

Voices from the Land

*Listening to New Englanders' Views
of the Future*



The Landscape Scenarios, Ecosystem Services, and Benefits to Society Research Coordination Network (S³ RCN)

The National Science Foundation-funded **Landscape Scenarios, Ecosystem Services, and Benefits to Society Research Coordination Network** (S³ RCN) was initiated in 2013 to promote new collaborations among New England land-use stakeholders, including residents, landowners, land managers, conservation managers, government officials, and researchers. An aim of the network was to develop and simulate a range of scenarios describing plausible future conditions as they are affected by external socio-ecological and environmental drivers and endogenous constraints and quantify the consequences of multiple stressors on forest dynamics and ecosystem processes. To date, the S³ RCN has engaged more than 120 stakeholders from NGOs, businesses, and government agencies, and many land managers as collaborators in cutting-edge research about the future of the land in New England.

The S³ RCN has launched the **New England Landscape Futures Project**, an ongoing research effort to analyze the consequences of landscape change for ecosystem services and communities and to apply the New England Scenarios to decisions about forest management, land-use planning, green and gray infrastructure investment, and conservation priority-setting. The New England Landscape Futures Project was established in 2014 with support from the National Science Foundation, Highstead, and the Harvard Forest. In 2018 a second major grant from the National Science Foundation was awarded to the project to support the design and development of an online scenario explorer and convening of interactive workshops to promote public engagement, uptake, and use of the scenario results.

The S³ RCN and the New England Landscape Futures Project has partnered with the **Science Policy Exchange** to create scenario products, communicate project outcomes, and maximize the use of the scenarios by communities, conservation organizations, and decision-makers. The Science Policy Exchange was created in 2011 as a collaborative of six world-class research institutions and four associated National Science Foundation Long Term Ecological Research (LTER) sites all dedicated to increasing the influence of science on environmental policy, conservation, and natural resource management, using proven and cutting-edge approaches to public engagement, actionable research, science communication, and training for the next generation of science leaders.



SCIENCE POLICY
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I. INTRODUCTION

After 150 years of expansion and regrowth, forest cover is declining in all six New England states at a combined rate of 24,000 acres of forest per year.¹ The incremental chipping away of open space is almost imperceptible on a daily basis yet land use is altering forests and other natural lands faster than climate change in the northeastern U.S.

Faced with the uncertainty of how the landscape and climate will change, citizens, conservation organizations, and natural resource managers are grappling with several important questions about the future.

How might the New England landscape change over the next 50 years?

What are the possible consequences for people and nature?

What actions could help sustain important resources in the face of change?

The goal of the New England Landscape Futures Project is to address those questions by engaging land managers, conservation groups, government officials, and scientists in a strategic conversation that draws on their unique experiences and perspectives to explore the consequences of possible future landscape change for people and nature. With support from a grant from the National Science Foundation, stakeholders from diverse sectors joined with scientists over a two-year period to develop a set of scenarios for the future of the New England landscape.

Through a series of interviews and workshops, New Englanders contributed their views about how the region might change. These perspectives formed the basis of four scenarios describing possible land use futures for New England (Box 1). In the scenario development process, participants were asked to reach beyond their current expectations to explore a wide range of options for changes in land development, conservation, harvesting, and agriculture over the next 50 years.

Box 1: Listening to Voices in New England

With the goal of initiating a futures-focused dialogue, the New England Landscape Futures team conducted interviews with **57 stakeholders** interested in land use and convened **6 workshops** with **128 participants** across New England. Sixteen interviewees also attended workshops bringing the total number of individuals contributing their views to **169**.

Participants were identified using a referral sampling approach, in which contributors were asked to identify others with relevant experience engaged with land-use issues in New England. The process was designed to provide insight into the challenges of transitioning towards sustainable land use as perceived by New Englanders, their views of possible futures, and to provide background for a replicable workshop process for generating landscape change scenarios at the regional scale. The results from the interviews and workshops are summarized in peer-reviewed publications.^{2,3}

This *Voices from the Land* report describes the context of the changing landscape (Part II), presents the results from these engagement activities as a compilation of New Englanders' views about the future of the region (Part III), describes a set of four scenarios for the future of the landscape that emerged from the participatory process (Part IV), and outlines ways that scenarios can be used to inform and motivate land-use planning, conservation, and research (Part V).

Interview and Workshop Questions

1. Imagine you are standing on top of a mountain in 2065 and can see the entire state. What do you see? How does it look different from today?
2. What factors or events may have driven or caused those changes? Please give specific examples.

Additional Interview Questions

1. Of the many possible impacts and benefits of a changing landscape, which are most important to you and why?
2. What major decisions do you anticipate in the coming years that will influence the outcomes that are important to you? Who makes those decisions? What factors are likely to influence those decision makers?
3. To what extent and how do you think climate change is altering land use in New England? How do you expect that will (or, might) change in the future?



Through a series of interviews and workshops, New Englanders contributed their views about how the region might change.



II. THE CONTEXT: OUR CHANGING LANDSCAPE

The great forest transition in New England has ended. What will come next? If recent trends continue, an additional 1.2 million acres of forestland will be lost by 2060.^{4,5}

“The incredible ecological, social, and economic opportunities in New England’s forested landscape are accompanied by threats of equal magnitude. For the first time since agricultural abandonment in the mid-1800s, all six New England states are experiencing a decline in forest cover. This second wave of deforestation poses far greater challenges than the previous episode. The permanent development and landscape fragmentation of today, often involving asphalt, concrete, and steel, are much harder to reverse than the historic clearing of land for farms and pasture.”⁶

As development reduces and fragments forest cover, it alters the character of New England and compromises ecosystem services including clean water, flood mitigation, food production, timber production, and wildlife habitat.

Of New England’s 46 million acres of forestland, 60% are owned by individuals and families. An additional 3% are owned by private non-profits, and 23% of forested land in New England is owned by private corporations.⁷ In sum, 86% of the land is in private ownership. More than half of the forest loss that has occurred since 2010 is a result of dispersed residential development. Accordingly, the fate of New England’s forests will be largely determined by the choices that local communities and the approximately 850,000 diverse private woodland owners across the region will make in response to changing environmental and economic conditions in the region and by the policies, markets, and incentives that influence those choices.

With so many landowners making independent decisions, it is difficult if not impossible to predict future landscape change with any degree of accuracy.

