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For a thriving New England

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February 28, 2019

Mr. James R. Beyer
Maine Department of Environmental Protection
Bureau of Land Resources - Eastern Maine Regional Office
106 Hogan Road, Suite 6
Bangor, ME 04401

Re: *Central Maine Power Company New England Clean Energy Connect: Application for Natural Resources Protection Act Permit and Site Location of Development Act Permits*

Dear Mr. Beyer:

Conservation Law Foundation (CLF) has reviewed the pre-filed direct testimony filed today by The Nature Conservancy (the Conservancy) in the above-captioned matter pursuant to the Department of Environmental Protection's (the Department) Third Procedural Order dated February 5, 2019. Specifically, CLF has reviewed the testimony filed today by Malcolm L. Hunter Jr., PhD., serving as an expert witness for The Nature Conservancy in Maine, and by Rob Wood, Andy Cutko and Bryan Emerson for The Nature Conservancy in Maine. As an intervenor consolidated with the Conservancy in the Department's consolidated intervenor Group 6, CLF supports the testimony filed today by the Conservancy.

Sincerely,

Phelps Turner

cc: DEP Service List
Sean Mahoney, Director, CLF Maine

**Testimony before the Maine Department of Environmental Protection**

**By**
**Malcolm L. Hunter Jr., PhD.**
**Serving as an Expert Witness for**
**The Nature Conservancy in Maine**

**February 25, 2019**

**RE: Central Maine Power's New England Clean Energy Connect Transmission Proposal**

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## 1. Background and Credentials

My name is Malcom L. Hunter, Jr., and I am the Libra Professor of Conservation Biology at the University of Maine, where I have taught for the last 40 years. I was born and raised in Damariscotta, Maine, and I received my Bachelor of Science degree in Wildlife Science from the University of Maine. I received my PhD. in Zoology from Oxford University, where I was a Rhodes Scholar. I am the past president of the Society for Conservation Biology, a global professional organization, and have served on the Editorial Board of the Ecological Society of America.

I have been the lead author or co-author in over 200 professional publications on wildlife and conservation biology, including 47 peer-reviewed journal papers and three books that specifically address the issue of fragmentation. My research has covered a variety of ecosystems and organisms – birds, amphibians, mammals, reptiles, insects, vascular plants, rivers, lakes, wetlands, grasslands, and more – but my major focus is on forest ecosystems and the maintenance of their biological diversity. I am a member of a research team that has studied one forest and the evolving interactions among its vascular plants, amphibians, birds, and small mammals through nearly 40 years. Perhaps most relevant to this project, I also work with ecosystems at large spatial and temporal scales, studying the effects of landscape structure and climate change on global ecosystems. My interests are geographically broad, and I have worked in 30 countries and on every continent except Antarctica. As a researcher and advisor, I interact with a broad spectrum of organizations including the Society for Conservation Biology, The Nature Conservancy, the U.S. Fish and Wildlife Service and U.S. Forest Service, and I have had three gubernatorial appointments to various natural resource advisory groups.

## 2. Role in this Project

I have followed the progression of this project over the past year. As a former Trustee of The Nature Conservancy of Maine, I have been in discussion with Conservancy staff over the past few months about their concerns regarding potential impacts to wildlife habitat. As an intervenor in the DEP proceedings, The Nature Conservancy has taken a neither 'for' nor 'against' position on this project. However, the Conservancy strongly asserts that the project will have significant cumulative and long-term impacts on the region's wildlife, and that the compensation and mitigation currently proposed are inadequate and not commensurate with those impacts. I understand that DEP provides significant latitude for the Department to consider cumulative, landscape-level impacts that extend beyond isolated impacts to specific resources, and I am providing testimony in support of The Nature Conservancy's concerns about these issues.

My testimony represents my own research and perspective and does not reflect the University of Maine. I have received no compensation for this testimony.

### 3. Habitat Fragmentation and NECEC

Stated simply, ecosystem fragmentation is the gradual breaking apart of a natural landscape into smaller blocks of native vegetation.[1] The impacts of fragmentation have been widely evaluated in the scientific literature, and there are at least hundreds, probably thousands, of peer reviewed publications on this topic. In short, it is widely recognized that fragmentation is one of the leading causes of biodiversity decline across the globe, but its role is context-dependent.

Thus, it's important to carefully consider the landscape in which NECEC is planned. Unlike some characterizations of the region, it is not pristine "wilderness." On the other hand, it is not an intensively managed industrial forest landscape with monoculture crops grown on short rotations, such as characterizes much of New Brunswick's forest. It is an extensively managed, working forest, traversed by logging roads and marked by a patchwork of forests in various age classes and harvest conditions. In multiple parts of its application, CMP argues that in a working landscape such as this, the additional impacts from a powerline corridor are inconsequential. However, it is important to recognize that with the exception of major haul roads, clearing from forest management is ***temporary***, and even industrial forest management requires forests to grow back to maturity before they are harvested again. The results of forest management across the western Maine landscape create a patchwork of age classes that shift over time. Although these shifts are more frequent, and the patches larger, than would occur in a totally natural forest setting (i.e., under a regime of natural disturbance such as windstorm and insect damage), because of the largely intact and connected landscape, over time Maine's wildlife are able to move among these patches. In contrast to these temporary and shifting impacts of forest management, ***the proposed NECEC corridor would be a permanent fragmenting feature, much like the few major forest roads in the region.***

It is also important to note that the *type, orientation,* and *spatial scale* of a fragmenting feature are instrumental in determining the level of impact. A 150-foot wide powerline will create a wider barrier to movement than a typical woods logging road (which may be one-fifth the width of the powerline), and both linear features will create far more edge and have a different impact than a similar area of widely spaced clear cuts.

In addition, we often ask, is a road, pasture, or utility line fragmenting to *what species*? A highly mobile, generalist species such as a black bear will react to a utility corridor very differently than a smaller species that strongly prefers a shaded forest floor, like a spotted salamander or wood frog.

There are no known examples of comparable development projects in Maine that traverse lands mapped as "Resilient and Connected" by The Nature Conservancy. ("Resilient and Connected" lands are those that have been identified, based on land form and land cover, as being most capable of supporting biodiversity as the climate changes.) As a result, because of the scale and location of this project, there are no studies I'm aware of that have assessed impacts in a landscape such as this. Thus, it can be challenging to apply academic studies to specific cases of

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[1] Hunter, M.L., Jr., and J. Gibbs. 2007. *Fundamentals of conservation biology* (3rd ed.). Blackwell Publishing. 482 pp.

fragmentation, but I have attempted to draw primarily from those factors and studies that are likely to have implications for the NECEC corridor project.

3.1 Types of Impacts

Fragmentation results in at least three related impacts: immediate loss of forest vegetation, increase in "edge" (i.e., the border between a forest and an opening), and a decrease in the overall amount of "interior" forest. These impacts can have both short-term and long-term impacts.

3.1.1. Habitat Loss and Alteration:

Loss and alteration of ecosystems are the leading causes of biodiversity declines in Maine and worldwide, and climate change is exacerbating these impacts. While the proposed NECEC corridor will retain shrub and herbaceous vegetation cover, Segment 1 is nonetheless a direct loss of nearly 1,000 acres of habitat for forest-dwelling species. According to the 2015 Maine State Wildlife Action plan, Maine is home to more than 800 species of vertebrate wildlife, including more than 200 that are listed as Species of Greatest Conservation Need.[2] For species that have small home ranges, such as the red-backed salamander whose populations can reach one per square yard in northern New England forests[3], the loss of 1,000 acres of forested habitat could impact millions of individuals. Even for larger species, the altered habitat in a utility corridor may serve as a barrier to movement. Biasotto and Kindel[4] report that, "Many studies suggested that the distribution and density of ungulates are affected by powerline RoW, especially when combined with roads. This response may be caused by a higher risk of predation, poor foraging conditions, hindered movement and decreased habitat quality."

