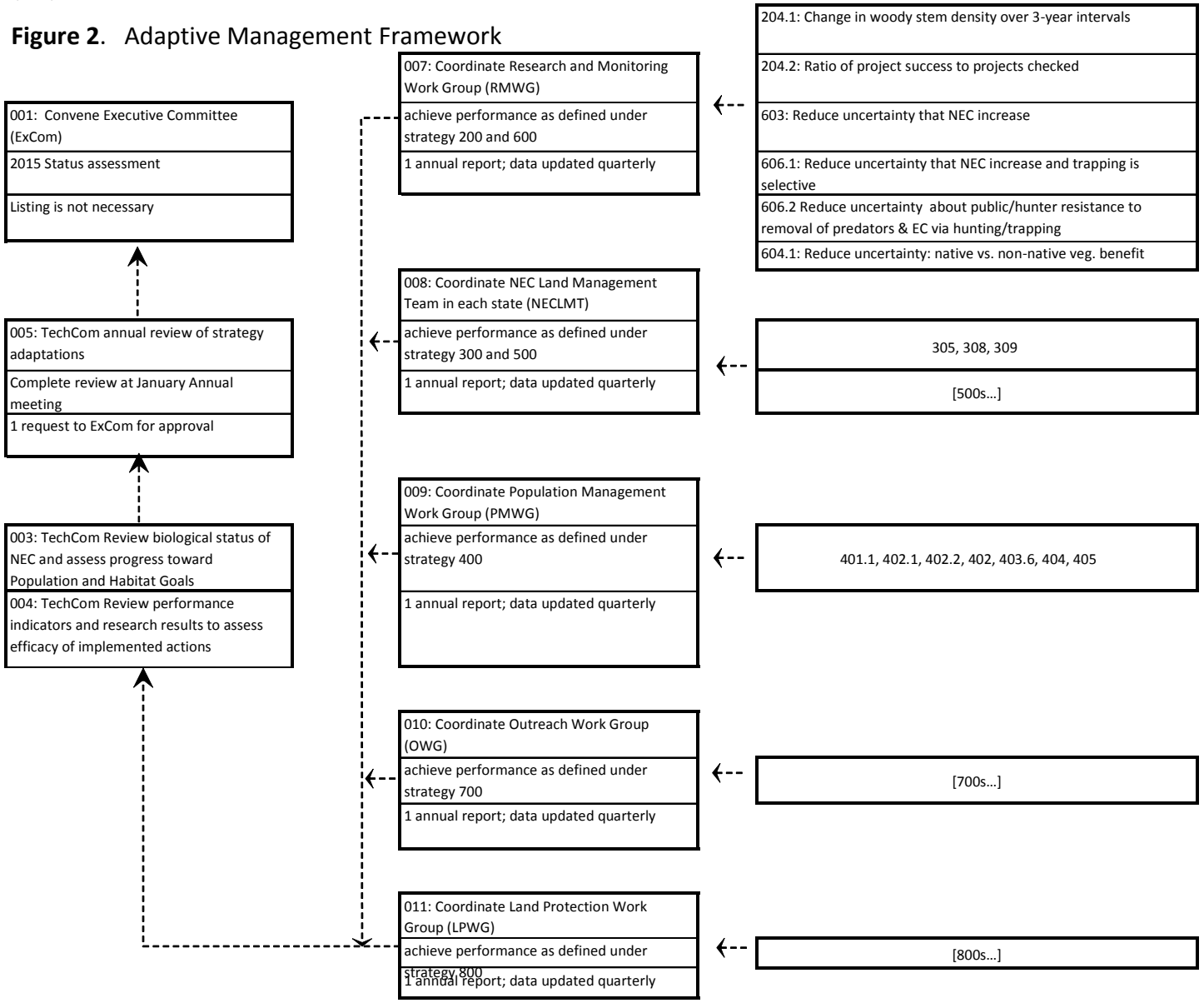
4. Integrative reporting and synthesis
Objective 006: Coordinate Information and Adaptive Management Work Group to collect and share information and data.

5. Evaluative
Convene NEC Technical Committee to review reports and data.
Objective 003: Review Species Status
Objective 004: Review Performance

6. Adaptive
Convene NEC Technical Committee to propose adaptation of objectives, review input from the work groups, and make recommendations to the NEC Executive Committee.
Objective 005: Review Conservation Strategy Adaptations

7. Decision-making
Objective 001: Convene Executive Committee to review and decide on proposed modifications and new objectives.

Figure 2. Adaptive Management Framework



Overview of Performance

The Conservation Strategy for the New England Cottontail was completed in 2012 and implementation began in 2013. Thus far, 6% of the objectives are complete and 73% have been implemented and are progressing on schedule toward their target levels. Of the remaining objectives, 8.5% are progressing at a rate below the prescribed target levels, 6% were delayed because of challenges or sequencing issues, but are now progressing, 2.5% remain delayed because of barriers to implementation, and 4% are inactive because they were intended to address potential emergent issues which have not yet required action, such as management of disease and predators.

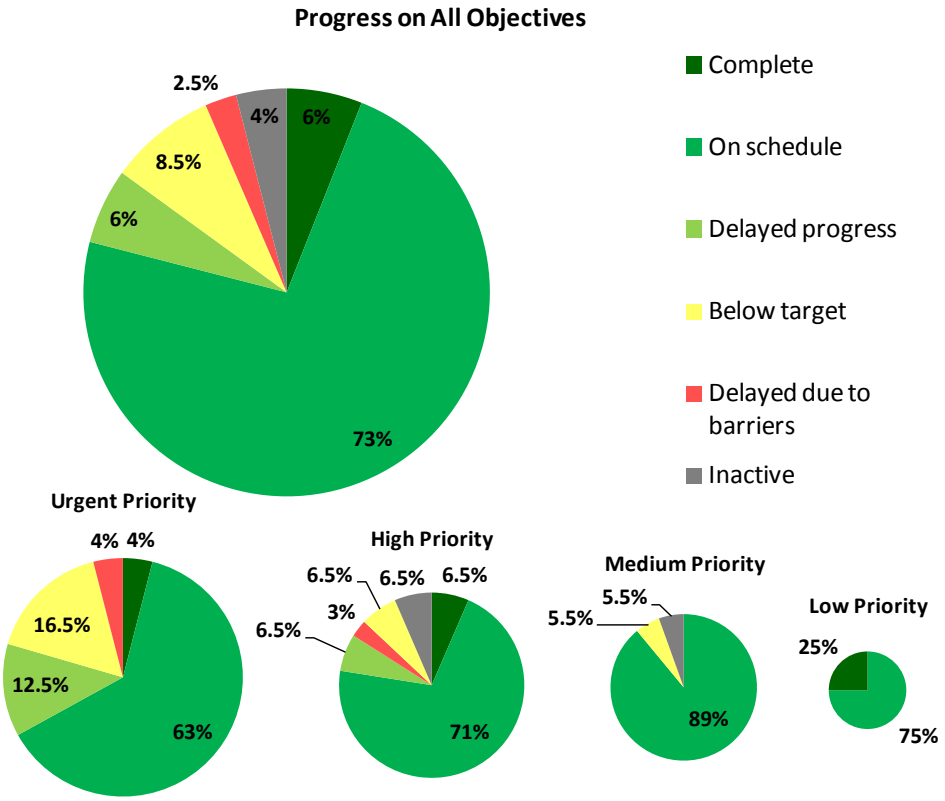


Figure 3. Implementation progress. Complete objectives are those that have attained their target level and no further implementation is anticipated beyond 2014. Objectives that are on schedule are implementing at or near annual target levels or are on track to achieve 2030 levels. Objectives with delayed progress were initiated after their scheduled date, but barriers have been addressed and implementation is active in 2014. Objectives delayed due to barriers will not reach target levels until specific barriers are resolved, such as a data sharing restrictions and approval of onerous compliance procedures. Objectives reported as below target are not performing at the prescribed target level, either because of insufficient effort or because approaches have not yet reached the desired efficacy. Some objectives are considered inactive were intended to address potential emergent issues which do not yet warrant action.

Estimated funding raised to implement the Conservation Strategy is $29,312,404 as of September 30, 2014, and a minimum of $32,809,256 is projected through 2015, or 49 percent of the $66,270,353 estimated total cost for implementation through 2020.

Of 2,643 acres of land management that have been confirmed as completed, 41 percent took place on tracts identified as Best Parcels (identified through remote assessments, based on spatial data, of habitat potential), and 76 percent occurred on land protected from development. Of 8,179 total acres of land management that have been planned, initiated, or completed, an estimated 43 percent were on Best Parcels and 48 percent were on protected land. Habitat created through land management, combined with existing habitat identified on the landscape, may already approach the amount of habitat needed to achieve NEC population and habitat goals and sustain viable populations according to the standards adopted in the Conservation Strategy. Nevertheless, we recognize that uncertainty exists concerning the effectiveness of management in some locations. It is important to recognize that land management is designed to augment existing habitat which, in many areas, may already be sufficient to support viable populations of NEC. The population and habitat goals reported in the Conservation Strategy (Fuller and Tur 2012, p. 40) are intended to create multiple resilient NEC populations throughout the species' range, of which habitat created through management is only one component.

Figure 4. Implementation progress by objective category. Green units stand for objectives that are complete or on schedule. Red units indicate objectives that have been delayed, are below prescribed targets, or are inactive.

Implementation Progress

000 Administration

Overview

Coordination and governance have been effective since the executive Committee ratified by-laws in 2011. Completion and adoption of the Conservation Strategy in 2012 marked a substantial commitment on behalf of all partners to conserve NEC. At least six out of eight NEC Technical Committee members participate in monthly meetings, and the Executive Committee has met annually with intervening phone conferences as necessary.

Currently, one of the primary functions of the governance structures—the Executive Committee, Technical Committee, Work Groups, and Land management Teams—is to carry out implementation in an annual cycle of adaptive management. This report marks the culmination of the first cycle of adaptive management. Status assessment is currently limited to thorough but inconsistent occurrence data. A protocol for estimating NEC population and habitat levels is under development, but annual status assessment has proceeded using the best available information.

Annual review of performance has been limited by data-sharing constraints for land management activities; the Information and Adaptive Management Work Group (IAMWG) has recommended that each state Land Management Team (LMT) use a shared data template developed by the USFWS to organize data, and non-sensitive data can then be compiled by the Wildlife Management Institute in a standard format and archived in the WMI Tracker Database, an online spatial accomplishment-reporting tool.

Conservation Strategy modifications have been proposed and approved in prior years, including revisions to focus area boundaries and/or goals in New Hampshire, Massachusetts, and Maine. However, the forthcoming Technical Committee annual review in January 2015 will be the first complete review informed by the best available status and performance information.

Five years of dedicated funding have been secured for coordination between the NEC Executive Committee and the NEC Technical Committee to support information management, adaptive management, and administration of grants and contracts. Grant applications and awards have continued to be successful in funding conservation efforts.

Outstanding Uncertainties: No significant uncertainties.

Implementation Recommendations:

- Review membership of NEC Technical Committee and state LMTs to ensure adequate staff are assigned and remain committed to moving implementation forward.
- Partners identify data-management capacity and delegate staff to serve on the IAMWG and the Research and Monitoring Work Group to improve data integration.

- More consistent and fuller representation would result if each member would designate an alternate should the main member be unable to attend certain meetings.

Conservation Strategy Modifications: None.

Objective 001: Convene NEC Executive Committee

The NEC Executive Committee oversees the decision-making element of the adaptive management framework. In 2012, the committee approved the *Conservation Strategy for the New England Cottontail* (Fuller and Tur 2012). The Executive Committee assigns the NEC Technical Committee tasks such as developing and carrying out habitat management, monitoring, and population plans, and tracking accomplishments. The Executive Committee also plays an important role in providing staff resources and obtaining funds to accomplish conservation tasks. The Executive Committee has established bylaws that outline procedures for communication among its members. It has convened face-to-face meetings at least once annually since ratifying its bylaws in February 2011. The Executive Committee also holds one to three conference calls per year.

Objective 002: Convene NEC Technical Committee

The NEC Executive Committee established the NEC Technical Committee and directed it to develop the Conservation Strategy for NEC, and to prioritize and carry out actions needed to conserve the species (Objectives 003, 004, 005, and 006). Six Work Groups help the Technical Committee carry out various tasks. They are composed of experts in fields important to developing and implementing different aspects of the Conservation Strategy. The Technical Committee coordinates the Work Groups to ensure that they meet their individual charges (Objectives 006 through 011). The Technical Committee participates in a face-to-face meeting annually to evaluate conservation progress. It also holds 10 to 12 monthly phone conferences and manages six Land Management Teams in the six states within the NEC range.

Objective 003: Review Species Status

The NEC Technical Committee helps the U.S. Fish and Wildlife Service (USFWS) carry out a key evaluative element of the adaptive management framework as described in Section 2.2 of the Conservation Strategy and as required by the federal Endangered Species Act: the annual review of the status of NEC, currently considered a candidate species for listing. The Technical Committee also makes sure that all partners in the conservation effort receive complete and accurate information concerning NEC so that they and the USFWS can work together and fulfill their duties. The Technical Committee is collaborating with USFWS to complete a status assessment of NEC in preparation for the 2015 listing decision. USFWS and the Technical Committee deferred a 2013 assessment in order to focus on beginning to implement the recently completed Conservation Strategy and to prepare for the 2014 status assessment.

The USFWS and the Technical Committee set the following population goals and corresponding criteria for their configuration on the landscape. In the Conservation Strategy, on page 31, the population goals sum to 13,500 and are referred to as the Range-wide Population Goal. On page 32, the rationale for providing criteria for the configuration of populations is provided:

> "We established a landscape design and conservation goals based on principles of population viability and biogeography that would: (1) keep or return NEC to most of its historic range; (2) protect existing populations by ensuring that enough individuals are present to overcome environmental and genetic uncertainty; and (3) provide multiple populations to guard against unexpected events such as disease outbreaks (Shaffer et al., 2002, p. 138). These principles have been translated into numbers that represent population goals for conserving the species."

On page 40, specific criteria for the configuration of populations on the landscape are provided:

- 1 landscape capable of supporting **2,500** or more animals;
- 5 landscapes capable of supporting **1,000** or more animals;
- 12 landscapes capable of supporting **500** or more animals;
- A landscape that is not likely to support more than **500** animals is not considered viable.

The distribution of populations described in the criteria sum to 13,500, however, the criteria do not specify certain locations on the landscape. The criteria do not require that larger population criteria be satisfied independently by single focus areas, nor do they need to be fixed over time. Focus areas should be viewed as convenient management units, and their boundaries recognized as somewhat arbitrary with regard to habitat distribution. The criteria should be used as a check to ensure that the populations combined across focus areas are sufficiently numerous, large, and connected to ensure the species will persist. For example, several adjoining populations in several focus areas, if well connected, could satisfy the criterion that the whole collection contain 1 landscape capable of supporting **2,500** or more animals.

The USFWS and the Technical Committee assembled the best available information on the status of NEC populations, habitat, and threats for each focus area using a comprehensive data-collection tool called the Focus Area Status Screening Template (FASST). Based on the best available information contained in the FASSTs, the USFWS, with assistance from the Wildlife Management Institute, ranked the conservation status of each focus area in two steps. In the first step, focus areas were ranked and the results were provided to the Technical Committee with recommendations to address any gaps in information—focus areas with known information gaps received an A2 or C2 as described below. In the second step, the updated FASSTs were ranked again using the same system:

> A1=Satisfies a USFWS population goal at the current estimated population level with current and best available information. No additional information is needed. The information presented supports a determination that the population level can be sustained with or without a targeted conservation effort because threat levels are minimal or ameliorated. Uncertainties

in the quantity of habitat and population levels are recognized, but reasonable and conservative extrapolations from existing data support the determination.

A2= Most likely satisfies a USFWS population goal at current estimated population level, however additional information is needed to support the rationale that threat levels are minimal or ameliorated or to demonstrate the current population level. Additional information may include existing data, published research, or new analysis of data that are clearly available now. Uncertainties in the quantity of habitat and population levels are recognized, but reasonable and conservative extrapolations from existing data will most likely support the determination.

B = Appears unable to satisfy a USFWS population goal. The focus area is not able to support a minimum viable population of 500 animals or more, according to USFWS standards, with or without a reasonable conservation effort. Note that standards of viability and conservation effectiveness other than those applied here may justify continued conservation effort by local organizations.

C1=May satisfy FWS population goal at future anticipated population levels because threats are addressed by ongoing conservation strategies. No additional conservation planning is required to address new threats, and information presented is sufficient to support the rationale.

C2=May satisfy FWS population goal at future anticipated population levels but additional information and modification of conservation strategies is needed. Conservation Strategy needs to be modified to address threats and information is needed to demonstrate population and/or habitat potential.

Notably, in the second phase of ranking, none of the focus areas received an A2 or C2, indicating that the Technical Committee achieved the best available information standard and improved strategies as necessary. The rankings are intended to summarize the status of populations, and to indicate the feasibility of achieving the population goals and configuration criteria described above, considering the estimated population level in the FASST and the efficacy of the conservation described to address threats. In some Focus Areas populations are currently at the goal level indicated (i.e. those where estimated current populations reach or exceed the goal level). In other Focus Areas conservation actions need to be implemented to address the threats that have been identified.

According to our analysis of the best available information provided in the FASSTs, NEC population and habitat levels may attain prescribed goal levels if conservation is implemented as planned, and assuming that strategies are effective in addressing threats or are modified as needed.

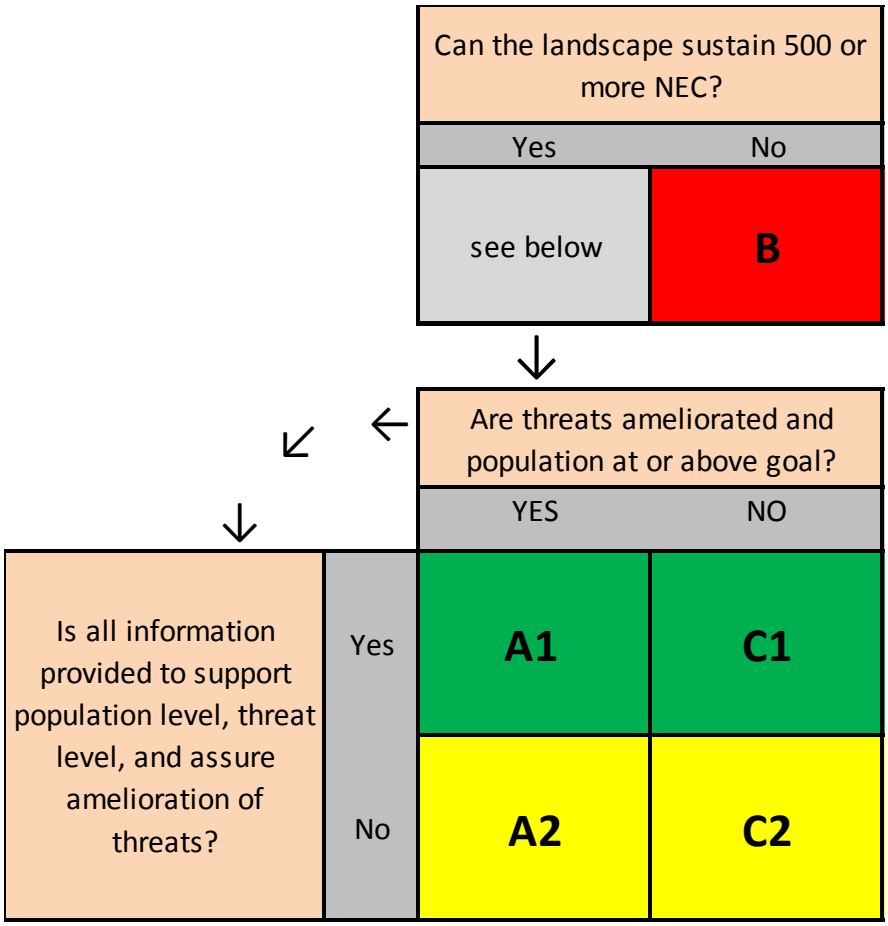


Figure 5. Diagram of focus area ranking process.

