Final Report of the North Quabbin Regional Landscape Partnership
Climate Conservation Planning Pilot Project

The Highstead Foundation and the North Quabbin Regional Landscape Partnership are pleased to submit this Final Project Report with deep gratitude to the Open Space Institute Resilient Landscapes Initiative Catalyst Grants Program and the Doris Duke Charitable Foundation.

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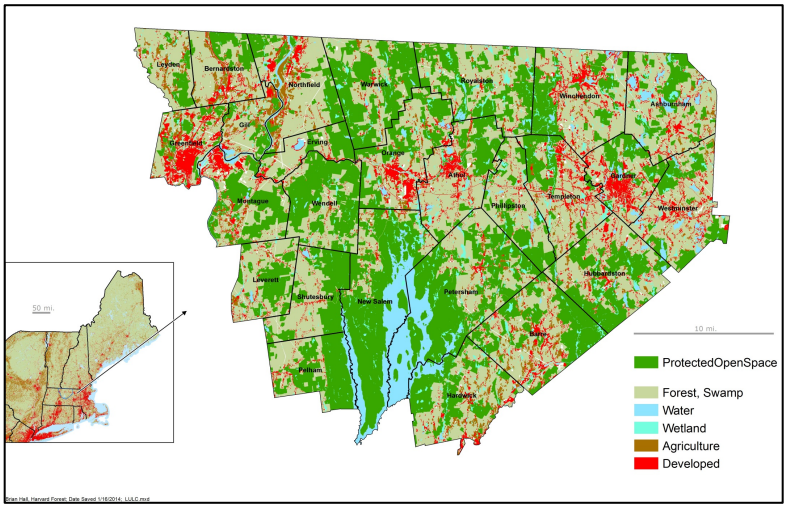
Introduction

The Project: From October 2013 through February 2014, the North Quabbin Regional Landscape Partnership, a 560,000 acre regional conservation partnership (RCP) in central Massachusetts, worked to incorporate the climate resilience science developed by The Nature Conservancy and underrepresented geophysical settings data developed by the Open Space Institute into a strategic conservation priorities map using a planning approach called a co-occurrence model. The goals were to 1) create agreement on conservation priorities based on traditional biological diversity data combined with the new TNC climate change science; 2) serve as a pilot project to help assess how to utilize the TNC climate change resiliency science for practitioner application; and 3) serve as a potential model for other RCPs to proceed with climate-resilient conservation planning.

RCPs and the North Quabbin Regional Landscape Partnership: In response to the growing recognition that we must conserve at the larger landscape scale, New England land trusts, communities, conservation organizations, and agencies are increasingly joining forces to work together to achieve conservation that is both locally grounded and regionally significant. These informal collaboratives working across town and even state lines are called regional conservation partnerships (RCPs). In the 1990s there were four RCPs, and today there are at least 39 examples of this rapidly growing form of collaborative conservation, covering 60% of the New England landscape. Ensuring that these innovative collaboratives have ecologically robust conservation plans that reflect both the conservation we need today and that we need for the warming climate of tomorrow is of paramount importance.

The North Quabbin Regional Landscape Partnership formed in the mid-1990s and represents one of the first RCPs in the region. This 560,000-acre region in central MA includes the Quabbin reservoir, the water supply for more than two million people in metropolitan Boston, and is also the southern anchor of a larger (2 million-acre) RCP called Quabbin to Cardigan (Q2C). The North Quabbin Landscape encompasses a beautiful tapestry of rolling hills, farmlands, expansive forests, wetlands, rivers and lakes. The region includes some of the largest remaining roadless areas in Massachusetts, and supports unique ecosystems and animals dependent on large unfragmented forest blocks, like moose, bobcat, fisher and bear. The NQRLP includes 26 towns, 12 different land trusts and conservation organizations, seven agencies, two academic institutions, and two regional planning agencies. Due to the



conservation commitment of the Partnership, the Commonwealth of Massachusetts, the land trusts and communities within it, 32 percent of the area is already in some form of conservation.