3.1.2 Increased Edge and Reduced Interior:

Forest loss associated with a transmission line and associated construction roads is amplified by the edge effects that extend the corridor's impact far into the adjacent forest. At the global scale, forest edges influence more than half of the world's forests and contribute to worldwide declines in biodiversity and ecosystem functions.[5] These changes occur as a result of differences in light and wind exposure at forest edges, associated changes in plant community composition and structure (e.g., forest vs. shrub), introductions of invasive species, and changes in predator/prey relationships. ***Segment 1 of the NECEC will create more than 100 linear miles of permanent new edge habitat in Segment 1 alone.***

Forest edge microclimates are typically windier, warmer, and drier than forest interiors.[6] Because of simple rules of geometry (i.e., a circle has the lowest perimeter to area ratio) the

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[2] https://www.maine.gov/ifw/fish-wildlife/wildlife/wildlife-action-plan.html#greatestneed

[3] Burton, T.M., and G.E. Likens. 1975. Salamander populations and biomass in the Hubbard Brook Experimental Forest, New Hampshire Copeia. 1975:541-546.

[4] Biasotto, L., and A. Kindel, 2018. Power lines and impacts on biodiversity: A systematic review. Environmental Impact Review Assessment 71:110-119.

[5] Pfiefer, M., V. Lefebvre, C.A. Peres, et al. 2017. Creation of forest edges has a global impact on forest vertebrates. *Nature 551*: 187–191.

[6] Hunter, M., and F. Schmiegelow. 2011. Wildlife, Forests, and Forestry: Principles of Managing Forests for Biological Diversity. Prentice Hall, Upper Saddle River, New Jersey, USA. 259 pp

amount of edge is also far greater for long narrow clearings, such as roads and utility corridors, than for more compact clearings of the same size, such as harvested areas. Forest edges are often more favorable to "generalist" species that can adapt to a wide variety of conditions, including raccoons, brown-headed cowbirds, blue jays, and others. As a result, some studies have found greater species richness and abundance in habitat fragments and edges compared to forest interiors.[7] These studies have been used to suggest that the impacts of habitat fragmentation on biodiversity may not be as significant as once considered.

However, generalist species are typically more common, and thus of lower conservation concern, than many species that are restricted to the specific habitat of interior forest. Depending on the species in question the edge impact may extend hundreds of feet into the forest.[8,9] At the global scale, species that live in interior forest and are more likely to be listed as threatened by the International Union for Conservation of Nature (IUCN), reached peak abundances only at sites farther than 200–400 m from forest edges. [10] In particular, smaller-bodied amphibians, larger reptiles, and some medium-sized mammals experience greater reduction from edge effects than other forest-core species.[11] Moreover, "distance from power lines has also been demonstrated as the most important factor determining the choice of nest and rest sites, influencing the movement of migratory birds and acting as a barrier to populations."[12]

In the Northeast U.S., the decline of many ground-nesting forest interior birds has been attributed to increased predation or competition from generalist species.[13] In Maine there are more than two dozen bird speciese.g., black-throated blue warbler, Canada warbler, black-throated green warbler, and wood thrush-- that are associated with forest interiors and are listed as Species of Greatest Conservation Need.[14] Typically these species tend to avoid forest edges and require hundreds of acres of continuous, relatively interior forest to reproduce, as do some mammals with large home ranges, such as American marten.[15] Northeastern forests have been shown to support important breeding grounds for many of these species, and these area-sensitive habitat specialists will decline if the size of habitat blocks falls.[16,17,18]

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[7] Fahrig, L., Arroyo-Rodríguez, V., Bennett, J., et al. 2019. Is habitat fragmentation bad for biodiversity? Biological Conservation 230.

[8] Laurance, W.F., T.E. Lovejoy, H.L. Vasconcelow, et al. 2002. Ecosystem decay of Amazonian forest fragments: A 22 year investigation. *Conservation Biology 16*: 605–618.

[9] Laurance, W.F., J.L.C. Camargo, P.M. Fearnside,et al. 2017. An Amazonian rainforest and its fragments as a laboratory of
global change. *Biological Reviews, 93*(1). 25 pp.

[10] Pfeifer et al 2017.

[11] Pfeifer et al 2017.

[12] Biasotto and Kindel 2018.

[13] Ortega, Y.K., and D.E. Capen. 1999. Effects of forest roads on habitat quality for ovenbirds in a forested landscape. *The Auk, 116*(4): 937–94.

[14] https://www.maine.gov/ifw/fish-wildlife/wildlife/wildlife-action-plan.html#greatestneed

[15] Chapin, T.G., D.J. Harrison, and D.D. Katnik, 1998. Influence of landscape pattern on habitat use by American marten in an industrial forest. *Conservation Biology, 12*: 1327–1337.

[16] Askins, R.A. 2002. Restoring North America's birds: lessons from landscape ecology. Yale University Press, New Haven, Connecticut.

[17] Blake, J.G., and J.R. Karr. 1984. Species composition of bird communities and the conservation benefit of large versus small forests. *Biological Conservation, 30*: 173–187.

As previously noted, most of the land surrounding Segment 1 is privately-owned working forest, traversed by logging roads and marked by a patchwork of forests in various age classes and harvest conditions. Nonetheless, approximately 48% of the forest in the Western Mountains is more than 3,300 feet from a public road or major logging road, which is beyond the distance of most edge effects (McMahon 2018). By contrast, only 5% of forestland in southern Maine is beyond this threshold[19], and globally this figure is about 30%[20]. ***Assuming an edge effect of just 330 feet, the acreage affected by Segment 1 of NECEC jumps roughly five-fold to 5,000 acres, and assuming an edge effect of 1,000 feet, the acreage affected increases nearly fifteen-fold.***

3.1.3 Introduction of Invasive Species

Utility corridors may serve as conduits for the movement and spread of invasive exotic species.[21] Most invasive plant species in Maine thrive on disturbed and early successional sites, such as old fields, roadsides, and utility corridors. Invasive plants such as Japanese honeysuckle, glossy buckthorn, Japanese barberry, and Japanese knotweed have the potential to profoundly alter forest ecosystems by colonizing forest edges, and they may penetrate far into the forest interior, degrading or eliminating habitat for native plants.[22] There are a number of locations in southern Maine such as the Rachel Carson National Wildlife Refuge where this alteration is already occurring.

Overall the region surrounding the proposed NECEC corridor has few invasive species documented, probably because large forest blocks resist woody plant invasions better than land that has a history of agricultural or residential use.[23] The current rarity of invasive plants in the region increases the importance of keeping them out, because after new populations establish in remote locations, they may go undetected or controlled for many years, and control becomes virtually impossible once populations have gained a strong foothold.

3.1.4. Other Impacts

In addition to impacts associated with forest loss and creation of edge, other impacts from utility corridors may include bird and bat collisions with transmission lines, and electromagnetic radiation on wildlife. This is not my area of expertise but I would note that Fernie and Reynolds[24] have reported that exposure of birds to electromagnetic radiation "altered the behavior, physiology, endocrine system, and the immune function of birds, which generally

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[18] Whitcomb, R.F., C.S. Robbins, J.F. Lynch, et al. 1981. Effects of forest fragmentation on avifauna of the eastern deciduous forest. Page 125-205 in R.L. Burgess and D.M. Sharpe (eds.), Springer-Verlag, New York.

[19] McMahon, J. 2018. The Environmental Consequences of Forest Fragmentation in the Western Maine Mountains. Occasional Paper #2 for the Maine Mountain Collaborative.

[20] Haddad, N.M., L.A. Brudvig, J. Clobert, et al. 2015. Habitat fragmentation and its lasting impacts on Earth's ecosystems. American Association for the Advancement of Science. *Science Advances, 1*, 9 pp

[21] Forman, R.T.T., and L.E. Alexander. 1998. Roads and their major ecological effects. *Annual Review of Ecological Systematics 29*: 207–231.

[22] Charry, B. 1996. *Conserving wildlife in Maine's developing landscape.* Maine Audubon Society, Falmouth, Maine.

[23] Mosher, E.S., J.A. Silander, Jr., and A.M. Latimer. 2009. The role of land-use history in major invasions by woody plant species in the northeastern North American landscape. *Biological Invasions 11*: 2317.

[24] Fernie, K.J., and J. Reynolds. 2005. The effects of electromagnetic fields from power lines on avian reproductive biology and physiology: A review. *Journal of Toxicology and Environmental Health, Part B, 8*: 127–140.

resulted in negative repercussions on their reproduction or development. Such effects were observed in multiple species, including passerines, birds of prey, and chickens in laboratory and field situations, and in North America and Europe."