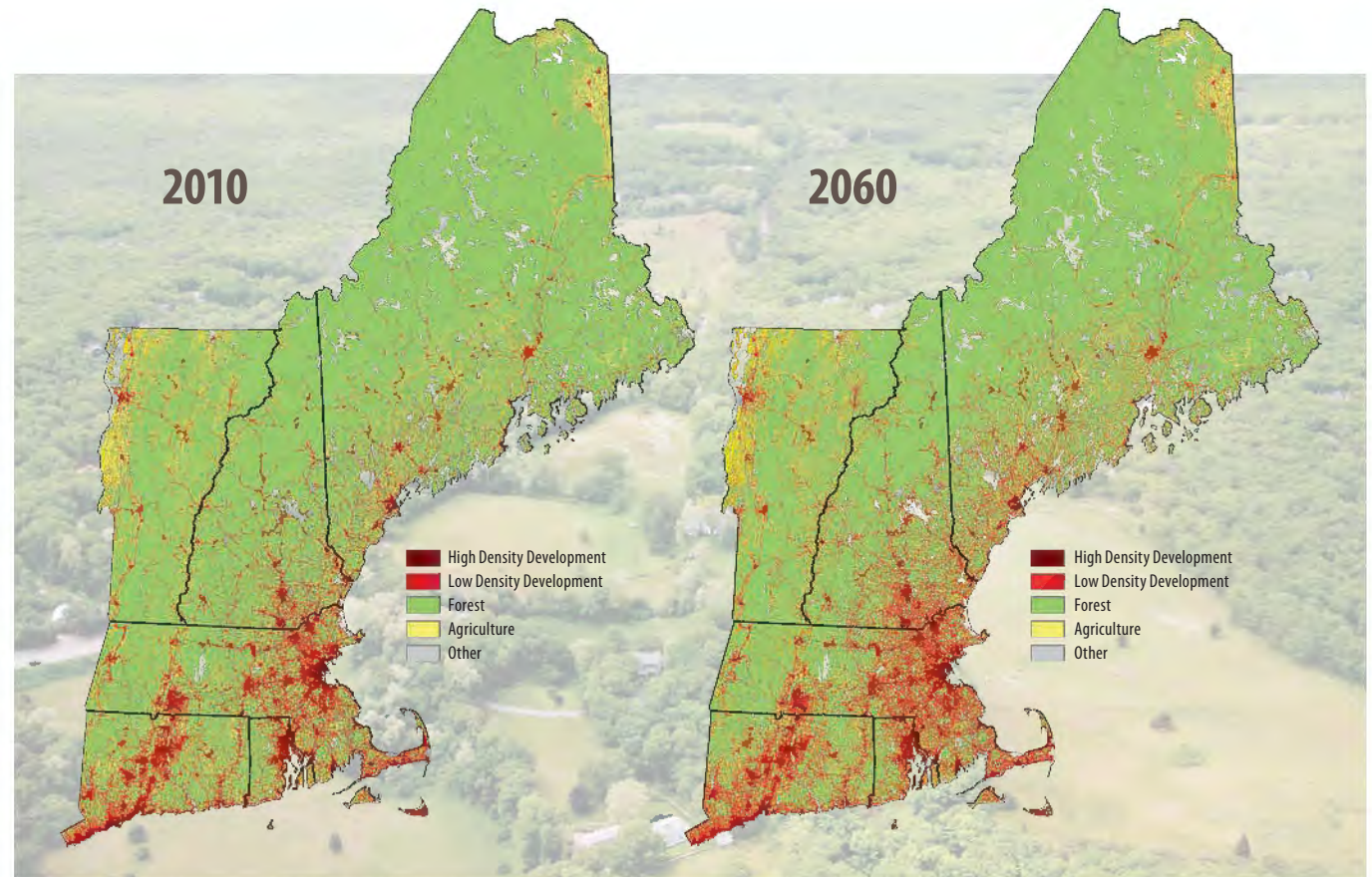


FIGURE 1: New England land cover in 2010 and 2060 based on recent trends. By 2060 an additional 1.2 million acres of forestland will be lost if recent trends continue. Recent trends were determined by an analysis of twenty years of Landsat satellite images documenting changes in New England land use from 1990 to 2010.

The mosaic of private ownership makes it critical that planners, lawmakers, landowners, and residents understand the potential aggregate consequences of land use. Shaping a sustainable future requires a comprehensive picture of this changing landscape—one that accounts for the history of land use in New England, the uncertainty of future changes, and the

impact of New Englanders’ choices on the products and benefits from the land that they care about and depend on such as the region’s beauty, wildlife, wood products, clean air, and clean water. Understanding historical trends and listening to the voices of resource professionals, and other stakeholders about how the landscape may change represent important steps in meeting this challenge.

More than half of the forest loss that has occurred since 2010 is a result of dispersed residential development.



*Historic villages and town centers
are vigorous centers of population
and employment as infrastructure
investments are centralized.*

(Private sector, VT)

III. NEW ENGLANDERS' VOICES ON THE FUTURE OF THE LANDSCAPE

The following summary distills the voices of people from across New England who participated in scenario interviews or workshops. These people included business owners, government officials, landowners, scientists, and non-profit employees representing a cross-section of New England's land-use sectors, including conservation, forestry and parks, urban forestry, agriculture, town planning, land investment, economic development; and individuals working across environmental health, tribal, and public policy domains. Their responses offer important insights on (1) how the forests and landscape of New England may change in the future, (2) concerns about the impacts of that change, and (3) barriers and opportunities for advancing conservation and land-use planning that take these possible futures into account in landscapes dominated by private land ownership.

A. POSITIVE VISIONS FOR THE FUTURE

1. Many New Englanders share common ideas about what a positive future could look like for people and the land.

The positive visions people expressed for the future of New England include continued desire for a forested landscape not much different than today, more local food, active sustainable forestry for local wood products, smart growth and redevelopment of cities, better transit with less pollution and congestion, and access to protected lands and waters.

I see vibrant walkable villages, downtowns, and urban centers that are surrounded and buffered by a network of forests and farms. (Conservation sector, RI)

I see large intact core forests stretching across the mountain ranges and extending—connected—into the valleys and forming a matrix around our village/town/city centers. Ribbons of green extending along our rivers and wetlands. (Private sector, VT)

Every town has a great balance of both economic vitality and conserved forests and farmlands thanks to market-based incentive programs. Development has been incentivized for where infrastructure is easy and open space owners were rewarded for doing the right thing, not punished by down zoning, designations or takings. (Private sector, MA)

My hope is that Massachusetts can still have a rural feeling; I can drive an hour and a half and feel that I am in a real woods; it still has ecosystem characteristics; nature is a little more in charge than humans; that has some resilience; that makes you feel that we live in a place that is human and nature, together. (Conservation sector, MA)

I think Maine's future still lies in its natural resource capital – forest, farms, fisheries, and water. (Academic, ME)

B. PERSPECTIVES ON LANDSCAPE CHANGE IN NEW ENGLAND

1. Many New Englanders expect that development and fragmentation will continue and increase in some parts of the region.

New Englanders perceive that existing development trends, urbanization, and forest loss will continue and may increase in southern New England. As a result, many envision a future landscape that is increasingly parcelized and fragmented by sprawl.

I think the landscape will be more fragmented, more sprawling development chopping up farms and forests, we will lose more of the character that everyone loves as the state and landscape. (Non-profit sector, RI)

Biggest threat I see to the forests is that they are increasingly being parcelized and developed or more roads cutting through them. It is more about preservation than a dramatic change in the current landscape. (State government, VT)

2. Views on the extent and impact of parcelization and fragmentation vary from northern to southern New England.

In southern New England, a growing economy within commuting distances of cities is exerting increased development pressure. In northern New England, a shrinking rural economy and population loss are reducing development pressures but some people think that may change with climate change.