Table 1. Summary of Focus Area Ranks. At present, the most feasible goals do not satisfy the 1,5,12 Landscape Goal unless smaller goals are combined across connected landscapes. The 1,5,12 Landscape Goal is attainable if conservation efforts are increased to reach the highest potential of 2,500 in at least one focus area. (Detailed ranks for each focus area are provided in Table XXX, below.)

Most Feasible Goal Categories	Count of Focus Area Ranks A1	B	C1
2500	-	-	-
1000	6	-	-
500	5	-	18
<500	-	12	-
Total		41	

Highest Potential Goal Categories	Count of Focus Area Ranks A1	B	C1
2500	-	-	8
1000	-	-	10
500	-	-	11
<500	-	12	-
Total		41	

Population Goal= 13,500
Most Feasible/Current Expectation= 17,500
Highest Potential/Future Expectation = 35,500
Current Rangewide Population Estimate =17,113

Table 2. Status of populations and habitat by focus area (continued below). Model estimates represent predicted potential populations, not current NEC numbers. Predictions were made to a subset of suitable habitat patches and occupancy was assumed to be 25%. Biologists provided FASST estimates based on local knowledge, partial surveys, observations in the field, and professional judgment of current populations. Empirical population estimates are not available. Model estimates should be interpreted as an index of the potential of the habitat to support a population.

State	Focus Area/ Subunit	Most Feasible Goal	Rank	Highest Potential Goal	Rank	FASST Population Estimate**	Low Model Population Estimate **	High Model Population Estimate**
CT	Goshen Uplands	1000	A1	2,500	C1	1639	335	3,450
CT	Lebanon	500	C1	500	C1	327	-	687
CT	Ledyard-Coast	500	A1	1000	C1	869	164	1,072
CT	Lower CT River	1000	A1	2,500	C1	1462	140	1,803
CT	Lower Housatonic	500	A1	1000	C1	544	85	1,383
CT	Middle Housatonic	1000	A1	2,500	C1	1163	138	808
CT	Newtown-Oxford	500	C1	500	C1	378	236	1,481
CT	Northern Border	500	C1	1000	C1	775	63	964
CT	Pachaug	1000	A1	2,500	C1	1086	137	920
CT	Redding-Easton	500	C1	500	C1	410	-	1,612
CT	Scotland-Canterbury	500	A1	1000	C1	617	107	809
CT	Upper Housatonic	500	C1	500	C1	571	49	759
MA	Harwich-Brewster	<500	B	<500	B	-	14	149
MA	Hyannis/Yarmouth	<500	B	<500	B	-	22	72
MA	Martha's Vineyard	<500	B	<500	B	-	-	1,418
MA	Mashpee	1000	A1	2,500	C1*	2000*	185	319
MA	Middlesex Co.	<500	B	<500	B	-	-	1,162
MA	Nantucket	<500	B	<500	B	-	213	1,382
MA	Pymouth Co.	500	C1	1000	C1	500	13	192
MA	Sandwich	500	C1	1000	C1	500	75	77
MA	Southern Berkshire	500	C1	500	C1	107	133	1,379
MA	Upper Cape-MMR	1000	A1	2,500	C1	1500	204	264
See totals for all focus areas below.								

* Population estimates for these Focus Areas was reported as a range in the FASST. The lower number is reported.

**FASST population estimates were provided by TechCom members based on local knowledge of habitat and population status. Model estimates represent predicted capacity to support a population, not census or survey results. Minimum and maximum population estimates were derived by multiplying habitat acres by a constant patch occupancy rate (.25) and NEC density (.5). Minimum habitat acres were derived by extracting predicted habitat locations (grid cells) meeting conservative criteria from two habitat models reported in Fuller et al. 2011. Within each focus area, the acreage of all patches were summed to create a high estimate of habitat. To create a low estimate of habitat, all patches <1000 meters from NEC locations (since 2009) were summed.

Table 2 (continued). Status of populations and habitat by focus area. Model estimates represent predicted potential populations, not current NEC numbers. Predictions were made to a subset of suitable habitat patches and occupancy was assumed to be 25%. Biologists provided FASST estimates based on local knowledge, partial surveys, observations in the field, and professional judgment of current populations. Empirical population estimates are not available. Model estimates should be interpreted as an index of the potential of the habitat to support a population.

State	Focus Area/ Subunit	Most Feasible Goal	Rank	Highest Potential Goal	Rank	FASST Population Estimate**	Low Model Population Estimate **	High Model Population Estimate**
ME	Cape Eliz./Scarborough	500	C1	500	C1	184	534	634
ME	Elliot/ The Berwicks	500	C1	500	C1	84	150	369
ME	Greater Maine	<500	B	<500	B	16	168	746
ME	Kittery	<500	B	<500	B	-	41	76
ME	N-S Corridor	500	C1	500	C1	0	1	61
ME	Wells East	<500	B	<500	B	-	57	100
ME	Wells-Kittery Combined	500	C1	500	C1	27	-	-
NH	Merrimack North	<500	B	<500	B	150	216	1,450
NH	Merrimack South	<500	B	<500	B	-	-	644
NH	Seacoast*	500	C1	500	C1	30	143	439
NY	Central Dutchess	500	C1	1000	C1	0	27	872
NY	Harlem-Housatonic	500	A1	2,500	C1	634	472	2,271
NY	Northern Columbia Co.	<500	B	<500	B	0	-	997
NY	Rensselaer Co.	<500	B	<500	B	0	-	2,132
NY	Southern Columbia Co.	500	C1	1000	C1	191	128	945
NY	West Putnam	500	A1	2,500	C1	814	250	1,553
NY	Westchester Co.	500	C1	1000	C1	46	49	665
RI	Aquidneck	<500	B	<500	B	-	175	334
RI	Little Compton/Tiverton	<500	B	<500	B	-	-	266
RI	Northeast RI	<500	B	<500	B	-	49	642
RI	Southwest RI*	500	C1	500	C1	63	47	1,493
Total	**Includes all focus areas from above (FWS Goal= 13,500)**	**17,500**	**A1, A2, C1**	**34,500**	**A1, A2, C1**	**16,687**	**4,818**	**38,851**

* Population estimates for these Focus Areas was reported as a range in the FASST. The lower numer is reported.

**FASST population estimates were provided by TechCom members based on local knowledge of habitat and population status. Model estimates represent predicted capacity to support a population, not census or survey results. Minimum and maximum population estimates were derived by multiplying habitat acres by a constant patch occupancy rate (.25) and NEC density (.5). Minimum habitat acres were derived by extracting predicted habitat locations (grid cells) meeting conservative criteria from two habitat models reported in Fuller et al. 2011. Within each focus area, the acreage of all patches were summed to create a high estimate of habitat. To create a low estimate of habitat, all patches <1000 meters from NEC locations (since 2009) were summed.

Objective 004: Review Performance

Based on input from the work groups, the NEC Technical Committee will review performance to ensure that priority conservation objectives are adequately funded and that funding shortfalls are identified; that habitat and population management measures to conserve NEC are effective; and that implementing the Conservation Strategy proceeds as scheduled. Until now, performance has been evaluated only according to criteria set forth in certain grants. This report represents the first comprehensive evaluation of performance compiled by the Technical Committee. Performance evaluation is made challenging by the need to track land management efforts and data gathered from multiple partners. Sharing spatial information about private lands is a constraint: data exchange among partners can be complicated by the need to avoid making public information on precise locations of NEC or the names and addresses of private landowners undertaking conservation activities.

Objective 005: Review Conservation Strategy Adaptations

The Technical Committee reviews status and performance, and proposes new or modified objectives to the Executive Committee if and when they are needed. Incorporating new information into the Conservation Strategy is an important part of the adaptive management process, because it increases the effectiveness of conservation measures over time (chapter 6.0 in the Conservation Strategy). It is important to differentiate between two kinds of adaptations in managing the effort to conserve NEC:

1) Adjusting the endpoint by modifying population and habitat goals, strategic objectives, or performance target levels: these modifications involve refining expectations and approaches to match what is feasible and necessary to sustain a viable NEC population;
2) Improving the rate of progress by changing the effort allocated to implement certain conservation actions to ensure that we achieve what is feasible and necessary.

Objective 006: Coordinate Information and Adaptive Management Work Group

The Technical Committee is successfully coordinating the Information and Adaptive Management Work Group (IAMWG). The scientists in this work group provide the integrative reporting and information oversight element of the adaptive management framework by consistently collecting and sharing data on NEC occurrence, habitat management, and other science-based aspects of the conservation effort. In fall of 2012, the IAMWG convened a structured decision-making workshop to evaluate management uncertainties for NEC. Participants recognized encroachment on NEC habitat by eastern cottontails as the greatest uncertainty to the recovery effort. The IAMWG coordinated with the U.S. Geological Survey and the Connecticut Department of Energy and Environmental Protection to help initiate two research projects: the first will test methods of managing eastern cottontails, and the second will develop monitoring protocols to detect changes in occupancy or co-occupancy by the two species. The IAMWG has been challenged by the limitations of data sharing and a lack of capacity to manage data. Recent grant awards will help NEC conservationists develop integrated data management tools to improve status and performance reporting.

Objective 007: Coordinate Research and Monitoring Work Group

Scientists in the Research and Monitoring Work Group (RMWG) provide oversight for the monitoring and research performance element of the adaptive management framework, associated conservation and management actions, and progress toward habitat and population goals. Coordination of the RMWG ensures consistent delivery of monitoring and research objectives (see objectives for sections 400 and 600). The RMWG has made progress in coordinating research on genetics, population and habitat ecology, and monitoring approaches, however, more coordination is needed. We anticipate that a rangewide monitoring and population assessment protocol will be available for use during winter 2014/2015. Implementing this protocol is key to understanding the current distribution and abundance of NEC.

Objective 008: Coordinate NEC Land Management Teams (LMTs) in Each State

This objective provides oversight for the land management performance element of the adaptive management framework, the associated measures, and progress toward explicit targets. Coordination of these LMTs by each state's Technical Committee representative helps to consistently recruit landowners and achieve habitat management objectives (see objectives in section 500). LMTs have been active in each state and have made significant progress toward land management target levels. LMTs have also been developing reserve designs for each focus area, which requires assessing existing habitat and evaluating complementary opportunities to secure land or recruit landowners for voluntary conservation projects. Together, habitat created by land management added to existing habitat identified on the landscape may already approach the amount of habitat needed to support NEC population and habitat goals to sustain viable NEC populations.

Objective 009: Coordinate Population Management Work Group (PMWG)

This objective provides oversight for the population management performance element of the adaptive management framework, the associated measures, and progress toward explicit targets. Coordination of the PMWG by an appointed coordinator ensures consistent delivery and coordination of population management objectives (see objectives in section 400). The PMWG has built indoor and outdoor breeding facilities for NEC in captivity, leading to the successful breeding of litters and reintroducing rabbits to wild habitats. Techniques and facilities to produce the number of rabbits needed to meet release objectives continue to evolve.

Objective 010: Coordinate Outreach Work Group (OWG)

This objective provides oversight for the outreach performance element of the adaptive management framework, the associated measures, and progress toward explicit targets. Coordination of this work group by an appointed coordinator ensures consistent delivery of outreach objectives (see objectives for section 700). The OWG has produced an outreach strategy, materials to help enlist landowner

participation, a Web site, signs, a logo for the New England Cottontail Regional Initiative, a rangewide brochure, and other communications tools. Conservation partners have secured five years of funding to support the highest priority activities of this work group.

Objective 011: Coordinate Land Protection Work Group (LPWG)

This objective provides oversight for the land protection performance element of the adaptive management framework, the associated measures, and progress toward explicit targets. Coordination of this work group ensures consistent delivery and coordination of land protection objectives (see section 800). So far, the LPWG has had minimal activity, deferring to the USFWS to lead in developing the North Atlantic Shrublands Land Protection Plan, an innovative proposal to expand National Wildlife Refuges across the NEC range to help NEC and other species in the region that need shrubland habitat.

Table 3. Coordination and Administration Objectives, Performance Measures, Scope, and Implementation Status (continued next page)

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
001: Convene Executive Committee (ExCom)	Conservation Strategy implemented contingent on funding availability	2015 Status assessment	Listing is not necessary	Not Available until 2015	Conservation Strategy is being implemented	high	On schedule
002: Convene Technical Committee (TechCom)	Coordinate TechCom and workgroups to provide oversight for plan implementation and adaptive management	1 annual meeting and monthly calls	6 out of 8 in attendance	>6	Participation level may be improved by designating alternates	high	On schedule
003: TechCom annual review of species status	Review biological status of NEC and assess progress toward Population and Habitat Goals	Complete review at January Annual meeting	1 request to ExCom for approval	Approval Pending	Status assessment is ongoing	high	On schedule
004: TechCom annual review of performance	Review performance indicators and research results to assess efficacy of implemented actions	Complete review at January Annual meeting	1 request to ExCom for approval	Approval Pending	Status Assessment is ongoing	high	On schedule
005: TechCom annual review of Conservation Strategy adaptations	Utilize substantive new information to adapt conservation strategies and refine landscape design (focus areas) to ensure recovery	Complete review at January Annual meeting	1 request to ExCom for approval	2 requests approved (2013, 2014)	New Hampshire, Massachusetts, and Rhode Island have modified focus areas. Maine modified goals.	high	On schedule
006: TechCom coordinate Information & Adaptive Management Work Group (IAMWG)	Work group ensures consistent delivery of information management objectives, and organizes information to support adaptive management	achieve performance as defined under Conservation Strategy 100	1 annual report; data updated quarterly	Report pending	Progress is limited by lack of capacity to manage data, data sharing challenges, and TechCom capacity to prepare data. Limitations will be addressed by multi-state PR grant.	high	Delayed progress has been addressed by PR grant.
007: Coordinate Research and Monitoring Work Group (RMWG)	Work group ensures consistent delivery and coordination of monitoring and research objectives	achieve performance as defined under Conservation Strategy 200 and 600	1 annual report; data updated quarterly	Report pending	Inconsistent progress; limited by TechCom capacity to coordinate, delayed development of monitoring protocols, technical expertise. Grant to USGS is now operational and will improve progress.	high	Delayed progress has been addressed by USGS project.

Table 3. (continued) Coordination and Administration Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
008: Coordinate NEC Land Management Team in each state (NECLMT)	NECLMTs in each state ensure consistent delivery of recruitment and habitat management objectives	achieve performance as defined under Conservation Strategy 300 and 500	1 annual report; data updated quarterly	6 reports delivered (2013, 2014)	Overall, land management teams are active and high performing. Need to improve flow of performance information.	urgent	On schedule
009: Coordinate Population Management Work Group (PMWG)	Work group ensures consistent delivery and coordination of population management objectives	achieve performance as defined under Conservation Strategy 400	1 annual report; data updated quarterly	Reports delivered (2013, 2014)	Group meets consistently, implementation of all objectives is underway as necessary, positive results have been achieved, yield needs to improve.	urgent	On schedule
010: Coordinate Outreach Work Group (OWG)	Work group ensures consistent delivery and coordination of outreach objectives	achieve performance as defined under Conservation Strategy 700	1 annual report; data updated quarterly	Reports delivered (2013, 2014)	Group is consistent and effective.	moderate	On schedule
011: Coordinate Land Protection Work Group (LPWG)	Work group ensures consistent delivery and coordination of land protection objectives	achieve performance as defined under Conservation Strategy 800	1 annual report; data updated quarterly	Report pending	Group is not consistent and protection activity is sporadic; however, FWS development of forthcoming LPP is a major milestone.	moderate	On schedule

100 Information Management

Overview

Conservation partners made significant progress toward developing an information management system. Several State Land Management Teams (LMTs) are using a data-collection tool developed by USFWS, and others are using unique databases to gather data in standard formats. Provided with data entered locally in standard formats, Wildlife Management Institute (WMI) can integrate regional data provided by Natural Resources Conservation Service (NRCS), FWS, and other partners, with progress reported by the LMTs.

Partners need a system to track updates to the Conservation Strategy and levels of resources committed; attempts to track funding in the WMI Tracker Database were challenging because of the complexity of funding for every project. Agency-level tracking of funding commitments by objective is recommended. Sharing data on performance has been onerous and has slowed the adoption of the WMI Tracker Database; with improved integration tools (including support for monitoring), technical assistance, and commitments to enter data, the system should be sufficient for long-term range-wide tracking.

Integrating data management systems has not progressed sufficiently to support automating reporting for status assessment and performance measures: investment in better integration approaches could save $50,000-$75,000 annually, based on the estimated cost to hire a full-time data manager to manually integrate data from separate sources.

Outstanding Uncertainties: Fully integrated data management and automated reporting may not be feasible.

Implementation Recommendations:

- Contract a data manager to develop a data-management strategy that will further the adaptive management approach (Objective 101).
- Schedule a workshop led by Information and Adaptive Management Work Group to develop data-management protocols and provide training.

Conservation Strategy Modifications:

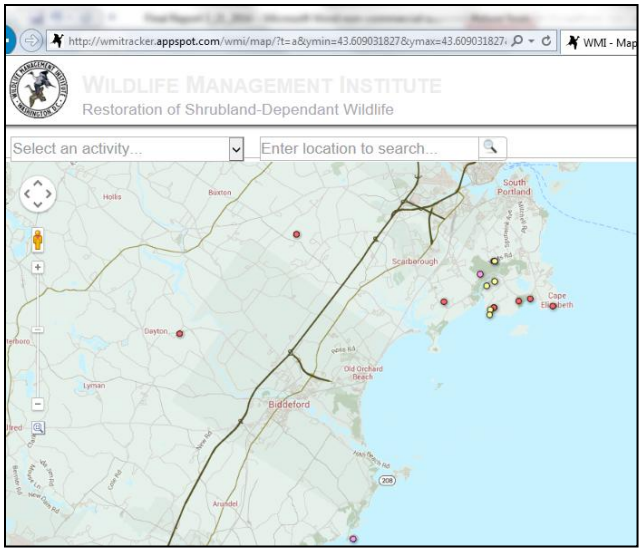
- Edit or remove automated reporting objectives and draft a new objective to hire a data manager.

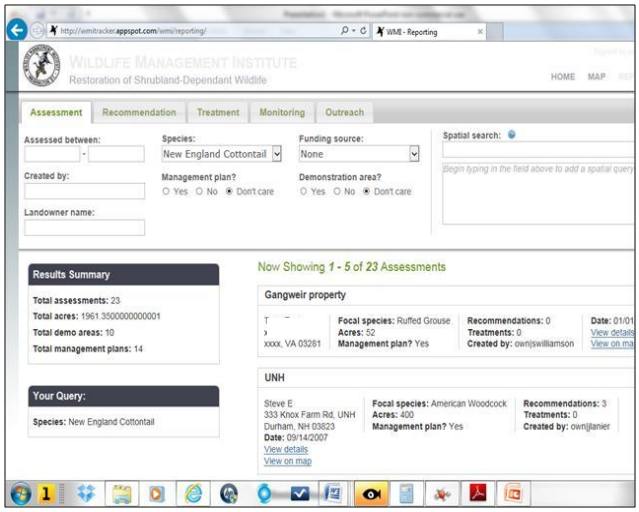
Objective 101: Assess Data-Management Needs

Conservation partners must identify and assess data and information from multiple sources to track the conservation effort so that they can reliably determine its progress. This information is important for ranking the priority of conservation actions.

Objective 102: Develop and Integrate Data-Management Tools

Partners must develop tools to combine and integrate data from multiple sources to track progress in the conservation effort. Automating the reporting and synthesis of data will save time and make the adaptive management effort more effective. The WMI Tracker Database includes a land-management component that will be valuable in tracking habitat management projects; however, this database has yet to be adopted by the NEC partnership because of sensitivities of spatial data on NEC occurrence and private landowners' conservation activities.