3.2 Cumulative, Long Term Consequences

Many forest fragmentation impacts are not immediate and may in fact take years, or even decades, to fully play out on the landscape. Tere and Parasharya[25] note that, "the cumulative effects of power lines and other sources of mortality might be noticed only after a few decades, making it difficult to reverse population declines." If, for example, is the edge effect of a powerline causes just a 10% decline in reproduction rate of a population deterred from crossing a powerline each year, over many years the cumulative impact of this may have a significant lag time, whereby impacts created today set in motion a population decline that is not fully manifested for years to come. The regulatory framework often falls short in acknowledging cumulative impacts. Bisotto and Kindel[26] note that most impact assessments neglect the long-term effects of transmission lines on biodiversity.

Immediate impacts from fragmentation may be deceiving. In one relevant study in Maine's working forestlands, Hagan et al.[27] found that densities of some forest-dwelling bird species actually increased within a forest patch soon after the onset of fragmentation, reflecting displaced individuals packing into remaining habitat. However, because many forest songbirds are highly territorial during the breeding season, nesting productivity was actually lower in these densely populated habitats.

As noted previously, pine marten in Maine prefer mature forests, and much prior work has focused on quantifying their habitat requirements. Studying marten populations in northern Maine, Legaard et al[28] and Simons-Legaard et al[29] suggest that forest harvest practices on much of Maine's commercial forestland are creating young habitat that no longer serves the needs of marten. As a result, the forest management practices of today are likely to have a detrimental impact on pine marten in the future.[30,31] Indeed, given that marten is an "umbrella species" (i.e., a species whose habitat overlaps the habitat of many other species), we should be concerned that the cumulative impact of logging roads, harvest practices, and powerlines may be creating a challenging future for many other species that use similar habitat.

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[25] Tere, A., & Parasharya, B. M., 2011. Flamingo mortality due to collision with high tension electric wires in Gujarat, India. Journal of Threatened Taxa 3: 2192–2201

[26] Biasotto and Kindel 2018.

[27] Hagan, J.M., W.M. Vander Haegen, and P.S. McKinley. 1996. The early development of forest fragmentation effects on birds. *Conservation Biology, 10*: 188–202.

[28] Legaard, K.R., S.A. Sader, and E.M. Simons-Legaard. 2015. Evaluating the impact of abrupt changes in forest policy and management practices on landscape dynamics: Analysis of a Landsat image time series in the Atlantic Northern Forest. *PLoS ONE, 10*(6): e0130428.

[29] Simons-Legaard, E.M., D.J. Harrison, and K.R. Legaard. 2018. Ineffectiveness of local zoning to reduce regional loss and fragmentation of deer wintering habitat for white-tailed deer. *Forest Ecology and Management, 427*: 78–85.

[30] Simons-Legaard, E.M., D.J. Harrison, W.B. Krohn, and J.H. Vashon. 2013. Canada Lynx occurrence and forest management in the Acadian Forest. *The Journal of Wildlife Management, 77*: 567–578.

[31] Simons-Legaard 2018.

In addition to the cumulative impacts cited above, forest fragmentation likely increases the vulnerability of Maine's native flora and fauna to climate change.[32,33] This is true because movements of individuals and ultimately entire populations is the main ways that species respond to climate change. According to McMahon, "The resiliency of the Western Maine Mountains in the face of climate change is largely due to the extent and connectivity of the region's forests."[34] In short, when we consider the long-term, cumulative nature of fragmentation impacts, the forest of western Maine may already be stressed by forestry roads and the addition of the NECEC could, while not the "straw that breaks the camel's back", still be a log that significantly weakens the camel.

**4. Shortcomings of the Proposed Mitigation Plan**

The NECEC corridor would be one of the largest fragmenting features in the region, and as previously noted, there really is no comparable precedent for assessing the impacts to wildlife connectivity. CMP has made adjustments to its original compensation plan to accommodate for corridor impacts to white-tailed deer (particularly wintering habitat) and a few selected rare species (roaring brook mayfly and northern spring salamander). While deer have been identified in this process because of their regulatory standing, there are approximately 800 species of vertebrate wildlife in Maine and thousands of species of invertebrates, and many hundreds of species are present in the region affected by this corridor. Although habitat fragmentation affects different species in different ways, it is clear that many other species would be affected in addition to deer. These include birds such as scarlet tanager and black-throated blue warbler, mammals including pine marten and Canada lynx, amphibians such as spotted salamander and wood frog, and reptiles such as the wood turtle. ***The proposed mitigation and compensation plan does not adequately address the cumulative impacts to the full array of Maine's wildlife.***

**5. Conclusion**

Because of the global ecological importance of this region and the substantial length of new corridor, it is challenging to find comparable examples of regulatory review and commensurate mitigation and compensation. It is my contention that, based on the evidence presented above, CMP has not made adequate provisions for the protection of wildlife and fisheries. If in fact the project is permitted, I believe that the DEP should recommend that either: A) the proposed mitigation package needs to be substantially increased (by significantly expanding some of the existing strategies proposed for Segment 1), and/or B) the compensation package needs to be considerably increased to conserve land commensurate with the impacts, as outlined by TNC.

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[32] Fernandez, I.J., C.V. Schmitt, S.D. Birkel, et al. 2015. *Maine's climate future: 2015 update*. University of Maine, Orono, Maine. 24 pp.

[33] Rustad, L., J. Campbell, J.S. Dukes, et al. 2012. *Changing climate, changing forests: The impacts of climate change on forests of the northeastern United States and eastern Canada. Gen. Tech. Rep. NRS-99. USDA Forest Service, Northern Research Station. Newtown Square, Pennsylvania. 48 pp.*

[34] McMahon 2018

By: _____
Malcolm L. Hunter, Jr., PhD.

Date: 25 Feb 2019

The above-named Malcolm L. Hunter Jr. did personally appear before me and made oath as to the truth of the foregoing pre-filed testimony.

_____
Notary Public/Attorney at Law

Date: 02/25/2019.

My Commission Expires: Althea Tibbetts
Notary Public, State of Maine
My Commission Expires August 12, 2025

**Testimony before the Maine Department of Environmental Protection**

**By**
**Rob Wood, Energy Policy and Projects Advisor,**
**Andy Cutko, Director of Science, and**
**Bryan Emerson, Mitigation Program Manager, for**
**The Nature Conservancy in Maine**

**February 26, 2019**

**Re: Central Maine Power's New England Clean Energy Connect transmission proposal**
**DEP Application: L-27625-26-A-N**

Thank you for the opportunity to provide testimony on the proposed Central Maine Power (CMP or "the applicant") New England Clean Energy Connect (NECEC) transmission corridor. This testimony is provided by The Nature Conservancy in Maine staff Rob Wood, Energy Policy and Projects Advisor, Andy Cutko, Director of Science, and Bryan Emerson, Mitigation Program Manager.

The Nature Conservancy ("the Conservancy") is a science-based, global conservation organization dedicated to conserving the lands and waters on which all life depends. The Conservancy has been working in Maine for more than 60 years and is the 12th largest landowner in the state. We own and manage some 300,000 acres, all of which are open to the public for a wide variety of uses, including hiking, hunting, canoeing and fishing. We work across the state to restore rivers and streams, rebuild groundfish populations in the Gulf of Maine, and develop solutions to climate change. In 2017, we paid more than $450,000 in property taxes statewide.

One of our properties, the Leuthold Forest Preserve, is directly adjacent to the proposed NECEC corridor. The Leuthold Preserve encompasses 16,934 acres of forest land southwest of Jackman, including Number 5 Mountain and the shorelines of seven ponds. Among the wildlife species found in the Leuthold Preserve are pine marten, Bicknell's thrush, gray jay, boreal chickadee, Blackburnian warbler, and blackpoll warbler. The proposed corridor would run along the southern border of our preserve.

In general, when new energy infrastructure is proposed, the Conservancy seeks to ensure that the planned infrastructure is well-sited and that projected impacts are appropriately addressed through the mitigation hierarchy, which includes avoidance, minimization, and compensation for unavoidable impacts. Although our position in this proceeding is "neither for nor against" a

permit being issued, it is our contention that if NECEC is permitted, it must be accompanied by mitigation measures that are commensurate with the projected impacts.

In our testimony below, we address three topics that speak to the siting of the proposed project and the applicant's proposed mitigation actions:

1. Wildlife Habitat and Fisheries (Habitat Fragmentation)
2. Alternatives Analysis
3. Compensation and Mitigation

## I. Wildlife Habitat and Fisheries (Habitat Fragmentation)

The Department's second procedural order states that 38 M.R.S. § 480-D (3) and DEP Chapter 375 § 15 are within the scope of the NECEC hearing. DEP Chapter 375 § 15 provides significant latitude for the Department to consider cumulative, landscape-level impacts that extend beyond isolated impacts to specific resources. The relevant Chapter 375 § 15 language is:

> "B) Scope of Review. In determining whether the developer has made adequate provision for the protection of wildlife and fisheries, the Department shall consider **all relevant evidence to that effect**, **such as evidence that**: … **(2) Proposed alterations and activities will not adversely affect wildlife and fisheries lifecycles**." (Emphasis added.)