Patterns of parcelization and sprawl will continue from southern New England to northern New England with the exception of the top 3rd of Vermont, top quarter of New Hampshire, and top 60% of Maine—where pressures won't reach that far north. (Private sector, NH)

[There is] always development pressure, but it is going to crank up. I don't know that land protection capacity will match the growing economy. (Non-profit sector, RI)

Climate change will change patterns of development. If we keep thinking as rural communities and small towns what is going to happen is with climate change and people moving north it is just going to become sprawl. (Academic, ME)

What are now small communities and towns may very well become cities. We need clear approaches to developing those cities to keep the character in Maine. (Academic, ME)

I see a number of people moving to the south. Only two southern counties have grown in recent decades. I see a continuing depopulation of rural landscape unless there is a turn-around in agriculture, forestry, ecotourism, and ecosystems services. (Academic, ME)

3. Concerns about the loss of economic opportunity and the viability of sustainably managed working lands prevail in northern New England states.

In addition to the ongoing parcelization and fragmentation of forestland, participants voiced concerns about the impacts of rural depopulation, the economic viability of working lands (i.e. lands used for forestry or agriculture), the inability of recreation to replace “older” resource extraction economies, and cultural shifts that are both a driver and consequence of these changes.

I see a continuing depopulation of rural landscapes unless there is a turnaround in agriculture, forestry, ecotourism and ecosystem services. (Academic, ME)

The weakness of our rural economy is a huge challenge. Finding jobs and surviving in rural areas is tough, people are leaving and losing social capital and sense of self. There is a lack of economic vibrancy in rural communities. (Conservation sector, ME)

Commercial forestry may all but disappear unless some sort of new markets develop that are analogous to local food markets since we can't compete in global markets and companies are going out of business. (City government, RI)

The curse and blessing of Maine is that there is not much development pressure, but lately there is pressure to make money which means clear-cutting public lands. (Academic, ME)

C. DRIVERS OF LANDSCAPE CHANGE IN NEW ENGLAND

Most New Englanders view changing land ownership patterns as the major force shaping the future landscape. New Englanders see land changing hands, particularly as long-standing, large private landholders and forestland owners age, retire, and sell their land. Participants are concerned that the changing landowner demographics will cause a loss of traditional New England values of accessible, usable forests. Participants expressed uncertainty about what this will mean for the future of the land and how to maintain the viability of working lands.

... the way we handle the big change over in land ownership will shape the land, 80% of the forest land is small, private ownership, and the median age is late 50s. What are the policies and incentives to ensure that working forests ...stay that way when there is generational transfer? How can we ensure decisions aren't driven by lack of prudent fiscal choices? (Non-profit sector, ME)

The average age of forestland owners is retirement age and older. We are at a great risk of having forest parcelized and developed in a way that we will lose ecosystem services and that will impact our capacity for resilience and adaptation—flooding, water quality. (State government, VT)

The fragmentation and shifting culture of who owns land and how use is perceived is going to chip away at forest management and all that comes from that. I see that trend continuing. All the policy and public money in the world is unlikely to have an impact on that. (Private sector, NH)

How much our next generation of land owners is going to have the same value system in terms of maintaining their properties in open space is going to be important—got to have that, or won't be interested in leaving their land in forest or in doing conservation projects. (State government, NH)

My concern is that the economic value that allows people to keep their land forested will go away.

(State government, NH)



D. CONCERNS ABOUT THE EFFECTS OF OWNERSHIP AND ENVIRONMENTAL CHANGE

1. Ownership change and reduced economic incentives to support working lands drive concerns over the future for rural towns.

Connection to the land and the sustainable use of forests is woven into the fabric of many New Englanders' identities, and many participants described land as important for maintaining their culture and sense of place.

There is decreasing social acceptance of forestry in rural lands owned for amenity purposes. We see this all over. People buy forestland and don't want to manage it without realizing that the history of their land is a history of people doing things on the land. (Academic, ME)

[I] see people who bought land for second homes unwilling to practice silviculture on their land. They say they want to keep it in the "natural state" without realizing that it is not natural, it has been managed for years. (Academic, ME)

2. The health of forests is a concern across the region.

Rising temperatures and expanding ranges for forest pests were cited as factors contributing to declining forest health that people in the region are concerned about.

As temperatures continue to rise, invasives will be growing problem. (Private sector, VT)

...with declining forest health we will see depressed diversity, complexity, and ultimately reduced biological forest productivity given the track we are on. (State government, VT)

3. Uncertainty about how forest managers and communities will adapt to unpredictable change was a frequently voiced concern.

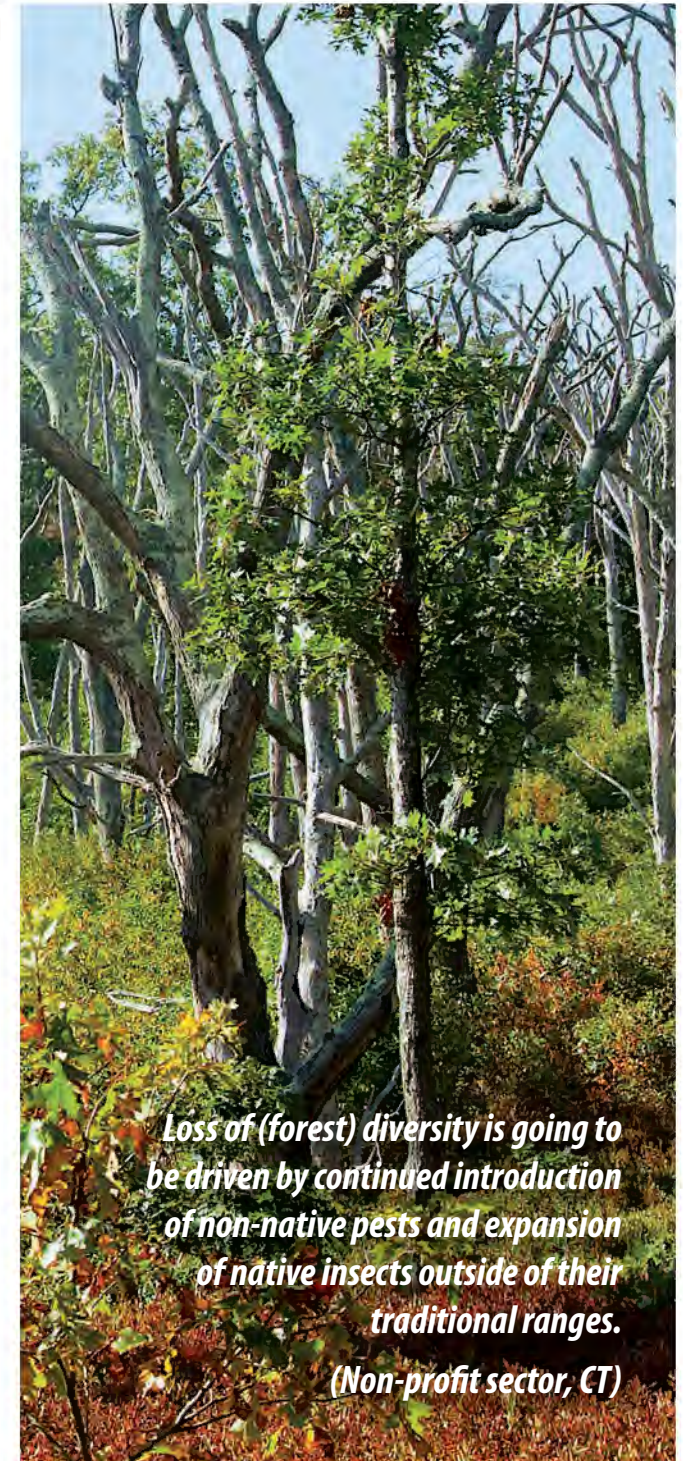
New Englanders pointed out that important decisions about food security, economic viability, ecosystem services, and public safety hinge on increasingly unpredictable weather (including temperature change, storm event frequency and intensity, and patterns of precipitation) and other external forces, making planning much harder.