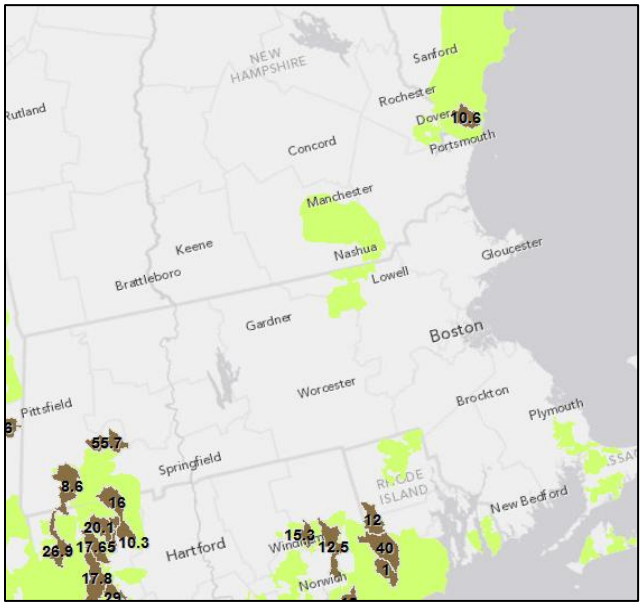


Figure 6. The WMI Tracker Database was designed to facilitate tracking and reporting of land management projects by multiple partners for the full suite of shrubland-dependent species. Projects may be tracked in a variety of ways, such as points or polygons, depending on the level of information sharing allowed by landowners. **A common system to track land management is critical, because few if any projects are developed exclusively by one partner. The USFWS developed a template that facilitates data uploading for all partners.**

Data about projects that are tracked by the database may be queried and exported only by users with privileges allowed under non-disclosure agreements. **Many state and federal partners have agreed that the terms and conditions of non-disclosure offer comprehensive protection of sensitive information – a significant accomplishment in itself.**

NRCS has provided comprehensive data on NEC land management for all NEC focus areas. Data are organized according to the type of conservation practice, the year, and Hydrologic Unit Code 12 watershed. **To date, NRCS has reported over 3,700 acres range-wide for 2012 and 2013**. WMI has provided significant assistance to NRCS and other partners to use geographic information system (GIS) data to identify the best parcels for NEC habitat restoration, offer technical assistance to land managers and land owners, and give guidance on implementing performance evaluation as described in the

Objective 103: Maintain and Manage Spatial Data

Partners and/or staff must develop a system to manage spatial data. To conserve NEC, we need to identify landscapes where management efforts will be most effective. New information on the occurrence of NEC populations and the importance of different habitat types to the species may require us to periodically re-evaluate those landscapes, including the boundaries of focus areas. Maintaining and sharing spatial data is complicated by a lack of data-management staff whose time is dedicated solely to NEC conservation; the absence of a protocol to assure the timely distribution of data; and sensitivities related to sharing spatial information.

Objective 104: Maintain and Manage Planning Data

Partners will design and develop an effective system of habitat reserves (see Section 3.3 of the Conservation Strategy) through the timely review of data by local teams implementing habitat management projects. Conservationists must develop a system for tracking incremental progress at the local or focus area scale to advance cooperation among conservation professionals responsible for identifying and carrying out such projects.

Objective 105: Maintain and Manage NEC Status Data

Conservationists must manage spatial data on the occurrence and numbers of NEC at different sampling locations. Such information helps in assessing the effectiveness of management projects and can inform changes in conservation design and delivery. Small populations of NEC are highly ephemeral, and the timely sharing of information on the species' presence on specific tracts will help scientists take protective measures to reduce adverse impacts on NEC living in areas where habitat management will take place.

Objective 106: Maintain and Manage Management Performance Data

Partners must develop a process for collecting performance data to better conduct management actions identified in the Conservation Strategy.

Objective 107: Acquire Necessary Data and Permissions

Conservationists must develop data-sharing protocols and agreements to ensure that sensitive information is protected. Data exchange among partners can be complicated by the need to avoid making public information on precise locations of NEC or personally identifiable information such as the names and addresses of private landowners involved in conservation activities.

Objective 108: Provide Technical Assistance to Managers

Conservation professionals may need guidance in carrying out the Conservation Strategy. Technical Committee and work group coordinators provide guidance, effective coordination, and consistent delivery of actions that advance the goals of the Conservation Strategy.

Objective 109: Create and Share Status and Performance Reports

Conservationists regularly create and share status and performance reports showing the progress of the NEC conservation effort, both to describe specific projects and actions, and to demonstrate the overall effectiveness of the New England Cottontail Regional Initiative. This information is critical to the USFWS listing decision process, which takes into account the effectiveness of partners' efforts to conserve the species.

Objective 110: Respond to Requests for Data

Partners are developing data sharing agreements, protocols, and management systems to promote timely and accurate responses to requests for data and information, and that explain the progress of the conservation effort and help guide future management actions.

Table 4. Information Management Objectives, Performance Measures, Scope, and Implementation Status (continued next page)

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
101: Assess data management needs	Conservation Strategy drafted to manage data in an adaptive management framework	Conservation Strategy specifies automated reporting templates for work groups	1 document	Incomplete	Development of Information and Adaptive Management Strategy limited by capacity to coordinate work group and difficulty resolving data sharing.	urgent	Delayed progress has been addressed by PR grant.
102: Develop/integrate data management tools	Integrative platform for Objectives 103-106; including data interface, query, report template & schedules for 202, 305, 306, 405, 502, 505-510	performance and status reports satisfy TechCom and ExCom	Approval of: 1 status and 4 performance reports	Incomplete	Integrated reporting platform has not been developed. WMI Tracker capable of tracking subject performance measures, but data sharing is not resolved. FWS data template is in use by many LMTs.	urgent	Delayed progress has been addressed by PR grant.
103: Maintain/manage spatial data	A populated platform to manage & access changing spatial data, such as focus areas	Data transferred to platform & updated	1 annual update	Update complete, Arc project under development	Data are being compiled in a cohesive project in the ArcGIS platform.	moderate	On schedule
104: Maintain/manage planning data	A populated platform to manage & access changing planning data, such as goals, objectives, & maps	Data transferred to platform & updated	1 annual update	Updates approved, platform TBD	Conservation Strategy updates were approved during 2013 and 2014. A platform for tracking updates has not been developed.	moderate	On schedule
105:Maintain/manage NEC status data	A populated platform to manage & access species population data	Data transferred to platform & updated for 200	1 annual update on target levels	Status update pending, GIS platform under development	Status data have been compiled in ArcGIS for 2015 listing decision. Monitoring protocol is under development by USGS and when complete, a platform will be developed.	high	On schedule
106: Maintain/manage management performance data	A populated platform for performance data, such as habitat treatments and outreach events	Data transferred to platform & updated for 300, 400, 500, 700, 800	quarterly updates on target levels	Updates complete for most objectives, platform under development	Performance data have been compiled for 2015 listing decision. LMTYS are independently developing standards and IAMWG is working to ensure future compatibility with a regional. platform	high	On schedule

Table 4. (continued) Information Management Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
107: Acquire required data and permissions	Agreements in place to share restricted data at appropriate levels	Signed agreement between NRCS, USFWS, and WMI	1 agreement	NRCS accepted sharing terms with WMI. FWS has not agreed to terms. NH, MA, and CT entered non-disclosure agreements with WMI.	1 agreement is not sufficient. Private lands projects remain a challenge to data sharing. NRCS is reporting projects at the HUC12 level. FWS data entry template will standardize data entry for LMTs and upload public land data to WMI Tracker.	high	Delayed
108: Provide technical assistance to managers	108.1 Technical assistance to TechCom on information management to support adaptive management	# of trainings provided to managers	1 workshop, 4 webinars	Workshop cancelled; 7 webinars provided	Workshop scheduled for 10/16-17/2013 was cancelled due to federal shutdown. 7 webinars were provided to states, IAMWG, and TechCom on 10/3/2013, 10/15/2013, 11/19/2013, 2/10/2014, 3/7/2014, 4/11/2014, 5/9/2014.	moderate	On schedule
	108.2 Assistance with data backlog	data backlog is addressed	perf. data from 2009; NEC from 2003	Occurrence data backlog has been addressed; Performance data from 2009 are pending.	Data are being compiled for 2015 listing decision. NRCS provided data back to through 2012. Upon request, NRCS may provide additional data.	high	Nearly complete.
109: Generate automated status/ performance reports	Generate automated reports on schedule adaptive management	staff cost saved per year by automation	$50-75k/year	No automation achieved. Expense incurred as a result is >$75k to hire contractors for data compilation.	Lack of integrated data management precludes automation of reports.	high	Below target
110: Respond to requests for data	Managers competent to upload and query integrated database	# of requests resolved by technical support staff or automated system	20	0	Lack of integrated data management precludes automation of reports.	moderate	Below target

200 Monitoring

Overview

Monitoring NEC populations provides information on the status and distribution of the species, helps in evaluating the effectiveness of the conservation effort, and guides any changes that need to be made in the Conservation Strategy. Monitoring helps reduce the uncertainty of management outcomes over time. Monitoring is different than performance evaluation and research. Together, these three kinds of information provide feedback for adaptive management when they are integrated in a decision-making framework. Monitoring involves collecting biological data within a sampling design; performance evaluation (section 4.0 of the Conservation Strategy) entails tracking implementation (Objective 004) or the species' biological status (Objective 003) derived from monitoring; and research (section 4.6 of the Conservation Strategy) tests management assumptions or uncertainties within an experimental, theoretical, or modeling framework.

This section describes the collecting of biological data, including data to quantify population status, needed to drive some of the key feedback mechanisms that address management uncertainties identified as critical to successful adaptive management (see chapter 6.0 of the Conservation Strategy):

1. Efficacy of management techniques for creating quality NEC habitat (Objective 204)
2. Survival of NEC in augmented populations (monitoring included under Objective 405)
3. Competition with eastern cottontails (research included under Objectives 602, 603, and 604)
4. Productivity of captive breeding (monitoring included under Objective 402)
5. Landscape-scale population response to the conservation effort (Objectives 201, 202, and 203)
6. Genetic monitoring and management of NEC populations (Objectives 202 and 402)

Outstanding Uncertainties:

- Weather and staff coordination may limit feasibility of carrying out habitat occupancy studies.

Implementation Recommendations:

- Schedule Research and Monitoring Work Group workshop to plan U.S. Geological Survey occupancy monitoring pilot project.
- Contract a monitoring coordinator to help states organize pellet collection and deliver all monitoring data to a data manager.

Conservation Strategy Modifications: None.

Objective 201: Quantify Extent of Habitat

Conservation partners must develop a standardized definition of NEC habitat, along with monitoring methods to establish baseline habitat levels. Clear nomenclature and monitoring protocols will let biologists periodically evaluate the quantity and location of potential habitat, including at the landscape level. They will help managers identify trends in habitat availability, such as a loss of habitat to development, which may limit the effectiveness of the Conservation Strategy. Progress on this objective has been achieved. To assess the extent of habitats, conservationists at the University of Rhode Island developed a GIS layer containing shrubland habitats within Rhode Island and used it to determine the distribution of patch sizes and trends in abundance within the State (Buffum et al. 2011). In Connecticut, researchers have estimated the extent of patches of regenerating forest, afforestation (old-field succession to forest), and persistent shrublands (e.g., shrub wetlands) (Rittenhouse 2014). This information is being used along with data from the Connecticut Department of Energy and Environmental Protection (CTDEEP) that estimates coastal shrubland habitats and shrub wetlands data from the USFWS National Wetlands Inventory to quantify the amount of NEC habitat. Recently, CTDEEP staff conducted investigations to estimate the extent of dense understory vegetation that is expected to support the NEC and that cannot easily be estimated through remote sensing techniques (Kilpatrick et al. 2014 personal communication). In New York, three wetlands habitat types within the Northeastern Terrestrial Wildlife Habitat Classification system, associated with many NEC location data points, were used to quantify wetlands-related habitat acreage, representing a similar approach to the use of the National Wetlands Inventory data (Novak et al. 2014 personal communication).

Throughout the NEC range, the extent of dense understory vegetative communities (e.g. greenbrier thickets) has not been quantified, because remote sensing of such habitat is made difficult by the tree canopy beneath which these shrubs often grow. In New York, areas of mountain laurel, an understory type known to support NEC, have been roughly delineated using color infrared photographs for a large portion of one focus area (Western Putnam) where mountain laurel is common.

Objective 202: Measure Habitat Occupancy Rates

To determine habitat occupancy rates by NEC based on data derived from collecting rabbit fecal pellets, conservationists must develop protocols that lead to accurate surveys. Pellet survey detection protocols have been developed and refined by researchers at the University of New Hampshire (Brubaker et al. 2014, entire). Currently scientists with the U.S. Geological Survey's Southeast Climate Science Center are incorporating the detection protocols in a rangewide survey design to ensure high-quality NEC presence or absence data at a patch-scale resolution that conservation partners may use to assess our landscape design and to detect landscape-scale NEC population trends. In the future, intensive pellet sampling may be used to derive a population index usable across the species' range.

Objective 203: Presence/Absence Distribution Surveys

The current distribution of the NEC has been thoroughly documented at a coarse scale since Litvaitis

et al. (2006) published the baseline survey. Wildlife biologists continue to conduct ongoing research to determine any changes in the distribution of the species. Confirming the presence of NEC in given habitat areas may signal that the conservation effort is working; conversely, decreases in NEC presence may raise additional concerns that need to be addressed. Significant findings resulting from the continued effort to assess the distribution of the species include the discovery of NEC at the Cape Cod National Seashore and on Nantucket Island (Scarpitti 2014 personal communication; Paton 2014 personal communication) and loss of occupied patches in other parts of the range (not just ME/NH). Field investigations to determine the extent of NEC distribution in these new locations have been conducted, and further work is planned.

Objective 204: Measure Vegetation Response to Management

Assessing the response of vegetation to habitat management measures is critical to determine the effectiveness of different techniques in making habitat suitable for NEC. Such vegetation monitoring is letting researchers and managers assess the condition of the habitat in targeted stands so that they can efficiently plan management actions. Efforts by a variety of conservation partners to measure vegetation response are occurring throughout the species' range. In some cases, vegetation response to management has led to population response by NEC (Tur and Holman, personal observation).

New Hampshire, Connecticut, and Massachusetts are studying habitat restoration activities by monitoring change in vegetative structure using a standardized stem density monitoring protocol. Stem density is significant because it can be a limiting factor in NEC winter survival rates. The protocol has been implemented to establish baseline conditions for assessing habitat projects on public lands and is currently being funded by State Wildlife Grants. The density of woody stems in restoration areas is measured for each woody species present prior to management to establish a baseline, and again three years after management on designated treatment sites. Stem density estimates will provide critical information to assess the effectiveness of various habitat management methods and to refine them if needed.

New Hampshire, Connecticut, and Massachusetts have also begun implementing multi-species bio-monitoring, which is critical to understanding the long-term benefits and tradeoffs that result from managing habitat for NEC. Bio-monitoring is occurring at both the spatial level, through GIS mapping of forest-cover types and successional stages, and at the field level through sampling of forest songbirds, insects (including butterflies), vernal pools, and vegetation. GIS mapping provides information on percentages of early, mid-, and late-seral forest habitat within a given management unit, and also on the diversity and abundance of forest types. Sampling forest songbirds, butterflies, amphibian and invertebrate wildlife in vernal pools, and forest trees, shrubs, and herbs lets conservationists determine whether or not complete assemblages of native species are present. When fully implemented, these three States will identify up to six sites in total for bio-monitoring case studies, and implement one control vs. restoration pre-treatment survey in each location prior to

managing habitat to establish a long-term baseline. Conservationists conducted pre-treatment surveys on some sites during 2013-2014, and post-treatment surveys will be completed after several years.

Table 5. Pre-treatment stem counts on Connecticut sites averaged 38,263 stems per acre. All sites were cut, and after three growing seasons, stem counts averaged 96,833 stems per acre and the percentage of native plants in the understory increased from 54.6 (pre-cut) to 91.7. In Connecticut, pre-treatment data have been collected on 10 sites, and measurement of post-treatment stem densities is scheduled to take place after sufficient vegetation response time. This stem density monitoring is coordinated with efforts in other states.

Site		Stems/ha			% Native		
Name	Acres	Pre	Post 1 year (2012)	**Post 3 year (Nov 2014)**	Pre	Post 1 year (2012)	**Post 3 year (Nov 2014)**
Roraback 1	12.3	22,640	40,033	**58,765**	65.5%	64.0%	**73.5%**
Roraback 1a	10.2	47,484	10,040	**65,774**	30.4%	72.9%	**87.3%**
Roraback 2	13.9	29,233	30,800	**184,273**	100.0%	98.1%	**100%**
Roraback 2a	14.7	26,077	36,846	**137,217**	89.1%	96.0%	**88.7%**
Housatonic 1 NORTH	13.3	51,000	71,240	**152,045**	8.2%	35.1%	**98.7%**
Housatonic 2 SOUTH	20.4	63,286	34,519	**44,420**			**97.6%**
Goshen 2 (30)	13	46,040	52,609	**45,500**	72.5%	93.0%	**99.2%**
C. Columbia	4	36,125	10,125	**86,667**	16.6%	98.8%	**88.3%**
Goshen 16 (delayed cut 2yrs)	**57**	**22,479**	**12,214**		**83.7%**	**88.7%**	
Average		**38,263**	**33,158**	**96,833**	**54.6%**	**79.7%**	**91.7%**

Objective 205: Monitor Disease and Parasitism

Conservationists must evaluate captured individual NEC and populations of NEC to determine the presence of diseases and parasites and, if needed, predict their possible impacts on NEC populations. Work to assess the prevalence of diseases is ongoing. Animals entering the captive breeding program at the Roger Williams Park Zoo, Providence, Rhode Island, are evaluated by the Zoo's veterinary staff. Researchers at Brown University are also conducting research to characterize changes in parasite/ pathogen composition and disease risk associated with NEC during population declines; in NEC during reintroduction and recovery; and in eastern cottontails when they establish themselves in newly created habitat (Smith and Neil 2014 personal communication). In addition, researchers at the State University of New York College of Environmental Science and Forestry are evaluating the parasite ecology of NEC (Gavard 2013). At this time, there is no evidence to suggest that disease or parasites have been or are a limiting factor for NEC; therefore, conservationists have proposed no conservation measures to manage these factors.

Table 6. Monitoring Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
201. Quantify extent of habitat	Develop a standardized definition of habitat and monitoring methods to establish a baseline habitat level and evaluate habitat extent every 10 years.	Percentage of NEC range mapped.	10% of range mapped after baseline is established	100% mapped by remote sensing and models.	Several models are available to map habitat for all or part of the NEC range. Proportion mapped by ground truth and photo interpretation is unknown.	high	On schedule
202. Measure Habitat Occupancy Rates	202.1 Finalized UNH detection sampling protocol will be used to develop regional survey design, including estimate of minimum detectable trends, number of surveys & sites.	Regional survey design complete with an acceptable balance of statistical power and available resources.	na	USGS project will produce draft for 2014-2015 pilot	Project was delayed due to administrative barriers.	urgent	Delayed, but now progressing
	202.2 Apply regional survey design on managed land as prescribed at varying intensity to measure trends in occupancy (lowest), density, and abundance (highest).	Create baseline densities for potential and actively managed sites; re-measure presence/absence annually; density and/or abundance every 5 years	Prescribed surveys implemented for 10 years, occupancy of managed sites ↑, occupancy natural habitats stable or ↑	n/a	n/a	high	Inactive
203. Presence/ Absence distribution surveys	Conduct presence absence surveys throughout the historic range using minimum detection intensity; target focus areas first.	Presence and absence data should be < 10 years old and all potential habitats in a focal area should be surveyed.	All suitable habitat	N/A	It is not feasible to survey all suitable habitat.	low	On schedule
204. Measure vegetation response to management	204.1 Implement stem density protocol & refine sampling intensity to test efficacy of treatments	Change in woody stem density over 3-year intervals	>50,000 stem–cover units per hectare	N/A	ME has done pre-treatment stem counts on 9 of 43 management sites. CT, MA, and NH monitor all state lands.	moderate	On schedule
	204.2 Quality control/rapid assessment to confirm response.	Ratio of project success to projects checked	0.9	N/A	To be estimated Alena Warren, ongoing UNH master's thesis	moderate	On schedule
205. Monitor disease	Detect epidemics	Cooperators are aware of carcass collection or disease monitoring efforts.	Opportunistic mortality surveillance	Non-epidemic disease detected.	RWPZ detected a non-epidemic pathogen in captive population.	low	On schedule

300 Landowner Recruitment

Overview

- The Natural Resources Conservation Service (NRCS) continues to recruit landowners to voluntarily make habitat for NEC, and this effort has proven very successful in areas where habitat creation is most needed;
- Future funding will need to be secured; however, the long-term need for additional funding will decrease as target properties are successfully recruited;
- The record of funding these activities is strong, and funding to continue this work has been secured in the short-term through several grants with additional funding anticipated;
- Business plan and reserve design development are continuing; the reserve designs are specific for each focus area and are helping conservation partners apply the Conservation Strategy design to that particular focus area, helping to clearly define the future need for landowners' voluntary participation in creating habitat on their holdings.