The phrase "all relevant evidence to that effect" is inclusive of the evidence we present below on the issue of habitat fragmentation. We also believe that the scale and cumulative impact of the habitat fragmentation caused by Segment 1 of the proposed NECEC corridor could potentially "adversely affect wildlife and fisheries lifecycles" for many years into the future.

38 M.R.S. § 480-D (3) provides additional direction to the Department to consider habitat fragmentation. Specifically:

> "3. Harm to habitats; fisheries. The activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, **travel corridor**, freshwater, estuarine or marine fisheries or other aquatic life." (Emphasis added.)

Although the term "travel corridor" can sometimes refer to MDIFW-mapped deer travel corridors, we interpret the term to be applied here more broadly. 38 M.R.S. § 480-D (3) mentions "significant wildlife habitat" and "travel corridors" separately, suggesting that mapped deer travel corridors fall under the definition of "significant wildlife habitat," and the term "travel corridors" is referring to travel corridors for wildlife more generally. As is detailed below, as well as in the expert witness testimony of Dr. Hunter, there are hundreds of fish and wildlife species that use the forests and waters of the region, and many of these species (in addition to deer) would be affected by the cleared NECEC transmission corridor. Habitat fragmentation can deter movement of specific species and therefore consideration of fragmentation is also warranted under this provision.

*The global importance of western Maine*

Maine's western forest is unique in the eastern United States for its concentration of well-connected and climate-resilient wildlife habitat. The Conservancy is concerned about the potential of NECEC Segment 1 to contribute to new and unprecedented fragmentation of this connected and resilient landscape. In a suburban or developed area, we would be less concerned about habitat fragmentation.

**TNC Exhibit 1** displays Conservancy data on the connectedness of landscapes in eastern North America. Landscape connectedness is a measure of how easily wildlife may move from one place to another. It is determined through remote imagery and is strongly influenced by the lack of permanent fragmenting features such as paved roads and development. Western Maine is unique in the eastern United States for lands with above-average to high-connectivity scores. Additional details on these factors, including the data used to create Exhibit 1, is available in Anderson et al (2016).[1]

**TNC Exhibit 2** provides the Conservancy's base data layer for connected and resilient lands in the northern Appalachian region, again demonstrating the concentration of well-connected landscapes in western Maine.[2]

**TNC Exhibit 3** shows unfragmented forest block data from the State of Maine (the proposed NECEC route is superimposed). At more than 500,000 acres, the forest block through which NECEC would traverse is one of the largest unfragmented forest blocks in the region.

Moreover, western Maine is the core of one of the world's last remaining contiguous temperate broadleaf-mixed forests. **TNC Exhibits 4 and 5** show the original extent (pre-colonization-era) and the current extent of broadleaf-mixed forests globally. This work was informed by a global assessment, using remote imagery, of land uses, forest loss and conversion, and forest cover.[3] Maine has successfully maintained forest connectivity over time while other regions have become increasingly fragmented. The western Maine mountains remain approximately 97 percent forested, well-above the statewide and national average.[4]

Largely for this reason, the western Maine region supports exceptional biodiversity.[5] It contains a diverse range of connected forest ecosystems—including floodplain hardwood forests, boreal forests, alpine tundra, ribbed fens—that provide habitat for roughly 140 rare species and the last stronghold for wild native brook trout in the eastern U.S. As shown in **TNC Exhibit 6**, the

[1] Anderson, M.G., Barnett, A., Clark, M., Prince, J., Olivero Sheldon, A. and Vickery B. 2016. Resilient and Connected Landscapes for Terrestrial Conservation. The Nature Conservancy, Eastern Conservation Science, Eastern Regional Office. Boston, MA.

[2] Anderson et al. 2016.

[3] Haselon, B, Bryant, D., Brown, M and C. Cheeseman. 2014. Assessing Relatively Intact Large Forest Blocks in the Temperate Broadleaf & Mixed Forests Major Habitat Type. The Nature Conservancy, NY.

[4] New England Forestry Foundation (NEFF) (in press). *Landscape scale resource inventory and wildlife habitat assessment for the Mountains of the Dawn*. New England Forestry Foundation, Littleton, Massachusetts.

[5] McMahon, J. 2018. The Environmental Consequences of Forest Fragmentation in the Western Maine Mountains. Occasional Paper No. 2. Maine Mountains Collaborative, Phillips, Maine.

region has also been mapped by the National Audubon Society as a globally important bird area, providing crucial nesting habitat for more than 30 northern woodland songbird species.

Western Maine is expected to be especially effective at maintaining biodiversity as the climate changes. This resilience to climate change is a function of the region's connectedness, as well as its topographical diversity and resulting diversity of landforms, such as wetlands, floodplains, mountaintops, and steep slopes. These diverse landforms create a variety of microclimates (a range of microclimates will allow species to persist by moving to adjacent microclimates as temperatures change).[6,7] Connected forests allow for greater species movement over time in response to climate change, and western Maine will serve as a key wildlife linkage in the northern Appalachian region.[8]

*Habitat fragmentation effects of the proposed NECEC corridor*

Habitat fragmentation occurs when continuous habitat is broken into smaller, more isolated patches. Segment 1 of the proposed NECEC corridor would create a new linear fragmenting feature in what is currently a large, mostly unfragmented forest block. We contend that this new fragmentation will have unpredictable implications for the health and viability of wildlife and plant species over time, and that such implications could be significant.

A growing body of research presents findings on the negative impacts of habitat fragmentation, ranging from edge effects (caused by sharp transitions from one habitat to another), to spread of invasive species, to increased pressure from associated uses (such as motorized vehicle use), to changes in species composition and behavior over time from reduced habitat patch sizes.[9] Fragmentation is of particular concern for wildlife species that require mature, closed-canopy forest cover, such as the American marten and many interior forest nesting birds. (Additional information on habitat fragmentation effects is provided in Dr. Hunter's expert witness testimony).

The applicant acknowledges the potential for habitat fragmentation and associated impacts on page 7-23 of the NECEC Site Location of Development Application. The application cites numerous studies and states that, "Transmission line corridors present potential direct impacts, as they may affect species movement, dispersal, density, nesting success and/or survival… For the undeveloped corridor of Segment 1, impact may include fragmentation and creation of new linear edges… Habitat conversion along transmission line corridors results in a loss of habitat types which, in turn, may adversely impact species that are reliant on the original habitat types." ***However, the applicant does not propose any measures to avoid, minimize, or compensate for these impacts***.

[6] Anderson, M.G., M. Clark, and A. Olivero Sheldon. 2012. *Resilient sites for terrestrial conservation in the Northeast and Mid-Atlantic Region*. The Nature Conservancy, Eastern Conservation Science.
[7] Anderson, M.G., M. Clark, C.E. Ferree, A. Jospe, and A. Olivero Sheldon. 2013. *Condition of the northeast terrestrial and aquatic habitats: A geospatial analysis and tool set*. The Nature Conservancy, Eastern Conservation Science. Boston, Massachusetts.
[8] Trombulak, S.C., and R.F. Baldwin (eds.). 2010. *Landscape-scale conservation planning*. Springer, New York.
[9] See *McMahon, J. 2018* references for a full literature review.

On page 7-25 of the Site Location of Development Application, the applicant suggests several reasons for choosing not to address habitat fragmentation. For example, the applicant states, "Some bird species within the NECEC Project area that may be sensitive to forest fragmentation are the long distance, neotropical migrants that rely on forest interior habitats, but plentiful suitable habitat is available near the NECEC Project areas for these interior forest species." While it is true that suitable habitat would remain for these species regionally, our concern is that the linear nature of the cleared right-of-way, coupled with the edge effects that may extend hundreds of feet into the forest, create a permanent area of unsuitable habitat that is several hundred feet wide and more than 53 miles long.

Furthermore, several of the bird species in question that require interior forest—specifically the wood thrush, Canada warbler, black throated blue warbler, and Blackburnian warbler—have been listed as Species of Greatest Conservation Need in the Maine State Wildlife Action Plan due to regional declines in populations, the importance of Maine in the overall breeding range of the species, or both.[10] Therefore, special attention is warranted to impacts to these species' habitat.