Co-occurrence Modeling: Co-occurrence analysis is often used to establish conservation priorities on a map as it provides a proven method for ranking (and visualizing) areas that have higher relative value than others based on how many important conservation features are present or "co-occur." To build this GIS-based model, one first chooses the natural resources features/GIS data layers that one considers important to the landscape (e.g., large forest blocks, proximity to conservation land). Then one ranks the importance of each feature. In the simplest models, all features are ranked "1" so that land with one conservation feature will have a score of "1," land with two conservation features will have a score of "2," and so forth. The lands with the highest scores will be considered the highest conservation priorities. In more complex models, conservation values may be ranked either higher or lower than 1 (e.g., .5 or 1.5 or 3) if one decides that some features are more or less important on that landscape for conservation purposes. In these models, the lands with higher scores will still be the higher conservation priorities, but it may be because of a particularly important conservation feature(s) rather than the sheer number of equally weighted features. The model thus involves a number of decision points along the way. Co-occurrence models are generally most effective to prioritize one aspect of conservation, such as biodiversity or agriculture, but not both at once, as the latter approach involves too many unrelated issues that cannot be comparatively ranked in a meaningful way**.**

There are many ways to incorporate the TNC and OSI resilience science and approach into conservation planning; an alternative way would be to input the resilience data layers to scale and create a separate climate resilience map. In this pilot project, Highstead and the NQRLP decided to craft a co-occurrence model so that resilience would become a fundamental and codified part of how the Partnership thinks about biodiversity conservation priorities going forward – a tangible illustration that "conserving the stage" for the coming uncertainties of a warming planet is as important as any measure of current biodiversity in the North Quabbin region.

The NQRLP Climate Planning Conservation Pilot

I. Planning and Process

A. Overview

The Partnership held three half-day meetings to make the strategic decisions central to the co-occurrence model and to agree on the elements of a strategic conservation priorities map, while a small GIS team met between each meeting to resolve technical questions, build the model, run different variations, and prepare for the larger gatherings. Approximately 30-40 people attended each Partnership meeting.

After the strategic conservation priorities map and process were complete, the Project team held a daylong workshop for other RCPs in order to introduce them to the science and the approach, and to get their valuable feedback on the practicality and replicability of the model. The Partnership also sent out a survey to participants to evaluate the success of the project from their perspective.

Meeting One:

1. Introduction to the OSI Resilient Landscapes Initiative and project goals and objectives, including the value of having a Partnership-wide strategic conservation priorities map and the value of conserving lands that will be most resilient to global climate change.

2. Presentation on the co-occurrence model approach and how it was used by the Mount Grace Land Conservation Trust and by the MassConn Sustainable Forest Partnership (slightly different approaches to chosen data sets and rankings methodologies).
3. Presentation on the TNC resilience science and approach, and on the OSI Underrepresented Geophysical Settings Tier 1 and Tier II approach.
4. Discussion and agreement to rank the importance of conservation feature data sets as the foundation for the model, through a survey listing all the important conservation features (per meeting discussion). Participants were to rank the importance of each data set/conservation value with the total combined score adding up to 100.

Meeting Two:

1. Presentation on conservation feature rankings based on survey results, and how they were adapted by the GIS team to come up with a draft co-occurrence model for the North Quabbin.
2. Presentation on and review of different model results depending on how natural features are ranked and whether TNC resilience data are used or not, and at what scale. Agreement to work more on the rankings and to have some interactive review of the choices at the next meeting.
3. Questions on how to approach the data (scale, etc.) are set out in the **Science and Modeling** section, below.