Outstanding Uncertainties:

- Some focus areas all opportunities to improve habitat may be exhausted before sufficient voluntary conservation is achieved on private land.

Implementation Recommendations:

- State Land Management Teams (LMTs) need to delegate specific tasks to all partners when recruiting landowners conduct habitat improvement projects on lands identified in reserve designs, and coordinate with the Wildlife Management Institute to identify unmet funding and staffing needs.
- LMTs must coordinate with USFWS refuges to prioritize possible acquisitions.

Conservation Strategy Modifications: None.

Objective 301: Convene NEC Land Management Team for Each State

Incentives are in place for NEC. USFWS approved a programmatic Candidate Conservation Agreement with Assurances for New Hampshire, and one is in final review for Maine.

Conservation partners have created state Land Management Teams, including representatives of state and federal agencies and nongovernmental organizations, to identify habitat management priorities, develop habitat creation projects, and identify resources to carry out those tasks. LMTs ensure the timely creation of high-quality NEC habitat. They are charged with adopting, revising, and sharing Best Management Practices (BMPs) developed by the BMP Working Group (now inactive). LMTs also play a key role in tracking many of the performance metrics reported in this report.

Objective 302: Develop and Deliver Incentives

Conservationists have developed and delivered incentives that attract private landowners to participate in the conservation effort. Incentives include Candidate Conservation Agreements with Assurances (CCAAs), regulatory assurances that let private landowners continue to use their land and gain income from it while voluntarily creating habitat for NEC. (CCAAs provide legal guarantees that no additional regulatory burdens will be placed on cooperating landowners should the New England cottontail formally be listed as threatened or endangered under the federal Endangered Species Act). A CCAA is in place for New Hampshire, and one is in the final review stage for Maine. Other incentives include cost-sharing through Farm Bill programs administered by NRCS, and technical assistance in developing habitat management plans.

Objective 303: Hire a Recruitment Coordinator

Recruitment coordinators have been identified in each state to approach owners of lands that are highly suited to habitat management benefiting NEC (see Section 4.7 in the Conservation Strategy). Each state, except NY, has increased capacity for landowener recruitment. For example, CT has allocated 7 staff and/or contractors to assist with landowner recruitment, totaling the equivalent of 3 full-time staff. To date, conservationists have made steady progress in signing up landowners willing to create NEC habitat, but such efforts require considerable time and resources. The cost of time spent developing personal relationships with landowners, educating them regarding NEC, and negotiating with them to set up habitat projects can be a key limiting factor. The Working Lands for Wildlife Initiative by NRCS may

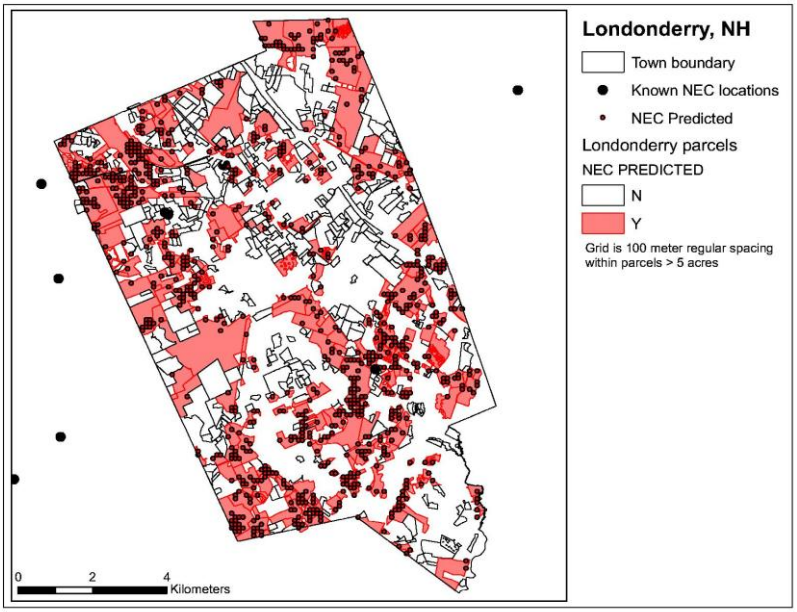


Figure 7. Parcel analysis allows conservation partners to understand exactly how much voluntary conservation action is needed. Early in the effort, all parcels in the species' range were analyzed to prioritize them for targeted landowner recruitment efforts. The prioritization allows landowner contacts to recruit voluntary participants that best complement a reserve design for conservation.

significantly lower costs, as NRCS staff who have not yet been involved in NEC habitat projects begin advising clients on how to manage land to help the species. However, there is a need to identify additional funding sources to increase recruitment of private landowners.

Objective 304: Contact Landowners

Conservation partners are reaching out to private landowners to increase their awareness of NEC and the need to create and manage habitat for this native species. Mailings, telephone calls, and workshops are being used to contact and enlist landowners. Following the development of a Habitat Suitability model (Fuller et al. 2011, page 1), tax parcels across the NEC range were prioritized, identifying the top 94 percent of parcels in each state. In the Seacoast Focus Area in New Hampshire, conservationists drew up a targeted mailing list for these important parcels and sent a mailing to landowners. In CT, biologists evaluated the top 20 ranked parcels in each focus area and reached out to those landowners. Next steps are to move on to the next 20 highly ranked parcel owners as well as landowners with known populations of NEC. Conservationists also routinely put on workshops in focus areas to further get the message out about the importance of voluntary participation to help in the NEC recovery effort.

Objective 305: Conduct Site Assessments

Conservation partners assess properties owned by landowners interested in joining the NEC conservation effort to determine their suitability for management, identify landowners' objectives before any management takes place, and develop effective management plans where pertinent.

Objective 306: Draft Applications, Preliminary Plans, and Cost Estimates

Conservation professionals are actively helping landowners, including private individuals, land trusts, Native American tribes, and municipalities plan specific habitat projects, estimate their cost, and draft applications to programs that help landowners pay for creating and managing habitat.

Objective 307: Draft and Review Land Management Ranking and Eligibility Criteria

To ensure that Farm Bill and other private land management resources are directed to projects that maximize benefits to NEC, conservationists developed ranking criteria for private lands. Program eligibility criteria at times pre-empt the award of some funding, thereby making it necessary to find funds through other programs. Recommendations on revision of rules specifying eligibility requirements should be collected and submitted through appropriate channels.

Objective 308: Manage Parcel Information and Landowner Status

Decision-support tools and NEC data are being used to identify key parcels, and track efforts to recruit willing landowners to manage those tracts.

Objective 309: Develop a Business Plan Incorporating Parcel Ranking and Reserve Design Principles

State land management teams developed a business plan for each focus area to direct resources and funding to projects that help create reserves that will best maintain and increase NEC populations. Parcel ranks provide a parcel-by-parcel assessment of conservation potential for local NEC; however, they do not reflect the ability of cottontails on those parcels to interact with other NEC populations. LMTs take into account habitat patch size, configuration, and connectivity between patches. In some cases, reserve design is further informed by research on local populations and dispersal. In the future, viability analysis may be possible within focus areas, if sufficient data regarding the demographic characteristics of NEC populations becomes available.

Table 7. Landowner Recruitment Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
301: Convene NEC Land Management Teams for each state (NECLMTs)	Operational state partnership to recruit landowners, review, develop, and coordinate land management projects	Monthly meeting includes field and office information sharing and reduces confusions	10 per year/state	Estimate 4/year/state	Target level is not feasible, but quarterly meetings may not be sufficient.	high	Below target
302: Create/apply incentives	Increase enrollment incentives (walking trails, views, economic, hunting opportunities, berry picking)	Acres enrolled/cost of incentives	undefined	$482.13/acre; estimate 8179 acres costing $3,943,320 in land management funds.	Does not include staff capacity. Acres include include planned, ongoing, and complete.	moder ate	On schedule
303: Support recruitment coordinator	Build capacity to recruit landowners and apply decision tools to ensure recruitment results in effective reserve design	positions filled	10	2 hired in ME, 1 NH, 1 MA, 1 RI, 3 CT, 0 in NY	Landowner recruitment rates may recede soon due to saturation of finite landscapes. In some states, hired positions have expired or will expire soon.	urgent	On schedule
304: Contact landowners via mail/phone/ workshops	Reach out to priority landowners and garner interest in managing habitat and increase interest.	n/a	n/a	>2000 landowner contacts	Contacts include direct mailings regarding land management and site visits. Performance level is estimated from inconsistent data.	low	On schedule
305: Conduct site assessments	Discover new populations, relocate historic populations, assess existing habitat conditions for management.	Best Parcel (BP) acres treated by 2020 in focus areas	75% in Best Parcels & total 15595 acres	Estimate 43% of 8179 total acres in Best Parcels.	Recruitment success on best parcels has been high. Not meeting Best Parcel criteria does not mean project location is poor. Acres include include planned, ongoing, and complete.	high	On schedule
306: Draft application/preliminary plan/cost estimates	Develop preliminary plans that are feasible, eligible, and acceptable for permitting and vendor contracting	Projects planned and projects implemented annually	Proposed measure: 75% implemented and 750 acres planned /year	Approximately 2000 acres planned, yearly rate unknown but average is approximately 700.	Proposed measure 750 acres planned per year ensures 15,000 acres younger than 20 years. This level will be adequate to maintain NEC if natural habitat and other land management are present.	urgent	On schedule
307: Draft/review land management ranking and eligibility criteria	All ranking criteria ensure that funds are not allocated to low priority parcels in focus areas or satisfy exception to focus area boundaries	Alignment of funded projects with NEC priorities	75% in Best Parcels	Estimate 43% of 8179 total acres in Best Parcels.	Acres include include planned, ongoing, and complete.	high	On schedule
308: Manage parcel information/landowner status	Use decision support tools and NEC data to identify key parcels, and track efforts to recruit them	Develop GIS layer of priority parcels	One map per focus area	Each state LMT is managing parcels.	Ongoing.	moder ate	On schedule
309: Develop/evaluate business plan incorporating parcel ranking &reserve design principles	Plan is drafted for each focus area & conservation funds are targeted to ensure effective spatial configuration of projects, optimize site conditions, and minimize cost (see also 307, 308, & 805)	Each NECLMT develops a plan with: a map, table of parcels, and summary of patch metrics for active focus areas	25	Completed or in progress in all states.	Ongoing. Reserve design is a living document reflecting best current opportunities for success.	urgent	On schedule

400 Population Management

Overview

- Captive breeding success has been increasing, captive-bred animals are surviving in the wild, efforts are underway to confirm breeding in the wild, and funding for these efforts is relatively secure;
- Productivity of the captive breeding program is below target levels;
- Management approaches to control eastern cottontail use of suitable NEC habitat are still being developed, and additional work is needed to determine if implementation is feasible and will be effective.

Outstanding Uncertainties:

- Eastern cottontail threat severity and management efficacy are not fully resolved;
- Litter size and survival rate to weaning of captive NEC are below planned estimates.

Implementation Recommendations:

- Additional capacity for breeders is needed, and could be achieved on island colonies, constructed pens, or additional zoos.

Conservation Strategy Modifications:

- Adjust target levels and/or approaches to reflect new information on breeding yields.

Objective 401: Obtain NEC for Captive Breeding

Conservationists have identified suitable populations from which to capture wild NEC for use in captive breeding. Some geneticists have recommended that population augmentation and reintroduction efforts should avoid moving NEC between geographically separated populations unless inbreeding depression of dwindling populations makes it necessary to do so (Fenderson et al. 2011, p. 955). However, it can be very hard to trap individuals in small local populations, and removing them from the wild can harm those populations, which may themselves need augmentation with captive-bred rabbits. With this in mind, the NEC Technical Committee recommended capturing breeding stock from nearby source populations, recognizing the likely need for limited geographic mixing. Scientists have and will continue to evaluate the health and general condition of all captured wild individuals to make sure they do not bring disease into breeding populations. To date, successful captive breeding with wild-caught animals has only taken place at Roger Williams Park Zoo (RWPZ), Providence, Rhode Island, but may also include additional facilities in the near future.

Objective 402: Conduct Zoo-Based Husbandry

Conservationists continue to develop a program to maximize the efficiency of zoo-based captive breeding without compromising the health and survival of captive NEC. Biologists and captive-breeding

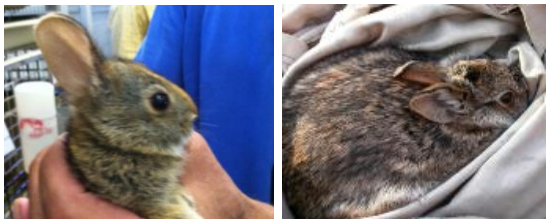


Figure 8. Captive breeding successes. The breeding program at Roger Williams Park Zoo has completed several seasons of successful captive breeding and releases. After one year of bringing animals in from the wild, refining husbandry techniques, and successfully maintaining a captive population of NEC, the staff at Roger Williams Park Zoo in Providence RI, began breeding NEC in 2011. As of November 2013, a total of 79 pairings had been made at the zoo, resulting in 157 births and the release of 131 juvenile NEC in Rhode Island and New Hampshire. In captivity, rabbits receive thorough veterinary examinations and high quality care. Released rabbits have had high survival rates that can likely be attributed to their healthy condition at the time of their release. The next steps in the captive breeding effort are to confirm breeding is taking place in island colonies, outdoor pens, and other augmented populations, and begin transferring NEC throughout their range.

specialists work together in a Population Management Work Group (PMWG) to coordinate their efforts so that captive breeding needs are quantified, reintroduction sites prioritized, and a schedule for implementation developed. Specialists have compiled a protocol, *Captive Propagation and Reintroduction Manual for the New England Cottontail*, that describes health checks on captive rabbits (adults and young) and includes a list of potential rabbit diseases. It also presents husbandry protocols, including all aspects of trapping, transporting, and housing animals, record keeping, veterinary care, sanitation, breeding, population genetics management, and release and monitoring of captive-bred animals. The PMWG has reviewed the protocol for compliance with state and federal regulations and appropriate permitting, and RWPZ continues to implement the plan in coordination with the states, the PMWG, and researchers at the University of New Hampshire and the University of Rhode Island. The manual addresses uncertainties and will continue to refine the overall captive breeding effort to produce a large quantity of healthy young. RWPZ designated a building for NEC captive breeding and husbandry and has refined, developed, and expanded the facility following an initial captive breeding pilot study. Genetics of candidate source and recipient populations continues to guide the establishment and management of the captive population. Select offspring are designated for augmenting wild populations in coordination with the PMWG and the recipient state, or held in captivity for breeding. The yields initially projected for captive populations appear to have been high, and ongoing evaluation of potential production may lead to adjusting those levels.

Are captive bred animals breeding in the wild? Rabbits acclimated in a pen at the RI National Wildlife Refuge Complex in Charlestown, RI, were released at Patience Island in Narragansett Bay, Rhode Island. The goal of releasing NEC onto Patience Island is to establish a breeding colony where genetic viability can be monitored and individuals can be strategically transferred to mainland sites to re-establish populations of NEC that have been extirpated or to supplement existing populations. Conservation partners monitored the "founder" population regularly, documenting a survival rate of approximately 50%-60%. Red arrows in the photos show ear notches from tissue samples taken in captivity, also photographically captured along with a radio collar on an animal released on Patience Island. Ear notches and radio collars are not visible on the animals photographed at right, as would be expected for the offspring of released animals. University of Rhode Island is testing DNA to confirm breeding. University of New Hampshire is testing to confirm breeding of captive bred animals after releases in New Hampshire.

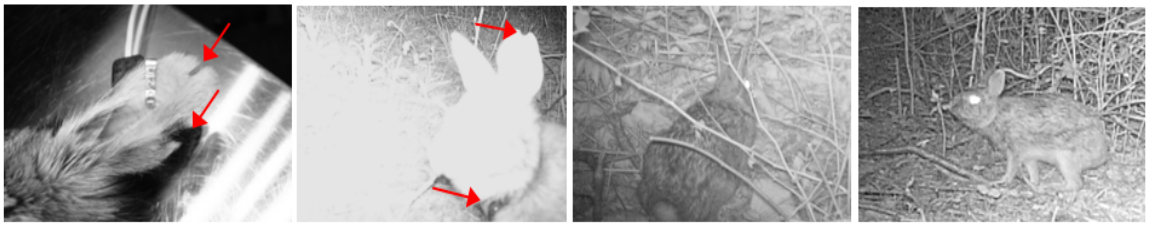


Figure 9. Captive animals breeding in the wild?

Objective 403: Evaluate Enclosure-Based Husbandry

Captive-breeding specialists continue to explore enclosure-based husbandry of NEC as an alternative to husbandry in a zoo setting. Meeting all population-augmentation and reintroduction needs through a zoo-based facility may not be feasible because of limitations on the size of the captive population that can be maintained. Two one-acre pens were constructed at Ninigret National Wildlife Refuge, Rhode Island, and Great Bay National Wildlife Refuge in New Hampshire. The pens protect against predation and are well-stocked with vegetation providing ample natural cover and forage. One NEC pair was housed in the Ninigret pen from June to August 2012, with no evidence of breeding taking place or offspring being produced. Attempts to overwinter captive-bred young at the Great Bay pen, so that they reach reproductive age the following spring, have not resulted in production of young. As an alternate approach, rabbits born in captivity and raised to reproductive age will be released into the pens in April 2015, where conservationists hope they will begin breeding.

Objective 404: Manage Island Colony or Colonies

Captive-breeding specialists continue to manage and monitor a small NEC population composed of offspring from RWPZ's captive-breeding pilot project that have been released each year since spring 2012 on 200-acre Patience Island in Rhode Island's Narragansett Bay. As of October, 2014, 33 young NEC have been released, with an annual survival rate estimated at 50 to 60 percent. By 2015, 20 more animals are expected to be released. Most mortality has been from avian predators, but the survival rate has been higher than expected. In early 2014, preliminary evidence of breeding was documented

through photographs taken by trail cameras. Several photographs showed rabbits that appeared to lack a radio collar, ear tag, or ear notch, all of which would be present on rabbits born at the zoo. Biologists collected pellets on the island in winter 2014, and genetic testing of these pellets to identify individuals is pending. If the Patience Island population continues to thrive, conservationists will capture NEC there and translocate them to locations on the mainland to augment depressed populations or establish new populations. With the initial success of the Patience Island project, scientists are exploring other offshore islands where similar breeding populations could be established. They conducted preliminary evaluations of Nomans Land Island National Wildlife Refuge in Chilmark, Massachusetts, and determined that the island is well-suited to support a population of NEC (Maynard 2013, entire). An environmental assessment is being conducted by USFWS that will further evaluate and consider planning actions needed to determine if an introduction will take place.