Additionally, the applicant states, "Most of the terrestrial mammal species that are likely to be found near the proposed transmission line corridors are likewise not dependent on mature forest." This is partly true; however, as noted in Dr. Hunter's testimony, the American marten does require mature forest and is particularly susceptible to forest clearing,[11] and the marten is considered an "umbrella species" that requires a large home range.[12] Therefore, it is reasonable to assume that a linear corridor, over time, could have negative effects on marten populations.

Finally, the applicant states, "[Segment 1] is located in an intensively managed timber production area and therefore not likely to significantly alter existing fragmentation." The right-of-way will indeed traverse working forest; however, our concerns about habitat fragmentation stem from the linear and permanent nature of the corridor. While there are long-term forest management roads in proximity to the project, these roads are much narrower (typically 20-40 feet wide) than the proposed transmission line. As a result, sustainable forestry does not fragment large forest blocks in the same manner as a wide, linear corridor, which bisects the landscape. A 53.5-mile corridor would create 107 miles of new habitat edge, while business-as-usual timber harvesting will result in significantly less edge—and, moreover, timber harvesting edge will change over time, whereas edge from a new transmission corridor will likely be permanent.

Ultimately, the Conservancy is most concerned about the unknown and largely unpredictable long-term impact of linear habitat fragmentation across a currently well-connected and resilient landscape. The fragmenting effects of utility corridors are less certain, in general, than the effects of paved highways, whose impacts are more readily studied (e.g., species mortality from

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[10] Maine Dept. of Inland Fisheries and Wildlife. 2015. Maine's wildlife action plan. Maine Dept. of Inland Fisheries and Wildlife, Augusta, ME.

[11] Legaard K.R., Sader, S.A., and E.M. Simons-Legaard. 2015. Evaluating the impact of abrupt changes in forest policy and management practices on landscape dynamics: analysis of a Landsat image time series in the Atlantic Northern Forest. PLoS ONE 10(6): e0130428. https://doi.org/10.1371/journal.pone.0130428.

[12] Hunter, M.L., Jr., and J. Gibbs. 2007. *Fundamentals of conservation biology* (3rd ed.). Blackwell Publishing. 482 pp.

automobile collisions). Furthermore, there have been few (if any) projects like the proposed NECEC corridor (53.5 miles through well-connected forest), so there have been few opportunities to study long-term impacts. However, there is ample evidence that habitat fragmentation from a variety of fragmenting features can have cumulative, and significant, negative effects on ecosystems over time, as well as ample research on specific species (e.g., American marten) that are averse to forest edges. Moreover, NECEC could potentially allow for new fragmenting features to develop in the future that could exacerbate habitat fragmentation—for example, new roads to access and service the NECEC line or new energy infrastructure development in the additional 150' of the Segment 1 right-of-way.

We recommend that the Department consider the full scope of potential habitat fragmentation impacts in its review of the NECEC application. We also recommend that the Department consider approaches to mitigating habitat fragmentation impacts to the maximum extent practicable. For example:

1. Edge effects could be minimized by significantly narrowing the cleared width of the corridor or portions of the corridor. This could be accomplished, for example, by burying additional sections of line and/or using vegetation management techniques to create a narrower, V-shaped corridor (as required for the Bingham Wind Project, DEP application L-25973-24-A-N/L-25973-TG-B-N). Co-location of the corridor or portions of the corridor with the Spencer Road could also reduce new habitat edge.

2. Fragmentation could be minimized using additional wildlife travel corridors similar to those proposed in the Segment 1 Deer Wintering Area. The applicant has proposed allowing 25-35' vegetation to grow under the wires in this Deer Wintering Area and has proposed raising pole heights in Roaring Brook Mayfly and Northern Spring Salamander habitat to allow forest canopy under the wires. We recommend that these measures be extended to other portions of the corridor. Using remote imagery and in consultation with other wildlife biologists, the Conservancy has identified nine areas totaling 21 miles within Segment 1 where habitat connectivity is a high priority. These high-priority connectivity areas are shown in **TNC Exhibit 7**.

3. Remaining habitat fragmentation could be compensated for through additional land conservation in the affected region (beyond what is proposed as compensation for wetland and other natural resource impacts). Land conservation could minimize the effects of existing habitat fragmentation and/or prevent future fragmentation.

## II. Alternatives Analysis

Among the three action alternatives presented in the NRPA Application, the applicant makes a reasonable case that NECEC would be the least damaging. We especially appreciate that the applicant explicitly considers habitat fragmentation in its analysis. On page 2-4, the applicant states:

> CMP's analysis identified the total length, in miles, of previously-undeveloped transmission line corridor to be developed and considered. To minimize wildlife habitat

> conversion, loss, or fragmentation, the analysis favored transmission line routes that minimized previously undeveloped land requiring clearing and development as a transmission line corridor.

To this point, Alternative 1 was rejected partly based on the projected magnitude of habitat fragmentation impacts (see NRPA Application page 2-10). The applicant also considered total acreage of tree clearing required within the proposed NECEC corridor versus alternatives when conducting its analysis.

We believe the applicant's emphasis on habitat fragmentation in its Alternatives Analysis provides additional rationale for the Department to consider mitigation measures for NECEC's potential habitat fragmentation impacts. In this vein, we believe that it would be reasonable for the Department to request an alternative to be analyzed that includes additional line burial in Segment 1 of the corridor, particularly if line burial were administered in conjunction with alignment of the corridor more closely with the Spencer Road. The Alternatives Analysis already contains an "underground transmission alternative" specific to the Kennebec Gorge; understanding the practicability[13] of underground transmission in Segment 1 of the corridor more generally could be useful in evaluating the proposed NECEC route, especially given that other proposed corridors in northern New England—such as Northern Pass and New England Clean Power Link—have included significant portions of buried line, suggesting that line burial may be logistically, technologically and financially practicable.

Finally, the Conservancy notes that there is an inconsistency in the delineation of the project's "purpose and need." On page 2-1 of the NRPA application, the "purpose and need" is framed in terms of the general purpose to deliver clean energy from Quebec to New England: "The purpose of the NECEC Project is to deliver up to 1,200 MW of Clean Energy Generation from Québec to the New England Control Area1 via a High Voltage Direct Current (HVDC) transmission line, at the lowest cost to ratepayers." On page 2-2, however, the framing shifts from a general purpose to a specific purpose of CMP delivering the energy:

> The no-action alternative, however, would not meet the NECEC Project's purpose of allowing CMP to deliver 1,200 MW of the clean energy generation from Quebec to the New England Control Area at the lowest cost to ratepayers. In addition, even if a non-CMP project could be permitted elsewhere and could economically deliver 1,200 MW of clean energy generation from Quebec to the New England Control Area, such a project would not meet CMP's need to deliver that energy, and such a project would have unknown environmental impacts.

On page 2-3, the frame shifts back to a general purpose: "The three HVDC transmission line routes, which have been considered as part of this analysis, would all meet the purpose and need to deliver clean energy generation from Québec to the New England Control Area." This discrepancy also arose in correspondence between the applicant and the Army Corps of

[13] DEP Chapter 310, section 5, paragraph A requires, "The activity will be considered to result in an unreasonable impact if the activity will cause a loss in wetland area, functions, or values, and there is a practicable alternative to the activity that would be less damaging to the environment. The applicant shall provide an analysis of alternatives (see Section 9(A)) in order to demonstrate that a practicable alternative does not exist."

Engineers (March 23, 2018 Response to February 23, 2018 USACE Information Request). Clarification of the purpose and need could be useful in evaluating the application and fully understanding the alternatives analysis.

## III. Compensation and Mitigation

The Nature Conservancy administers the Maine Natural Resource Conservation Program (MNRCP) under contract with DEP; therefore, we cannot comment on the applicant's proposed compensation and mitigation for wetland and vernal pool impacts. Below we provide testimony on the applicant's proposed mitigation and compensation for cold water fisheries habitat, as well as additional testimony on mitigation pertaining to habitat fragmentation.

*Cold Water Fisheries Habitat*

Replacing undersized culverts with Stream Smart culverts, as proposed by the applicant, can improve aquatic habitat connectivity. We appreciate the applicant's recognition of the benefits of Stream Smart culvert projects and their proposed funding for such projects.