I wonder about small towns' capacity to deal with change. (Non-profit sector, VT)

How do you budget for snow removal, how do you plan when to plant crops, control invasive species? With less predictability comes much more difficult choices and it makes it hard to plan smartly for things. (Private sector, MA)

How do you manage for a 80-100 year cycle—how do you adapt forest management to respond to a changing climate? It is harder to manage forests because of the unpredictability of how things are evolving. (Private sector, MA)

I am very concerned about water in the future. Hartford is not on the coast. Lots of coastal places will be under water. All resiliency money is going into coasts. Need to change Hartford so it can absorb (migrating coastal) populations. (Non-profit sector, CT)



Loss of (forest) diversity is going to be driven by continued introduction of non-native pests and expansion of native insects outside of their traditional ranges.

(Non-profit sector, CT)

E. BARRIERS TO ADAPTING TO CHANGE

1. Many people cited limited resources and dispersed planning as limiting factors in New England's capacity to adapt to on-going changes in climate and land use.

New Englanders are concerned that there will be insufficient resources and inadequate social and political capacity for effective environmental management, and are further concerned that existing levels of support for planning and conservation will decline.

Time and money and resources are the biggest challenges. (Federal government, ME)

[The] biggest decisions are the decisions made at the local government level to allow development and subdivision. While Vermont prides itself in strong land-use laws and land ethic, the land ethic is not reflected in local zoning so towns have incentive to allow subdivision. Many towns have no zoning. (State government, VT)

2. Another frequently mentioned challenge in the region is a perceived lack of social and political awareness of forest and land use issues.

New Englanders concerned about the future of the land expressed that getting communities and policymakers to look ahead and consider long-range impacts of our actions on forests is challenging, but fear many are unaware of the problem or take for granted a status quo that could easily change.

People take our forests for granted and [through our conservation programs we] hope to change their perceptions. (Conservation sector, VT)

Constituency building is so important, great work and thought that happens around the science and models, but in the end if communities and states and regions don't care, all of this work could unravel. (Non-profit sector, MA)

There's a disconnect between people and the landscape, certainly social ground to be made up in terms of forestry and land management, even though we have been doing forestry since the 70s, I'm not sure we've seen the progress we would like, so we need more engagement, between a woodland owners and woodlands, between outdoor recreationers and those lands... (Private sector, CT)

3. New Englanders observe that the reach of planning and land conservation efforts can be limited when groups work separately rather than coordinating.

Many people said they hoped to see increased coordination to improve the reach and effectiveness of conservation and planning actions.

Breaking down silos and being able to work across sectors is critical. Eco-folks can't decide to create closed loop economy without engaging other nodes. Greater cooperation is needed to develop co-benefits for conservation and the economy. (Non-profit sector, VT)

In New England, whether states can act as a region rather than in isolation. States have indicated that they can do it with RGGI. That needs to go further in their approach to siting and managing energy infrastructure as well as managing energy planning. A consistent approach is what's needed to be fully successful. (Private sector, MA)



What does the public feel about the land—what kind of branding does it have? Are people willing to take a stand about it with their elected officials? (Conservation sector, MA)



F. OPPORTUNITIES FOR SHAPING AND RESPONDING TO CHANGE

1. New Englanders recommend prioritizing conservation and development approaches that benefit people by enhancing payments for ecosystem services and incentives for smart growth.

Some participants suggested leveraging new economic opportunities that align with conservation goals by investing in the wide array of benefits and products that forests provide in ways that also help promote low-impact development in areas that add to the economic vitality of communities while conserving the resources they depend on. New programs, expertise, and pilot projects will need to be developed to support this approach.

It is exciting that there are alternative ways of bringing in private capital into conservation including the rise of social investing and potential that that could hold for advancing conservation. (Private sector, ME)

Rather than call it ecosystem services—something more like, “how nature makes your life better,” “what we need nature for,” “what nature does for us.” There are so many things

we don't even think about—how trees keep us cool in the summer. What it feels like to walk down the street in 98 degrees and there is no tree to stand under. (Conservation sector, MA)

We need recognition of the value that forests provide or monetization of the value forests provide. Without that recognition the forests become more of an obstacle to development. (Private sector, MA)

Nationally, we have to begin to pay landowners big and small for the services they provide. I think it is critical that we recognize that carbon sequestration, water quality, air quality, and habitat are vital products. We can price them now and forestland owners ought to be compensated for that. Right now those products are basically unpriced and

landowners donate that. Sooner or later we need to move toward a system of recognition and compensation. (Academic, ME)

Land conservation done well in the state will not only provide open space for recreation, ecosystem services, it will also in some ways help to channel development to those areas that are more suitable for development and maybe help to promote more low-impact development in what are already more densely populated areas. (Government, NH)

Create incentives to make it more affordable to develop in existing communities—so growth happens where we want it. (State government, VT)



It is more important than ever to continue to use conservation to make sure people are connected to the land—we only protect what we love and love what we know. (State government, VT)



2. Forestry professionals described management for carbon as a potential economic opportunity, particularly in northern New England.

Northern New Englanders expressed interest in expanding opportunities for payments to forest owners for carbon sequestration via incentive programs for forest management and conservation practices that result in increased carbon uptake and storage. They see a need for new research on management options to optimize carbon sequestration in northern New England.

Most interesting to me is—how do we optimize carbon sequestration in forest management and what are the implications to more and more land being unmanaged, for whatever reason (easements, wild, landscape busted up). All those trees getting older and older—issue is there is no forestry happening over 100,00 of acres—all busted up with houses under those trees. Older, bigger, beautiful to look at but utterly unmanaged—what does that mean in terms of its carbon sequestration capability. (Private sector, NH)

Unorganized commercial forests are probably going to be maintained as forests with the owners paid by carbon rather than timber. (Academic, ME)

My view is that programs such as carbon credits are the most effective way to pay for older age classes and to continue to thoughtfully secure ecological reserves with willing landowners which would ensure older growth. (Conservation sector, ME)

I'd like to see clear science emerge in next 10-15 years about what types of forest management optimizes the carbon benefits of forests. (Private sector, NH)

3. New Englanders expressed an interest in new coordination and partnerships to advance conservation goals in the region.

Participants expressed the view that existing measures to counter the trends of parcelization and development are inadequate. They wondered whether existing approaches to support private land conservation in New England are on pace and coordinated enough to achieve sustainable land use and regional conservation goals over time. Participants are concerned that current efforts are falling short and see opportunities to embrace new ways of achieving conservation action in a time of change.

