A Clean, Connected and Climate Resilient Merrimack Watershed:

The 2025 Merrimack Watershed Conservation Plan

The Nature Conservancy

CONTENTS

EXECUTIVE SUMMARY

THE MERRIMACK WATERSHED CONSERVATION PLAN: A SHARED VISION FOR CONSERVATION IN THE MERRIMACK RIVER WATERSHED

The 2025 Merrimack Watershed Conservation Plan (the plan) offers a science-based framework for guiding conservation action across one of New England's most ecologically and socially significant watersheds. By integrating robust spatial analysis with meaningful community engagement, the plan identifies high-impact opportunities to deploy land protection, restoration and nature-based solutions for a sustainable, ecologically healthy and climate-resilient Merrimack River watershed. The plan equips conservation practitioners with the tools and data needed to align efforts across disciplines, address climate resilience and deliver lasting benefits for both people and nature throughout the Merrimack River watershed.

The original 2014 plan focused on land conservation priorities in undeveloped portions of the watershed. The 2025 plan expands the focus to include conservation opportunities in the developed and densely populated areas of the watershed. The plan's community-informed approach identifies specific vulnerabilities and opportunities in the largest cities along the Merrimack River.

FOCAL COMMUNITIES

The watershed is home to more than 2.6 million residents in more than 180 communities across two states. Focusing efforts on deeper engagement in fewer communities allowed us to build stronger relationships with local organizations, learn from residents and address significant gaps within the 2014 conservation plan.

From the outset of the project, the team focused engagement efforts on four major cities along the mainstem of the river which had received nearly no coverage in the 2014 plan: **Lowell and Lawrence, Massachusetts and Manchester and Nashua, New Hampshire.** These are large cities with limited green space and each still bears the legacy of the textile mills which reshaped the river during the Industrial Revolution.

SPATIAL THEMES

Input from the Merrimack Conservation Partnership members and the broader community informed the plan's four themes: community climate resilience, wildlife habitat and connectivity, working lands and water resources. Alone, each theme highlights priority areas for projects that meet a specific need; together, they highlight places where projects can provide multiple benefits for nature and people.

- **Community Climate Resilience** identifies priority areas using integrated spatial modeling and community-informed data to address flood risk, heat vulnerability, tree cover and access to green space.
- **Wildlife Habitat and Connectivity** identifies priority areas for protecting and restoring habitats, resilient landscapes and wildlife corridors.
- **Working Lands** highlights agricultural and forestry landscapes with high conservation value, based on soil quality and land cover.
- **Water Resources** targets areas where restoration and renaturing can improve water quality, protect wetlands and safeguard public water supplies.

ACKNOWLEDGEMENTS

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We gratefully acknowledge the Merrimack Conservation Partnership and the contributions of the Partnership Advisory Committee. Your collaboration and expertise were essential in shaping and designing the conservation plan, ensuring it reflects both scientific rigor and shared community priorities. We also extend our special thanks to Brian Hotz for convening and leading the partnership and serving as a key advisor throughout this planning effort. This collective effort has laid a strong foundation for achieving long-term conservation goals for the watershed.

In addition to the project team members listed as authors, the following current and former employees of The Nature Conservancy played a crucial role in the success of this project: Alison Bowden, Holly Costello, Charles DeCurtis, Jessica Dietrich, Loren Dowd, Sarah Garlick, Megan Gordon, Susie Hackler, Meredith Hatfield, Megan Latour, Melissa Leszek, Tina McCarthy, Jim O'Brien, Jessica Rice Healy, Rachel Rouillard, Pete Steckler, Ben Sweeney, Matthew Thorne and Sheila Vargas Torres.

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THE MERRIMACK CONSERVATION PARTNERSHIP

Established in 2012, the Merrimack Conservation Partnership (the Partnership) is a regional alliance of over thirty conservation and planning organizations formed to protect the southern portion of the greater Merrimack River watershed in New Hampshire and Massachusetts. The Partnership uses its collective resources and expertise to preserve, steward, educate and advocate for a sustainable, ecologically healthy and climate-resilient Merrimack River watershed. To support these shared goals, grant programs—privately funded and administered by Partnership member the Society for the Protection of New Hampshire Forests—are available to eligible land trusts, municipalities and state agencies.

Vision of the Partnership: We envision a Merrimack River watershed where everyone benefits from clean air, clean water and expanded access to green space.

Committed to the Watershed: Our Partnership is comprised of individuals and organizations who care deeply about protecting the Merrimack River watershed. Our work aims to create connections and aligned action between all the partners and stakeholders, who represent different disciplines and perspectives.

Centered in Community and Science: We recognize that experience within the community, high-quality data and conservation best practices are all important to lasting progress and we prioritize and integrate each into this work.

Collaboration and Respect: We work collaboratively to protect the watershed by sharing information, leveraging collective resources and working towards common goals. Our work is rooted in respect for the partners, the community, the environment and the watershed.

PLANNING AS A COLLABORATIVE TEAM

The **Merrimack Conservation Partnership (the Partnership, or MCP)** approached The Nature Conservancy to lead the update of the 2014 conservation plan to better reflect community priorities and conservation opportunities within the developed portion of the watershed. The request was based on previous TNC work on other spatial plans, work with community entities and strong presence in both watershed states.

The **Merrimack Conservation Partnership Advisory Committee (Advisory Committee)** was established through volunteer participation of Partnership members. The committee met regularly to guide critical components of the planning process by providing expert input on conservation targets, priority datasets and spatial analysis methodologies. Their expertise ensured technical decisions were grounded in science and aligned with overarching conservation goals. Beyond technical review, members supported community engagement by identifying potential partners and opportunities for project coordination. This structure integrated scientific expertise with local knowledge, enhancing both the analytical rigor and practical applicability of the planning framework.

The Nature Conservancy (TNC) is a science-based, nonpartisan conservation organization with more than 70 years of experience working locally and globally. Since 1951, TNC has worked across states and around the world to partner with communities, advocate for and influence policies that equitably support people and nature and provide the science, tools and resources to work toward solutions. Local teams in Massachusetts and New Hampshire collaborated on this effort to develop, analyze and use the best available conservation science and guide intentional engagement with community. Project leads were Emma Gildesgame, Massachusetts Climate Adaptation Director and Anna Ormiston, New Hampshire GIS Manager and Spatial Scientist. Ally Snell, New Hampshire Community Partnerships Manager, led the community engagement approach. The full list of team members is available in Appendix 1: Project Team Organization.

Individuals selected by local organizations for their deep ties to their respective neighborhoods acted as **community advisors**. As trusted entities, community advisors helped reach a broader subset of residents for data collection and plan engagement.

Liberation Nexus Lab consulted on community engagement, partnership structure and implementation strategy for the plan. Principals Erin Allgood and Emerald Anderson-Ford provided coaching, process review and recommendations to assure community engagement was done in an intentional and inclusive manner. The Liberation Nexus Lab is a consulting firm specializing in custom programs, resources and strategic planning and coaching that focus on shifting hearts and minds towards deep community building and connection.

FB Environmental Associates is an environmental consulting firm committed to the practical stewardship of the natural world. Through science and community collaboration, the firm works to restore and protect ecosystems, focusing on clean water and biodiversity conservation. For this conservation plan, FB Environmental conducted spatial analysis to develop the Community Climate Resilience theme and designed interactive web tools to make the updated conservation plan accessible and actionable. Julia Maine, FBE Project Manager and Coastal Science Lead, provided project management, GIS analysis and web mapping design. Christine Bunyon, FBE Project Manager, Geospatial Services Lead and Water Resource Scientist, provided sourcing, preparation and integration for input data and GIS modeling and spatial analysis. Elliott Boardman, FBE Project Manager, Ecologist and Wildlife Specialist, provided web tool design and creation. Their work advanced GIS analysis with user-focused visualization to help conservation practitioners and municipal decision makers explore spatial patterns, assess vulnerabilities and identify opportunities for resilience and conservation strategies.

PLANNING FOR A HEALTHIER MERRIMACK

In 2010, the Merrimack River was identified by the US Forest Service as "one of the most threatened watersheds in the nation" in terms of projected loss of private forest land over the next twenty years. This designation inspired a broad partnership of environmental organizations and public agencies in New Hampshire and Massachusetts to embark on an ambitious effort to develop a conservation plan that would focus and accelerate land conservation in the Merrimack River watershed. Working together, the group developed a science-driven, consensus-based land conservation plan that integrates the best-available natural resource data with expert judgment to prioritize land protection in the Merrimack River watershed.

Serving as a complimentary study to the existing 2014 Conservation Plan, the 2025 update focuses on a community-informed approach to data collection in the developed areas of the watershed, where the majority of residents live. The updated plan identifies conservation opportunities to improve water quality, climate resilience and access to green spaces. It also identifies specific community climate vulnerabilities in the largest cities along the Merrimack River.

The 2.6 million residents of the Merrimack River watershed are highly dependent on nature, including more than half a million residents who rely on the Merrimack for drinking water. Many watershed towns and socially vulnerable communities are at high risk for flooding and drinking water contamination. Accelerating climate change and pressures of population and development will lead to intensifying storms, increased risks of flooding, water pollution and habitat destruction.

Through science-based and community-driven climate adaptation initiatives, this project identified locations for future efforts that can reduce the risks facing these communities by securing clean and abundant water supplies for a growing population and mitigate risks from increasingly frequent and severe storms.

THE APPROACH

Data Collection: A Community-Informed Approach

The Merrimack Conservation Partnership explicitly requested that The Nature Conservancy incorporate the voices, priorities and needs of Merrimack watershed communities into the updated plan. To do this, the project used a tiered approach to community engagement that started broad, gathering input on issue areas and values and gradually narrowed to specific discussions of neighborhood-scale observations and needs. To allow for the time and deep engagement necessary to build relationships with established community-based organizations and leaders the project team focused this work exclusively in four focal cities along the mainstem of the Merrimack.

The community engagement strategy for the plan update was developed iteratively in response to input from partners and community members, to ensure the creation of a conservation plan that integrates community needs and assets and represents the lived experiences of people within the watershed. Incorporating perspectives from these parties results in a plan that is relevant for more people and provides more opportunities for collaboration between conservation organizations and others working in the watershed.

Selecting Focal Communities

At the outset of the project, the team opted to focus community engagement and relationship building efforts on four major cities along the mainstem of the river: Lowell and Lawrence, Massachusetts and Manchester and Nashua, New Hampshire. What happens within each city significantly influences the river and the health of the river significantly impacts residents of those communities. Though there are more than four communities within the watershed, these four are the largest along the mainstem and were largely excluded from the 2014 plan (see gray areas in Figure 1). Manchester and Nashua are the largest two cities in New Hampshire by population[1] and Lowell and Lawrence are the

1 Annual Estimates of the Resident Population for Incorporated Places in New Hampshire: April 1, 2020 to July 1, 2024 (SUB-IP-EST2024-POP-33), Source: U.S. Census Bureau, Population Division, Release Date: May 2025. Accessed via https://www.census.gov/data/tables/time-series/demo/popest/2020s-total-cities-and-towns.html

two largest Massachusetts cities along the Merrimack mainstem[2]. Together, the four cities are home to more than 410,000 people. Though the community engagement efforts were focused on these four cities, the emergent topics in the community climate resilience themes (flooding, heat severity and green space condition) were evaluated using other data sets for the entire watershed.

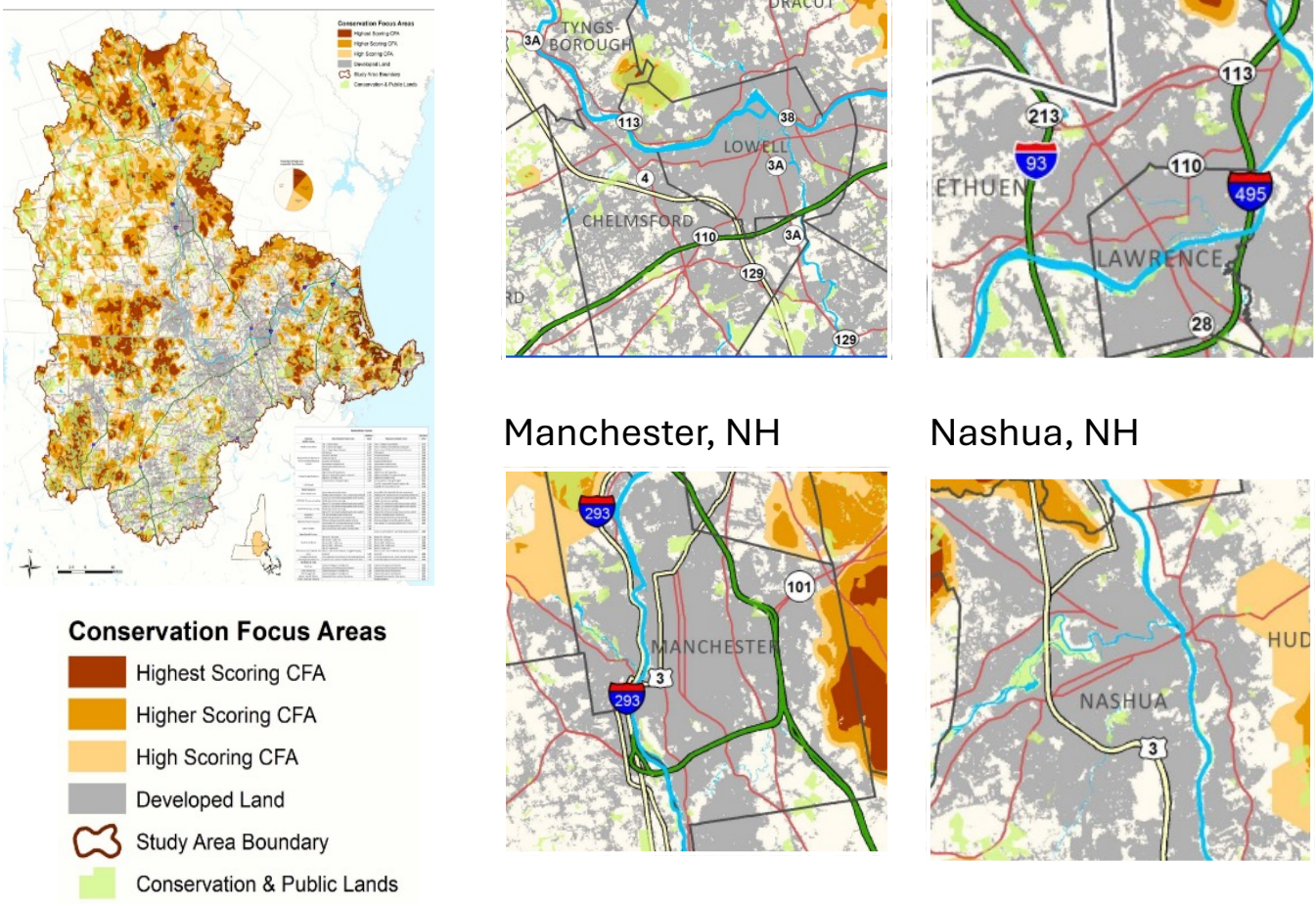


Figure 1: The focal communities were excluded from the 2014 analysis because they are densely developed. (Map by: Merrimack Conservation Partnership)