Meeting Three:

1. Review and discussion of the interactive webpage developed for partners to look at in advance of the meeting. This "Webplanner" allowed participants to re-weight data layers and turn data layers on and off in order to explore how these choices affected the model. Please see Attachment 1 for a memo prepared for participants explaining the webplanner and how to use it in advance of the meeting.
2. Interactive iterations of the model at the meeting; including straw votes on the final weighting of each conservation feature.
3. Final decisions on the model and final strategic conservation priorities map.

B. Planning Lessons Learned

1. It was central to the success of the exercise that the Partnership had a widely trusted coordinator (and Americorps staff), and that it had two professionals with sophisticated GIS capability (from the Harvard Forest and Mount Grace Land Conservation Trust) as well as a few members in the partnership who had a deep understanding of the datasets used. There were six people total on the GIS Team, reflecting higher than average science capacity for an RCP, and a solid interest in the idea of factoring climate change into conservation planning.
2. Although this process was successful, ideally the timeline should be longer. More than three meetings should be held so that people have time to discuss and absorb the complicated aspects of co-occurrence modeling and resilience science and feel fully part of the process. Time should be spent at each meeting going over some of the basic concepts. The Partnership survey results (13 responses) reflect the fact that people were generally very pleased with the process, but would have liked more time to understand the science and interact on the issues at hand. Please see Attachment 2. Pre-meeting planning is also vital to efficient and effective group meetings. Although considerable time was spent in this area, and the survey suggests high satisfaction with meeting management, a more carefully planned discussion of the various natural features and data sets before people filled out the ranking survey would have revealed some of the duplication inherent in CAPS, BioMap2, and separate data sets and avoided some confusion and the need for the GIS team to tweak the rankings. Although this slight course correction was necessary,

modifying the Partnership ranking survey led to a few participants questioning if their views were being heard sufficiently.

3. The interactive WebMap developed so that participants could try their own rankings and model iterations was a very successful tool that allowed everyone to explore the datasets, preliminary scores, and feel involved, and helped lead to a very smooth final meeting and set of decisions.
4. Other Partnerships may well have the same questions that NQRLP participants voiced at the first meeting and organizers should be prepared. These questions included: 1) what is the value of crafting a strategic conservation priorities map and the relationship between a Partnership-wide plan and local priorities that an individual land trusts might pursue? 2) Why focus on a terrestrial biodiversity plan when the Partnership has other priorities as well, such as farmland protection and managed forestland? (It was agreed those are also important but will be assessed in a different process.) 3) Why is a co-occurrence model valuable and why is it best used for one conservation focus and not more (e.g., not biodiversity conservation *and* agricultural vitality)? 4) What about human resiliency and incorporating a climate change resiliency plan that looks at flooding, impacts to agriculture, the economy, community vitality, and more?
5. It is of course central to the first meeting to have a robust presentation and discussion on the difference between (and synergies of) traditional biodiversity protection and the TNC "conserving the stage" approach—and why thinking about climate change is important. One key lesson from the pilot project is that people were generally eager to wrestle with how to factor climate change into conservation, thought the conversation was overdue, and seemed pleased to get beyond handwringing to a tangible planning methodology, even if the TNC approach is not the complete solution. As noted by one participant, "This may not be the final answer on climate change conservation, but at least it's a start, and we have needed to have this conversation for a very long time." We have received similar feedback during presentations on the Pilot Project.

II. Science and Modeling

In building the co-occurrence model, it was fortunate that participants were already familiar with the state's BioMap2 biodiversity data layers and that the data are recognized for their high quality, are reasonably current, and are at a scale appropriate for land trusts and RCPs. (Part of the acceptance of BioMap 2 by the conservation community is a direct result of the fact that BioMap 2 is given tremendous weight in awarding all of the state-funded land conservation grants.) The members were less familiar with the newer TNC/OSI resilience data sets and needed to discuss: 1) data appropriateness; 2) dataset selection; 3) data "grain;" and 4) resilience score scaling before becoming comfortable with them. Key issues that arose:

A. Co-occurrence Model Questions and Decisions

1. Should NQRLP use the TNC resilience data layer or the individual components of complexity and permeability?
   - ✓ NQRLP used the combined resilience data layer developed by TNC.