We need a big emphasis on holistic approaches for cost saving and efficiency... That is the new frontier moving forward. To what extent can we work as integrated community to find co-benefit strategies? (Conservation sector, VT)

I think it comes back to this holistic response and the extent to which we can work together at multiple scales to protect ecosystem services at watershed scale. (Conservation sector, VT)

We should embark on a sustainable plan, even now, these kinds of programs and incentives are going to make a difference. Instilling some of that ethic, starts today, leads to 2065. Local landowners can turn not just to experts, but other land owners, land trusts, community level ambassadors. (Private sector, CT)



Programs around community forests and engaging communities in acquiring and stewarding forestland are important to help engage people and understanding and controlling what happens in their forests and land. (Non-profit sector, ME)

4. Many New Englanders recommend updating land-use planning tools so that they are better able to address contemporary challenges.

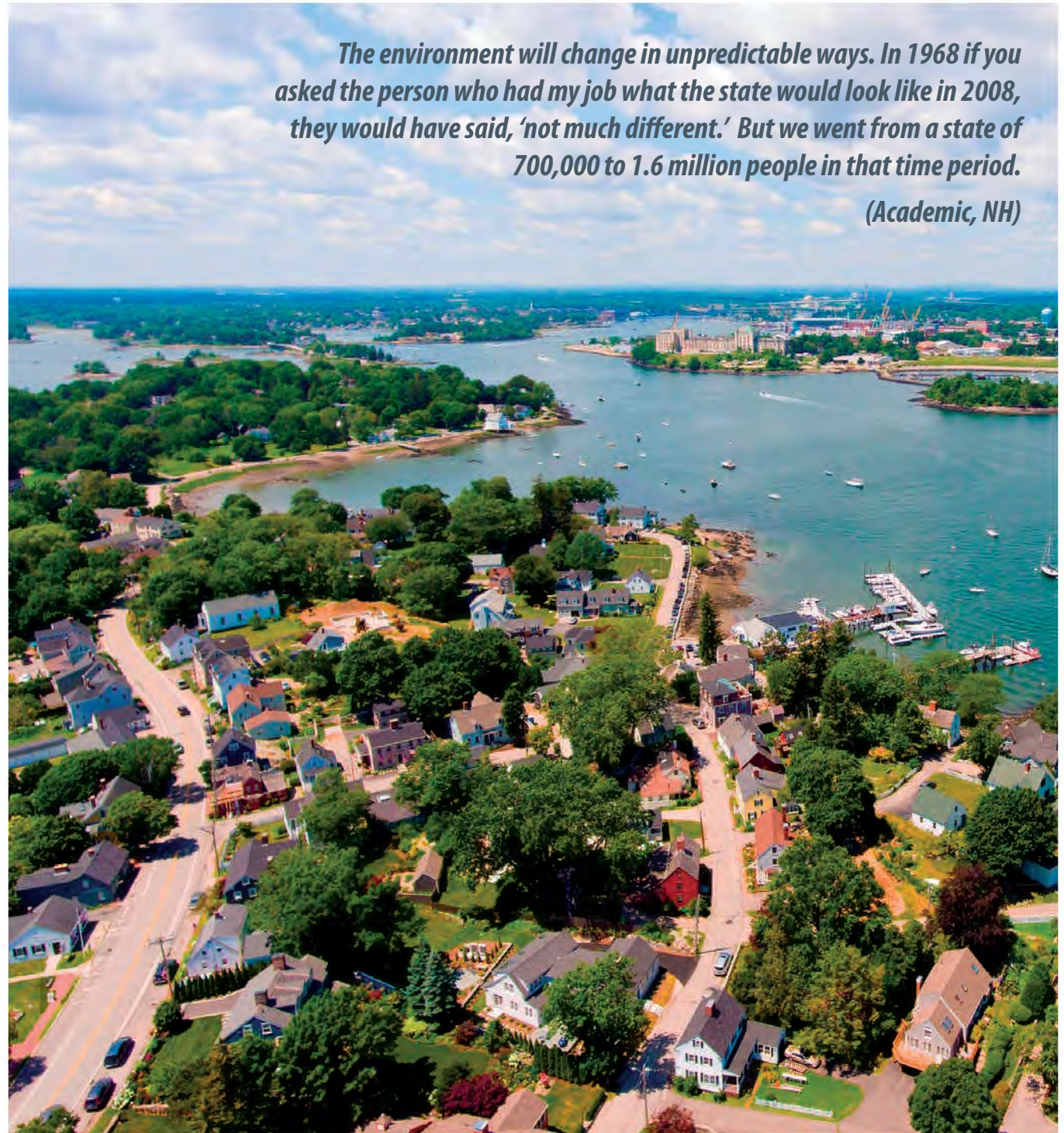
Participants noted that planning and zoning policies are insufficient or outdated in many towns and regions and may actually be promoting sprawl rather than encouraging redevelopment or cluster development. These shortcomings can fragment the land, increase air pollution, and reduce quality of life in New England due to high-impact development, inefficient transportation, and increased traffic congestion.

There is a lack of state vision and implementation regarding policies that promote compact development. (State government, ME)

Land use law protects against large scale development. Not small, incremental development—that is up to communities and most don't put appropriate limits on it. (State government, VT)

First thing we ought to do is get rid of perverse incentives—developers get a pass on large lots, 40 acre exemption in subdivision regulations in wildlands; towns have no power to regulate. Liquidators got ahold of these exceptions and abused them. (Private sector, ME)

I do think also that the frustration of congestion on roads, people are making the connection that as we make poor land-use decisions we are shooting ourselves in the foot as we try to get to work. People realize the connection between spread-out housing and traffic congestion. (State government, CT)



The environment will change in unpredictable ways. In 1968 if you asked the person who had my job what the state would look like in 2008, they would have said, 'not much different.' But we went from a state of 700,000 to 1.6 million people in that time period.

(Academic, NH)



B. Developing Landscape Scenarios for New England

The New England Landscapes Futures Project facilitated a process through which participants from across New England worked to define and explore alternative futures by considering how combinations of key trends and uncertainties could lead to different outcomes. The participants were challenged and prompted to think beyond their experience and to imagine a richer set of possibilities for what the future may hold. Participants engaged in drawing, storytelling, identifying drivers of change, narrative development, and early development of indicators and metrics for evaluating change.^{2,3}