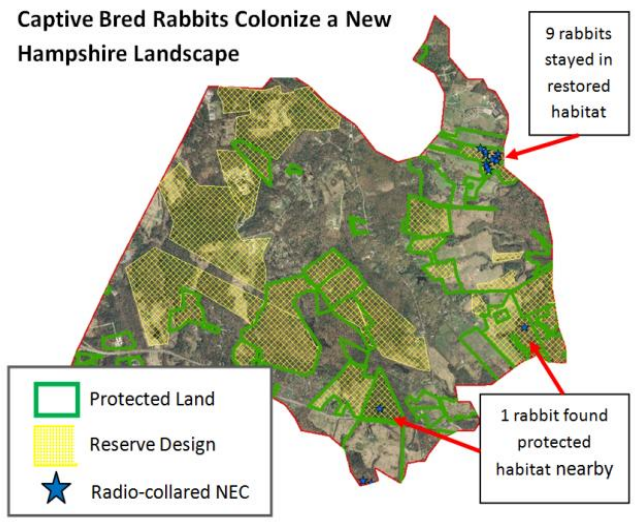


Figure 10. Rabbits are settling in new habitat in New Hampshire. Ten NEC born at the Roger Williams Park Zoo were released at Bellamy Wildlife Management Area in New Hampshire starting July 2013. While being monitored with radio-telemetry, all stayed within a 20 acre managed habitat patch—except for one female that dispersed immediately upon release. She was observed moving from habitat patch to patch before settling into new protected habitat after 1 week of dispersal and nearly 2 km of travel. Releases have continued, and to date, the released rabbits have remained on site and there is 100% survival after one month—monitoring will continue. UNH is testing pellets to confirm breeding in the wild.

Objective 405: Release NEC to Augment or Establish Wild Populations

The Conservation Strategy states that partners will release captive-bred or wild-caught NEC to boost wild populations or to establish new populations in suitable habitat. Animals for augmenting or establishing populations may come from several sources: captive breeding conducted in zoos; animals born in outdoor enclosures; animals from island-based or large, healthy mainland populations; and animals produced by commercial breeders. Rabbits from zoo-based or commercial facilities will be held in temporary hardening pens (like the one at Ninigret National Wildlife Refuge) before full release to better acclimate them for a life in the wild.

To date, conservation partners have released captive-bred NEC to augment one wild population in New Hampshire. Rabbits were held in the pen at Great Bay National Wildlife Refuge for 2-6 weeks after weaning at the zoo to get used to natural food sources and gain adequate weight to support radio collars for telemetry monitoring after their release. Survival in the pens during acclimation has been variable. In general, predation appears negligible in the summer months when vegetative cover is dense. Predation by both mammalian and avian predators during the winter has been more substantial in New Hampshire. To improve the chance of survival and breeding in

the pen, RWPZ will hold a small number of individuals over the winter to breeding age before releasing them into the pen in spring 2015.

Altogether, thirteen rabbits have been released into the wild in New Hampshire. Survival has been higher than expected, with only four confirmed killed by predators. The release technique was to take the rabbits from the pen and let them go in the habitat patch. Conservationists may decide to build "soft release" enclosures 100 to 200 square feet in area to temporarily hold (for one to two weeks) individuals prior to their release, a technique that has increased success in other rabbit reintroduction efforts (Cabezas, Calvete and Moreno 2011). That technique has not yet been tried for NEC reintroduction and will be used only if there appears to be a clear advantage to doing so.

Objective 406: Manage Eastern Cottontails

Conservationists will use an adaptive management approach to learn whether managing eastern cottontails will help conserve NEC and boost populations. The Information and Adaptive Management Work Group (IAMWG) attended a structured decision-making workshop in 2012 to develop an approach for testing hypotheses related to managing eastern cottontails. The IAMWG crafted an adaptive management framework to implement management actions and conduct scientific monitoring studies gauging the feasibility and effects of managing eastern cottontails in NEC focus areas. The IAMWG plans to request proposals for putting the adaptive management framework into practice. Connecticut Department of Energy and Environmental Protection biologists have started pilot projects to begin investigating key uncertainties regarding the feasibility of removing eastern cottontails through hunting or trapping, and the population response of both rabbit species following eastern cottontail removal (Kilpatrick 2014, personal communication). Early results show that hunting is difficult to coordinate, while trapping is effective and provides the opportunity to discern between the two species before removal. Preliminary results suggest that removing eastern cottontails from an area will shift the population to favor a higher ratio of NEC. This shift is more significant in patches surrounded by forestland (which do not provide a source for repopulation by eastern cottontails) compared to patches surrounded by agricultural lands that eastern cottontails may already inhabit.

Objective 407: Manage Predators

Although it is extremely difficult to document very small populations, and harder still to verify trends, many believe small populations of NEC (less than a few dozen individuals) are particularly vulnerable to dying out. As landscapes become increasingly fragmented, and as the quality and extent of available habitat decreases, NEC may be become more apt to be caught by coyotes, red and gray foxes, domestic cats and dogs, hawks, owls, and other predators. Thick, extensive stands of early successional habitat are the NEC best defense against predation. For that reason, habitat management and creation is the emphasis of conservation for NEC. Most present-day thicket habitats supporting NEC are neither large nor dense enough to provide adequate food and cover to sustain rabbit populations amid high predation rates caused by a diverse set of midsized carnivores (Brown and Litvaitis 1995, pp. 1005-1011; Villafuerte et al. 1997, pp. 148-149). Habitat patches need to be increased in size and number to

minimize predation. Where patches are small and isolated, the effects of predation may further suppress populations and hasten their extinction. In such settings, predator control could become an important strategy. Currently, conservationists are making no efforts to suppress predator numbers to increase NEC survival, although the practice has been given consideration. Several issues confront efforts to reduce predator numbers. The effectiveness of predator control is uncertain, because mammalian predators are often numerous, wary, and hard to locate and kill. Predator control can be costly. Control of some predators, such as hawks, will likely be opposed by the public as well as prohibited by regulations protecting these migratory birds. Many scientists believe that suppressing predator numbers, except in limited localized situations, may be neither feasible nor desirable.

Objective 408: Manage Disease

Cottontails are susceptible to diseases, such as tularemia, and are afflicted with ectoparasites, including ticks, mites, and fleas, and endoparasites such as tapeworms and nematodes (Eabry 1968, pp. 14-15). However, there is little evidence to suggest that disease or parasites have been or are a limiting factor for NEC. Monitoring natural populations and screening the health of wild NEC brought into captivity should let scientists detect any potential problems from diseases and parasites. Should such problems arise, conservationists will take appropriate measures to address them. Researchers in New York have begun studying parasites and their possible effects on NEC (Gavard, E. 2013).

Objective 409: Manage Hunting

Similar to the effects of predation, hunting of cottontails may be unsustainable in areas where there are few NEC. In such areas, it may be prudent to forbid rabbit hunting to prevent the loss of individual NEC that are extremely valuable to the survival of small populations. This practice is used in Maine and New Hampshire, where there currently is no open hunting season for any cottontails in areas where NEC occur. Conversely, in areas like Connecticut and New York, where NEC populations are more abundant and widely distributed, wildlife professionals believe, and there is no documentation to suggest that hunting is having a discernible effect on density or distribution. All rabbit hunting is conducted in accordance with season and bag limit restrictions.

Objective 410: Reduce Predation

An alternative, or complementary, approach to managing predators may be to take steps that reduce the effects of predation of NEC. For example, on some habitat projects, workers, including volunteers, are building brush piles that provide hiding places where NEC can escape or remain shielded from predators. Another way to reduce predation is to alter NEC foraging behavior by providing supplemental food to keep individuals from leaving escape cover and exposing themselves to predators (Weidman 2010). In some areas conservationists put out prepared rabbit foods, or cut down trees and shrubs in parts of NEC-occupied patches to give rise to dense re-growing vegetation that cottontails can feed on.

Table 8. Population Management Objectives, Performance Measures, Scope, and Implementation Status (continued below)

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
401: Extract NEC for captive propagation	401.1 Trap individuals for breeding while preserving genetic diversity	number of rabbits available for captive breeding from representative genetic strains	30/year captive breeding population	2011: 2+4 rabbits 2012: 5+10 rabbits; 2013: 8+16 rabbits; 2014: 7+12 rabbits; Average: 16	Recommend modify desired outcome to maintain captive population of 30 rabbits to maintain diversity. Level is limited by space in captive breeding facility. Other zoos are under consideration to increase capacity.	urgent	Below target
	401.2 Increase number of focus areas approved as sources via interagency agreement or geographic mixing	Number of source focus areas	6 focus areas	8 locations, not all in focus areas.	Sources do not appear to be a limiting factor.	urgent	Complete
402: Zoo-based husbandry	document basic biological/physiological characteristics of NEC, preserve genetic integrity, conservative approach to production, individuals for release	rate of survival to weaning	8/female/ year	Average 2.05 weaned per litter	Target level should be weaned per litter; may need adjustment. Target level exceeds average litter size 4.6.	urgent	Below target
403: Enclosure-based husbandry	403.6 Construct outdoor hardening pens	pens constructed	6	2	Pens are still under study. New construction should wait for verification of efficacy.	urgent	On schedule
	403.2 Manage hardening pen to acclimate captive offspring and promote breeding before release	Number of rabbits released from pen	80/pen/ year	2012: 15; 2013: 21; 2014: 25 (expected); Average: 20.33	Recommend changing target level to 40/pen/year. Majority of captive bred animals have been released in pens; however the output from captivity is the real limiting factor. Predation levels can be significant in winter and minimal in summer.	urgent	Below target
404: Manage island colony	To establish breeding colony requiring minimal handling	Number of rabbits released from Island	4/acre/ year	Release from Patience Island pending.	No Man's Island is under evaluation to host a colony.	urgent	Delayed

Table 8. (continued) Population Management Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
404: Manage island colony	To establish breeding colony requiring minimal handling	Number of rabbits released from Island	4/acre/ year	Release from Patience Island pending.	No Man's Island is under evaluation to host a colony.	urgent	Delayed
405: Release NEC to augment population(s)	Establish self sustaining populations of NEC, rescue populations/ patches/ individuals from extirpation, maintain genetic diversity	number of individuals	500 individ-uals released annually	2011: 11 2012: 48; 2013: 42; 2014: 30; Average 30.75	Yield of rabbits available for release is due to limited breeding capacity, and litter size smaller than expected. Also, breeding in pens and on islands is not ready to contribute to yield.	urgent	Below target
406: Manage EC	Relocate EC via trapping to increase available habitat for NEC	percent EC	<10%	Study pending.	CT-DEP and SUNY ESF are conducting studies on trapping EC and EC/NEC ecology.	high	On schedule
407: Manage predators	Increase annual survival in suburban and source patches, increase success of release	Change in density of NEC	Increase	Inactive	Inactive.	moder ate	Inactive
408: Manage disease	Monitor outbreaks or potential vectors	documentation of spike in disease	No outbreaks	Non-epidemic disease detected.	RWPZ detected a non-epidemic pathogen in captive population.	low	On schedule
409: Manage hunting	To preserve hunting as a traditional sustained activity, prevent eradication of NEC, modify season and bag limit to "take" and preserve sustainability of population NEC	Hunting continues in region	4 states	4 states allow hunting	No change in hunting regulations.	low	On schedule
410: Non-lethal predation management	n/a	n/a	n/a	n/a	n/a	n/a	n/a

500 Habitat Management

Overview

Each state's Land Management Team (LMT) have provided data on habitat management activities between 2009 and 2014. In most cases, the data were entered into a USFWS template by conservationists with the LMTs, the University of New Hampshire (UNH), and WMI. The template uses the spatial boundary of the management area, along with the following attributes: land ownership type (private, state, etc.), management acres, management status (planned, in progress, or completed), funding source, focus area, and more. Habitat management data came from many sources across the six states; the data collection template was selected by the Information and Adaptive Management Work Group because it ensures some consistency in the quality of information, and is compatible with future uploads of non-sensitive data to the WMI Tracker Database. For some projects, it was not possible to record the data in this format because of the need to protect private landowner information.

Partial information on projects funded by NRCS was obtained from a NEC habitat monitoring project conducted by Alena Warren at UNH. The data gathered by UNH were used to analyze whether NRCS projects occurred on Best Parcels (Fuller and Tur 2012; page 57). The land management acreage statistics reported in this section were generally provided by UNH using the template developed by USFWS. However, overall Farm Bill acreages were provided by NRCS to WMI at the HUC12 watershed level rather than the site level to make sure privacy restrictions were not violated. The acreage estimates provided by NRCS may exceed those of the LMTs because all NRCS staff and projects are not necessarily reported to LMTs.

Objective 505, Create Habitat on Private Land Through Farm Bill funding, was evaluated by totaling the management acres planned by and implemented through NRCS. These projects were funded through the Working Lands for Wildlife program and other programs. Private lands not eligible for Farm Bill funding (Objective 506) consisted of all other projects on private lands. Habitat creation on municipal, state, and federal lands (Objectives 507, 508, and 509) was funded by a variety of sources and calculated based on land ownership type.

To determine the acres of habitat management that are occurring on Best Parcels and conserved land, the management areas were overlaid with the Best Parcels data obtained from WMI, and conservation lands data from the Nature Conservancy, for spatial analysis. This analysis did not include the projects for which no spatial data was provided; therefore, these estimates are likely lower than the actual acreage (30 percent of all management acres were reported with no associated spatial data).

Habitat Management Efficacy

Figure 11. The first NEC habitat restoration project is a proven success. Conducted as a mitigation project at Stonyfield Farms, a yogurt-manufacturing company in Londonderry, New Hampshire, this was the first habitat management project. Removal of mature canopy created thick young forest that now, four years later, is actively being used by NEC. Biologists are monitoring the site.

New England cottontail habitat suitability is typically assessed using measures of woody stem density and vegetation height. At UNH, Alena Warren and Dr. John A. Litvaitis are conducting a rangewide habitat monitoring effort, which includes a more comprehensive protocol for estimating a site's suitability. Due to the successional nature of NEC habitat, it is not expected that managed patches will immediately be suitable for NEC occupancy. However, the preliminary results of the monitoring project indicate that, according to expert opinion, many of the patches managed between 2009 and 2014 are already suitable based on stem density and vegetation height.

The UNH team visited and evaluated a subset of about 80 managed sites as a part of this monitoring effort. The current suitability ranged from not suitable at all, in the cases of recent clear-cuts or areas subjected to other intensive management techniques, to very suitable for NEC. For example, in New Hampshire and Maine, 25 percent of all recently managed sites are perceived as suitable by local biologists, whose assessments are supported by the vegetation data.

One of the difficulties in measuring management efficacy is the diversity of habitat characteristics caused by the original site conditions, habitat types, and management practices. Habitats can include old fields, coastal shrublands, mountain laurel understories, regenerating forests, and others. Management spans a variety of practices, including prescribed burning, mechanical removal of unsuitable vegetation, mowing, planting trees and shrubs, and treating invasive species. In order to address the need to evaluate the habitat suitability of managed sites, a Habitat Suitability Index is being developed. The index will rate a site's suitability on a 0 to 1 scale based on vegetation density, height, and the abundance of herbaceous forage and refugia that it offers to NEC.

Upon the completion of this monitoring project in 2014, a report on the suitability of the assessed sites will be generated, as well as a protocol that can be used to standardize the way sites are evaluated across the states and over time. Additionally, the efficacy of management will be evaluated on a landscape scale. The spatial data available on habitat management will be used to determine whether

the habitat acreage, distance between patches, and configuration on the landscape will support NEC populations over time.

- As of autumn 2013, across the species' range 14,204 acres had been assessed, had management plans written, or had habitat-management treatments contracted.
- By the end of 2014, we estimate over 3,000 acres of treatments will be complete on state and other public lands, and 3,700 acres of treatments completed by NRCS**.** Data reported for this report document a **total of 8179 acres** complete, ongoing, or planned for land management.
- Well over **10,000 acres of naturally self-sustaining habitat have been** identified on the ground.
- Since most NEC habitat is ephemeral, it needs continued management and maintenance activities to remain suitable for NEC.
- Habitat distribution is not equal across focus areas.

Outstanding Uncertainties:

- Annual acreage of management needed to maintain habitat over time is unclear due to lack of information about the extent of existing habitats in general and self-sustaining natural habitats in particular. For example, the target levels should be based on an annual schedule to maintain approximately 15,000-20,000 acres across the NEC range over a 20-year time period (750-1,000 acres per year), if we assume 10,000 acres of habitat are relatively self-sustaining, and if recent habitat management projects have addressed habitat deficiencies.

Implementation Recommendations:

- For each management project, consider barriers that might exist to future management actions on those sites, and plan to sequence projects in the context of maintaining USFWS viability goals for each focus area;
- Identify opportunities to address major administrative barriers to managing habitat on public land.

Conservation Strategy Modifications:

- Adjust prescribed target levels to reflect contribution of existing habitat, incidental management, and natural habitats. Tapering management to 750-1,000 acres per year rangewide will likely be sufficient to maintain habitat, considering a typical 20-year habitat suitability of young forest.

Objective 501: Create Demonstration Areas

Habitat demonstration areas across the NEC range are increasing the amount of shrubland, young forest, and other habitat capable of supporting NEC. Demonstration areas are useful places where landowners can see and learn about NEC habitat when considering whether they would like to join the conservation effort by creating habitat on lands they own or manage. To date, we estimate 30 demonstration projects have been planned, initiated, or implemented across the six NEC states.

Prospective visitors can learn about habitat demonstration areas on www.newenglandcottontail.org, a Web site supported, maintained, and frequently updated by the Wildlife Management Institute.

Objective 502: Develop Site-Specific Management Plans

The NEC Technical Committee (Fuller and Tur 2012, page 42) estimates that more than 900 patches of habitat need to be created to achieve rangewide habitat goals. LMTs in each state coordinate the development of management plans (Objective 301). Each plan identifies practices to be implemented, monitoring expectations, number of acres targeted, and numbers of acres managed. Planning each land-management project to ensure compliance with environmental regulations, successfully carrying out those projects, and measuring a positive response by NEC is time-consuming and requires experience and expertise, representing a significant limiting factor and reflecting the most costly aspect of carrying out the Conservation Strategy. The Working Lands for Wildlife Initiative by NRCS has markedly defrayed the cost to other partners. To date, we estimate over 250 habitat projects have been planned, initiated, or implemented across the six states.

Objective 503: Coordinate with National Wildlife Refuges

Several National Wildlife Refuges, managed by USFWS, are located in NEC focus areas and conduct cooperative land management and acquisition activities. Existing partnerships between refuges and other land-protection partners (state agencies, nongovernmental organization, land trusts, etc.) present high-value opportunities to help NEC. Such partnerships have been expanded or will be initiated in response to the recently approved Preliminary Project Proposal to expand six refuges, including the Rachel Carson NWR, Parker River/Great Bay NWR, Eastern Massachusetts NWR Complex, Rhode Island NWR Complex, Silvio O. Conte NF&WR Complex, and Wallkill River NWR Complex in the NEC range, for the benefit of North Atlantic shrubland species. Partners need to continue to advance the development of a Land Protection Plan, the required next step in acquiring those important lands.

Objective 504: Coordinate with National Estuarine Research Reserves

Partners are furthering NEC conservation on National Estuarine Research Reserves (NERRs) and monitor achievements on these reserves, four of which are in NEC focus areas: Great Bay NERR in southern New Hampshire; Wells NERR in southern Maine; Waquoit Bay NERR on Cape Cod in Massachusetts; and Narragansett Bay NERR in Rhode Island. Lands held in these partnership efforts involving the National Oceanic and Atmospheric Administration (NOAA) and coastal states offer valuable conservation opportunities. For example, Patience Island, in the Narragansett Bay NERR, is providing a secure site for the release of captive-born NEC from the Roger Williams Park Zoo. At Wells River NERR and Great Bay NERR, habitat management that benefits NEC is already underway.