Focusing efforts geographically allowed the project team to build stronger relationships with local community-based organizations, learn from residents and elevate targeted community conservation priorities and themes. In choosing the four largest municipalities along the river, each one with a rich cultural history and legacy of industrialization, the project team could focus their efforts to fill in the most significant gaps from the earlier version of the conservation plan. Over the course of two years, the project team approached work in these communities through the lens of careful and intentional trust building. The project team began with conversations and interviews of representatives from municipalities and environmental organizations, many of which had existing relationships with the Partnership or TNC (see Figure 2). Coupled with targeted polling in the four focal cities, these initial efforts helped the project team narrow the scope of the plan to topics that were not heavily covered in existing plans and studies within the watershed, thus not replicating existing work.

2 Annual Estimates of the Resident Population for Incorporated Places in Massachusetts: April 1, 2020 to July 1, 2024 (SUB-IP-EST2024-POP-25), Source: U.S. Census Bureau, Population Division, Release Date: May 2025. Accessed via https://www.census.gov/data/tables/time-series/demo/popest/2020s-total-cities-and-towns.html

Community Engagement Approach & Methods

Figure 2: The community engagement approach for this project started broad and continually narrowed in focus to gather deeper, more specific insights from individual members of the community.

1. **Polling:** Polling focal-community residents helped the project team better understand the issues and impacts most important to residents. (See polling results in Appendix 2: Polling Findings and Data)
2. **Interviews:** Initial and ongoing conversations with existing municipal and organizational partners in the region provided important context around existing activities in the watershed and in focal communities. This included ongoing and emerging projects, opportunities to plug into existing efforts and recommendations of other organizations and individuals to engage in the project.
3. **Tabling:** Direct engagement with residents at fairs and festivals to gather spatially explicit information about their experiences of flooding, green space, heat and tree coverage within their communities. (See event images in Appendix 3a: Input from Community Events).
4. **Community Mapping:** Dedicated community mapping events, hosted in partnership with trusted local organizations, focused on gathering detailed information from residents.

Municipal and Organizational Partner Interviews

Between the summer of 2023 and late 2024, the project team conducted interviews and informal discussions with key community advocates—local decision makers and leaders in municipal, conservation or organizational roles—in the focal cities. Conversations with these municipal and organizational partners often led to recommendations of additional contacts and partners for the project team. These conversations helped shape the exploratory methodology for community data collection as well as informed and alerted key partners to the project's intentions and work in the watershed, which helped eliminate confusion and unintended duplication of efforts. A summary of interviews, events and meetings, along with information about our approach, can be found in Appendix 3: Community Engagement.

Key themes from Municipal and Organizational Partner Interviews:

- Most of the focal municipalities had recently revised their master plans, which served as key starting points for understanding priorities and opportunities relative to conservation and climate adaptation. Nashua, NH, had recently concluded a multi-year effort to develop the Livable Nashua plan, which incorporated many aligned conservation, climate mitigation and climate adaptation themes along with a dashboard and quarterly newsletter tracking progress.
- Municipalities in Massachusetts received support for project implementation from the state-wide Municipal Vulnerability Preparedness program and had established partnerships with local non-governmental and community-based organizations to provide further support.

All the focal municipalities expressed concerns around increased flooding, stormwater management and as a result, water quality issues.

- Community members and community leaders expressed concerns about lack of tree coverage and the condition of existing urban trees.
- Municipal and organizational partners alike expressed a desire to reach a greater diversity of residents to be involved in local planning and civic efforts, yet noted that they lacked the resources, capacity and knowledge to obtain sustained engagement. This presented the project team with a clear opportunity to focus efforts on building trust locally to drive toward deeper levels of resident engagement in the planning process.

These themes, coupled with polling data, helped the project team focus on the scope of research and better communicate requests and outcomes with engaged community members.

NOTE: Conversations yielded several concerns, such as rates of PFAS contamination, trash and litter, and other forms of non-source point pollution in the Merrimack, which were deemed outside of the scope of this plan and the Partnership's scope of work and influence.

Community-Based Organization Engagement

Obtaining community-sourced data and information was a core component of the project team's approach to expanding the coverage of the Merrimack Conservation Plan to the developed areas of the watershed. While the project team had existing relationships and established reputations in some of the focal communities, the team sought out new and expanded relationships with key organizations that were better positioned to connect with a wider subset of community members. The approach of building relationships and partnerships with small, localized community-based organizations (CBOs) also reinforced local leadership roles in decision making. Many of the organizations and people working on related issues within the watershed are affiliated with small CBOs and have deep knowledge of and connections with people and their neighborhoods. Uplifting locally identified, place-based expertise is essential to developing effective local strategies and solutions.

These local CBOs (full list in Appendix 3b: List of Key Stakeholder Interviews) have the knowledge, solutions and constituencies impacted by the intersecting issues of public and environmental health, housing and food insecurity and other related concerns. Building these partners into the planning process resulted in a plan that is relevant to a variety of sectors and breaks down traditional silo structures to create more opportunities for radical collaboration between conservation and public health, affordable housing and municipal leadership.

The project team used a "snowballing" approach to identify and connect with CBOs within the watershed. During initial interviews with community advocates, the project team asked for connections to other individuals and organizations doing interesting and related work in the watershed. They then contacted those entities for initial conversations and asked for more recommendations, thus building upon the existing local knowledge base and moving through networks at the speed of trust.

During and after these initial conversations, the project team regularly met with CBO representatives to assess their interest and capacity in playing an ongoing role in the project. Through this dialogue with local leaders, the team identified a need for, and supported, paid community advisors to assist with outreach, education and engagement in the community climate resilience data collection. These community advisors provided invaluable community expertise, opening channels of communication and partnership that previously were not available to the project team.

Community leader and partner engagement leads to more durable outcomes within urban conservation projects. The project team took time to foster relationships of trust between the Partnership and community leaders, that resulted in guiding recommendations and the identification of key community assets, which allow the conservation plan to build on existing work and local knowledge. The plan's depth of community voice is indicated by the more than 700 individual community-sourced datapoints included in the final planning tool.

The project team employed an exploratory methodology for data collection in order to facilitate an organic and authentic approach to community engagement that prioritized conservation and climate adaptation goals. The methodology described in Figure 3 allowed for a continually adaptive approach to incorporate community insight and priorities, transformed to spatial datapoints, which helped steer the mapping process toward a co-creation model of conservation priorities.

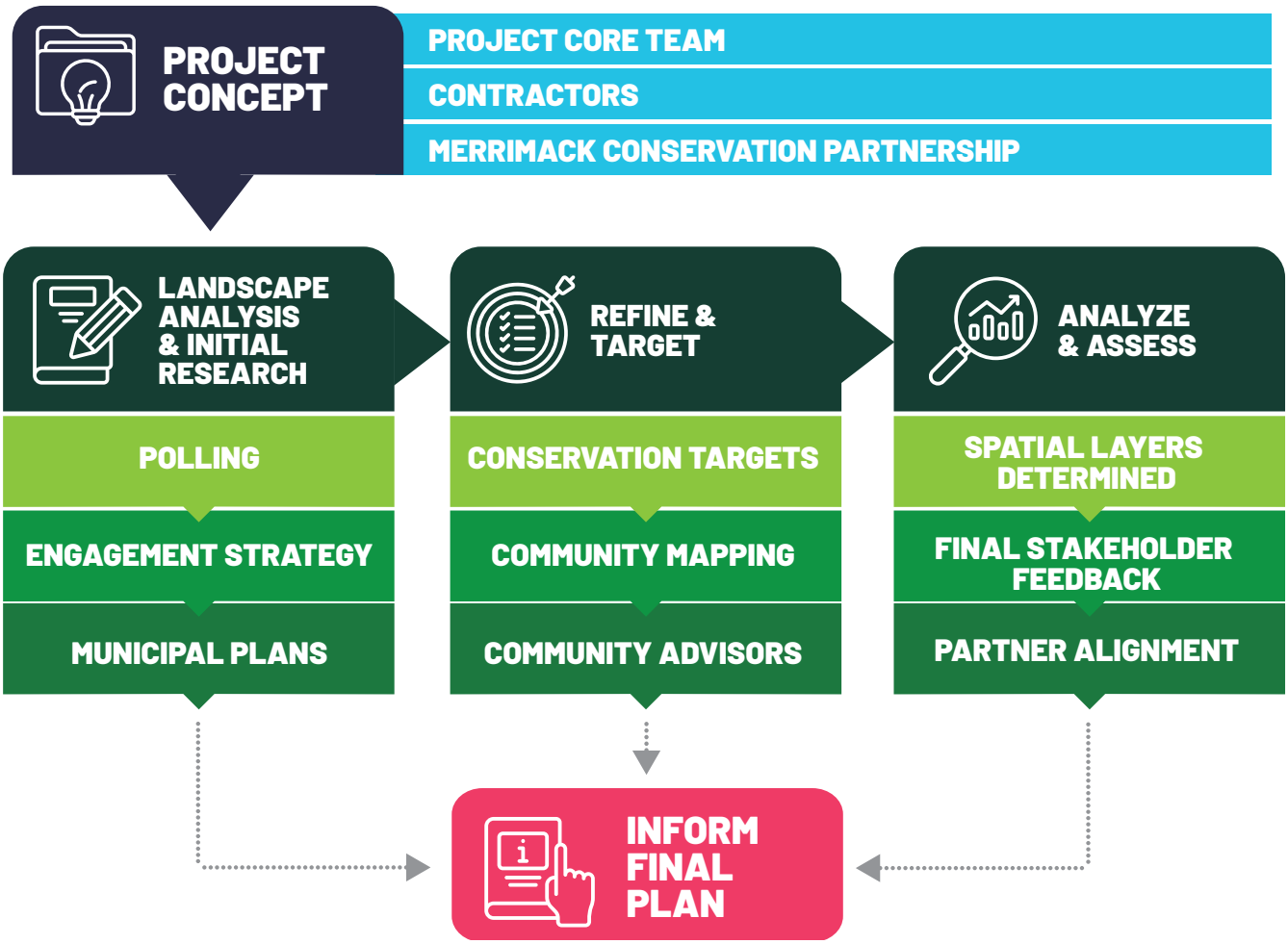


Figure 3: Utilizing an exploratory methodology allowed the project to not only integrate community and partner feedback but iterate the data collection approach based on community need and priorities- making this a truly collaborative research approach.

THE COMMUNITY ADVISOR MODEL

The approach to engagement with community members relied on relationships with local leaders and advocates to tailor custom approaches for each focal community.

In New Hampshire, the project team collaborated primarily with Granite State Organizing Project (GSOP), a faith-based, grassroots nonprofit organization with chapters in Manchester and Nashua, NH that focuses on strengthening communities to effect change. GSOP was selected as an effective partner given its alignment with the project's geographical and community-led approach. GSOP helped identify and support two community advisors in Manchester and one in Nashua, all of whom represent different communities and perspectives.

In Massachusetts, the team worked with a range of nonprofit partners and messengers to connect with Lowell and Lawrence communities. Staff from these organizations advised on project priorities and data, supported tabling and outreach opportunities, co-hosted or cross-promoted community mapping dinners in winter 2025, provided valuable feedback on the plan and approach and directly engaged with residents during their other programming. These organizations included:

- Lowell Parks & Conservation Trust: a local land trust "working to improve the quality of life for the people of Lowell through education and conservation of parks." Lowell Parks and Conservation Trust is a long-time member of the Partnership.

- Mill City Grows: a food justice organization rooted in Lowell that creates gardens, markets and educational opportunities for all Lowell residents.
- The Merrimack Valley Project: a coalition of community organizers working in Lowell, Lawrence and surrounding cities to "unite and organize faith, labor and community leaders & organizations towards social, racial and economic justice."
- Groundwork Lawrence: a nonprofit that builds community-based partnerships to empower people, businesses and organizations to promote environmental, economic and social well-being. The project team was able to build off an existing relationship with Groundwork Lawrence.