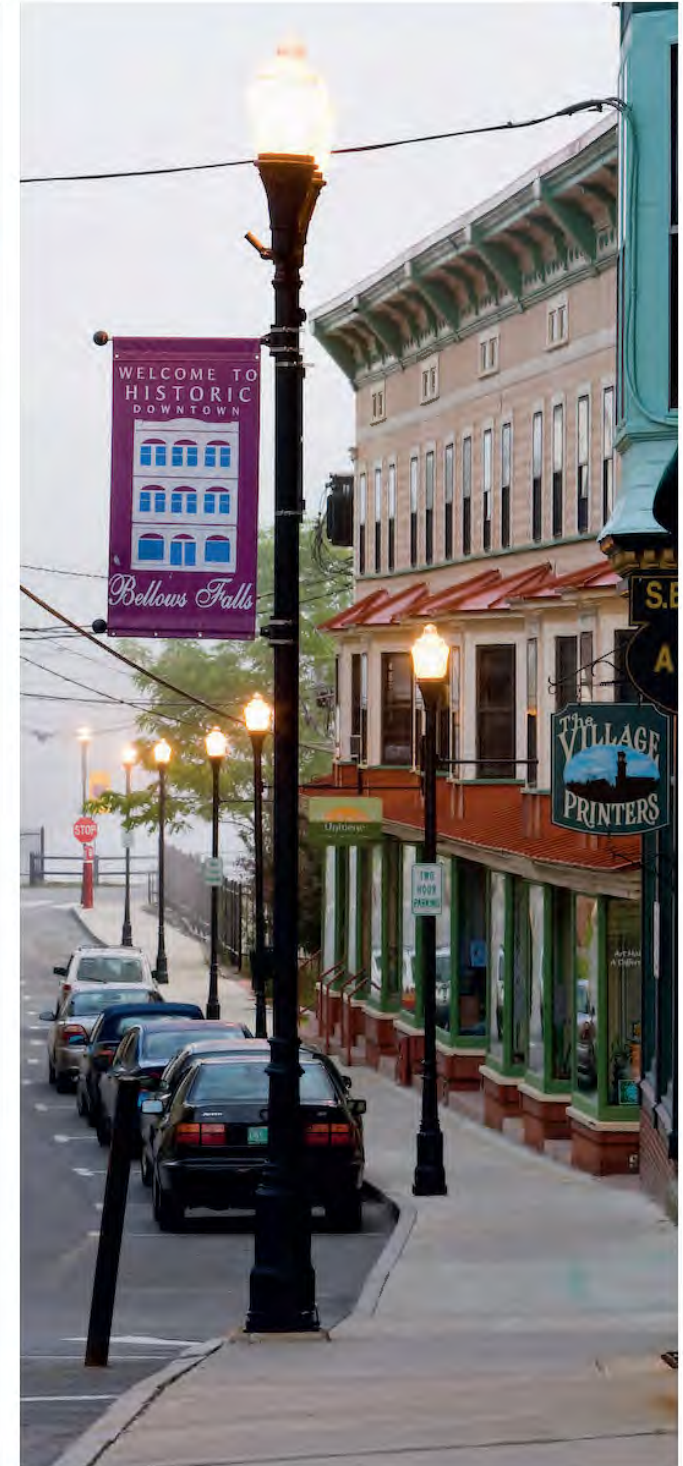
The process used to craft the scenarios summarized here is known as the scenario matrix method. The matrix method has been widely used by organizations such as the National Park Service⁹ and the World Bank¹⁰, and is the scenario development technique that has been used in prominent environmental research and planning efforts such as the Millennium Ecosystem Assessment.¹¹

The outcome of the scenario generation process was four alternative scenarios that differ from recent trends and describe how the New England landscape might change given our uncertain future. Each of these visions for New England posits a future shaped by two key drivers of landscape change identified during the scenario development process: the extent of natural resource planning and innovation (ranging from high to low) and the scale of socio-economic connectedness (ranging from local to global).

Two Key Drivers of Landscape Change:

Socio-economic connectedness refers to the extent to which population migration, culture, economic markets, goods and services, and trade and climate policy are globally oriented or locally oriented. For this driver the two poles of the axis are, “Local socio-economic connectedness” and “Global socio-economic connectedness.”

Natural resource planning & innovation refers to the extent to which governments engage in proactive land-use planning and invest in technological advances for land, energy, and water use. It also reflects the degree of private sector innovation in resource use and investment in ecosystem services. This driver also incorporates social attitudes of individuals toward land stewardship and sustainability. For this driver, the two poles of this axis are “High natural resource planning & innovation” and “Low natural resource planning & innovation.”



The two final drivers of landscape change were generated by combining the drivers that participants identified for each of the six New England states when asked what they thought would be the most uncertain and highest impact forces of land-use change over the next 50 years. When the two drivers are drawn as a vertical axis of “natural resource planning and innovation” and a horizontal axis of “socio-economic connectedness” they create quadrants that define the four alternative scenarios (Figure 2). The conditions that characterize each scenario are defined by the poles of the drivers for each quadrant.

To produce the narratives for the final four scenarios, the research team drew from the results of the state-based workshops in which participants worked in groups to flesh out descriptions for the scenarios they developed. Through a series of interactive webinars, participants helped further define the characteristics of the New England-wide scenarios, and voted on names.

To translate the scenario narratives into land-use simulations, researchers drew on participant input to decide how scenario conditions would change the amount, distribution, and intensity of development, forest clearing for new farmland, land conservation, and forest harvesting compared to recent trends. Given these decision rules, scientists from Harvard Forest and elsewhere are using a series of computer models to simulate what the landscape might look like in the future under recent trends and the four alternatives and what the consequences would be for specific natural resources and ecosystem services. The computer simulations have resulted in maps of future land-cover and forest conditions at ten-year intervals to the year 2060.

C. New England 2060: Four Alternative Scenarios

The four scenarios for New England that were developed with New Englanders as departures from the recent trends are Connected Communities, Yankee Cosmopolitan, Go It Alone, and Growing Global. The following pages provide a brief description of each scenario, an illustration and a summary of the resulting land use and land cover change. All percent changes are rounded to the nearest 5%. Acres harvested refers to any land from which trees were cut regardless of harvest intensity, and some acres are harvested more than once over the 50 year period. The scenarios create widely contrasting landscape conditions.



FIGURE 2: The scenario matrix illustrating the four quadrants created by the two drivers, “Socio-economic connectedness” and “Natural resource planning & innovation,” along with the characteristics of the four scenarios. The full-length narratives for each of the scenarios can be found online at harvardforest.fas.harvard.edu/landscapefutures.

RECENT TRENDS



This is a future of continuing along the current path where forest cover is declining in all New England states. Most landscape change in New England is due to the conversion of forest and farmlands to low-density development near major cities and natural amenities such as lakes and mountains. Based on recent trends, 1.2 million acres of New England forestland will be lost by 2060, reducing forest cover in the region by 4%, from approximately 75% of the total land area today to 71% in 2060.^{5,6} The forested areas most prone to being developed are near already developed areas, particularly near large southern New England cities including Boston, Hartford, and Providence. Also vulnerable are forests near roads. In northern New England, recent trends suggest forests will become more fragmented. The Concord and Laconia areas of New Hampshire are predicted to be hardest-hit areas, with fragmentation increasing by more than 10% near those towns. In all, recent trends indicate a future New England landscape with less forest overall, and increased fragmentation of our remaining forests, slight increase in farmland, and continued sprawling development.

Recent Trends: New England-wide change in forestland from 2010 to 2060

1.2 million forest acres developed*

0.2 million forest acres converted to agriculture

10.3 million forest acres conserved

28.9 million forest acres harvested

**These data represent a net loss of 1.2 million acres of forest by 2060 despite the increase in acres conserved, because development eliminates forest while conservation protects existing forest but does not create more forest.*



CONNECTED COMMUNITIES

High natural resource planning & innovation and Local socio-economic connectedness



This is a future where a shift towards living 'local' and valuing regional self-sufficiency increases public interest in protecting local resources.

The New England population has increased slowly over the past fifty years and most communities are coping with climate change by anchoring in place rather than relocating, making local culture and the use and protection of local resources increasingly important to governments and communities. New England has been less affected by climate change than many other regions of the U.S. in this scenario. Concerns about global unrest and the environmental impacts of global trade have led New Englanders to strengthen their local ties and become more self-reliant. These factors combine with heightened community interest and public policies to strengthen local economies and fuel burgeoning markets for local food, local wood, and local recreation.