Objective 505: Create Habitat on Private Land through Farm Bill Funding

The NRCS and other partners are delivering on substantial commitments to help implement land management under Farm Bill program funding and the Working Lands for Wildlife Initiative. To date, we estimate 3,709 acres of treatments benefiting NEC have been implemented using Farm Bill funding in the six NEC states.

Objective 506: Create Habitat on Private Lands Not Eligible for Farm Bill Funding

In addition to NRCS, other partners and programs, such as USFWS's Partners for Fish and Wildlife Program and habitat projects designed and funded by WMI, focus on private lands not eligible for funding through Farm Bill programs, including industrial lands and privately owned tracts where active habitat projects have reached Farm Bill funding limits. To date, we estimate 1,043 acres of treatments benefiting NEC have been implemented using sources of funding other than the Farm Bill in the six NEC states.

Objective 507: Create Habitat on Municipal Land

Throughout the NEC range, partners and programs such as the USFWS Partners for Fish and Wildlife Program and WMI are making habitat on municipally owned lands. To date, we estimate 260 acres of treatments benefiting NEC have taken place on municipal lands in the six NEC states.

Objective 508: Create Habitat on State Land

State natural resource agencies oversee numerous parcels containing many acres and are committed to managing habitat to benefit NEC. To date, we estimate 2,461 acres of treatments benefiting NEC have taken place on state lands in the six NEC states.

Objective 509: Create Habitat on Federal Land

The USFWS and other federal agencies, including the Department of Defense and the U.S. Forest Service, have management authority over potentially important habitats for NEC. Specifically, USFWS has authority over national wildlife refuges, many of which actively manage habitat for wildlife, including NEC. To date, we estimate 706 acres of treatments benefiting NEC have taken place on federal lands in the six NEC states.

Objective 510: Manage Habitat Through Prescribed Burning

Conservation partners believe that prescribed fire (also called "controlled burning") represents an effective tool for creating and renewing important NEC habitats, with the potential for providing substantial savings over many other land-management techniques. Using prescribed fire is difficult because numerous logistical and liability considerations must be addressed. Overcoming these barriers is critical to creating NEC habitat in important landscapes such as pitch-pine scrub-oak ecosystems on

Cape Cod and elsewhere in the NEC range. To date, we estimate 760 acres of prescribed burning benefiting NEC has been implemented in the six NEC states.

Objective 511: Refine Best Management Practices for Making NEC Habitat

The Best Management Practices Work Group (currently inactive) developed Best Management Practices (BMPs) for creating and maintaining NEC habitat. Conservation partners continue to refine BMPs and review them for their compatibility with NRCS practices in support of that agency's Working Lands for Wildlife Initiative and other Farm Bill programs. LMTs handle the adoption, revision, and dissemination of BMPs (see Objective 301). Publishing and distributing BMPs helps land managers learn and understand these measures so that they can incorporate them into site-specific habitat management plans.

Figure 12. The first NEC habitat restoration project is a proven success. Conducted as a mitigation project at Stonyfield Farms in Londonderry, New Hampshire, this was the first habitat management project. Removal of mature canopy created thick young forest that is now, 4 years later actively used by NEC. Biologists are monitoring the site.

Objective 512: Manage Contracts and Vendors

Conservation partners manage contracts and providers of habitat-management actions to insure that NEC habitat is created in a timely and effective way. This task continues to be managed effectively by WMI, which has done so since the New England Cottontail Regional Initiative began in 2011.

Objective 513: Implement Restoration (Acres) on Tribal Lands

Several federally recognized Native American tribes own lands in identified focus areas. These tribal lands provide significant opportunities for managing habitat for NEC. To date, we estimate 87 acres of treatments benefiting NEC have been implemented on Tribal lands within the NEC range.

Table 9. Habitat Management Objectives, Performance Measures, Scope, and Implementation Status (continued next page).

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
501: Create Demonstration Sites	Show diversity of habitats; beneficial to NEC; available to public; showcase BMP techniques; etc.	Completed projects, signage, and marketing.	at least two per state	MA: 3; RI: 3; CT: 11; ME: 9; NY: 1; NH: 3.	See demonstration projects at: http://www.newenglandcottontail.org/	moderate	On schedule
502: Draft site-specific management plans	Comprehensive planning documents that meet agency compliance, permitting, logistic, and contracting constraints	projects implemented	943 habitat patches	>250 projects, precise number of patches unknown	Management plans generally are not a limiting factor, however, on some large state and federal properties comprehensive land management plans are needed.	urgent	On schedule
503: Coordinate with National Wildlife Refuge partnerships	Implementation on NWR lands and adjacent properties	Completed projects	Support for Focal area goals & objectives	Multiple projects completed (Rachel Carson=6 active management sites)	Projects complete on Rachel Carson, Great Bay, Mashpee, and Ninigret NWR.	urgent	On schedule
504: Coordinate with Estuarine Research Reserves	Implementation on Research Reserves and adjacent properties	Completed projects	Support for Focal area goals & objectives	Projects complete on Great Bay and planned on Waqouit; Wells NERR enrolled in NEC plan.	NH has completed 2 projects in coordination with Great Bay. Projects are being planned on Waqouit.	moderate	On schedule
505: Create Habitat on Private Land through Farm Bill Funding	Sufficient suitable habitat to meet species state and rangewide goals.	Best Parcel (BP) acres treated by 2020 in focus areas	75% BP & total 10470 acres	Est. 41%, 3709 acres total	Includes planned, ongoing, and complete. Farm Bill estimate based on NRCS data provided to WMI for 2012-2013. All other data provided by UNH for NRCS. Target level is not equitable with minimum viable habitat—this level grossly exceeds habitat need if existing habitat is not included.	high	On schedule
506: Create Habitat on Private Lands Not Eligible for Farm Bill Funding	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 5125 acres	16%, 1043 acres total	See 505.	high	On schedule
507: Create Habitat on Municipal Land	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 1290 acres	33.5%, 260 acres total	See 505.	urgent	On schedule
508: Create Habitat on State Land	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 8080 acres	41%, 2461 acres total	See 505.	urgent	On schedule
509: Create Habitat on Federal Land	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 525 acres	100%, 706 acres total	See 505.	urgent	On schedule

Table 9. (continued) Habitat Management Objectives, Performance Measures, Scope, and Implementation Status.

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
510: Implement prescribed fire (acres)	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 10475 acres	82%, 760 acres total	See 505. Acreage may also be included in state and federal figures.	high	On schedule
511: Refine Best Management Practices for Making NEC Habitat	Completed document that can modified for individual states.	Comprehensive document	Minimize adverse impacts, maximize habitat suitability	Complete	May need updating soon.	low	Complete
512: Administrative technical support to manage contracting & vendors	Complete projects cost-efficiently assuring efficacy, delivery, and compliance	Projects completed	na	237 projects completed	Existing contracting management capacity has mot limited progress.	high	On schedule
513: Implement restoration (acres) on Tribal Land & Inter-state project coordination	Sufficient suitable habitat to meet species state and rangewide goals.	BP acres treated by 2020 in focus areas	75% BP & total 25 acres	100%, 87 acres total	See 505. Acreage may also be included in private land figures.	high	On schedule

600 Research

Overview

In 2008, wildlife biologists concerned with the status of NEC met to identify and prioritize research and information needs. Since then, scientists have conducted research to address many of those needs. Information obtained from the studies was used to develop the NEC Conservation Strategy and to begin specific efforts and projects to conserve NEC. The Research and Monitoring Work Group periodically evaluates and updates the list of research needs and priorities. The group also discusses procedures for exchanging and disseminating information, including data on NEC occurrence across the species' range. The following research projects have been completed:

Brubaker, D.R., A.I. Kovach, M.J. Ducey, W.J. Jakubas, and K.M. O'Brien. 2014. Factors influencing detection in occupancy surveys of a threatened Lagomorph. Wildlife Society Bulletin 38(3):513–523. DOI: 10.1002/wsb.416.

Buffum, B., S.R. McWilliams, and P.V. August. 2011. A spatial analysis of forest management and its contribution to maintaining the extent of shrubland habitat in southern New England, United States. Forest Ecology and Management. 262:1775-1785.

Fenderson, L.F, A.I. Kovach, J.L. Litvaitis, K.M. O'Brien, K. Boland, and W. Jakubas. 2014. A multi-scale analysis of gene flow in the New England cottontail, an imperiled habitat specialist in a fragmented landscape. Ecology and Evolution 4(10): 1853-1875 doi: 10.1002/ece3.1068

Kilpatrick, H., Goodie, T. and A.I. Kovach. 2013. Comparison of live-trapping and noninvasive genetic sampling to assess patch occupancy by New England cottontail rabbits. Wildlife Society Bulletin DOI: 10.1002/wsb.330.

Kovach, A.I. and D.R. Brubaker. 2012a. Detecting New England cottontails during winter pellet surveys: an evaluation of current practices and recommendations for an improved monitoring protocol for maximal detection of occupancy. A report for managers and a product of NEAFWA RCN grant #2009-04.

Kovach, A.I. and D.R. Brubaker. 2012b. Estimating abundance of New England cottontail populations using fecal DNA collected during winter pellet surveys. A report for managers and a product of NEAFWA RCN grant #2009-04.

Kovach, A.I. 2012. Development of noninvasive monitoring tools for New England cottontail populations: implications for tracking early successional ecosystem health. Final report to the Northeast Fish and Wildlife Agencies Regional Conservation Needs Grant Program for RCN Project #2009-04.

Research projects underway in New York include:

Cheeseman, A. 2013. New England cottontail demographics and habitat associations in New York. Dissertation research proposal. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Gavard, E. 2013. Parasitology and nutrition analysis of the New England cottontail in the Hudson River Valley. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Outstanding Uncertainties
Outstanding Uncertainties need to be evaluated through a structured prioritization of research needs.

Implementation Recommendations:

- Contract with a writer to compile and edit a summary of research.
- Update the list of priority research items and status of uncertainties.

Conservation Strategy Modifications: None

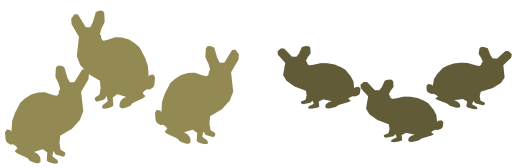
Objective 601: Determine NEC Demography

Scientists are constantly learning more about the life history and demography of NEC. (Demography is the study of population characteristics such as size, growth, density, and distribution.) Although scientists have researched the survival rates of adult NEC during winter, little is known about other life stages. Information regarding these other life stages will influence management actions. Scientists may research factors to: (1) increase NEC fecundity, such as nutrition; (2) increase survival of nestlings; and (3) increase recruitment of juveniles into the adult population. For example, several studies involving other rabbit species suggest that more-fertile soil can lead to an increase in litter size and growth rates of juvenile rabbits because the soil supports healthy browse habitat (Hill 1972; Williams and Caskey 1965). Research to evaluate NEC demography is ongoing in New York (Cheeseman 2013). Monitoring captive populations at Roger Williams Park Zoo has revealed a high level of nestling mortality in the first few days of life. Scientists do not know whether this is also occurring in the wild, although so far it has not been recorded.

Objective 602: Determine NEC Distribution and Abundance

While preliminary documentation of the current distribution of NEC has taken place (Litvaitis et al. 2006), this subject is still under study. Wildlife biologists are working to determine changes in the distribution and abundance of the species, including exploring whether rangewide conservation efforts are proving effective. Surveys to determine the distribution of NEC are ongoing (see Objective 203).

Figure 13. New England cottontails move in after management. The Connecticut Department of Energy and Environmental Protection is studying colonization of habitat by both New England and eastern cottontails. All three specimens collected from the Spignesi Wildlife Management Area in Scotland, Connecticut, prior to 2007 were confirmed as eastern cottontails. Shortly after an eight-acre even-aged timber harvest took place in 2007, pellet samples were collected and analysis of fecal DNA showed that all 10 were from eastern cottontails. In 2014, pellet samples were collected from the regenerating clearcut – three were confirmed as NEC and five were confirmed as eastern cottontails.



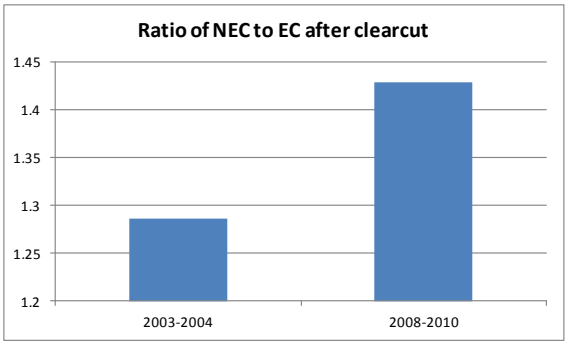
Objective 603: Study NEC/Eastern Cottontail Interaction

Biologists are investigating habitat partitioning in sympatric populations of eastern cottontails and NEC in Connecticut and New York (Kilpatrick 2014, personal communication.; Cheeseman 2013). Fine-scale assessment of habitat characteristics for both eastern and NEC was conducted by researchers at the University of Rhode Island (Gottfried 2013; entire); their findings indicate that NEC occupied sites that had more canopy cover and greater vegetative basal area than sites occupied by eastern cottontails, which were more closely associated with areas containing more shrub cover, herbaceous cover, less canopy cover, and a lower basal area. More research is needed to ensure that eastern cottontails are not benefiting from habitat management at the expense of NEC. Scientists have begun to study the mechanisms of competition between the two species: Do eastern cottontails interfere with NEC reproductive behavior, physiology, or development? Conservation departments in New York and Connecticut have committed funding to help answer these questions. (See Objective 406 for additional information on eastern cottontails.)

Objective 604: Investigate Habitat Ecology

Scientists are conducting research to improve our understanding of the relationship of habitat type to NEC population density; the amount of habitat available at a landscape scale; and the relationship between NEC, eastern cottontails, and non-native invasive plants, which are prominent in many shrub communities in the NEC range. Successfully restoring habitat for NEC in areas that support both cottontail species depends on knowing how each type of rabbit benefits from different management approaches. Researchers at the University of Rhode Island, in coordination with the Rhode Island Department of Environmental Management, have launched a study to examine food preferences and digestibility through an evaluation of cottontail fecal pellets.

Figure 14. New England cottontails hold their own with long-term management. Over 200 acres of even-aged timber harvests created young forest habitat at the Pachaug Forest in North Stonington, Connecticut, between 1996 and 1999. The site is now being used as part of a radio telemetry monitoring study. Biologists with the Connecticut Department of Energy and Environmental Protection collared 9 NEC and 7 eastern cottontails in 2003-2004 and 20 NEC and 14 eastern cottontails in 2008-2010.



Objective 605: Study NEC Taxonomy and Genetics

Ongoing research to refine and lower the cost of techniques that use genetic material obtained from rabbit fecal samples to distinguish NEC from eastern cottontails is occurring through a partnership between the USGS Leetown Science Center, the University of New Hampshire (UNH), the University of

Rhode Island (URI), and the USFWS. Although genetic data indicate that NEC and eastern cottontails are not interbreeding, the potentially serious effects of hybridization may warrant study to test for hybridization in focus areas where we will concentrate NEC restoration efforts. Fecal pellet surveys provide an efficient method to generate a growing dataset useful in monitoring the genetic health of NEC populations (Kilpatrick, Goodie, and Kovach 2013, entire). Geneticists at URI recently developed a mitochondrial DNA barcode method for distinguishing lagomorph species utilizing fecal pellet genetic samples (Sullivan 2013, entire). URI specialists also continue to perform genetic monitoring and provide management recommendations for the zoo-based captive-breeding program (Objective 402) to manage the risk of inbreeding and outbreeding in wild populations that may be augmented through the release of captive-born NEC. Genetic approaches are being used to address a number of research questions, including many beyond those here—at all of the current partner academic institutions.

Objective 606: Test Management Assumptions

Conservationists have begun to conduct research to determine if habitat management actions taken to increase populations of NEC are effective. Are habitat creation measures increasing NEC abundance and distribution? Are habitat maintenance measures minimizing harmful impacts on resident rabbits while providing stable habitat conditions? Such questions should be explored for all habitat management techniques, including prescribed burning, timber harvesting, controlling invasive plants, and others, and all habitat types. If performance measures lag below target levels for Objective 202 (NEC habitat occupancy rate) and Objectives 505-510 (habitat acres created), population research may be needed to determine if the focus area and reserve design considerations presented in section 3.3 of the Conservation Strategy are effectively creating persistent local NEC populations. The USGS occupancy study described in Objective 202 will be used to evaluate the landscape-level response to management actions. Fine-scale population assessment will likely be informative and is expected to occur at several locations throughout the species range. In Massachusetts, biologists are investigating NEC occupancy of managed pitch pine/scrub oak habitats to evaluate habitat use in response to prescribed fire and other management techniques.

Table 10. Research Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
601: Determine NEC demography	Measure NEC vital rates in captivity	litter size, growth rate, age at weaning, and mortality are documented	3 litters for 20 females/year	47 litters studied 2011-2014	Detailed demography and growth data are being tracked for every captive animal. Survival is tracked for released animals.	moderate	On schedule
602: Determine NEC distribution/ abundance	NEC occupancy/detection/population estimation protocols	na	na	Patch occupancy studies complete.	Studies were completed by UNH in multiple states. CT-DEP conducted studies in CT.	low	Complete
603: Study NEC/EC interaction	Measure response of NEC/EC to management in co-occupied habitats	Reduce uncertainty that NEC ↑	TBD	Study results pending	CT-DEP is studying responses to management in co-occupied habitat.	urgent	On schedule
604: Investigate habitat ecology	604.1 Measurement of NEC/EC habitat use, nutrition, and parasite loads in native vs. non-native vegetation	Reduce uncertainty that native vs. non-native vegetation benefit NEC	TBD	Study results pending	SUNY-ESF is conducting studies of habitat ecology and EC/NEC interactions.	high	On schedule
	604.2 Obtain survival rates via telemetry in burned and unburned habitat	Statistically valid survival rates	As needed	Study results pending	MMR is conducting studies of NEC in burned and unburned habitat.	moderate	On schedule
605: Study NEC taxonomy/genetics	Refine taxonomy/species markers	na	na	Study results pending	No comment.	low	On schedule
606: Test management assumptions	606.1 Measure response of NEC to removal of eastern cottontails via via trapping	Reduce uncertainty that NEC ↑ & that trapping is selective	TBD	Study results pending	CT-DEP is studying responses to removal of EC. SUNY-ESF is conducting studies of EC/NEC interactions.	urgent	On schedule
	606.2 Measure public/hunter opinion about removal of predators & EC via hunting/trapping	na	na	Inactive	Inactive	high	Inactive

700 Outreach and Education

Overview

Some of the habitat- and population-management techniques used to help NEC will arouse controversy, such as heavy logging to create young forest, prescribed burning to renew shrubland habitat, managing eastern cottontails to reduce competition between this introduced species and the native NEC, and buying land to expand wildlife refuges. Conservationists must address potential communication and education problems in a proactive way to inform all stakeholders, minimize opposition, and achieve informed consent for habitat projects and the NEC conservation effort in general. Communications and educational activities are rangewide and involve many participants across the conservation effort. An Outreach Work Group (OWG) consisting of wildlife biologists and communications specialists has begun identifying social barriers to NEC restoration and determining how best to overcome them. The OWG has created and distributed a range of communications and outreach products to explain why we as a society must conserve NEC and how we can best fulfill this responsibility.

An effective outreach strategy is a high-priority need because:

- Success of the conservation effort depends on participation by and cooperation between private landowners, nonprofit organizations, and state and federal agencies;
- Public opposition to forest and shrubland management techniques that create prime early successional habitats for NEC can hamper conservationists' efforts to make and renew such habitat;
- Political support for NEC conservation is vital; and
- Public understanding of all aspects of the conservation effort will make it much more likely to succeed.

Outstanding Uncertainties: None.

Implementation Recommendations:

- Target key focus areas identified through status assessment for increased efforts to recruit landowners and inform the public about NEC conservation.

Conservation Strategy Modifications: None.