Each community advisor relationship was tailored to meet the needs and goals of each party and ranged from short-term or one-off collaborations to longstanding collaborative relationships. The project team provided compensation through ongoing partnership agreements for longer-term relationships and those that required the partner to contribute significant time or other resources. Community advisors played a critical role in creating a plan that reflects community realities and provided critical context about ongoing work, challenges and dynamics in their community. A broader subset of residents were more likely to attend an event co-hosted and shaped by these known entities than by the lesser-known Merrimack Conservation Partnership or TNC.

Figure 4: Connecting with and learning from residents in each community at fairs and festivals during summer 2024. (Photo credits, clockwise from top left: Emma Gildesgame/TNC, Meredith Hatfield/TNC, Emma Gildesgame/TNC, Anna Ormiston/TNC)

Inclusive Community Engagement Practices

Throughout the project, the project team endeavored to implement several practices to welcome all community members and encourage a wide range of participation and input. These practices included several tactics and considerations, such as:

- Work with existing organizations, structures and opportunities to host mapping sessions and other project engagements during a partner group's regularly scheduled meeting. This included evening and weekend work to meet community members when they were available.
- Offer a meal and childcare for any in-person sessions that were longer than an hour, particularly when they took place after work hours.
- Compensate community members for their time by providing generic gift cards for in-depth work that required time and effort, such as the community mapping sessions. This helped offset opportunity costs incurred in participation (such as needing to take unpaid leave from a job or transportation costs) and emphasized the value of community members' time, lived experiences and knowledge.
- When hosting meetings and events, select a venue that meets ADA accessibility standards and proactively ask participants if they require language interpretation or any other accommodations to allow all participants the chance to share their knowledge. When organizing events, be sure to budget in advance for these services.
- When promoting events, advertise in many different venues and platforms such as email, community calendars, posted flyers and partner organization newsletters. For different communities, the project team shared information on WhatsApp group chats, through school newsletters and apps and other means as recommended by community advisors. Offer multiple ways to RSVP, such as an email address, QR code and a phone number.
- If possible, offer a variety of formats to share information- a slideshow coupled with printouts (in multiple languages) so people can readily absorb the information.
- Always offer a "call to action" of the audience such as a post-event survey or request to sign up for the next event or a newsletter.
- When asking community members for their participation, feedback and involvement, it is essential to craft a feedback loop in your outreach. This can look like follow-up emails, presentations or a regular correspondence on project milestones like a newsletter.

Investing in relationship building with local organizations, community leaders and local government representatives early in the data collection process is an essential component of building trusting, mutually beneficial relationships. It is through these relationships that conservation professionals can help create conditions for all community members' experiences and expertise to be integrated into a truly representative plan. Durable conservation outcomes only occur through careful and sustained community dialogue; these experiences help inform and reinforce future projects and initiatives.

Photo credits: From left, Loren Dowd/TNC, Photo credit: Emma Gildesgame/TNC, Crystal Paradis-Catanzaro/TNC

Polling

As a first step in data collection, the team conducted watershed-wide polling to assess residents' perceptions of water quality in the river and the watershed, to learn more about where community members get information and what sources they trust and to assess their understanding of how to address environmental and climate concerns at the local, state and federal levels of government.

Polling aimed to collect perspectives of people who were not already engaged in environmental or conservation organizations or decision making within the focal communities. Professional research teams New Bridge Strategy and FM3 Research conducted a telephone and online survey among 400 low- and middle-income residents[3] in Lawrence and Lowell, MA and Manchester and Nashua, NH, from April 13-26, 2023.

Findings identified a wide range of concerns in the area, including cost of living, crime and gangs and the quality of public schools. However, when asked specifically about the effects of climate change, **over six-in-ten residents (65 percent) reported personally experiencing the effects of climate change;** more than 7-in-10 said that they had been personally impacted by flooding or extreme heat. (Refer to Appendix 2: Polling Findings and Data for full polling results and analysis). Other findings include:

- Rivers are important cultural and social elements of each of the four communities, with more than half of residents visiting local rivers at least once a month. Eighty-two percent of residents described the rivers as fairly or very "important to my city;" 74 percent described the rivers as fairly or very "important to me personally."
- One in three residents polled said that extreme heat in their city had gotten worse over the last 5-10 years. In all four communities, residents with the lowest incomes were more likely to say that there were too few outdoor places to cool off during the hottest summer days. Residents of color were more likely to have experienced negative impacts of flood and extreme heat.
- When asked open-ended questions about recommendations to improve local rivers and the natural areas around them, residents frequently mentioned the need for more cleaning and maintenance of these areas.
- Scientists, local teachers and local environmental organizations were the most trusted messengers about issues relating to local rivers and natural areas.

Participation in Community Events

The project team participated in existing community events at the request of community partners to build trust, increase project visibility and learn from residents in the focal communities. Many of these events served constituencies that did not regularly engage in conservation planning, thus familiarizing new audiences with the project and approach. The project team, with input from CBOs and other partners, developed a way to solicit feedback from the community in an informal setting (such as a community festival table or during pre-existing community meetings), which allowed residents to share their experiences in a variety of ways (Figure 4).

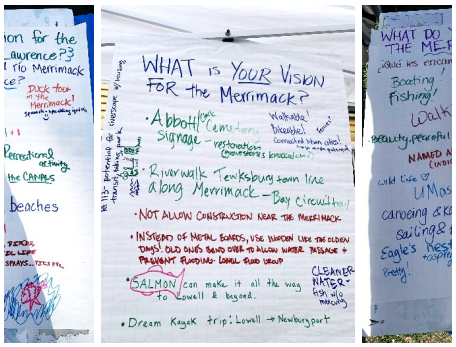
Gaining community information during these sessions employed a two-pronged approach: thematic maps which gathered specific information from residents about their neighborhoods and interactive and dynamic exhibits that drew attention and inspired curiosity about the watershed. As these were the first initial public engagements, the project team used a mix of targeted questions ("*where do you see flooding?*") and open-ended questions ("*what is YOUR vision for the Merrimack River?*") that achieved two goals:

1. Create a baseline understanding of the three community climate resilience themes across all four focal cities
2. Crowdsource ideas, themes and concepts to further investigate within the plan.

3 Income requirements varied by city based on cost of living and other factors. Lawrence - Under $50,000; Lowell - Under $70,000; Manchester - Under $80,000; Nashua - Under $90,000

The interactive exhibit was an EnviroScape watershed model, which helps people explore the connections between actions on land and impacts on water quality (see Figure 5). This model, which uses food coloring and sanding sugar to represent nonpoint source pollution and sponges to represent nature-based solutions to reduce flooding and pollution.

Figure 5: Project co-lead Anna Ormiston talks with a Lowell resident about watersheds using the EnviroScape watershed model. Photo credit: Emma Gildesgame/TNC



The project team gathered input on three types of environmental conditions using large format maps, which showed flood risk, heat severity and green spaces within each focal city. Community members then used stickers to indicate where they had experiences of flooding or extreme heat and places where they wish there were more or improved green spaces within their community. They also added additional open-ended comments with ideas, notes and concerns about the topics using flip charts (see selected flip charts in Figure 6 and refer to Appendix 3a: Input from Community Events to see more information gathered at community events.)

Figure 6: Open-ended responses to questions about people's perceptions of and relationship to the Merrimack River during tabling events in 2024. Photo credit: Emma Gildesgame/TNC

Community event participation increased overall visibility of the project and helped engage residents with the roles climate resilience and water quality play in their day-to-day lives. Event tabling also provided a critical opportunity to advertise future engagement events to a wider audience, such as community mapping sessions, thus ensuring more participation. Ultimately the project team participated in seven community events and fairs, reaching over 380 individuals in the focal communities.

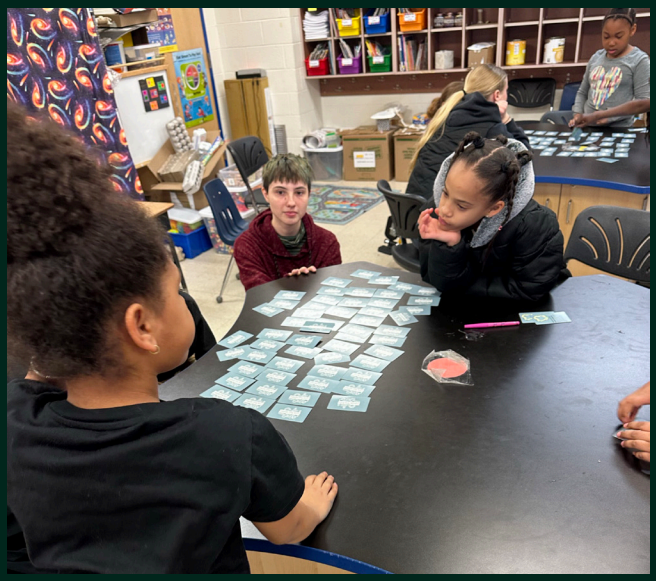
Gaining Youth Perspectives in Conservation Planning

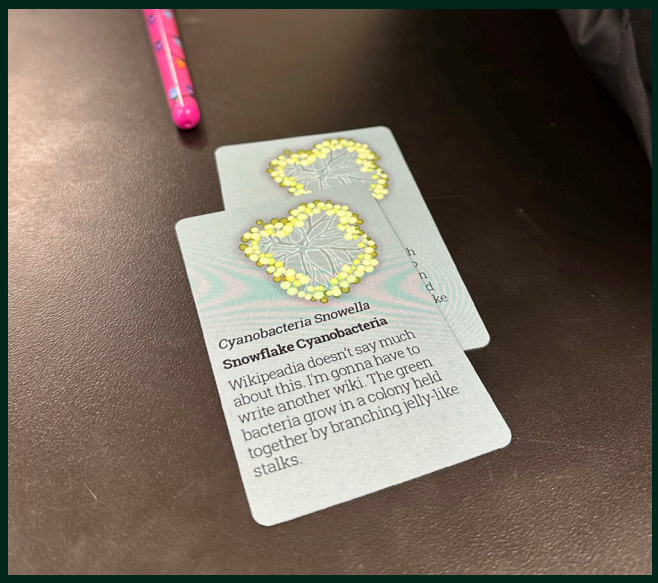
by Megan LaTour, TNC

Throughout the community partnership process, the project team regularly heard from partners about the need to involve youth in meaningful conservation planning. A series of key partner conversations ultimately led to the development of a novel data collection and education project with relationship-based learning organization Unchartered Tutoring, founded by Amber Nicole Cannan. Her vision—to empower students as scientists and stewards of their communities—has shaped a program that brought watershed science to 60 students across four Title 1 schools in Manchester and Nashua and allowed 3rd-5th graders the opportunity to share their community climate resilience experiences and perspectives via map-making (Appendix 3d: Unchartered Tutoring - Youth Conservation Maps).

Through an eight-week afterschool series, students engaged in hands-on environmental science, including water filtration experiments, moss microscopy and maybe most notably, mapping exercises that connected their experiences to broader conservation goals. Students identified and recorded flooding zones and tree locations in their own neighborhoods. This data was then incorporated into the plan, ensuring that youth perspectives and community voices were meaningfully represented in shaping the future of their neighborhoods.

The program's success is evident not only in the data collected, but in the students' transformation—from curious observers to confident community scientists. The chance to contribute to the plan was the opportunity that the team at Unchartered Tutoring needed to enhance environmental science education in their existing curriculum while providing meaningful opportunities for some of the communities' youngest residents and their families to identify conservation priorities.





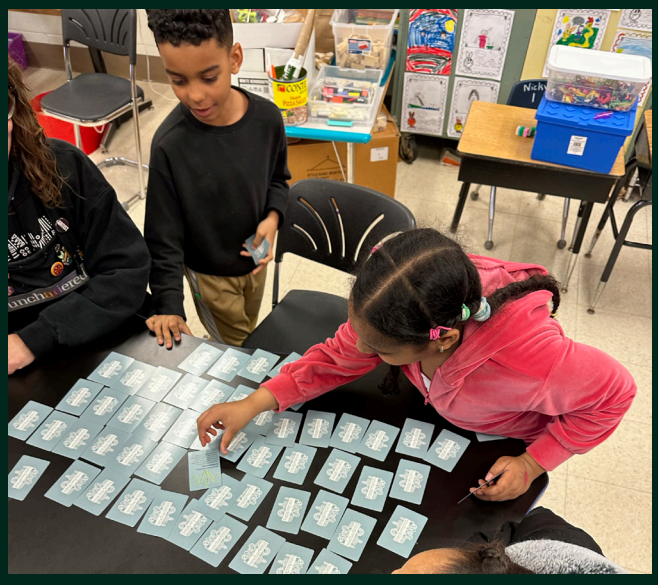


Photo credits: Ally Snell/TNC

Community Mapping

After collecting key climate adaptation insights from community members at community events, public meetings and festivals, the project team and community advisors co-organized a series of community mapping events in each focal city. The mapping events were developed to allow community members to think more deeply about their perceptions and experiences with community climate resilience in their communities. A custom community mapping tool (Appendix 3c: Community Mapping Methods & Facilitators Guide) was informed by several existing tools and frameworks from Asset Based Community Development[4] frameworks, Participatory Action Research[5] principles and Design Thinking[6].

To ensure that the data collected during the community mapping events matched the same questions posed to community members during the tabling events, the project team focused on three key topics to be explored in the workshop:

1. Experiences with flooding and ranking the severity/regularity of the flooding.
2. Observations of areas with or without tree coverage (as a proxy for areas of high heat) and the rate of tree coverage from minimal to high.
3. Awareness of green spaces (parks, forests, trails, community gardens, playgrounds) based upon past visitation and the condition of these green spaces (poor to excellent).