However, based on our experience, the proposed funding amount of $200,000 will not go as far as the applicant estimates. The applicant's Revised Compensation Plan states that this amount will be "sufficient to replace approximately 20-35 culverts on lands outside of CMP's ownership." The cost of one Stream Smart replacement can range from $50,000 (on logging roads) to several hundred thousand (in high-traffic areas), with an average cost around $120,000. Therefore, if funds are applied directly, the applicant could expect $200,000 to cover a maximum of four culvert replacement projects (or eight if matching funds are leveraged). Achieving the desired number of culvert replacements (20-35) would realistically require a minimum commitment of $1 million, and likely a higher commitment.

The Conservancy also appreciates the applicant's proposal to allow vegetation to grow up to 10 feet in stream buffers (Site Location of Development Application, Exhibit 10-1, pp. 8-9). However, we encourage the applicant to follow MDIFW's recommendation that a "100-foot buffer be maintained along all streams, including perennial, intermittent, and ephemeral streams, within the Project area." (March 15, 2018 MDIFW project review comments, p. 12). The applicant currently proposes riparian buffers within 100 feet of "all perennial streams within the greenfield (Segment 1) portion of the Project, outstanding river segments, or rivers, streams, or brooks containing Threatened or Endangered species… (Site Location of Development Application, Exhibit 10-1, p. 8). At a minimum, more information on the practicability of 100-foot buffers along all streams should be provided.

*Extending the scope of the applicant's compensation plan*

Page 1 of the applicant's revised Compensation Plan states, "This Plan achieves a *no-net-loss* of ecological functions and values…" (Emphasis added by the applicant.) The Conservancy believes that for no-net-loss of ecological functions and values to be achieved for the proposed project, habitat fragmentation impacts must be addressed alongside impacts to protected natural resources regulated under NRPA.

We believe it is within the Department's discretion to apply the mitigation hierarchy to habitat fragmentation. The Department, in consultation with MDIFW, has required that the applicant propose mitigation for impacts for which mitigation and compensation are not explicitly required in law or regulation, for example impacts to cold water fisheries.

There are approximately 800 species of vertebrate wildlife in Maine and thousands of species of invertebrates, and most of these are present in the region affected by this corridor. While habitat fragmentation affects different species in different ways, many other species would be affected in addition to those specified in the applicant's Compensation Plan.

It is notable that the applicant's proposed mitigation strategies acknowledge that NECEC would impact habitat connectivity. Specifically, the Compensation Plan proposes allowing 25- to 35-foot softwood stands to grow under the lines in the Segment 1 Deer Wintering Area and raising pole heights to allow for greater forest growth in Roaring Brook Mayfly and Northern Spring Salamander habitat. These strategies are certainly a step in the right direction. However, these strategies apply only to a very small portion of the 53.5-mile Segment 1 corridor.

Accounting for habitat edge effects, we estimate that Segment 1 of the proposed NECEC corridor could directly and permanently impact more than 5,000 linear acres of habitat for species that require mature forest. Steps could potentially be taken to avoid, minimize and compensate for this habitat fragmentation impact. As mentioned above, the Conservancy recommends that the Department consider approaches to mitigating habitat fragmentation impacts to the maximum extent practicable. For example:

1. Reducing edge effects by significantly narrowing the cleared width of the corridor or portions of the corridor, either by burying additional sections of line or changing vegetation management practices to narrow the corridor. For example, the Bingham Wind Project was required to narrow its transmission corridor in places and to use V-shaped vegetation management (See DEP application L-25973-24-A-N/L-25973-TG-B-N, Final Order, page 18). Requiring co-location of the line or portions of the line with the Spencer Road would also significantly reduce new habitat edge.

2. Minimizing habitat fragmentation by requiring additional wildlife travel corridors. These would be similar to the applicant's proposed areas of increased vegetation height under the wires in the Segment 1 Deer Wintering Area and Roaring Brook Mayfly and Northern Spring Salamander habitat. We recommend that these measures be extended to other sections of corridor identified as high-priority habitat connectivity areas in **TNC Exhibit 7**.

3. Compensating for remaining habitat fragmentation by reducing or preventing fragmentation elsewhere in the affected region through land conservation. Conservation could come in the form of preservation, working forest conservation easements, or a combination of the two. Applying a 8:1 multiplier for the approximately 5,000 affected acres would indicate compensation of approximately 40,000 acres, and applying a 20:1 multiplier would suggest compensation of approximately 100,000 acres.

Thank you again for the opportunity to provide testimony on the proposed NECEC transmission project. We are happy to answer any questions now or in the future.

Dated: 2/26/19

By: _____
Rob Wood

_____
Andrew Cutko

_____
Bryan Emerson

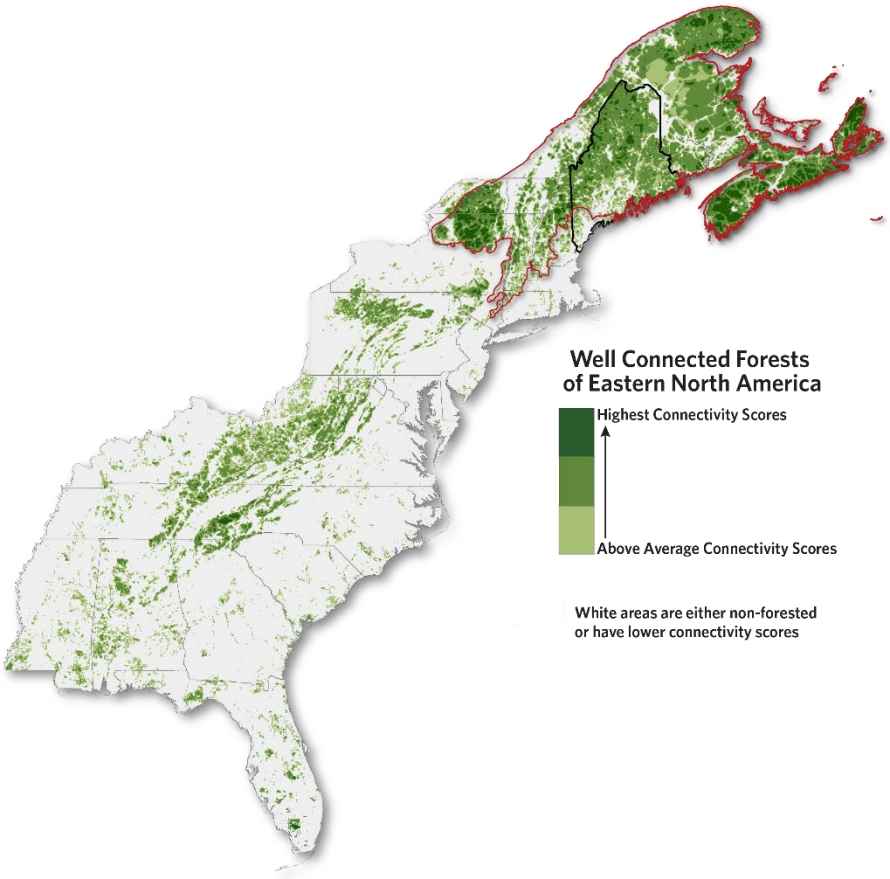
Date: 2/24/2019

The above-named Rob Wood, Andrew Cutko, and Bryan Emerson did personally appear before me and made oath as to the truth of the foregoing pre-filed testimony.