Objective 701: Develop an Outreach Strategy

In 2012, wildlife biologists and professional communicators collaborated to create an outreach strategy that identifies barriers to restoring NEC, proposes products to address those barriers, and outlines the methods to deliver messages to different audiences. The outreach strategy provides cost estimates for developing and distributing those products. The plan was prepared during and between 12 meetings prior to its approval by the NEC Technical Committee and subsequent approval by the NEC Executive Committee on November 20, 2012.

Objective 702: Develop and Maintain a Web Site

NEC partners, through the Wildlife Management Institute (WMI), have built and developed a Web site to educate and inform partners and the public about NEC conservation. The site describes and explains management actions and documents increasing participation in the conservation effort by state, federal, municipal, nongovernmental organization, and private landowner partners. The Web site, supported by WMI, was launched in March 2012 and can be accessed at www.newenglandcottontail.org. The site is updated regularly. Communications tools and products that can be accessed through the site include:

- approximately 50 resources (popular and scientific articles on NEC, brochures, fact sheets, guidebooks and manuals, posters, PowerPoints, videos, links to other Web sites, photographic images, signs, and audio clips);
- a major feature article on NEC, "Saving a New England Native," that ran in the Summer 2013 *Northern Woodlands* magazine (published by the Center for Northern Woodlands and widely read by private landowners, foresters, and natural resource professionals in New England and New York), available on the home page;
- *The Conservation Strategy for the New England Cottontail* (Fuller and Tur 2012), edited by communications specialists and available on the home page;
- *Best Management Practices: How to Make and Manage Habitat for the New England Cottontail* (Rothbart et al 2013), edited by communications specialists and available on the home page;
- strategic links between newenglandcottontail.org and youngforest.org, and timberdoodle.org, two other WMI Web sites that provide additional information about young forest and shrubland and the wildlife that need those habitats;
- 21 articles written for the general public describing habitat projects throughout the NEC range, with at least one project for each of the six states that have NEC; the articles identify funding and partners, plus explain how the public can visit these areas to view a range of different habitat management techniques;
- Ongoing revision and addition of information ensures that the Web site will continue to attract and appeal to visitors;
- Registered more than 21,236 unique page views with the most popular pages being the home page, natural history page, FAQs, news stories, conservation, and resources.

Objective 703: Develop Communications Products to Explain and Further NEC Conservation

Wildlife biologists, habitat managers, and communications specialists continue to collaborate in developing a range of products that accurately and persuasively tell the story of NEC conservation. Products include print publications, scripts and illustrations for use in presentations to live audiences, workshops for prospective conservation partners, and videos. All products include the NEC Web site's URL, driving traffic to the site where visitors can find up-to-the-minute information. These products continually increase awareness of the need to conserve NEC and encourage and inform landowners on how to create NEC habitat.

Communications partners developed a logo featuring a stylized image of a cottontail and the names of the six states that have NEC. A survey was offered to the OWG, and through them others were drawn in to participate, with a total of 19 people reviewing proposed logo designs. Commenters ranked logos on five criteria: memorable, effective without color, scalable, relevant, and overall reaction. Communicators presented the finalist among the designs to the NEC Technical Committee in January 2014, where it gained the support of those in attendance. The Executive Committee approved the logo in March 2014, and it is now being used on a range of communications products. It is available for partners to use and can be found at www.newenglandcottontail.org.

Additional work completed includes draft messaging for specific management actions and habitat projects, and offering communications services and collaboration to the communications staffs of partners in each of the NEC states and focus areas.

In addition to the logo, conservation partners have created numerous other products, including:

- A Landowners Guide to New England Cottontail Habitat Management (www.edf.org/sites/default/files/8828_New-England-Cottontail-Guide_0.pdf).
- A tagline, Working Together for the New England Cottontail, which now appears on the home page of www.newenglandcottontail.org.
- a short video (accessible through www.newenglandcottontail.org).
- New Hampshire Cooperative Extension brochure (http://extension.unh.edu/resources/files/resource001135_rep1417.pdf).
- Maine brochure “Wildlife Needs Shrublands” (accessible through www.newenglandcottontail.org).
- New England cottontail outreach panels, specialized signage, and “Wildlife Habitat in Progress, please no mowing” signs, templates available from Rachel Carson NWR.
- A metal generalized sign, “Helping Wildlife” (developed through a USFWS Partners’ grant) explaining why cutting trees and shrubs helps NEC and other species and presenting the logos of the New England Cottontail Initiative as well as major state, federal, and nongovernmental organization partners; quantities were distributed to each state for use by agencies and partners on recently managed lands to build awareness, understanding, and support for these actions, with the Web addresses www.newenglandcttontail.org and www.youngforest.org promoting a means of gaining additional information.
- A rangewide “evergreen” brochure about New England cottontail restoration and management practices funded by the same grant and distributed to states and partners for use at outreach events and meetings.
- Additional efforts, supported by two grants, will be completed in the coming months. They include projects funded by the USFWS Partners grant and additional funding from the regional Federal Aid grant currently moving through the approval process. These projects will assist in landowner recognition, messaging about NEC status and the performance review process for the Conservation Strategy, tips for working with the media, and Wildlife and Sport Fish Restoration Program role in supporting restoration of New England cottontail.

Objective 704: Direct Outreach Efforts to NEC Focus Areas

Outreach specialists in each state work with wildlife biologists and habitat managers to deliver outreach messages, information, and products to landowners and other potential partners who may decide to make or maintain NEC habitat in focus areas throughout the species' range. It is difficult to categorize all outreach activities that influence the success of conservation efforts, and therefore general categories (contacts, events, and recipients of outreach) are being used to estimate numbers of people influenced by outreach. More than 200 landowners have been contacted, through site visits and direct mailings about land management and site assessments. More than 100 events have been delivered through workshops and other events specifically designed to educate invited attendees about NEC and their habitat. Over 20,000 individuals are estimated to have received general or broadcast outreach material, such as publications, or messages delivered by broadcast media—the number truly affected by messages is unknown.

Table 11. Example of outreach activity in CT.

Summary of CT outreach			
Type	**Description**	**Number of Events**	**Number Reached**
Article	CT Wildlife Magazine articles -featuring NEC initiative in CT	2	6,614*
Article	Newspaper Articles featuring NEC projects (3 in New London Day, 1 in Waterbury Republican American, 1 in Danbury News-Times, 3 in local papers)	8	unknown
Consultation	Meeting with DEEP & Audubon biologists	2	19
Exhibit	3-panel display or poster at events (e.g., Uconn Natural Resources conferences, CT DEEP Sportsmen's Day)	14	3,775*
Field Workshop	Workshops for landowners and Forest Practitioners	7	289
Indoor presentations	Presentations for conservation organizations, land trusts, sportsmen's clubs, and academics	25	1,021
Organized Walks	Walks on state-managed forests	5	177
E-mailings	Emailing of Ct NEC newsletter	4	450
Mailings/Calls	Direct mailings or calls to landowners	8	184
Websites	features on www.ct.gov/DEEP and Newenglandcottontail.org sites	2	unknown
Other	CT Envirothon (High Schools) - special topic NEC	1	200
Other	Sportsmen's Association Dinners	2	270
Other	Radio Interview, WTIC	1	unknown
Total			**12,996**

***** Number represents attendees or recipients; actual number who read material is unknown.

Objective 705: Target Outreach to Key Audiences

Outreach efforts contributed directly and indirectly to the successful planning, initiation, or completion of 8,179 acres of land management. The OWG met seven times in 2013, and as of this writing has

convened five times in 2014. These conference calls let members share information and issues that need attention. The group collaborated with the New Hampshire Fish and Game Department to participate in an outreach event at Stonyfield Farms Yogurt, where a habitat project has been conducted, letting communicators meet with additional local landowners, conservation advocates, and community members, and help raise money for the NEC conservation effort. Easter-linked media efforts were carried out in 2013 and 2014, yielding abundant coverage of the NEC restoration effort from New England to California by a variety of media.

The OWG designed an Outreach Products Survey and sent it to members of the NEC Technical Committee. Sixteen committee members responded, representing five of the six NEC states plus individuals who work rangewide. Major points included:

- A prioritized list of products ranked the top five needs as a rangewide brochure, demonstration area signs, articles, fact sheets, and a PowerPoint presentation.
- Other suggestions for products included a radio "blurb," an interactive game tying habitat, food, and predators to NEC populations, a Web site, a publicity contact list, BMPs that include outcomes and methods, a list of resources available to landowners for planning and funding habitat creation, and a rangewide outreach point-of-contact communicator to help coordinate messages.
- Both generic and customizable (preferred) materials were of interest to the respondents, 63 percent of whom reported having access to graphic designers and audio/video production facilities for customization.

The OWG is on track with many of the items mentioned in the survey, which are already available for conservationists to use. The survey responses illustrate the need to promote existing communications products such as the newenglandcottontail.org and youngforest.org Web sites, a Flickr image bank, a young-forest-oriented PowerPoint, the new rangewide brochure, and a regional outreach contractor available to coordinate and assist on local and regional communications efforts. Dr. Ashley Dayer of Cornell University recently published research that directly impacts the New England Cottontail Regional Initiative:

Dayer, A. A., S. B. Allred and R.C. Stedman. 2014. Developing Tools to Encourage Private Forest Landowners to Participate in Early Successional Forest Habitat Management. Human Dimensions of Wildlife: An International Journal. 19:4, 355-370, DOI:10.1080/10871209.2014.918678

A communications specialist has contracted with WMI to coordinate many aspects of outreach prescribed in both the outreach strategy and the Conservation Strategy. The NEC communications specialist assists the OWG, Technical Committee members, and the Executive Committee. She is available to develop and present information about outreach products to agencies, municipalities, nongovernmental organizations, land trusts, Native American Tribes, and the general public.

Beginning July 1, 2013, the communications specialist contributed to the following activities:

- Performed duties as directed by the NEC Outreach Committee and approved by the NEC Executive Committee to develop and provide communication products to explain and further NEC conservation.
- Organized and participated in meetings as needed to complete these services and prepared and distributed meeting notes to increase the level of communication within the NEC partnership and support ongoing collaboration.

Table 12. Outreach and Education Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
701: Develop outreach strategy	A completed outreach strategy which identifies critical target audiences & prioritizes outreach tactics and tools.	Completed Plan	1	1	Available at: http://www.newenglandcottontail.org/	high	complete
702: Develop/maintain website	Website featuring info on NEC biology, ongoing projects/programs, contacts and how to get involved.	Projects highlighted	5 per year	5	Visit: http://www.newenglandcottontail.org/	high	On schedule
703: Develop Communications Products to Explain and Further NEC Conservation	Media/messages available for use in NEC outreach, targeted to audiences defined in outreach strategy	Targeted media provided to OWG and they are trained on delivery	1 trained specialist in each state	1 trained specialist in each state	Staff have been trained in each state via workshops at NEAFWA and via OWG calls.	high	On schedule
704: Direct Outreach Efforts to NEC Focus Areas	Landowners recruited to manage for NEC public support within project areas	Number of private landowners receiving media or attending workshop	10,000 landowners	>2000 landowner contacts; >100 events; >20,000 recipients of outreach	Contacts include direct mailings regarding land management and site visits. Performance levels are estimated from inconsistent data.	urgent	On schedule
705: Target Outreach to Key Audiences	Dedicated outreach specialist who can promote implementation of restoration, including prescribed fire--by agencies, Tribes, towns and NGOs, and Inter-state	increase in habitat management acreage objectives for 507, 508, 509, 510, 513	10,000 acres	8,179 acres of land management have been planned, initiated or completed.	A communications specialist contracted with the WMI is coordinating many aspects of outreach prescribed in the outreach strategy.	urgent	On schedule

800 Land Protection

Overview

Our assessments indicate that voluntary habitat management to conserve NEC must take place on 7,000 to 15,000 acres of privately owned land (Fuller and Tur 2012, section 4.3), with the remaining rangewide habitat goals to be met on public land. The estimated need for voluntary participation provides a context for planning the scope of permanent land protection. Land-management experts and the NEC Technical Committee believe that more than 20,000 acres of public lands are both suitable and available for potential management, requiring only another 7,000 acres of private land to meet the rangewide USFWS goal of 27,000 acres of habitat. Except within the few NEC focus areas that lack ample public lands, land protection is not a short-term priority to successfully conserve NEC. Rather, land protection is a long-term strategy to be used when key habitats need permanent protection to ensure continued access for management. Land protection is not considered to be a requirement for successful NEC conservation on private land.

By carefully delineating focus areas and thoroughly assessing the lands within them, conservationists believe they will achieve the goal of creating, maintaining, or expanding the rangewide habitat for NEC to 27,000 acres before 2020. By design, and confirmed by subsequent evaluations, NEC focus areas are characterized by ample amounts of public land, minimal parcelization of the landscape surrounding those public holdings, and the presence of persistent shrub wetlands already protected by state and federal regulations. These persistent shrub wetlands provide a base of existing and future habitat which is critical to the long-term persistence of NEC. However, because NEC habitat is often times short-lived, our strategy is not to prevent development by purchasing and protecting large areas of land but rather to build partnerships to manage landscapes that are largely secure from development. Nevertheless, the voluntary recruitment of landowners is uncertain, and reserve design necessities – such as maintaining connectivity between NEC populations – will undoubtedly mean that some key parcels will need to be acquired.

Outstanding Uncertainties:

- Funding for land protection will always be uncertain. The North Atlantic Shrublands Land Protection Plan (LPP) may provide some funding stability, but approval of the plan and subsequent U.S. Land and Water Conservation Fund allocations remain uncertain;

Implementation Recommendations:

- Convene workshop with representatives of National Wildlife Refuges to obtain input on the North Atlantic Shrublands Land Protection Plan;
- Strengthen partnerships with local, state, and regional land trusts;
- Reconvene the NEC Land Protection Work Group (LPWG).

Conservation Strategy Modifications: None.

Objective 801: Expand National Wildlife Refuge Partnerships and Land Protection Efforts

Collaborating with the LPWG and the NEC Technical Committee, the managers of National Wildlife Refuges (NWR) throughout the NEC range have developed a Preliminary Project Proposal (PPP) that presents a concept for expanding NWR System land-protection efforts to acquire important habitats for NEC, either through fee acquisition, purchasing easements, or leasing. Upon regional approval, the PPP will be forwarded to the USFWS Washington, D.C., office for consideration. Should the USFWS director approve the proposal, individual refuges will begin working on a consolidate and detailed Land Protection Plan (LPP) that will provide information to partners and the public outlining resource protection needs, an implementation schedule and priorities, and the dimensions of the USFWS proposal. The LPP will include maps, a priority acquisition table identifying specific tracts, and additional properties to enlist as candidates for NWR assistance in land management.

Objective 802: Develop Local and Regional Land Protection Partnerships

Different kinds of land protection efforts are currently underway in many NEC focus areas. Communication and collaboration between the groups guiding these efforts will help in determining if the lands being protected are suitable and available for managing to benefit NEC. In addition, engaging with groups working to protect land can help develop local support for NEC conservation projects and garner additional resources for in-kind match purposes that will then leverage additional land-protection funds. NEC conservationists are working to identify groups such as nongovernmental organizations, land trusts, and municipalities that are active in managing or protecting wildlife habitat in the focus areas.

Objective 803: Develop Projects

Conservation partners are actively working to identify land protection opportunities in NEC focus areas identified as high-priority areas for this type of activity. In ME and NH, 584 acres of habitat were protected with the coordination assistance of funding provided by the National Fish and Wildlife Foundation, completing 100% of the protection goal set forth in the NFWF Business Plan. The completion of the North Atlantic Shrublands LPP in 2015 will help to streamline land protection, including conducting title searches, boundary surveys, appraisals, etc., culminating in final land transactions. NRCS easement programs have been active in protecting numerous acres in New Hampshire and elsewhere. In CT, at least 4 parcels have been acquired at least in part to benefit NEC. Two parcels totaling approximately 55 acres were added to the Spignesi WMA in Scotland, CT. Both protect a significant amount of existing rabbit habitat and were purchased largely for this reason. Two parcels were purchased with assistance from CT's Open Space and Watershed Land Acquisition program, administered by the CT Department of Environmental Protection. The acquisitions were made by the Cornwall Conservation Trust (317 acres) and Goshen Land Trust (127 acres).

Objective 804: Raise Funds

Conservation partners are exploring ways to increase the amount of funding available to protect land in NEC focus areas. One important approach will be securing grants, which requires writing clear proposals and demonstrating a diverse partnership that offers pooled resources to help conservation efforts succeed.

Objective 805: Develop Land Protection Ranking Criteria

Because resources for protecting important NEC habitat are and will be limited, will finalize ranking criteria as part of the North Atlantic Shrublands LPP in 2014. Criteria may include land protection needs within focus areas, parcel-specific habitat potential, proximity to known NEC occurrences, and how the parcel may contribute to the landscape being designed to conserve NEC.

Table 12. Land Protection Objectives, Performance Measures, Scope, and Implementation Status

Objective	Desired Outcome	Performance Measure	Target Level	Estimated 2014 Performance Level	Comment	Priority	Status
801. Expand NWR partnerships & land protection efforts	Completion and implementation of a Land Protection Plan (LPP).	Plan approved	N/A	PPP is approved, LPP draft complete by 2015	FWS is working to complete LPP draft for review during fall 2014.	high	On schedule
802. Develop local and regional land protection partnerships	Organizations agree to prioritize land protection to benefit NEC and adopt Ranking Criteria	organizations adopting ranking criteria	1 land trust per focus area; ExCom,	Trust for Public Land adopted NEC as priority for New England	TPL adopted NEC as a priority for New England, however ranking criteria have not been formally approved by any land trust.	moderate	On schedule
803. Develop projects	Transactions to protect NEC habitat are negotiated by buyer/seller on highest priority NEC parcels in focus areas in need	Alignment of parcels negotiated with NEC priorities	TBD by LPP	584.38 acres protected in Maine and New Hampshire	Land has been conserved in Maine and NH by TPL and other conservation partners specifically to benefit NEC. Elsewhere, land protection has not specifically targeted NEC. Specific projects for negotiation will be developed under the North Atlantic Shrublands LPP.	moderate	On schedule
804. Raise funds	Negotiated transactions are funded and completed on highest priority NEC parcels in need	Alignment of funded transactions with NEC priorities	TBD by LPP	Unknown pending approval of LPP	Region 5 staff have adopted NEC focus areas, parcel rankings, and forthcoming reserve designs; raising funds and completing transactions is contingent on approval of the LPP.	high	On schedule
805. Development of Land Protection Ranking Criteria	Regional criteria ensure that funds are not allocated to focus areas with a secure land base for NEC or to low priority parcels in focus areas in need	Screening factors filter focus areas of need and select high-ranking or connecting parcels	fully developed ranking criteria	Ranking Criteria Drafted, approval pending	Ranking criteria were drafted, but have not been formally adopted. Criteria need review and adoption by 2015.	high	On schedule

New England Cottontail Regional Initiative
Funding Summary (2005 – 2015)

The New England Cottontail Regional Initiative has worked hard to generate significant funding to support activities that advance NEC recovery and restoration. This initiative began in an informal manner in 2005 when all six states within the species' range included NEC in their State Wildlife Action Plans (SWAPs) as Species of Greatest Conservation Need (SGCN). In 2006 Maine convened a state working group to study NEC, followed by New Hampshire in 2007. In that same year, coordination with the National Fish and Wildlife Foundation (NFWF) resulted in the establishment of a Keystone funding initiative and an accompanying business plan to promote NEC conservation. In 2009 the first of four Competitive State Wildlife Grants was awarded to the new initiative, and in February of 2011 the initiative was formally convened by the six state wildlife directors, the U.S. Fish and Wildlife Service (USFWS), and the Natural Resources Conservation Service (NRCS) with the adoption of bylaws and the establishment of Executive and Technical Committees.