All questions were formulated to encourage participants to draw upon their own perceptions and experiences with these topics. Participants were asked to place color-coded dots on maps for each topic and were then provided worksheets to link the dot to more information including location details, qualitative information and any other notes/commentary. To make the activity accessible to all community members, the mapping and worksheets were done on paper and later digitized and transcribed into GIS data forming the basis of the community climate resilience layer in the plan. The workshops were intentionally done in this analog manner based on guidance from community advisors to address varying levels of fluency and familiarity with digital technology, particularly spatial tools. Transcribing this information added additional time to the data processing but made the in-person events significantly more engaging and accessible. Ultimately this methodology yielded over 700 individual community-submitted data points within the watershed. The analysis of this layer included ranked severity of the climate topics experienced and the frequency an issue or location was mentioned. Further information on the Community Climate Resilience theme is provided in the Spatial Analysis Results, and data processing methods are detailed in Appendix 4: Spatial Methodology.

Throughout the fall and winter of 2024-2025, the project team conducted six community mapping workshops in the four focal cities, with over 250 participants. This included one modified mapping workshop delivered to over 70 high school students at Manchester West High School as part of their Career Day event. Participants in mapping events represented a cross-section of neighborhoods, experiences, demographics and socio-economic statuses. In all four communities, the mapping exercises were simultaneously conducted in several languages, representing large communities speaking English, Spanish, Swahili, French, Vietnamese and American Sign Language. Refer to Appendix 3a: Input from Community Events for highlights from these sessions.

The Community Advisors in both states were instrumental in helping forge relationships with neighborhood groups and local families thus greatly increasing interest in the project and turnout at the mapping workshops. The logistics of the events were shaped, promoted and implemented through guidance provided by the community advisors. The collaboration with community advisors led to high levels of participation from a wide range of community members and largely successful and engaging events.

4 https://abcdinstitute.org/

5 Kindon, S., Pain, R. & Kesby, M. Participatory Action Research Approaches and Methods: Connecting People, Participation and Place (Routledge, 2007

6 https://dschool.stanford.edu/innovate/tools/get-started-with-design

Photo Credit: Meredith Hatfield/TNC

SPATIAL ANALYSIS RESULTS

The spatial analysis presented here reflects input from Merrimack Conservation Partnership members and the broader community. It is organized around four key themes: community climate resilience, wildlife habitat and connectivity, working lands and water resources. Each theme identifies priority areas for conservation and restoration projects that address specific ecological and social needs. When considered together, these themes reveal locations where projects can deliver multiple benefits for both nature and people. *For details on the spatial methodology used in this analysis, please see Appendix 4: Spatial Methodology. To access the data through the interactive web viewer, please visit: www.nature.org/merrimack*

MERRIMACK CONSERVATION PARTNERSHIP SERVICE AREA

Figure 7 illustrates the Merrimack Conservation Partnership Service Area (The MCP Service Area), which spans the lower portion of the Hydrologic Unit Code (HUC 4 Merrimack Watershed). This area follows the Merrimack River mainstem from Franklin, New Hampshire, to its outlet at the Gulf of Maine in Newburyport, Massachusetts. The Partnership's focus on the lower Merrimack complements work by other regional partnerships in the upper watershed, helping ensure that conservation and resilience efforts are distributed across the entire basin. The MCP Service Area encompasses a distinct rural-to-urban gradient, reflecting diverse land use and development patterns. To capture this variation, analyses incorporated U.S. Census-defined Urban Areas[7], referred to throughout this report as the MCP Urban Area. Understanding this gradient is critical because more developed areas present unique challenges and opportunities for climate resilience. These locations often combine infrastructure vulnerabilities with potential for nature-based solutions, making them priority areas for strategies that help communities adapt to climate change.

7 Federal Geographic Data Committee. "Urban Areas." GIS data, ArcGIS Hub, Year. https://gisnation-sdi.hub.arcgis.com/datasets/fedmaps::urban-areas/explore. Accessed January 2025.

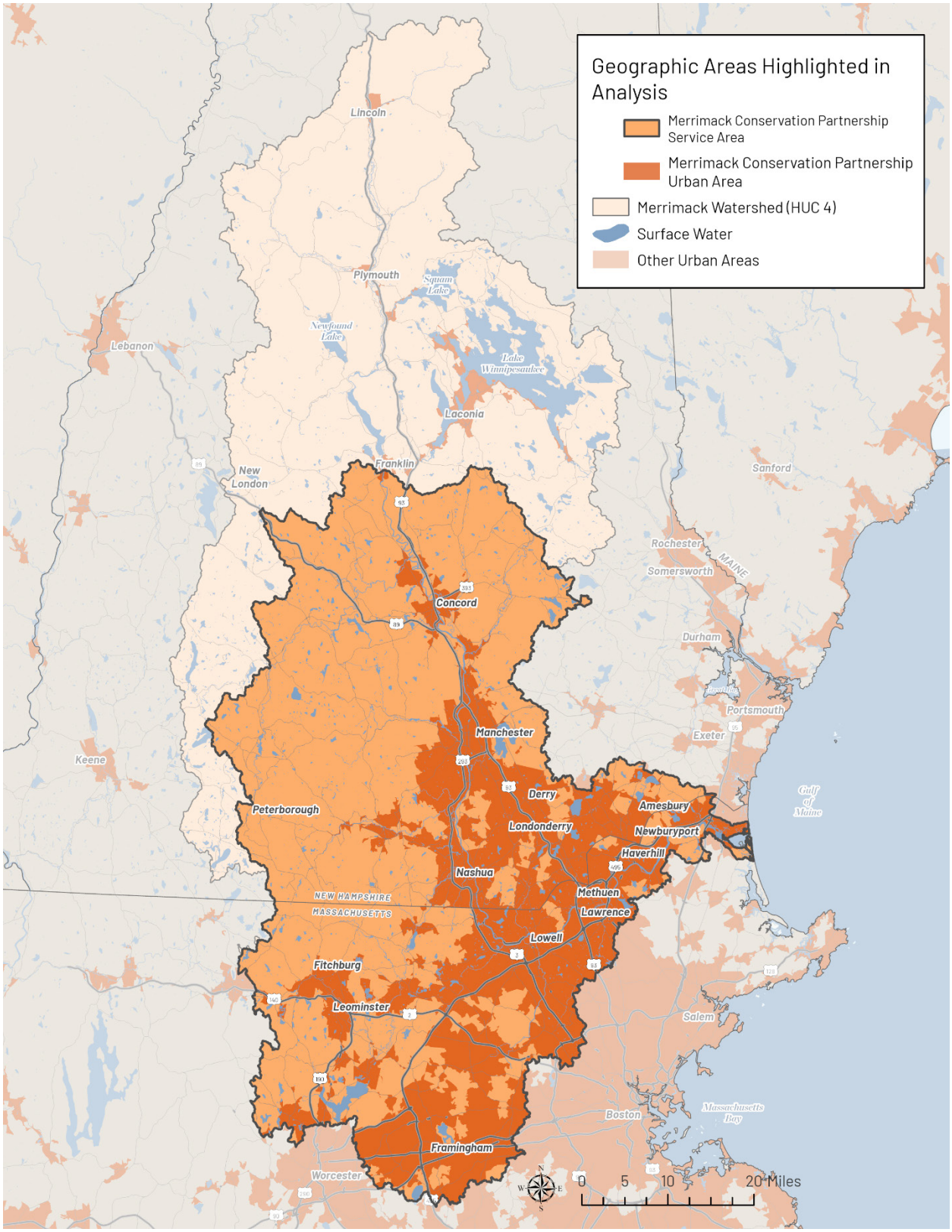


Figure 7: This map illustrates the MCP Urban Area (dark orange) and MCP Service Area (orange) in relation to each other and the entire HUC 4 Merrimack Watershed (light orange). Other urban areas are depicted on the map for reference. Map credit: Anna Ormiston/TNC

WILDLIFE HABITAT AND CONNECTIVITY

The Wildlife Habitat and Connectivity theme highlights priority areas for conservation action, focusing on the protection and restoration of priority habitat blocks, resilient landscapes and wildlife corridors. By synthesizing geospatial data on prime habitat, wildlife corridors and landscape resilience and connectivity, the results pinpoint focus areas where targeted interventions can most effectively support biodiversity and ecosystem resilience. These insights are intended to guide practitioners in making informed decisions about where to concentrate conservation resources to maximize ecological outcomes and long-term landscape functionality.

Figure 8 shows the total area designated for Wildlife Habitat and Connectivity within Merrimack Conservation Partnership's Service Area (MCP Service Area). Table 1 further delineates how much of this area overlaps with existing conservation lands, areas at low risk of conversion (such as surface waters and the wettest wetlands) and areas considered vulnerable to conversion. The total area of Wildlife Habitat and Connectivity focus areas account for 49 percent of the MCP Service Area (Figure 7 and Table 1). Of that 49 percent, 31 percent are conserved (GAP 1-3 and State Board and State Trust Lands). Of the remaining 69 percent of the Wildlife Habitat and Connectivity focus areas, approximately four percent are water resource types considered at low risk of conversion from a natural condition to a developed condition. Sixty-five percent of the Wildlife Habitat and Connectivity focus areas are vulnerable (Table 1).

Twenty-three percent of the Wildlife Habitat and Connectivity focus areas are within the census-defined urban areas (MCP urban area) of the Merrimack Conservation Partnership's service area (Table 1). While 23 percent of the focus areas within the census defined urban areas are protected, 68 percent of those urban focus areas are vulnerable to development with eight percent being undevelopable. Using updated input datasets that emphasize wildlife corridors and large habitat blocks within the more developed portions of the Merrimack Conservation Partnership service area, the plan identified a critical opportunity to enhance landscape connectivity. Specifically, there is potential to protect pathways for wildlife movement across developed areas, linking them to larger, intact habitat blocks beyond the more densely developed areas. Figure 9 provides a visual representation of these focus areas within the MCP Urban Area and their relationship to the Merrimack River mainstem and adjacent high-quality habitat corridors.

The four focal communities can help maintain wildlife corridors, particularly along the Merrimack and Nashua Rivers.

As described in Table 2, the four focal communities—Manchester, Nashua, Lowell and Lawrence—play a critical role in maintaining wildlife corridors, particularly along the Merrimack and Nashua Rivers. Wildlife Habitat and Connectivity Focus Areas within these cities represent a small proportion of the MCP Urban Area (Manchester: three percent, Nashua: two percent, Lowell: one percent, Lawrence: 0.3 percent), yet they contain essential linkages between large habitat blocks. Table 2 also illustrates variation in conservation status: Manchester and Nashua have the highest acreage of protected lands (26 percent and 34 percent, respectively). Vulnerability remains significant across all cities, with 57 percent of Manchester's focus areas and 55 percent of Nashua's classified as vulnerable, compared to 37 percent in Lowell and 43 percent in Lawrence. Targeted conservation in these vulnerable areas would strengthen regional connectivity and link large priority blocks across the region.

Figure 10 depicts how the focal communities serve as critical linkages between urban wildlife corridors and larger habitat blocks in the MCP Service Area. Table 2 details that about three percent of Wildlife Habitat and Connectivity Focus Areas lie within Manchester, NH, which includes a critical corridor along the Merrimack River linking habitat blocks in and around the city. In Nashua, NH, over 2,500 acres of Wildlife Habitat and Connectivity Focus Areas—representing 55 percent of the city's total—are vulnerable to conversion. Priority wildlife corridors identified by the New Hampshire Fish and Game's 2021[8] analysis traverse Nashua, linking large forest blocks to the southwest, north and beyond. While Mine Falls Park secures a core segment of this network, opportunities remain to conserve or actively manage adjacent corridors that sustain ecological connectivity. In Lowell and Lawrence, MA, a significant habitat block along the Merrimack River presents restoration potential to reinforce regional connectivity.

8 New Hampshire Fish and Game Department. "New Hampshire Wildlife Corridors." GIS data, ArcGIS Online, Year. https://nhfg.maps.arcgis.com/home/item.html?id=3215a291a4db409c8a0fc2436fc3b8b2. Accessed August 2024.