Connected Communities New England-wide change in 2060 compared to recent trends

75% decrease in development

150% increase in agriculture

25% increase in land conservation

29.5 million acres of forest harvested in the 50-year period, compared to 29 million acres of forest harvested as projected by recent trends (some acres are harvested more than once).



YANKEE COSMOPOLITAN

High natural resource planning & innovation and Global socio-economic connectedness



This is a future where we embrace change through experimentation and proactive investments. While environmental changes break records and urbanization continues to pressure natural systems, society responds with greater flexibility and ingenuity.

In this scenario, New England has experienced substantial population growth spurred by climate and economic migrants who are seeking areas less vulnerable to heat waves, drought, and sea-level rise. Most migrants are international but some have relocated from more climate-affected regions in the U.S. At the same time, a strong track record in research and technology has made New England a world leader in biotech and engineering, creating a large demand for skilled labor. The region's relative resilience to climate change and growing employment opportunities has made New England a major economic and population growth center of the U.S. Abundant forests remain a central part of New England's identity, and support increases in tourism, particularly in Vermont, Maine, and New Hampshire.

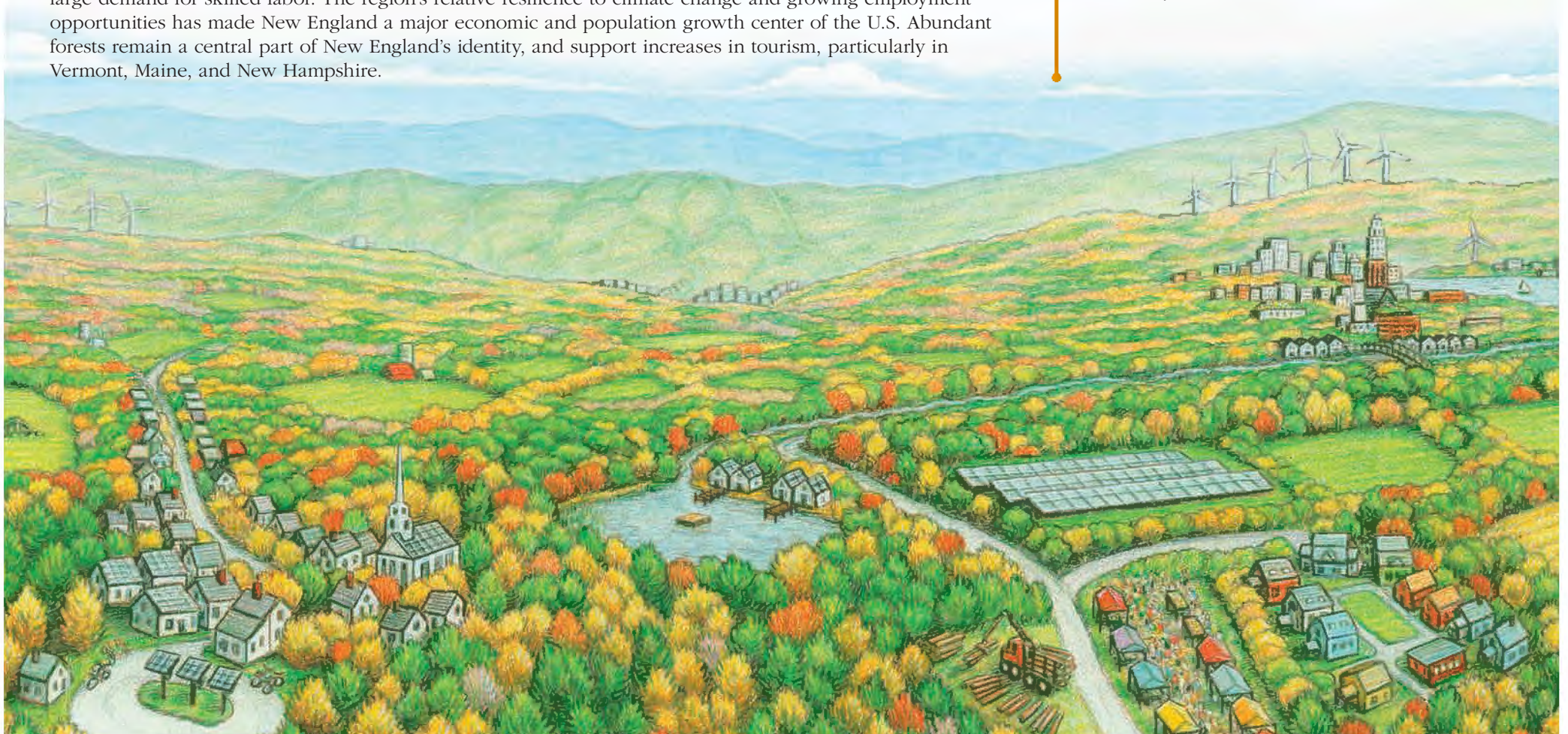
Yankee Cosmopolitan New England-wide change in 2060 compared to recent trends

40% increase in development

0% change in agriculture

10% decrease in conservation

17.8 million acres of forest harvested in the 50-year period, compared to 29 million acres of forest harvested as projected by recent trends (some acres are harvested more than once).



GROWING GLOBAL

Low natural resource planning & innovation and Global socio-economic connectedness



This is a future where a large influx of climate change migrants seek refuge in New England and existing residents move inland, taking the region by surprise. New pressures on municipal services drive a trend towards privatization. Regional to national policies have promoted global trade but global agreements to address climate change have failed.

In this scenario, by 2060, a steady stream of migrants has driven up New England's population, with newcomers seeking to live in areas with few natural hazards, ample clean air and water, and low vulnerability to climate change. This influx of people has taken the region by surprise and local planning efforts have failed to keep pace with development. The region has experienced increasing privatization of municipal services as state and local governments struggle to keep up with the needs of the burgeoning population. Trade barriers were lifted in the 2020s to counter economic stagnation and the volume of global trade has multiplied over the past 40 years as a result of increasing globalization. However, all attempts at global climate change negotiations and renewable energy commitments have failed in this globally divided world.

Growing Global New England-wide change in 2060 compared to recent trends

180% increase in development

905% increase in agriculture

40% decrease in conservation

61.3 million acres of forest harvested in the 50-year period, compared to 29 million acres of forest harvested as projected by recent trends (some acres are harvested more than once).



GO IT ALONE

Low natural resource planning & innovation and Local socio-economic connectedness



This is a future where the region is challenged by shrinking economic opportunities paired with increasing costs to meet basic needs, yet innovation is stagnant and new technologies are not rising to increase efficiency or create new opportunities. With local self-reliance and survival as the primary objectives, natural resource protections are rolled-back and communities turn heavily to extractive industries.

In this scenario, population growth in the region has remained fairly low and stable over the past 50 years as the lack of economic opportunity, high energy costs, and tightened national borders have deterred immigration and the relocation of people from within the U.S. to New England. The concurrent shrinking of national budgets and lack of global economic connections have left little leeway to deal with challenges such as high unemployment, demographic change, and climate resilience. Within New England this has resulted in the rolling back of natural resource protection policies and the drying up of investments in new technologies and ecosystem protections in response to a lack of regulatory drivers. Over the last 50 years, the region has seen the significant degradation of ecosystem services as a result of poor planning, increased pollution, and heavy extractive uses of local resources using conventional technologies.