2. Should NQRLP use BioMap2 or the individual data layers?
   - ✓ NQRLP used many of the data sets from BioMap2, but individually so we could choose our highest BioMap2 priorities.

3. Should NQRLP use OSI's "under-represented settings Tier 1 and 2" when they are under-represented at the eco-regional level but abundant in the North Quabbin (especially mafic)?
   - ✓ Yes. If we want to contribute to eco-regional resilience we should think at this scale.

4. What scale TNC data should we use: 1,000-acre hexagons or 30-meter cells?

- ✓ The 30-meter scale is more suitable for land trusts, more "visible" on the ground, more conducive to proactive landowner outreach, and compatible with other MA data.

5. How should we weigh TNC's resilience prioritization, given that it is based on the entire eco-region and compares the resilience of a cell only to other cells in the same geophysical setting? It does not rank resilience relative to all cells in the NQRLP region, which would be helpful.
   - ✓ NQRLP did the latter analysis from the underlying data and gave a point for each approach (eco-regional resilience by geophysical setting *and* overall resilience within data scaled only to the NQRLP as a whole).

6. Would surficial geology be better than bedrock geology for our glaciated region?
   - ✓ The group agreed that bedrock geology was a good place to start until this science and research evolves further, but a crisp answer on this point would be helpful for future projects.

7. Why is water such a large a barrier in the TNC model and why is the Quabbin Reservoir a lesser barrier than the Connecticut River? This seemed flawed to the participants, and did not sufficiently account for non-terrestrial species (birds), seasonally frozen water bodies, or aquatic diversity.
   - ✓ The group used BioMap2 data sets on aquatic diversity (this was before TNC aquatic diversity data sets were complete) but continued to feel that water bodies were too heavily weighted as a deterrent to resilience.