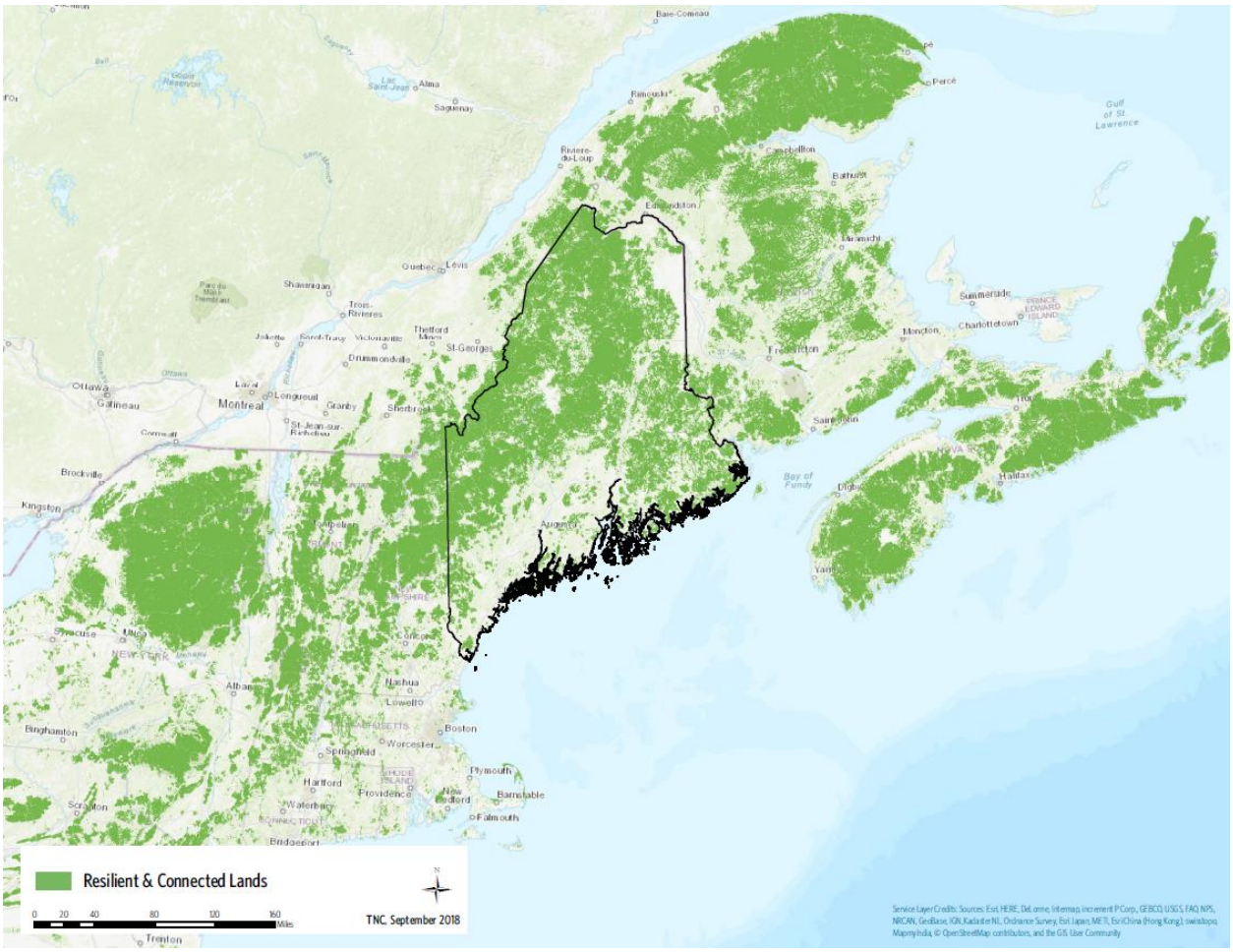
_____
Notary Public/Attorney at Law
My Commission Expires: _____

DANIEL J. GRENIER
NOTARY PUBLIC
SAGADAHOC COUNTY
MAINE
MY COMMISSION EXPIRES NOVEMBER 9, 2023

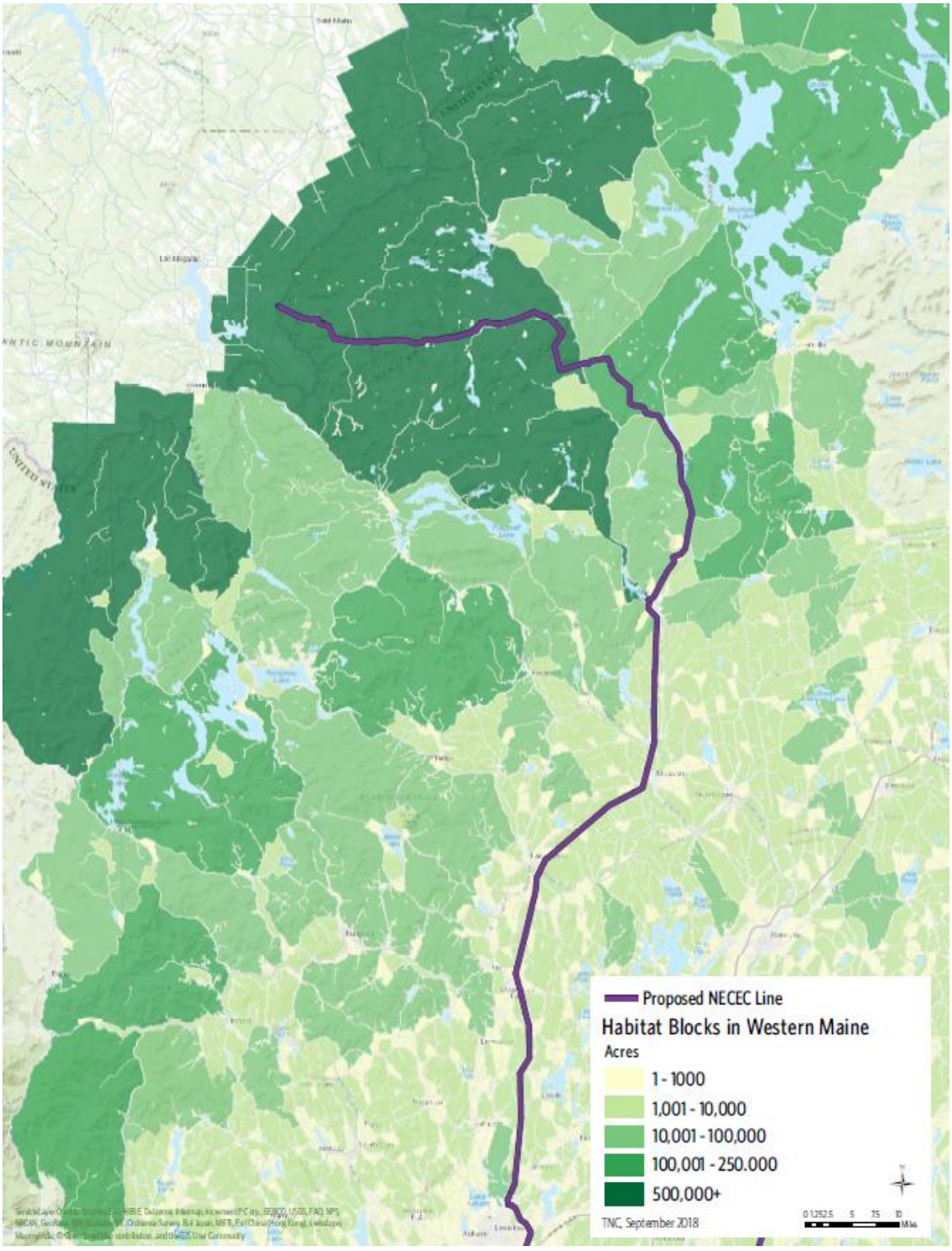
**TNC Exhibit 1: Connected and resilient forests of eastern North America (The Nature Conservancy)**