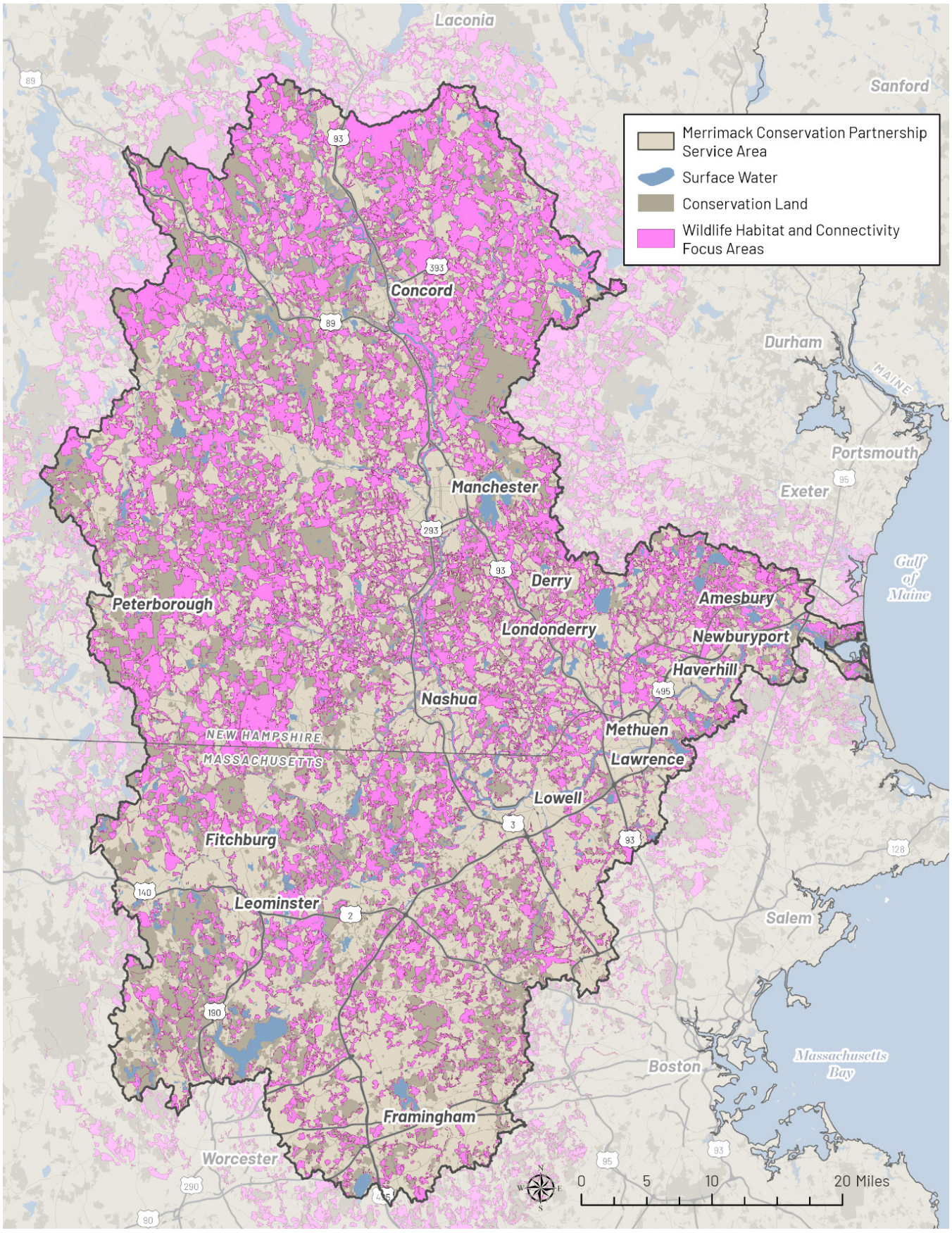


Figure 8: Wildlife Habitat and Connectivity Focus Areas (pink). Map credit: Anna Ormiston/TNC

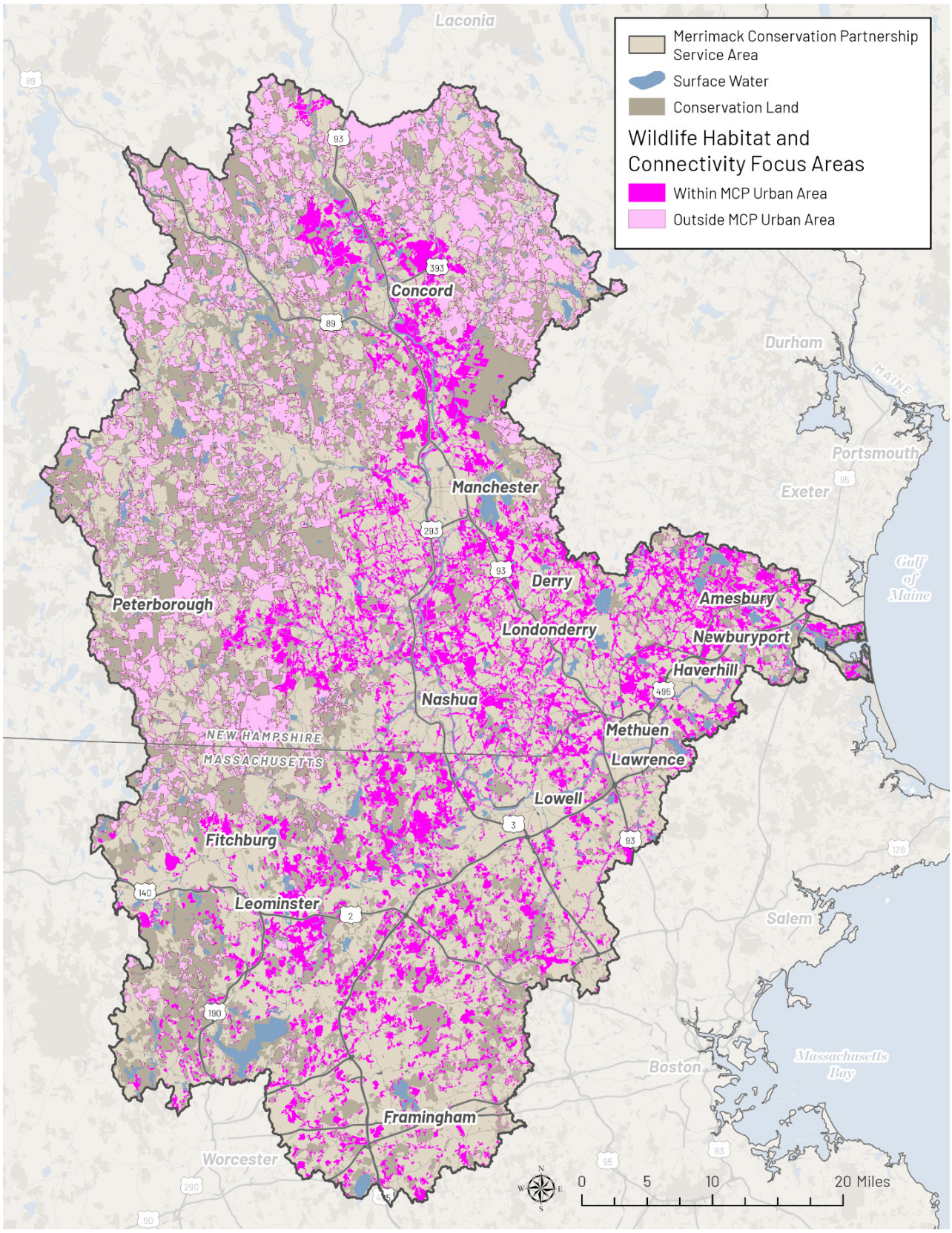


Figure 9: Map depicting Wildlife Habitat and Connectivity focus areas classified by spatial relationship to the MCP Urban Area: areas within the urban boundary (bright pink) and areas outside the boundary (light pink). The urban area exhibits a corridor network structure that underscores its critical role in facilitating wildlife movement and maintaining ecological connectivity. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Figure 10: Map depicting the spatial extent of Wildlife Habitat and Connectivity Focus Areas (pink) within the focal communities. Map credit: Anna Ormiston/TNC

Table 1: Conservation and vulnerability status of Wildlife Habitat and Connectivity focus areas within the MCP Service Area and MCP Urban Area. Percentages indicate the proportion of each category relative to the total focus area, highlighting the extent of protected, undevelopable and vulnerable focus areas.

Conservation and Vulnerability Status of Wildlife Habitat & Connectivity Focus Areas		
Conservation and Vulnerability Status	**MCP Service Area** *Acres (percent)*	**MCP Urban Area** *Acres (percent)*
Already Protected Focus Areas *(GAP 1–3; State Board Lands and State Trust Lands)*	281,895 (31%)	49,655 (23%)
Undevelopable Land within Focus Areas *(not protected)**	43,350 (4%)	18,118 (8%)
Vulnerable Focus Areas	593,961 (65%)	145,936 (68%)
Total Wildlife Habitat and Connectivity Focus Areas	**919,206 (49% of total MCP service area)**	**213,709 (23% of total Wildlife Habitat Focus area)**

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*

Table 2: Conservation and vulnerability status of wildlife habitat and connectivity focus areas within the project's four focal cities of the MCP Urban Area. Percentages indicate the proportion of each category within city-specific focus areas, showing the extent of protected, undevelopable and vulnerable focus areas.

Conservation and Vulnerability Status of Wildlife Habitat & Connectivity Focus Areas within Focal Cities				
Conservation and Vulnerability Status	**Manchester** *Acres (percent)*	**Nashua** *Acres (percent)*	**Lowell** *Acres (percent)*	**Lawrence** *Acres (percent)*
Already Protected Focus Areas *(GAP 1–3; State Board Lands and State Trust Lands)*	1,573 (26%)	1,537 (34%)	369 (28%)	131 (20%)
Undevelopable Land within Focus Areas *(not protected)**	1,032 (17%)	534 (11%)	461 (35%)	234 (37%)
Vulnerable Focus Areas	3,478 (57%)	2,512 (55%)	497 (37%)	271 (43%)
Total Wildlife Habitat and Connectivity Focus Areas *(Percentages here are of the total MCP Urban Area)*	**6,083 (3%)**	**4,583 (2%)**	**1,327 (1%)**	**636 (0.3%)**

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*

WORKING LANDS

The Working Lands theme identifies agricultural and forestry landscapes that hold high conservation value based on factors such as soil quality and land cover. These areas represent opportunities to integrate conservation goals with ongoing land use to support biodiversity and ecosystem services while sustaining rural livelihoods. Additionally, agricultural resources within more developed areas of the watershed are important for supporting local food sovereignty, reinforcing the need to protect and manage these lands thoughtfully. To support targeted decision-making, the theme is divided into two sub-themes: **Priority Agricultural Resources** and **Priority Forestry Lands**. This structure helps practitioners determine where to concentrate resources and implement projects that balance production with ecological resilience.

PRIORITY AGRICULTURAL RESOURCES

The Priority Agricultural Resources sub-theme highlights agricultural landscapes with regionally high conservation value, identified based on their productivity, versatility and resiliency within the MCP Service Area (Figure 11). These areas represent the most suitable lands for sustaining agricultural production while supporting ecological functions, making them critical for long-term food security and landscape health. Additionally, agricultural resources within more developed areas of the watershed play an important role in supporting local food sovereignty, reinforcing the need to protect and manage these lands thoughtfully. By pinpointing these priority areas, the analysis provides guidance for conservation practitioners to focus efforts where agricultural viability and ecological benefits intersect, ensuring that working lands remain productive and resilient in the face of changing environmental conditions.

Table 3 summarizes the total area of priority agricultural resources and breaks it down by the percentage that overlaps with existing conservation lands, low-risk conversion features (such as surface waters and the wettest wetlands) and areas vulnerable to conversion. Priority Agricultural Resources account for five percent of the Merrimack Conservation Partnership's service area. Twenty-one percent of the Priority Agricultural Resource areas are conserved (GAP 1-3 and State Board and State Trust Lands). Of the remaining 79 percent of Priority Agricultural resources, one percent consists of water resources considered at low risk of conversion. The vast majority—about 78 percent—is vulnerable to development.

Figure 12 illustrates the results of a Hot Spot Analysis, which identified statistically significant clusters of high-acreage areas designated as priority agricultural resources within the MCP service area. These Hot Spots highlight areas where large, contiguous tracts of farmland are concentrated, offering strategic opportunities for land protection and ecological restoration to strengthen watershed health and agricultural resilience. Table 4 summarizes the acreage of vulnerable priority agricultural resources within each Hot Spot confidence level. The analysis reveals that 6,627 acres (ten percent) fall within 99 percent confidence Hot Spots, representing the most statistically robust clusters. These areas should be prioritized for conservation planning, restoration investment and flood mitigation due to their potential for significant landscape-scale impact. An additional 2,132 acres (three percent) and 2,173 acres (three percent) fall within the 95 percent and 90 percent confidence levels, respectively. These areas show strong to moderate clustering and may support targeted conservation actions, particularly where they align with ecological or community goals. The remaining 56,771 acres (84 percent) are not statistically significant, indicating a more dispersed pattern of priority agricultural resources. While these areas may still support productive farmland and site-specific conservation, they are less likely to contribute to watershed-scale restoration based on spatial clustering alone. These findings help quantify the extent of high-priority agricultural lands and support strategic decision-making for land protection, ecological restoration and efforts to enhance watershed health and agricultural resilience.