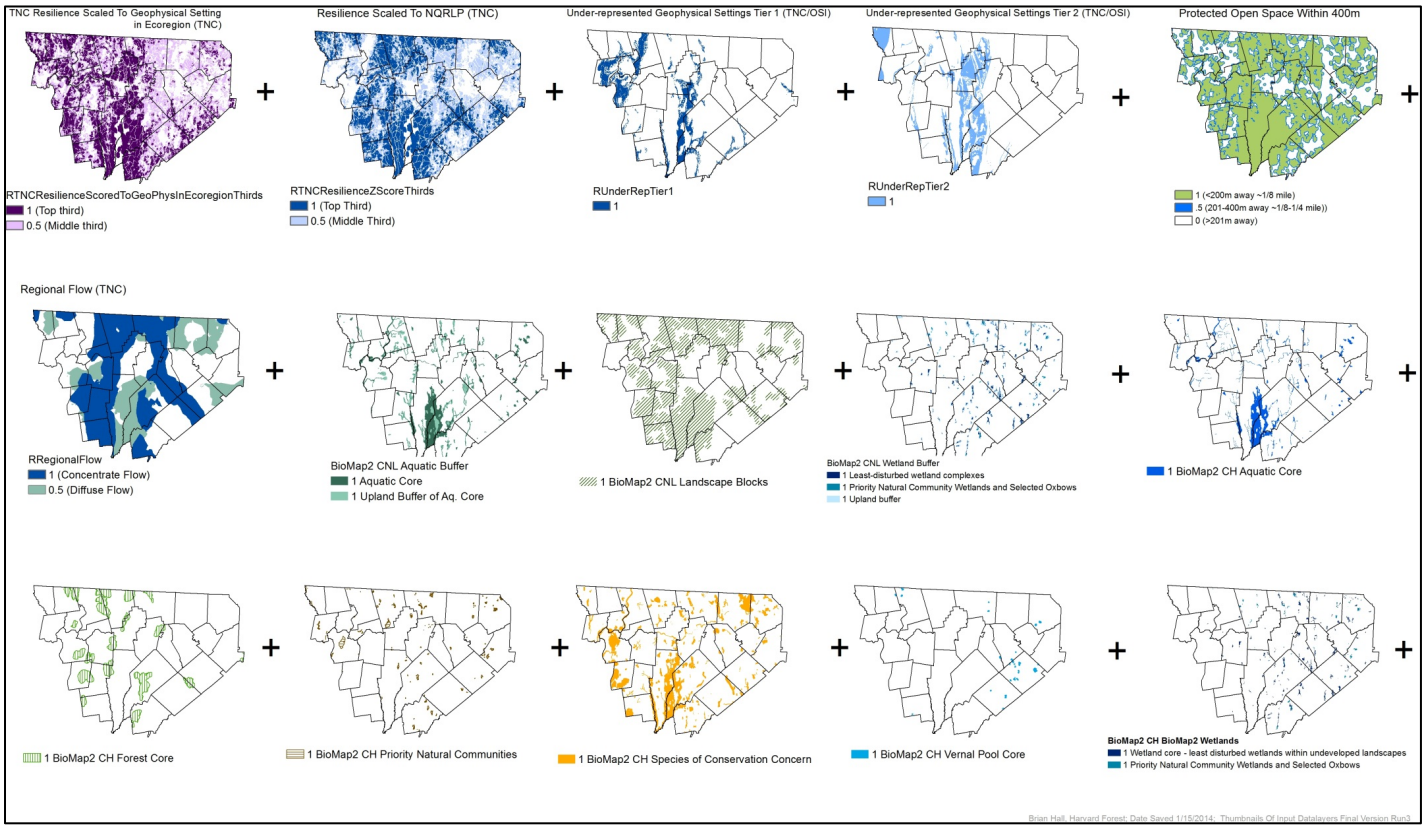
8. Should NQRLP use the TNC regional flow data?
   - ✓ Yes. This "species-agnostic" approach to regional connectivity identifies potential larger-scale directional movements and pinpoints the areas where they are likely to become concentrated, diffused, or rerouted, due to the structure of the landscape--important planning and conservation issues as the planet warms and species need to move. Some partnership members had used the data in previous projects and found it useful and informative.