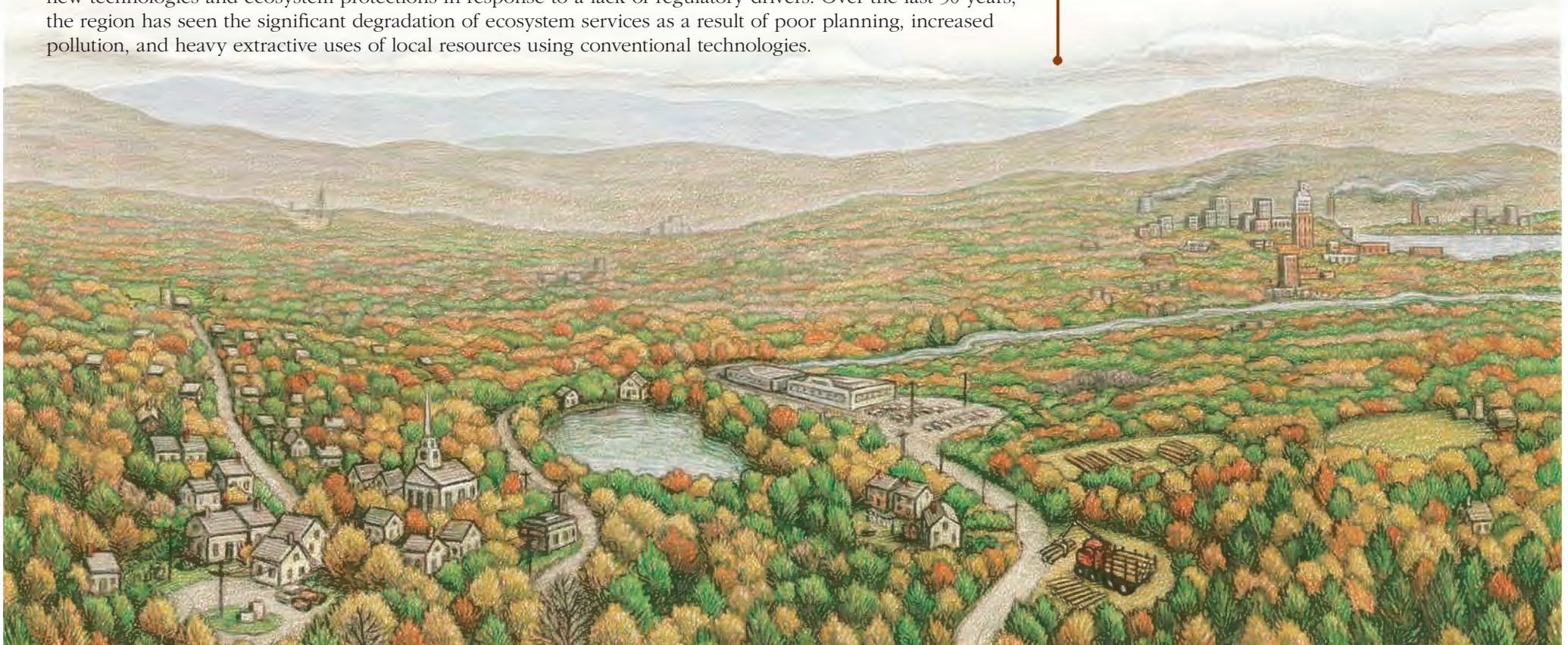
Go It Alone New England-wide change in 2060 compared to recent trends

25% decrease in development

100% decrease in agriculture

80% decrease in conservation

67.8 million acres of forest harvested in the 50-year period, compared to 29 million acres of forest harvested as projected by recent trends (some acres are harvested more than once).





V. NEW ENGLAND LANDSCAPE SCENARIOS IN ACTION

The New England landscape scenarios (recent trends and four alternatives) provide a resource for communities, government agencies, conservation groups, and researchers seeking to overcome the limitations of conventional predictions and planning processes to chart a path to a resilient future for people and nature. As described below, groups can use the scenarios to stimulate community dialogue, guide plans and actions, and articulate the case for policies and resources to help achieve positive outcomes for people and the land.

Land-use planners and government entities –

Across New England, town and regional planners play an important role in shaping future land use. These scenarios can help planners understand forces shaping development pressure, land areas most vulnerable to development, and consequences of future land use for agriculture, timber harvest, forest structure, flooding, and more. Planners can host meetings in which community groups discuss the four scenarios and current trends and together consider how their town

or region might change, how robust their current land use plans would be under each scenario, and what actions or changes could make their communities as resilient as possible to a range of possible futures.

Scientists – Research teams are already using the scenarios to assess how ecosystem processes and services may change under a range of landscape futures. Researchers from Smith College, Arizona State University, and Harvard Forest are applying the scenarios to understand future water supplies, investigating how alternative scenarios of climate and land-use change will influence stream flows in watersheds across New England. A University of Vermont-based wildlife conservation team is using the scenarios to understand how future land use may impact the regional distributions of hunted wildlife species. They are investigating the implications for conservation, species management, and wildlife diseases. Mass Audubon is applying the scenarios to explore futures for the Narragansett Bay Watershed. The aim of their project is to calculate the economic

value of future ecosystem services received from conserved land and clean water. These current projects underway indicate just a few of the many research possibilities.

Conservation organizations – These scenarios are intended to support strategic conversations about land use and land conservation. Organizations may use these scenarios to communicate about the diverse futures the communities they serve could face, and the potential consequences for the landscape. They may also use the scenarios to engage community members in creating a landscape vision for their own region. The scenarios are intended to help challenge assumptions about what the expected future will be and how to develop robust conservation strategies. The scenario simulation maps can be overlaid with conservation plans to identify which priority lands are most vulnerable to change under different scenarios. Results can be used to help guide conservation priorities, inform fundraising efforts, and evaluate how robust conservation strategies will be under different views of the future.

SUMMARY

New Englanders shared their views on how the landscape might change between now and 2060, and helped generate possible land-use scenarios for the future. Their viewpoints showed a deep commitment to the future of the land, including optimistic ideas about the potential for New Englanders to increase the pace of conservation and stabilize rural economies, along with concerns that if current trends continue, rural character and rural industries could be lost. These voices were distilled into storylines that form the basis of four scenarios capturing the future of the land in the coming decades. The scenarios are intended for use by researchers, conservation managers, communities, and decision-makers to inform land-use planning, land conservation, and resource management.

- ▶ Many participants expressed similar views about what a positive future for New England could look like.
- ▶ Compounding pressures that are changing the land at accelerating rates and in less predictable ways pose new challenges for land owners and managers.
- ▶ New Englanders view environmental, social, and economic issues as interconnected forces that together shape the future of the land, as illustrated by the two drivers of change that define the future scenarios.
- ▶ Many believe that new land-use planning approaches, land conservation partnerships and resources are needed to better adapt to change.
- ▶ Future scenarios defined by participants show that the New England landscape could change in dramatic ways depending on how key driving forces play out and how people and organizations respond.
- ▶ Communities, conservation organizations, and scientists can use the New England scenarios to understand the consequences of landscape change and develop robust land use planning and conservation priorities to help sustain important resources into the future in the face of uncertainty.

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Voices from the Land

Listening to New Englanders' Views of the Future