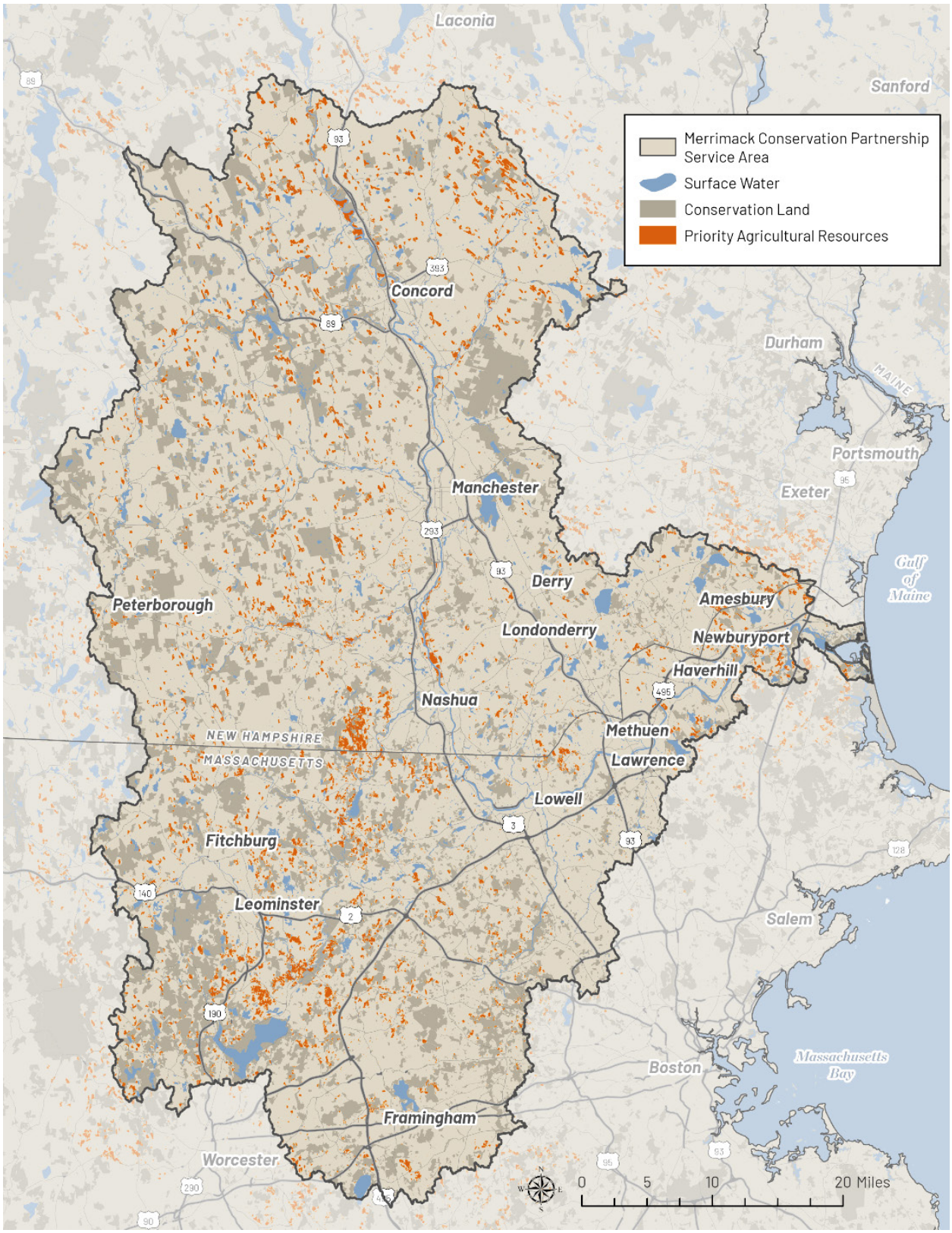


Figure 11: Priority agricultural resource areas within the MCP Service Area. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Table 3: Conservation and vulnerability status of priority agricultural resources within the MCP service area. Most priority agricultural resources (78 percent) remain unprotected, alongside smaller areas that are protected or undevelopable.

Conservation & Vulnerability Status of Priority Agricultural Resources within the MCP Service Area	
Conservation and Vulnerability Status	**MCP Service Area** *Acres (percent)*
Already Protected Priority Agricultural Resources *(GAP 1–3; State Board Lands and State Trust Lands)*	18,183 (21%)
Undevelopable Land within Focus Areas *(not protected)*	591 (1%)
Vulnerable Priority Agricultural Resources	67,703 (78%)
Total Priority Agricultural Resources (percentage of total MCP service area)	**86,476 (5%)**

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*

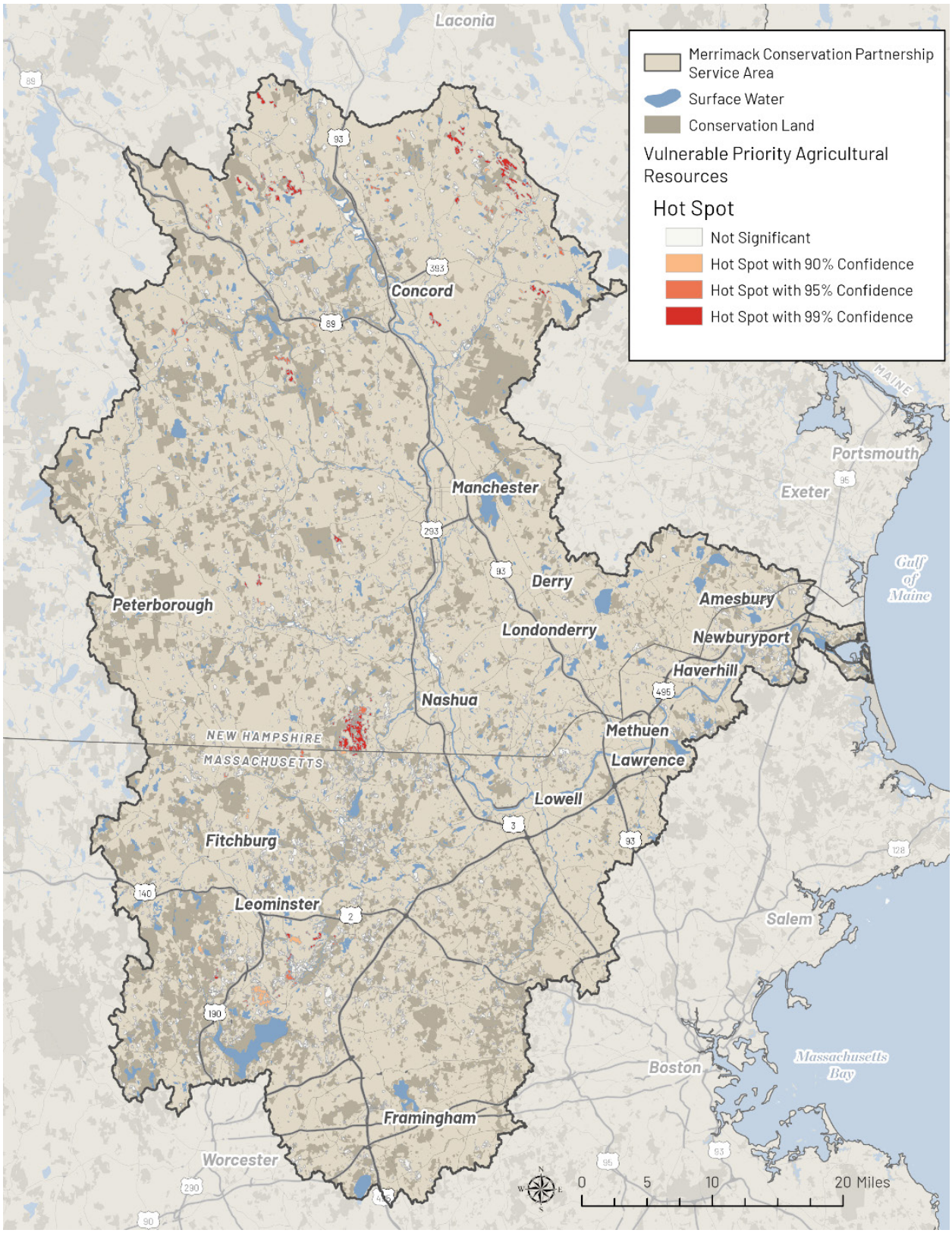


Figure 12: Hot Spot Analysis for priority agricultural resources. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Table 4: Hot Spot Analysis for priority agricultural resources identified statistically significant clusters of high-acreage priority agricultural resources within the MCP service area, highlighting strategic opportunities for land protection and restoration, with the most robust clusters (10 percent) prioritized for landscape-scale impact and additional areas supporting targeted conservation aligned with ecological and community goals.

Priority Agricultural Resources Hot Spot Analysis		
Confidence Level	**Total Acreage**	**Percent of Total Vulnerable Priority Agricultural Resources**
99%	6,627	10%
95%	2,132	3%
90%	2,173	3%
Not Significant	56,771	84%

Priority Forestry Lands

The Priority Forestry Lands sub-theme identifies forested landscapes that are most suitable for sustainable timber production and long-term forest management. These priority lands represent areas that are larger forest blocks with prime forestry soils, where active management can maintain economic viability while supporting broader conservation goals. In addition to their role in providing timber resources, these forests deliver critical secondary benefits, including wildlife habitat, carbon storage and landscape resiliency. By highlighting areas with the greatest potential for both economic and ecological returns, the analysis helps practitioners prioritize management strategies that balance production with sustainability.

Figure 13 illustrates the distribution of Priority Forestry Lands, while Table 5 breaks down the total acreage by its overlap with existing conservation areas, low-risk conversion features (such as surface waters and the wettest wetlands) and areas vulnerable to conversion. The Priority Forestry Lands account for three percent of the MCP service area. Of that three percent, thirty-eight percent of the Priority Forestry Lands are protected (GAP 1-3 and State Board and State Trust Lands). Of the remaining 62 percent of Priority Forestry Lands, less than one percent is considered at low risk of conversion, while the vast majority—just over 61 percent—is vulnerable to development. Across the MCP service area, 81 percent of total priority forestry lands are located in New Hampshire and 19 percent in Massachusetts; notably, 90 percent of the vulnerable lands fall within New Hampshire, with the remaining 10 percent in Massachusetts.

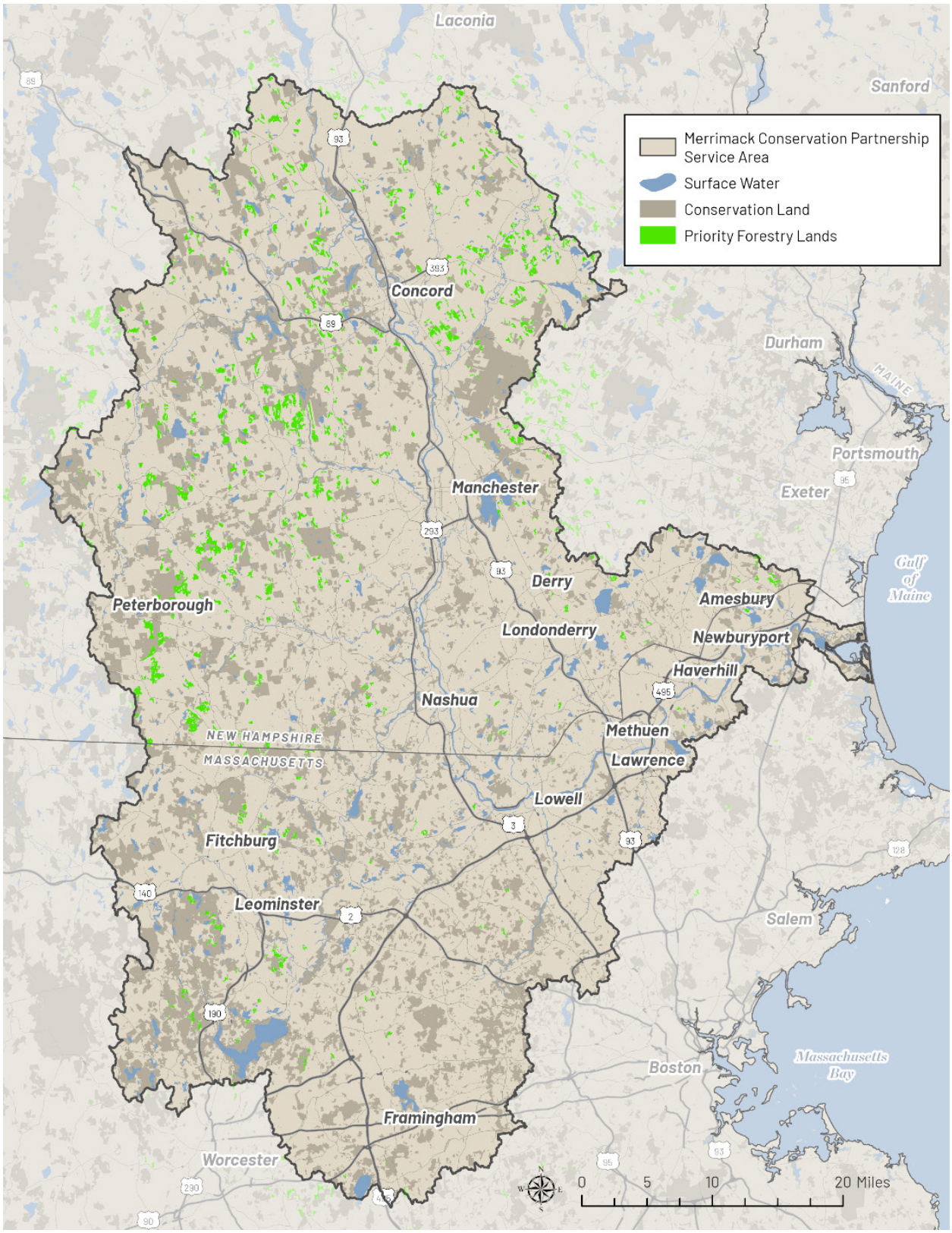


Figure 13 Priority forestry lands within the MCP Service Area. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Table 5: Conservation and vulnerability status of priority forestry lands within the MCP Service Area and by state. Percentages indicate the proportion of protected, undevelopable and vulnerable forestry lands, revealing that most priority forestry lands remain vulnerable—particularly in New Hampshire (69 percent) compared to higher protection levels in Massachusetts (31 percent),

Conservation & Vulnerability Status of Priority Forest Lands: MCP Service Area and by State			
Conservation and Vulnerability Status	**MCP Service Area** *Acres (percent)*	**New Hampshire** *Acres (percent)*	**Massachusetts** *Acres (percent)*
Already Protected Priority Forestry Lands *(GAP 1–3; State Board Lands and State Trust Lands)*	24,708 (38%)	16,097 (31%)	8,611 (69%)
Undevelopable Land within Priority Forestry Lands *(not protected)**	9 (0.01%)	8 (0.02%)	1 (0.01%)
Vulnerable Priority Forestry Lands	40,198 (61.99%)	36,348 (68.98%)	3,850 (30.99%)
Total Priority Forestry Lands (percentage of total MCP service area)	**64,915 (3%)**	**52,453 (81%)**	**12,462 (19%)**

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*

WATER RESOURCES

The Water Resources theme targets areas where land protection, restoration and renaturing[9] efforts can deliver the greatest benefits for water quality, wetland protection and the safeguarding of public water supplies. By integrating spatial data on hydrology, land cover and watershed conditions, the results identify areas where strategic interventions can reduce nutrient loading, enhance natural filtration and maintain ecological integrity. To guide conservation planning, the Water Resources theme is divided into three sub-themes: **Public Water Supply Areas**, **High-Potential Renaturing Opportunities** and **Pollutant Attenuation & Removal Areas**. This structure helps practitioners focus efforts where they can achieve the most significant improvements in water quality and watershed resilience based on their targeted solutions and goals.