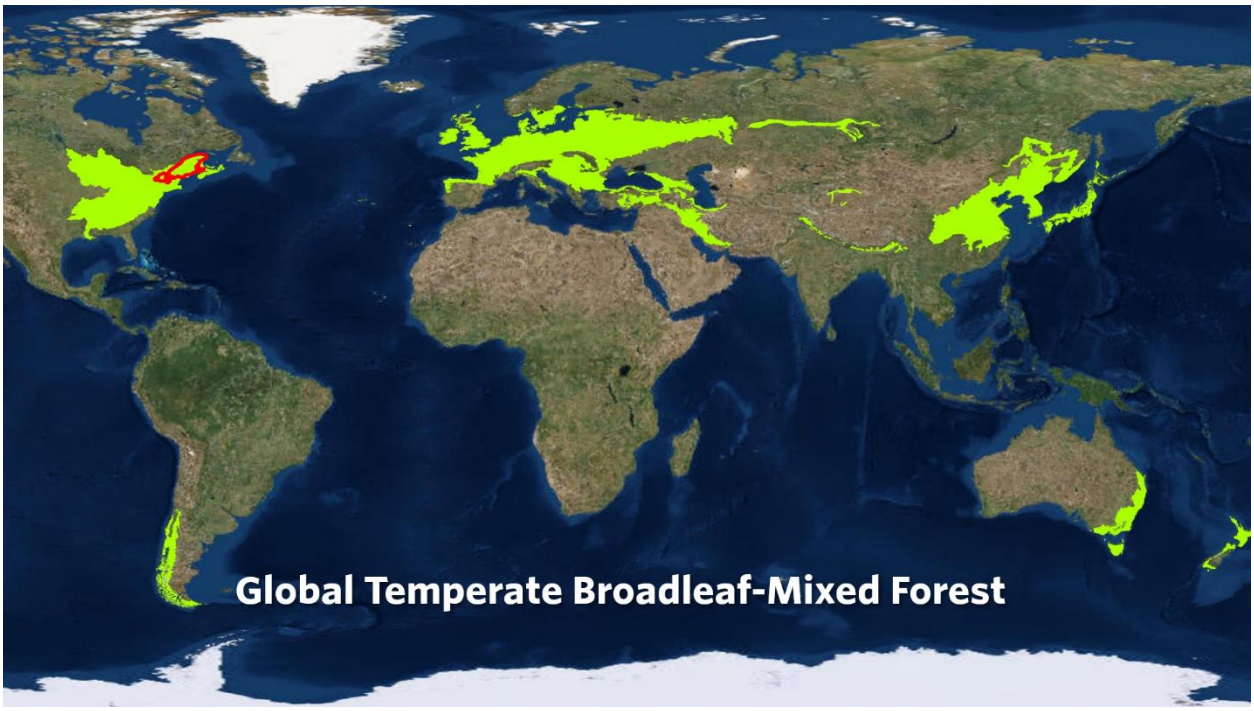
**TNC Exhibit 2: Connected and resilient forests of the northern Appalachian region (The Nature Conservancy)**



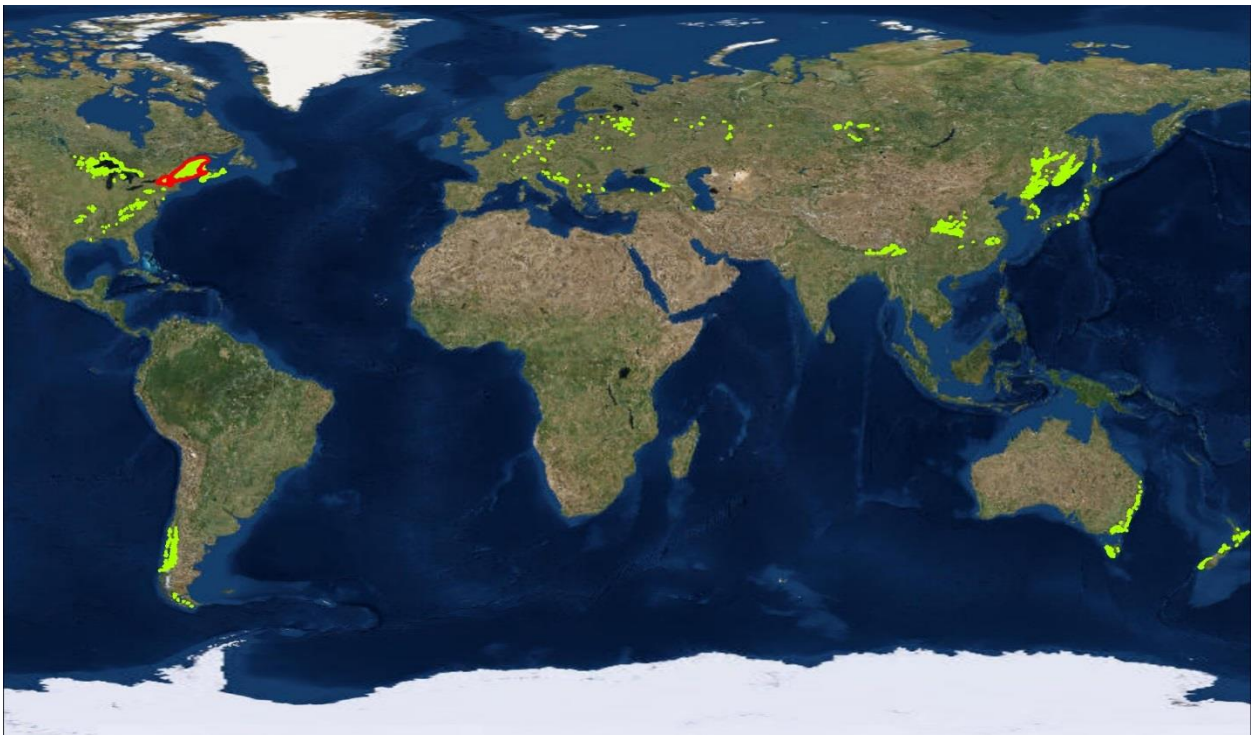
**TNC Exhibit 3: Forest blocks in western Maine (State of Maine)**



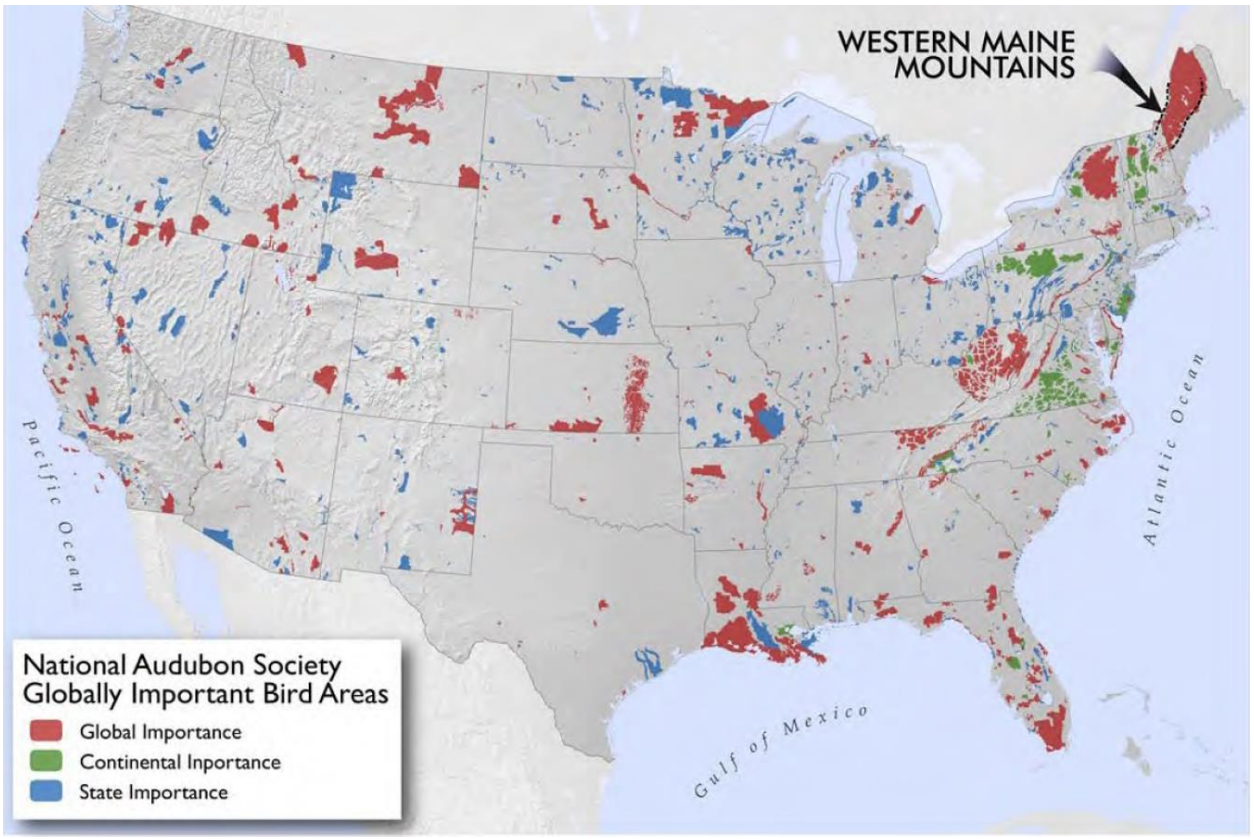
**TNC Exhibit 4: Global temperate broadleaf-mixed forests, original extent (The Nature Conservancy)**




**TNC Exhibit 5: Global temperate broadleaf-mixed forests, current extent (The Nature Conservancy)**



**TNC Exhibit 6: Globally Important Bird Areas in the United States (National Audubon Society)**



**TNC Exhibit 7: Priority areas for habitat connectivity in the proposed NECEC corridor (The Nature Conservancy)**