Summary of Key Considerations and Decisions

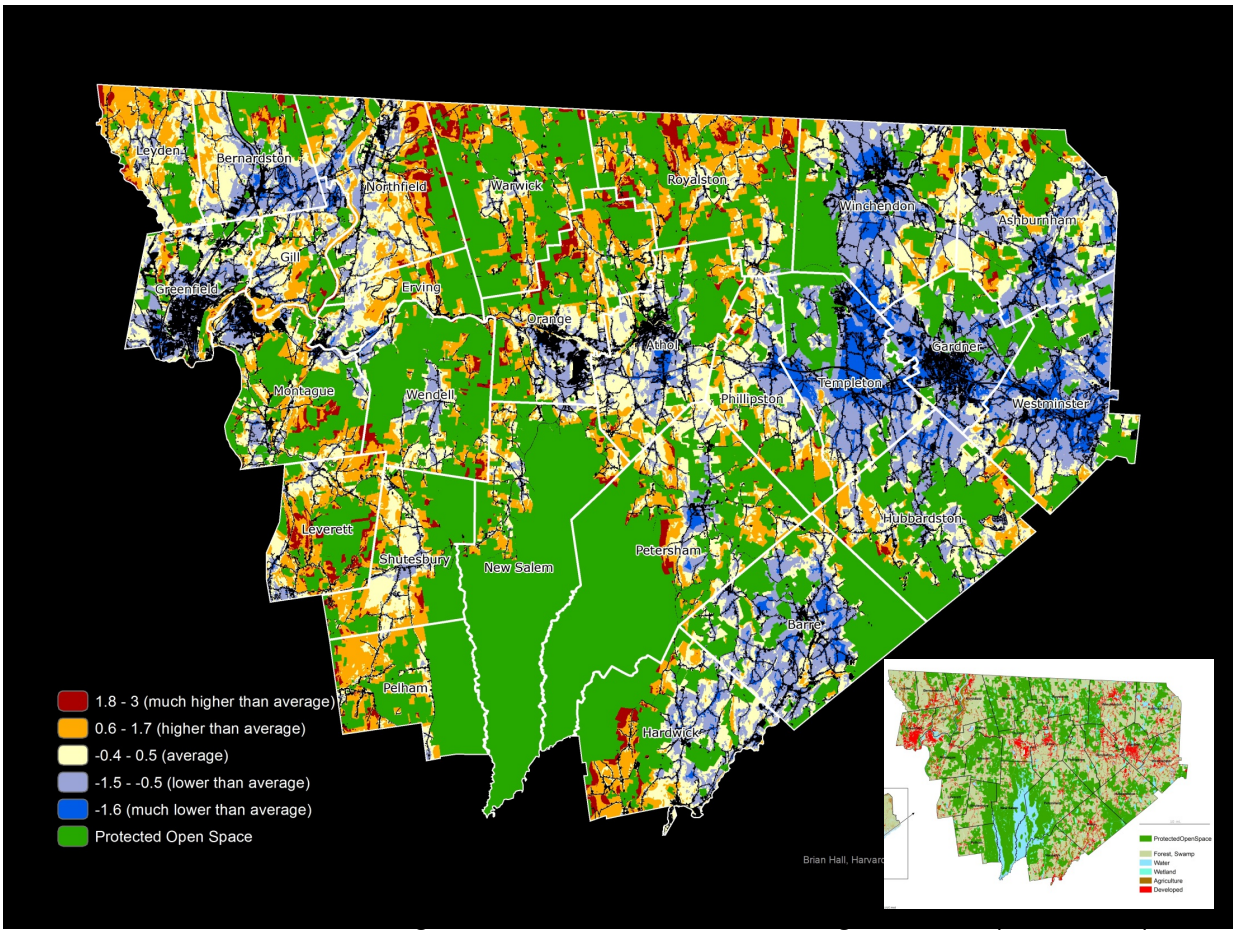
Issue/Consideration	**NQRLP Decision**
1. Data Appropriateness	a. Use TNC geophysical settings b. Use TNC/OSI under-represented settings c. Accept TNC local connectedness (permeability) d. Use TNC regional flow data
2. Dataset Selection	a. Resilience only; no component layers b. BioMap2 individual component data layers c. Use 30 meter cells, not 1,000-acre hexagons
3. Resilience Score Scaling	a. Relative to geophysical setting in Eco region b. *Also* Relative to NQRLP