Pollutant Attenuation and Removal Areas

The Pollutant Attenuation and Removal Areas sub-theme highlights areas within the watershed where natural systems provide the most effective pollutant removal and buffering services. Protecting and restoring these areas will protect and enhance the ability of these systems to remediate pollution into the future. Tier 1 identifies regions providing the greatest pollutant attenuation across the entire watershed, while Tier 2 represents a distribution of higher-functioning wetlands at a localized scale. The analysis draws on data from wetlands and land cover to pinpoint these critical areas, emphasizing the importance of preserving and enhancing natural processes that maintain water quality. These areas are essential for filtering pollutants, maintaining a healthy watershed and reducing nutrient and sediment loads.

Table 6 and Figure 14 show that 285,857 acres—representing fifteen percent of the MCP service area—are designated as Pollutant Attenuation and Removal Areas. Of these, thirty percent (86,813 acres) are protected, four percent (11,211 acres) are undevelopable and the majority—66 percent (187,833 acres)—are vulnerable to conversion. Prioritizing these vulnerable lands for conservation and restoration is essential to prevent increased pollutant loads in waterways.

9 **Renaturing** refers to the process of restoring natural functions and ecological integrity to developed or degraded landscapes through nature-based solutions—such as rain gardens, bioswales and riparian buffers—that improve water quality, enhance aquifer recharge and strengthen overall watershed resilience.

Expanding protections beyond the current thirty percent will help maintain ecological functions, safeguard clean water and reduce long-term restoration costs.

Figure 15 illustrates the conservation and vulnerability status of Pollutant Attenuation and Removal Areas across Tier 1 and Tier 2 areas. In Tier 1 areas, 35 percent (24,520 acres) are protected, 13 percent (8,834 acres) are undevelopable and 52 percent (36,099 acres) remain vulnerable to conversion. This combination of protected and undevelopable lands provides a moderate level of built-in water quality protection. Improving the connectivity of natural areas—such as linking wetlands, riparian buffers and forest patches—and restoring their ecological health in Tier 1 areas will help maintain natural water filtration processes, support wildlife movement and reduce fragmentation. These actions strengthen the watershed's integrity and resilience, making it better-able to withstand development pressures, flooding and nutrient pollution while continuing to provide clean water and ecosystem services. Tier 2 areas, by contrast, are primarily vulnerable: 70 percent (151,733 acres) remain unprotected, while only 29 percent (62,293 acres) are protected and one percent (2,377 acres) is undevelopable. Protecting these lands through conservation easements, zoning and strategic acquisition is critical to prevent water quality decline and avoid costly remediation. Restoration efforts—such as rehabilitating wetlands and riparian buffers—are important across both tiers to restore ecological functions in degraded areas. In short, prioritizing land protection in Tier 2 areas and implementing targeted restoration across both tiers is essential for sustaining clean water, reducing nutrient pollution and supporting long-term watershed health.

Table 6: Conservation and vulnerability status of pollutant attenuation and removal areas within the MCP Service Area. Percentages show the proportion of these areas that are protected, undevelopable, or vulnerable, with two-thirds (66%) remaining unprotected and at risk.

Conservation and Vulnerability Status of Pollutant Attenuation and Removal Areas within the MCP Service Area	
Conservation and Vulnerability Status	**Acres** *(percent)*
Already Protected Pollutant Attenuation and Removal Areas *(GAP 1–3; State Board Lands and State Trust Lands)*	86,813 (30%)
Undevelopable Land within Pollutant Attenuation and Removal Areas *(not protected)*	11,211 (4%)
Vulnerable Pollutant Attenuation and Removal Areas	187,833 (66%)
Total Pollutant Attenuation and Removal Areas (Percentage of MCP Service Area)	**285,857 (15%)**
**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*	

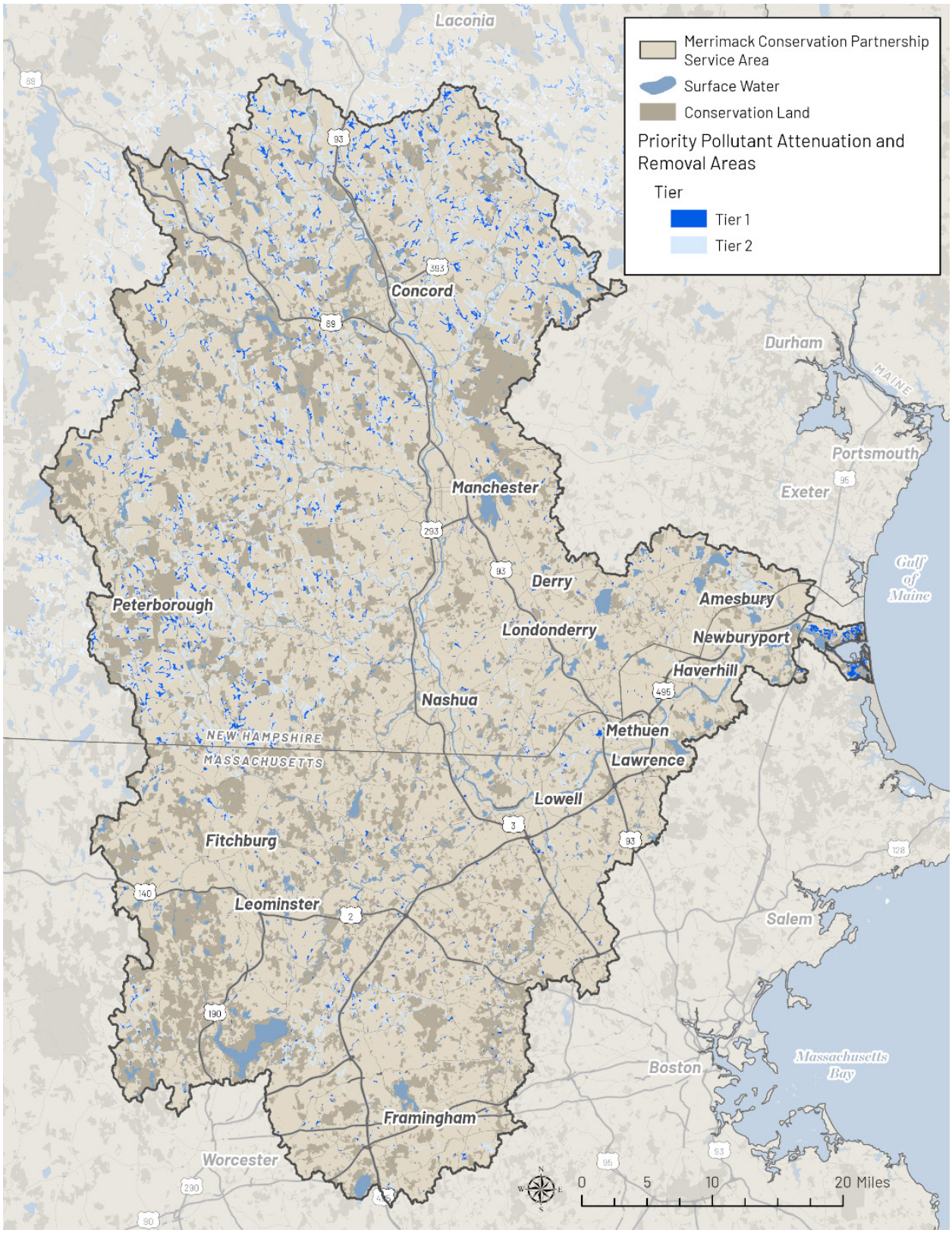


Figure 14: Priority pollution attenuation and removal areas. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack

Map credit: Anna Ormiston/TNC

Pollutant Attenuation and Removal Areas by Tier: Conservation and Vulnerability Status

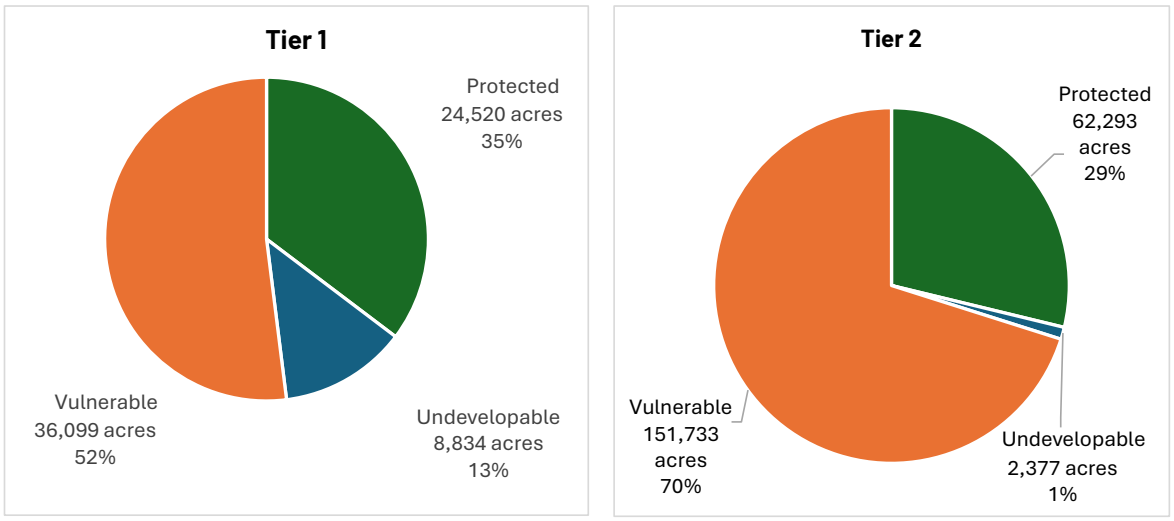


Figure 15: Pollutant Attenuation and Removal Areas by Tier: Conservation and Vulnerability Status. The distribution of land areas within Tier 1 and Tier 2 priorities by conservation status and vulnerability is as follows: Tier 1 comprises 35 percent protected (24,320 acres), 52 percent vulnerable (36,086 acres) and 13 percent undevelopable (8,643 acres). Tier 2 comprises 23 percent protected (8,228 acres), 70 percent vulnerable (25,733 acres) and 7 percent undevelopable (2,577 acres).

High Potential Areas for Renaturing

The High Potential Areas for Renaturing sub-theme targets opportunity areas where restoration and renaturing[9] efforts can enhance water quality and help safeguard public water supplies. By identifying locations suitable for interventions such as rain gardens and other nature-based solutions, this theme supports increased filtration, aquifer recharge and overall watershed resilience. These opportunities offer practical pathways for improving ecosystem function while contributing to sustainable water resource management.

Figure 16 illustrates the High Potential Renaturing Opportunities within the MCP Service Area. As shown in Table 7, the MCP service area contains 54,233 acres classified as High Potential Renaturing Areas, accounting for three percent of the total area. Of these, 98 percent (53,241 acres) are categorized as opportunity areas—lands not currently protected or undevelopable—highlighting significant potential for restoration efforts. Notably, 70 percent of these opportunity areas (37,057 acres) are located within the MCP Urban Area, emphasizing the importance of urban renaturing strategies. High potential renaturing opportunities within the four focal communities are presented in Table 8 and Figure 17. Among the four focal communities, Nashua has the highest proportion of High Potential Renaturing Areas, with 2,580 acres (13 percent of its total area) identified. Manchester follows with 2,227 acres (10 percent) while Lawrence has 575 acres (12 percent) and Lowell 196 acres (two percent) designated for renaturing opportunities.

Protecting and restoring High Potential Renaturing Areas is especially important for maintaining clean and reliable public water supplies. These areas support natural filtration processes that reduce pollutant loads before they reach surface waters and they play a vital role in recharging groundwater aquifers. In urban settings, where impervious surfaces limit infiltration, renaturing opportunity areas offer strategic potential to implement nature-based solutions—such as rain gardens, bioswales, green roofs and permeable pavements—to enhance water retention and filtration. Green roofs significantly help slow and capture rainfall, reducing runoff and allowing more water to infiltrate into surrounding permeable surfaces, thereby supporting localized aquifer recharge. Such interventions improve drinking water quality and support aquifer recharge and contribute to climate resilience by reducing urban heat, managing stormwater and mitigating flood risks.