The accompanying tables demonstrate a significant dedicated effort to the ongoing work of species restoration and recovery. Generation of these tables was initiated by an Executive Committee action at their June 20, 2013, meeting. States, USFWS, and NRCS state offices were solicited for funding estimates going back to 2009, and projections going forward to 2015 for funds expended that were not the result of specific grants (identified and tallied separately). No attempt has been made to update the non-grant funding provided by states, USFWS, or NRCS since the summary was completed in October 2013. Grant-related funding has been updated through September 2014.

In addition to the grants listed, full project proposals have been submitted to the 2014 Conservation Partners program through NFWF for $250,000, and the Phase IX Early Successional Habitat NFWF Keystone for $500,000 (a portion of which would be spent on NEC conservation). A full project proposal has been solicited by NFWF for $2.6 million through the Regional Conservation Partnership Program of the 2014 Farm Bill (a portion of which would be expended in support of NEC).

NEC Organizational Funding Summary***

CT - DEEP

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$0	$17,600	$0	$124,810	$0	$0	$0	$142,410
2010	$0	$0	$0	$124,810	$0	$1,000	$0	$125,810
2011	$14,711	$43,955	$0	$19,000	$0	$1,000	$0	$78,666
2012	$14,711	$640,880	$0	$19,000	$70,733	$500	$0	$745,824
2013	$14,711	$83,955	$0	$19,000	$70,733	$2,200	$0	$190,599
2014	$0	$0	$0	$0	$48,233	$0	$0	$48,233
2015	$0	$0	$0	$0	$48,233	$0	$0	$48,233
To-Date	**$44,133**	**$786,390**	**$0**	**$306,620**	**$141,466**	**$4,700**	**$0**	**$1,283,309**
Thru 2015	**$44,133**	**$786,390**	**$0**	**$306,620**	**$237,932**	**$4,700**	**$0**	**$1,379,775**

CT - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$0	$0	$0	$0	$0	$0	$0	$0
2010	$0	$0	$0	$0	$0	$0	$0	$0
2011	$20,000	$0	$0	$0	$0	$0	$0	$20,000
2012	$300,000	$477,000	$0	$0	$0	$0	$0	$300,000
2013	$120,000	$555,000	$0	$0	$0	$0	$0	$120,000
2014	$50,000	$278,279	$0	$0	$0	$0	$0	$50,000
2015	$50,000	$0	$0	$0	$0	$0	$0	$50,000
To-Date	**$440,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$440,000**
Thru 2015	**$540,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$540,000**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

MA - DFW

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$0	$0	$0	$0	$0	$0	$0	$0
2010	$22,003	$0	$0	$0	$0	$0	$0	$22,003
2011	$32,570	$18,882	$0	$0	$0	$0	$3,000	$54,452
2012	$38,379	$51,627	$0	$0	$0	$0	$4,400	$94,406
2013	$58,865	$92,073	$0	$9,987	$0	$0	$0	$160,925
2014	$50,000	$150,000	$0	$10,000	$5,000	$0	$0	$215,000
2015	$40,000	$50,000	$0	$10,000	$5,000	$0	$0	$105,000
To-Date	**$151,817**	**$162,582**	**$0**	**$9,987**	**$0**	**$0**	**$7,400**	**$331,786**
Thru 2015	**$241,817**	**$362,582**	**$0**	**$29,987**	**$10,000**	**$0**	**$7,400**	**$651,786**

MA - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$0	$0	$0	$0	$0	$0	$0	$0
2010	$60,000	$11,700	0	$0	$0	$0	$0	$71,700
2011	$90,000	$200,800	$0	$0	$0	$0	$0	$290,800
2012	$90,000	$194,000	$0	$0	$0	$25,000	$0	$309,000
2013	$90,000	$99,500	$0	$0	$0	$10,000	$0	$199,500
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$330,000**	**$506,000**	**$0**	**$0**	**$0**	**$35,000**	**$0**	**$871,000**
Thru 2015	**$330,000**	**$506,000**	**$0**	**$0**	**$0**	**$35,000**	**$0**	**$871,000**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

NEC Organizational Funding Summary***

ME - IF&W

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$150,000	$0	$0	$16,263	$0	$0	$0	$166,263
2010	$151,063	$0	$0	$20,000	$0	$0	$3,955	$175,018
2011	$155,153	-$543	$0	$20,700	$0	$0	$6,478	$181,788
2012	$95,059	$0	$0	$0	$0	$0	$6,277	$101,336
2013	$39,678	$0	$16,667	$0	$0	$0	$3,626	$59,971
2014	$0	$0	$50,000	$0	$0	$0	$0	$50,000
2015	$0	$0	$50,000	$0	$0	$0	$0	$50,000
To-Date	**$590,953**	**-$543**	**$16,667**	**$56,963**	**$0**	**$0**	**$20,336**	**$684,376**
Thru 2015	**$590,953**	**-$543**	**$116,667**	**$56,963**	**$0**	**$0**	**$20,336**	**$784,376**

ME - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2008/09	$135,000	$87,235	$0	$0	$0	$0	$0	$222,235
2010	$56,000	$39,275	$0	$0	$0	$0	$0	$95,275
2011	$107,000	$75,000	$0	$0	$0	$0	$0	$182,000
2012	$200,000	$191,203	$0	$0	$0	$0	$0	$391,203
2013	$200,000	$139,640	$0	$0	$0	$0	$0	$339,640
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$698,000**	**$532,353**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,230,353**
Thru 2015	**$698,000**	**$532,353**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,230,353**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

NH - F&G

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2008/09	$75,000	$0	$0	$29,000	$2,000	$0	$2,000	$108,000
2010	$29,500	$0	$0	$18,000	$0	$22,500	$2,000	$72,000
2011	$37,000	$0	$0	$0	$0	$22,500	$1,000	$60,500
2012	$64,500	$0	$0	$0	$0	$19,500	$3,000	$87,000
2013	$68,000	$0	$0	$0	$0	$19,500	$1,000	$88,500
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$274,000**	**$0**	**$0**	**$47,000**	**$2,000**	**$84,000**	**$9,000**	**$416,000**
Thru 2015	**$274,000**	**$0**	**$0**	**$47,000**	**$2,000**	**$84,000**	**$9,000**	**$416,000**

NH - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$200,000	$0	$0	$0	$0	$30,000	$0	$230,000
2010	$200,000	$0	514,840	$0	$0	$30,000	$0	$744,840
2011	$200,000	$0	$0	$20,000	$0	$25,000	$0	$245,000
2012	$200,000	$350,000	$5,400,000	$0	$120,000	$25,000	$0	$6,095,000
2013	$200,000	$375,000	$0	$0	$0	$0	$0	$575,000
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$1,000,000**	**$725,000**	**$5,914,840**	**$20,000**	**$120,000**	**$110,000**	**$0**	**$7,889,840**
Thru 2015	**$1,000,000**	**$725,000**	**$5,914,840**	**$20,000**	**$120,000**	**$110,000**	**$0**	**$7,889,840**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

NEC Organizational Funding Summary***

NY - DEC

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$30,000	$0	$0	$0	$0	$0	$0	$30,000
2010	$100,000	$0	$0	$0	$0	$0	$0	$100,000
2011	$100,000	$0	$0	$0	$0	$0	$0	$100,000
2012	$100,000	$0	$0	$0	$0	$0	$0	$100,000
2013	$180,000	$25,000	$0	$220,000	$0	$0	$0	$425,000
2014	$180,000	$100,000	$0	$220,000	$0	$0	$0	$500,000
2015	$180,000	$100,000	$0	$220,000	$0	$0	$0	$500,000
To-Date	**$510,000**	**$25,000**	**$0**	**$220,000**	**$0**	**$0**	**$0**	**$755,000**
Thru 2015	**$870,000**	**$225,000**	**$0**	**$660,000**	**$0**	**$0**	**$0**	**$1,755,000**

NY - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$4,860		$0	$0	$0	$0	$0	$4,860
2010	$8,834		$0	$0	$0	$0	$0	$8,834
2011	$14,262		$0	$0	$0	$2,000	$0	$16,262
2012	$32,754	$15,738	$0	$0	$0	$0	$0	$48,492
2013	$26,606	$5,600	$0	$0	$0	$500	$0	$32,706
2014	$0	$0	$0	$0	$0	$0	$0	$0
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$87,315**	**$21,338**	**$0**	**$0**	**$0**	**$2,500**	**$0**	**$111,153**
Thru 2015	**$87,315**	**$21,338**	**$0**	**$0**	**$0**	**$2,500**	**$0**	**$111,153**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

10/16/2013

RI – DEM

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$1,852	$0	$0	$0	$0	$0	$0	$1,852
2010	$15,300	$0	$0	$150,028		$0	$0	$165,328
2011	$18,720	$0	$0	$149,125	$0	$0	$0	$167,845
2012	$23,088	$7,400	$0	$94,407	$0	$0	$0	$124,895
2013	$27,820	unknown	$0	$492,660	$0	$0	$0	$520,480
2014	$32,000	unknown	$0	$400,000	$0	$0	$0	$432,000
2015	$32,000	unknown	$0	$400,000	$0	$0	$0	$432,000
To-Date	**$86,780**	**$7,400**	**$0**	**$886,220**	**$0**	**$0**	**$0**	**$980,400**
Thru 2015	**$150,780**	**$7,400**	**$0**	**$1,686,220**	**$0**	**$0**	**$0**	**$1,844,400**

RI - NRCS

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$120,000	$0	$0	$0	$0	$0	$0	$120,000
2010	$120,000	$0	0	$0	$0	$0	$0	$120,000
2011	$120,000	$0	$0	$0	$0	$15,000	$0	$135,000
2012	$120,000	$227,000	$0	$0	$0	$15,000	$0	$362,000
2013	$120,000	$121,000	$0	$0	$0	$0	$0	$241,000
2014	$80,000	$74,000	$0	$0	$0	$10,000	$0	$164,000
2015	$0	$0	$0	$0	$0	$0	$0	$0
To-Date	**$600,000**	**$348,000**	**$0**	**$0**	**$0**	**$30,000**	**$0**	**$978,000**
Thru 2015	**$680,000**	**$422,000**	**$0**	**$0**	**$0**	**$40,000**	**$0**	**$1,142,000**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

NEC Organizational Funding Summary***

FWS Region 5 Operational Totals

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
2009	$222,480	$72,100	$0	$2,300	$2,000	$2,500	$3,000	$304,380
2010	$308,724	$220,300	$0	$50,000	$28,282	$30,000	$21,950	$659,256
2011	$442,526	$64,300	$0	$40,644	$13,580	$300	$17,000	$578,350
2012	$482,388	$406,100	$0	$46,136	$60	$16,600	$10,500	$961,784
2013	$485,637	$67,000	$0	$16,833	$3,500	$450	$6,860	$580,280
2014	$500,754	$0	$0	$0	$500	$100	$1,000	$502,354
2015	$512,432	$0	$0	$0	$500	$100	$1,000	$514,032
To-Date	**$1,941,755**	**$829,800**	**$0**	**$155,913**	**$47,422**	**$49,850**	**$59,310**	**$3,084,050**
Thru 2015	**$2,954,941**	**$829,800**	**$0**	**$155,913**	**$48,422**	**$50,050**	**$61,310**	**$4,100,436**

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

Competitive/Special Grants

8/14/2014

Year	Grant Program	Grant $$
2005	Rachel Carson NWR Challenge Cost Share Grant	$30,000
2006	Rachel Carson NWR Challenge Cost Share Grant	$12,725
2008	NFWF NEC Keystone - Phase I (WMI)	$40,000
2008	NFWF NEC Keystone - Phase I (FWS)	$245,000
2008	Maine Outdoor Heritage Fund (UNH Landscape Genetics Study)	$21,684
2008	Rachel Carson NWR Challenge Cost Share Grant	$12,500
2009	Rachel Carson NWR & Maine IF&W Challenge Cost Share Grants	$38,400
2009	NFWF NEC Keystone - Phase II	$300,000
2009	NEAFWA grant to UNH for monitoring, pop. est. and detectability study	$35,000
2009	Competitive State Wildlife Grant - Phase I	$731,975
2009	Maine Jetport Settlement for NEC habitat	$1,000,000
2009	Maine Jetport Settlement for NEC removal, release and monitoring	$20,000
2010	NFWF NEC Keystone - Phase III	$322,880
2010	USFWS-Tribal Wildlife Grant	$160,497
2010	USFWS-Challenge Cost Share	$55,000
2010	Maine Outdoor Heritage Fund	$40,000
2010	Regional Conservation Need Grant	$49,016
2010	Maine Natural Resource Conservation Program	$100,000
2010	WCS NEC SWAP Opportunity Grant	$150,000
2011	NFWF TAP Grant – Maine	$104,122
2011	NFWF TAP Grant – Connecticut	$199,800
2011	Competitive State Wildlife Grant - Phase II	$1,000,000
2011	Open Space Institute NEC Grant	$75,000
2011	FWS Rachael Carson NEC Grant	$2,450
2011	FWS NEC/Bog Turtle Coastal Grant	$24,000
2012	USGS- Science Support Partnership	$235,498
2012	Conservation Partners Grant	$300,000
2012	CT NEC Research Grant	$241,165
2013	USFWS – Capacity Grant	$215,000
2013	USGS- Science Support Partnership	$237,447
2013	Competitive State Wildlife Grant - Phase III	$500,000
2014	USFWS – Capacity Grant	$40,000
2014	USFWS – Capacity Grant	$200,000
2014	USFWS – Capacity Grant	$217,000
2014	Regional Pittman-Robertson Grant (5-year funding)	$1,359,855
2014	Competitive State Wildlife Grant - Phase IV	$500,000
2014	RI DEM P-R grant to URI genetics lab + genetics lab match (5-year funding)	$1,658,123
2014	NFWF NEC Grant to Maine	$75,000
Total Competitive Grants		**$10,549,137**

NEC Organizational Funding Summary***

Overall Summary

8/14/2014

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total (plus grants)
To-Date	$6,834,753	$4,017,320	$5,931,507	$1,702,703	$310,888	$326,050	$96,046	$29,604,404
Thru 2015	$8,541,939	$4,417,320	$6,031,507	$2,962,703	$418,354	$326,250	$98,046	$33,265,256

States Summary

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
To-Date	$1,657,683	$980,829	$16,667	$1,526,790	$143,466	$88,700	$36,736	$4,450,871
Thru 2015	$2,171,683	$1,380,829	$116,667	$2,786,790	$249,932	$88,700	$36,736	$6,831,337

Region 5 FWS Summary

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
To-Date	$1,941,755	$829,800	$0	$155,913	$47,422	$49,850	$59,310	$3,084,050
Thru 2015	$2,954,941	$829,800	$0	$155,913	$48,422	$50,050	$61,310	$4,100,436

NRCS Summary

10/16/2013

Year*	Personnel**	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
To-Date	$3,215,315	$2,132,691	$5,914,840	$20,000	$120,000	$177,500	$0	$11,520,346
Thru 2015	$3,235,315	$2,206,691	$5,914,840	$20,000	$120,000	$187,500	$0	$11,784,346

*Year is fiscal year, whatever dates that encompasses for your organization

**Personnel is full and part-time, salary, benefits and travel

*** Overall summary includes updates to grants through 8/14/14. Organizational summaries have not been updated since 10/16/13

Overall To-Date Summary By Organization/Type

Organization	Personnel	Habitat Mgmt.	Habitat Acq.	Research	Monitoring	Outreach	General	Total
CT - DEEP	$44,133	$786,390	$0	$306,620	$141,466	$4,700	$0	**$1,283,309**
MA - DFW	$151,817	$162,582	$0	$9,987	$0	$0	$7,400	**$331,786**
ME - IFW	$590,953	-$543	$16,667	$56,963	$0	$0	$20,336	**$684,376**
NH - F&G	$274,000	$0	$0	$47,000	$2,000	$84,000	$9,000	**$416,000**
NY - DEC	$510,000	$25,000	$0	$220,000	$0	$0	$0	**$755,000**
RI – DEM	$86,780	$7,400	$0	$886,220	$0	$0	$0	**$980,400**
NRCS	$3,335,315	$2,206,691	$5,914,840	$20,000	$120,000	$187,500	$0	**$11,784,346**
FWS	$1,941,755	$829,800	$0	$155,913	$47,422	$49,850	$59,310	**$3,084,050**
Grants	N/A	N/A	N/A	N/A	N/A	N/A	N/A	**$10,549,137**
Total	**$6,754,753**	**$3,943,320**	**$5,931,507**	**$1,702,703**	**$310,888**	**$316,050**	**$96,046**	**$29,604,404**

Literature Cited

Brubaker, D.R., A.I. Kovach, M.J. Ducey, W.J. Jakubas, and K.M. O'Brien. 2014. Factors influencing detection in occupancy surveys of a threatened Lagomorph. Wildlife Society Bulletin 38(3):513–523. DOI: 10.1002/wsb.416.

Buffum, B., S.R. McWilliams, and P.V. August. 2011. A spatial analysis of forest management and its contribution to maintaining the extent of shrubland habitat in southern New England, United States. Forest Ecology and Management. 262:1775-1785.

Cheeseman, A. 2013. New England cottontail demographics and habitat associations in New York. Dissertation research proposal. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Fenderson, L.E. 2010. Landscape Genetics of the New England Cottontail: Effects of Habitat Fragmentation on Population Genetic Structure and Dispersal. M.S. thesis, University of New Hampshire, Durham. 186 pp.

Fenderson, L.E., A.I. Kovach, J.A. Litvaitis, and M.K. Litvaitis. 2011. Population genetic structure and history of fragmented remnant populations of the New England cottontail (Sylvilagus transitionalis). Conservation Genetics 12:943-958.

Fenderson, L.F, A.I. Kovach, J.L. Litvaitis, K.M. O'Brien, K. Boland, and W. Jakubas. 2014. A multi-scale analysis of gene flow in the New England cottontail, an imperiled habitat specialist in a fragmented landscape. Ecology and Evolution 4(10): 1853-1875 doi: 10.1002/ece3.1068

Fuller, S., K. Callahan, and T. Boucher. 2011. Designing Conservation for the New England cottontail (*Sylvilagus transitionalis*): Habitat models and decision support tools. Unpublished. 43 pp.

Fuller, S. and A. Tur. 2012. Conservation Strategy for the New England Cottontail (*Sylvilagus Transitionalis.*

Gavard, E. 2013. Parasitology and nutrition analysis of the New England cottontail in the Hudson River Valley. SUNY College of Environmental Science and Forestry, Syracuse, NY.

Gottfried, A.E. 2013. Fine-scale assessment of habitat characteristics of two cottontail species in southern New England. Master's Thesis. University of Rhode Island.

Kilpatrick, H., Goodie, T. and A.I. Kovach. 2013. Comparison of live-trapping and noninvasive genetic sampling to assess patch occupancy by New England cottontail rabbits. Wildlife Society Bulletin DOI: 10.1002/wsb.330.

Kovach, A.I. and D.R. Brubaker. 2012a. Detecting New England cottontails during winter pellet surveys: an evaluation of current practices and recommendations for an improved monitoring

protocol for maximal detection of occupancy. A report for managers and a product of NEAFWA RCN grant #2009-04.

Kovach, A.I. and D.R. Brubaker. 2012b. Estimating abundance of New England cottontail populations using fecal DNA collected during winter pellet surveys. A report for managers and a product of NEAFWA RCN grant #2009-04.

Kovach, A.I. 2012. Development of noninvasive monitoring tools for New England cottontail populations: implications for tracking early successional ecosystem health. Final report to the Northeast Fish and Wildlife Agencies Regional Conservation Needs Grant Program for RCN Project #2009-04.

Maynard, C. 2013. Evaluating Coastal Islands as Potential Translocation Sites for New England Cottontail.

Rittenhouse, C. 2014. Final report: estimation of early successional habitat in Connecticut. Department of Natural Resources and the Environment. University of CT, Storrs.

Sullivan, M.E. 2013. Comparative phylogeography and a mitochondrial DNA barcode for identifying three sympatric lagomorphs in the northeastern United States. Master's thesis. University of Rhode Island, Kingston.