B. The Strategic Conservation Priorities Map

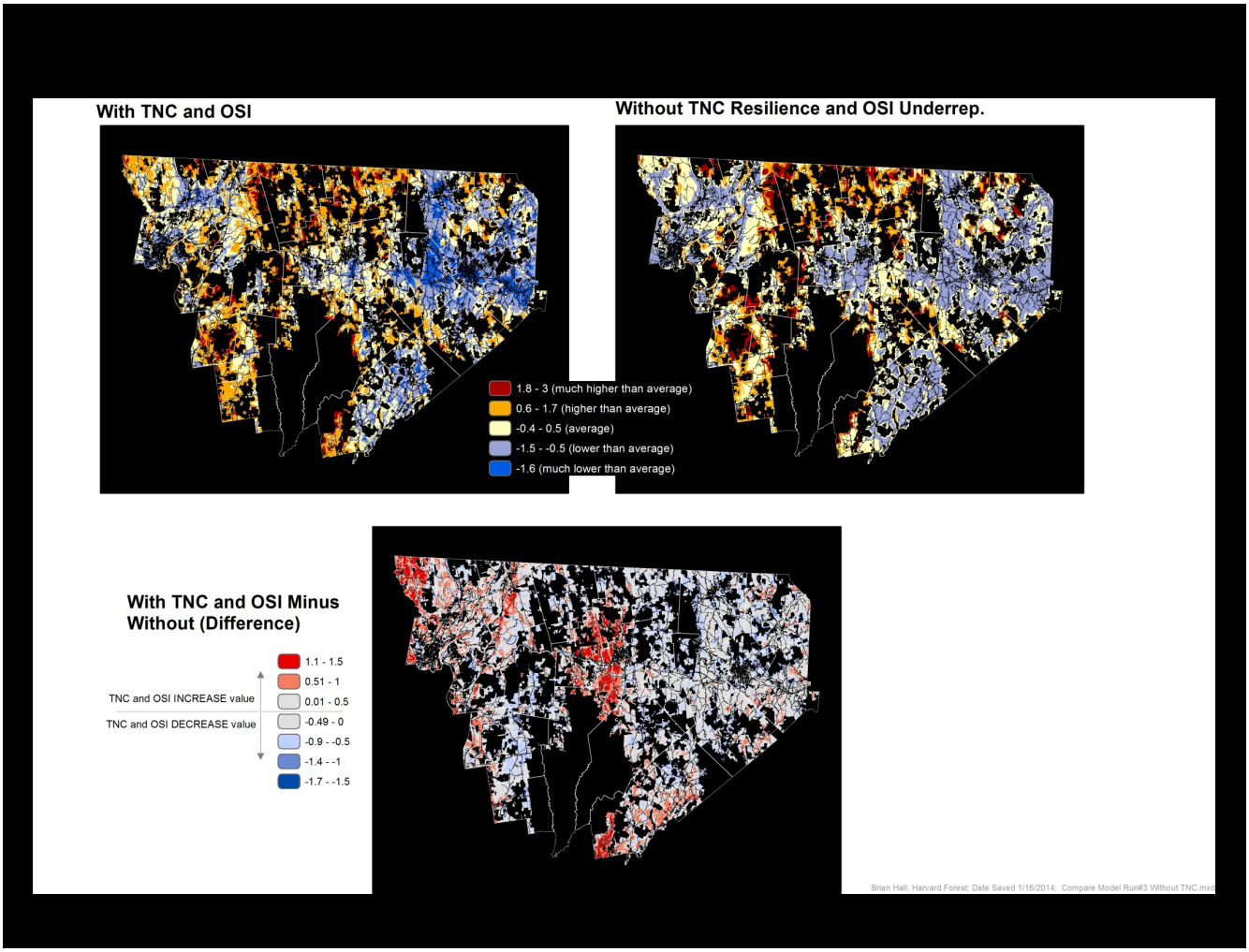
At the final and very successful Partnership meeting, GIS expert Brian Hall from Harvard Forest set out four different "final" maps depending on how the group wanted to weight resilience, local versus regional scales, OSI underrepresented settings Tier I and II and more. In the end, the group chose the following data layers with the weights assigned to them as noted under the maps:



When roads, developed land, and conserved lands and water were removed from the map, the combined data layers were rescaled relative to the remaining cells (i.e. "land available for conservation") to create the final Strategic Conservation Priorities Map for the North Quabbin Regional Landscape Partnership. *See* the map that follows:



Did the resilience planning make a difference? Yes. The mapset below (and the red shading in the third map) illustrates the new lands that had an increase in scoring because of the inclusion of the TNC data.



Beyond Mapping: Using the Results

A. Next Steps for the North Quabbin Regional Landscape Partnership

Partnership leaders have spent considerable time working to craft a new strategic conservation priorities map that includes important but unfamiliar new resilience science and concepts about "conserving the stage." But a map is just a map until there is widespread buy-in on this new framework and concerted focus on local and regional implementation. Partnership members' goals going forward include:

- Holding informational meetings with municipal open space, conservation, and planning committees to help guide future land use decisions. This will help advance one of the three objective of the OSI Catalyst grant program: How resiliency science can inform land management, stewardship and land use planning to ensure long term protection in the face of climate change.
- Developing strategic outreach plans to engage landowners in land conservation in the five areas highlighted by the new plan. This will advance the stewardship objectives of the OSI grant program.

- Finding funding for climate conservation. Funding is a main driver of where and when land conservation occurs. If OSI or other funders are able to provide land acquisition and due diligence grants for strong projects that occur in the priority areas of the plan, then the plan is most likely to be implemented (just as land conservation organizations and agencies currently embrace the BioMap2 strategic plan because conservation grants are given to projects in BioMap2 priority areas).

B. Next Steps for Regional Conservation Partnerships

One important objective of the North Quabbin Pilot Project was to explore whether this model could be exported to other RCPs who want to undertake climate conservation planning. Our assessment is as follows:

1. The Pilot project successfully applied the TNC science and approach to RCP conservation planning and provides a number of valuable lessons learned on science and methodology that should be disseminated to other partnerships. This acquired expertise has already been shared with Catalyst grantee, Bear Paw, and can similarly help other practitioners from reinventing the proverbial wheel each time the TNC science and approach is applied by land trusts or RCPs.
2. The Pilot project also successfully demonstrated how to run a scientifically complex planning process in a large conservation collaborative that will be similarly valuable to other RCPs.
3. The NQRLP Partner survey suggests solid satisfaction with the pilot process, the results, and the value of climate conservation planning. It also reflected an increased understanding of some pivotal new thinking, including on "conserving the stage" and the value of a more ecoregional perspective. Exporting these results to many of the other 39 RCPs will catalyze regional understanding on the need and value of resilient landscapes.
4. A presentation on the Pilot project at the MA Land trust coalition retreat reflected high interest in learning more about a tangible climate conservation planning process – "beyond the handwringing," as one participant noted. A number of RCPs and individual conservation organizations have requested a simple handout on the TNC resiliency data and methods for using and incorporating the data.
5. The RCP workshop Highstead/NQRLP organized as part of this grant to solicit feedback on the results produced very positive feedback. Nine RCPs chose to attend, and six expressed real interest in proceeding with climate conservation planning based on TNC resilience science. Discussion at the workshop also revealed that RCPs are grappling with how to approach conservation in an era of global climate change, attempting various approaches, and receptive to incorporating the tangible TNC approach into their conservation priorities as part of that work.

We believe that interested RCPs will fall into two basic categories: 1) RCPs that are receptive to a full conservation planning process analogous to that of the NQRLP, where the Highstead/Harvard Forest project team would help set up the process and provide some ongoing consultation thereafter; and 2) RCPs that need some technical assistance to update their conservation plans or develop a climate resilient map but not a comprehensive planning process. More case studies on climate conservation planning, including case studies that showcase community education/outreach and tangible implementation of the climate resilient plan(s), will be important.

In further developing a program for RCP climate conservation planning, the following should be considered over time:

- Incorporating other climate resiliency science as available.
- Incorporating other climate concepts including flood resilience, water storage, and carbon sequestration as practicable.

- Incorporating other major drivers of ecosystem health as feasible, including land conversion threat.
- Addressing methodologies over time to dovetail climate-robust planning with other important RCP priorities, including local agriculture, sustainably managed forestlands, recreation, and smart growth, so that climate conservation becomes one integrated priority component of sustainable community and regional planning for the benefit of future generations of animals and people.

Effective conservation planning that addresses both the world of today and the warming world of tomorrow is a community, regional, and national imperative. Translating and disseminating the complex and growing body of science for practitioners' use is a key strategy to catalyze climate conservation planning in the Northeast region. The Highstead Foundation is pleased to submit this Final Report and looks forward to further discussion with the Open Space Institute on climate-resilient RCP conservation planning and implementation.