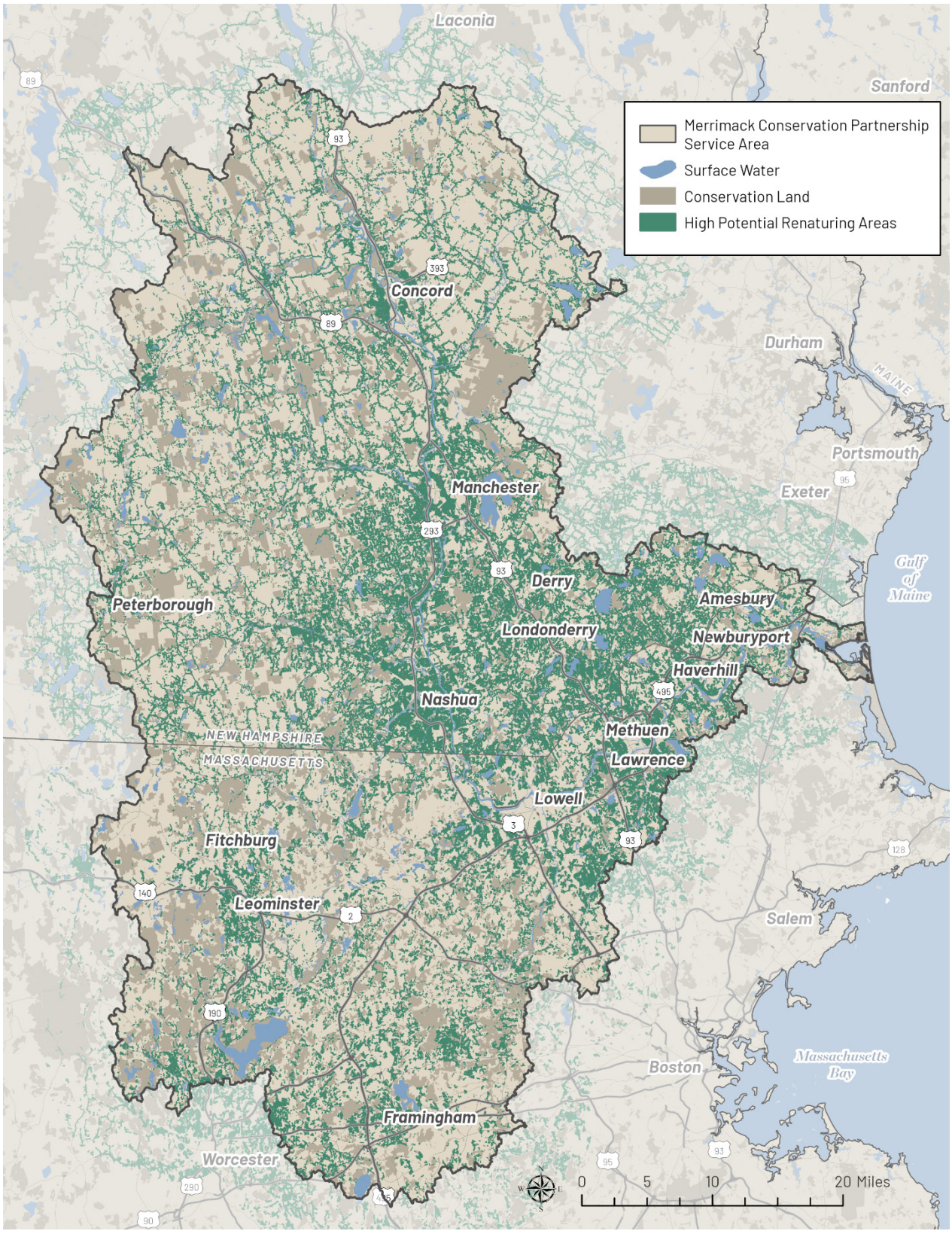


Figure 16: Map depicting the extent of High Potential Renaturing Areas across the MCP Service Area. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

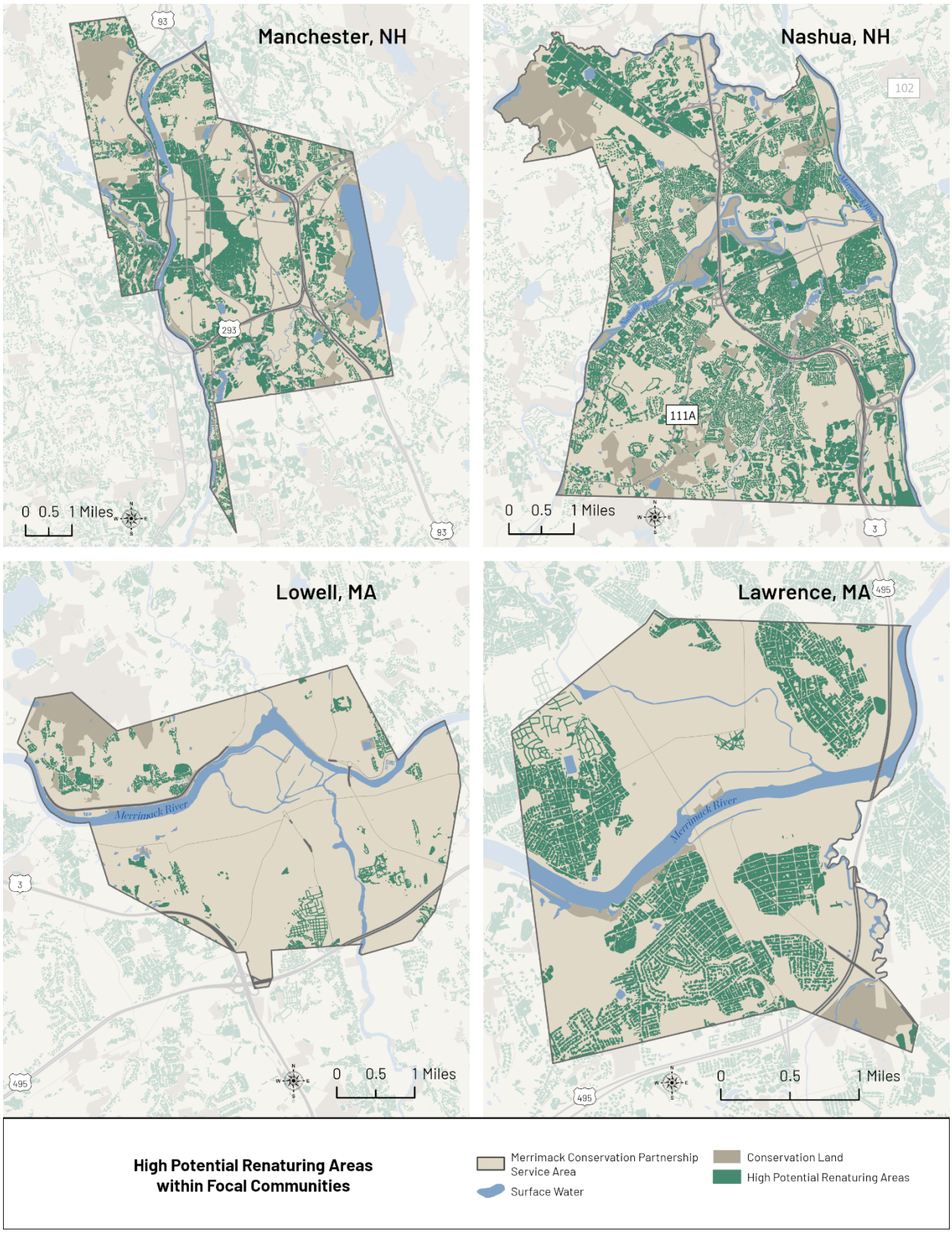


Figure 17: High Potential Renaturing Areas are illustrated within the four focal communities. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Table 7: Conservation and Opportunity Status of High Potential Renaturing Areas within the MCP Service Area. Shown here is an overview of High Potential Renaturing Areas categorized by conservation and opportunity status within the MCP Service Area.

Conservation and Opportunity Status of High Potential Renaturing Areas within the MCP Service Area	
Conservation and Opportunity Status	**Acres** *(percent)*
Already Protected High Potential Renaturing Areas *(GAP 1–3; State Board Lands and State Trust Lands)*	873 (2%)
Undevelopable Land within High Potential Renaturing Areas *(not protected)**	119 (0.2%)
High Potential Renaturing Opportunity Areas	53,241 (98%)
Total High Potential Renaturing Areas (Percentage of MCP Service Area)	***54,221 (3%)***

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*

Table 8: High Potential Renaturing Opportunities in Focal Communities. This table shows the extent of High Potential Renaturing Areas within selected focal communities.

High Potential Renaturing Opportunities in Focal Communities		
Project's Focal Community	**High Potential Renaturing Opportunities** *(Acres)*	**Percent of the city's area**
Manchester	2,227	10%
Nashua	2,580	13%
Lawrence	575	12%
Lowell	196	2%

Public Water Supply

The Public Water Supply sub-theme (Figure 18) identifies priority catchments that play a critical role in sustaining public water supplies. These catchments contribute to surface water supply areas, groundwater supply areas or both and are essential for ensuring the availability and quality of drinking water. Prioritizing these areas for protection and restoration strengthens watershed-wide strategies for managing and protecting water resources. Tier 1 catchments have a higher likelihood of contributing to both surface water and groundwater supply areas, making them the most critical for protection; Tier 2 catchments are more likely to contribute to either surface water or groundwater supply areas; and Tier 3 catchments support surface water or groundwater supply areas, typically where public water supply areas make up 5–49% of the entire catchment. This tiered approach helps prioritize actions where they will have the greatest impact on maintaining drinking water quality and watershed resilience.

The Public Water Supply sub-theme identifies priority catchments that are critical for sustaining drinking water resources across the MCP Service Area. These catchments contribute to surface water and groundwater supply systems, forming the backbone of regional water security. Figure 19 illustrates the conservation and vulnerability status of public water supply areas within the MCP Service Area, totaling 936,008 acres (49 percent of the MC Service Area). Of this total, 75 percent (702,574 acres) remain vulnerable and unprotected, 21 percent (194,963 acres) are already protected and four percent (38,471 acres) are undevelopable but not formally conserved. This distribution underscores a significant conservation gap, particularly in high-priority catchments that directly influence water quality and availability.

The tiered vulnerability breakdown further refines conservation priorities:

- ***Tier 1* (five percent, 47,056 acres)** comprises the most critical zones for immediate protection due to their direct influence on water supply infrastructure and recharge areas.
- ***Tier 2* (23 percent, 211,108 acres)** includes areas with moderate vulnerability, where targeted restoration and land-use controls can yield substantial benefits.
- ***Tier 3* (47 percent, 444,471 acres)** represents the largest share of vulnerable lands, requiring broad-scale strategies to prevent fragmentation and degradation.

Figure 20 illustrates the conservation and vulnerability status of public water supply areas within the MCP urban area, totaling 411,910 acres (44 percent). Within this area, the majority of these lands—347,232 acres (84 percent)—are classified as vulnerable, meaning they are not currently protected. In contrast, 47,182 acres (11 percent) are protected and 17,496 acres (four percent) are undevelopable but not formally conserved.

The tiered vulnerability breakdown further refines conservation priorities:

- ***Tier 1:* (eight percent, 31,367 acres)**– the highest priority areas for protection due to their critical role in water supply.
- ***Tier 2*: (26 percent, 106,320 acres)** – moderate priority lands that could benefit from targeted conservation measures.
- ***Tier 3:* (51 percent, 209,685 acres)** – the largest share, representing areas with lower immediate risk but significant long-term importance.

Table 9 and Table 10 together provide insight into the distribution and relative significance of vulnerable public water supply areas within the four focal communities—Manchester, Nashua, Lowell and Lawrence. Manchester has the largest vulnerable acreage at 18,151 acres, nearly half of which (46%) falls in Tier 1, indicating high-priority lands for protection. Nashua follows with 15,071 acres, where Tier 2 and Tier 3 dominate and Tier 1 accounts for 29%. In contrast, Lowell and Lawrence have smaller vulnerable acreages—4,448 acres and 2,114 acres, respectively—almost entirely concentrated in Tier 3. When compared to the MCP service area total of 702,574 acres, Manchester and Nashua represent the largest shares at 2.58% and 2.15%, while Lowell and Lawrence contribute 0.63% and 0.30%.

The predominance of vulnerable lands within public water supply catchments presents an opportunity for proactive planning focused on land protection and restoration. Conserved landscapes—such as forests, wetlands and healthy soils—help maintain watershed function by storing and gradually releasing water, which supports base flows and groundwater recharge during dry periods. These natural systems also filter pollutants, reducing the likelihood of contamination from runoff or development. By addressing vulnerability before degradation occurs, communities can better maintain drinking water quality, manage treatment costs and support long-term resilience under changing climate and land-use conditions.

Overall, most water supply lands remain unprotected, both across the MCP service area and within urban areas, presenting opportunities for strategic conservation and restoration. While the MCP service area includes 936,008 acres of water supply lands with 75 percent vulnerable (Figure 19), urban areas account for 411,910 acres with an even higher proportion—84 percent—classified as vulnerable (Figure 20). This suggests that urban catchments may require particular attention in planning efforts to maintain water quality and resilience.

Although each focal community's share of vulnerable public water supply areas is modest (Table 10), they represent localized areas where strategic conservation and restoration can have a meaningful impact on water quality and resilience. The tier system provides important context for prioritization: Tier 1 lands are most critical because they have a higher likelihood of contributing to both surface water and groundwater supply areas, making them essential for immediate protection. Tier 2 lands are likely to support either surface water or groundwater supply areas, offering significant benefits for targeted conservation. Tier 3 lands pose an important role for long-term watershed integrity as they are typically found where public water supply areas are lacking in the landscape. Communities with higher proportions of Tier 1 and Tier 2 lands—such as Manchester and Nashua—present key opportunities for near-term action, while Lowell and Lawrence, dominated by Tier 3 lands, may require broader-scale strategies to maintain resilience over time.

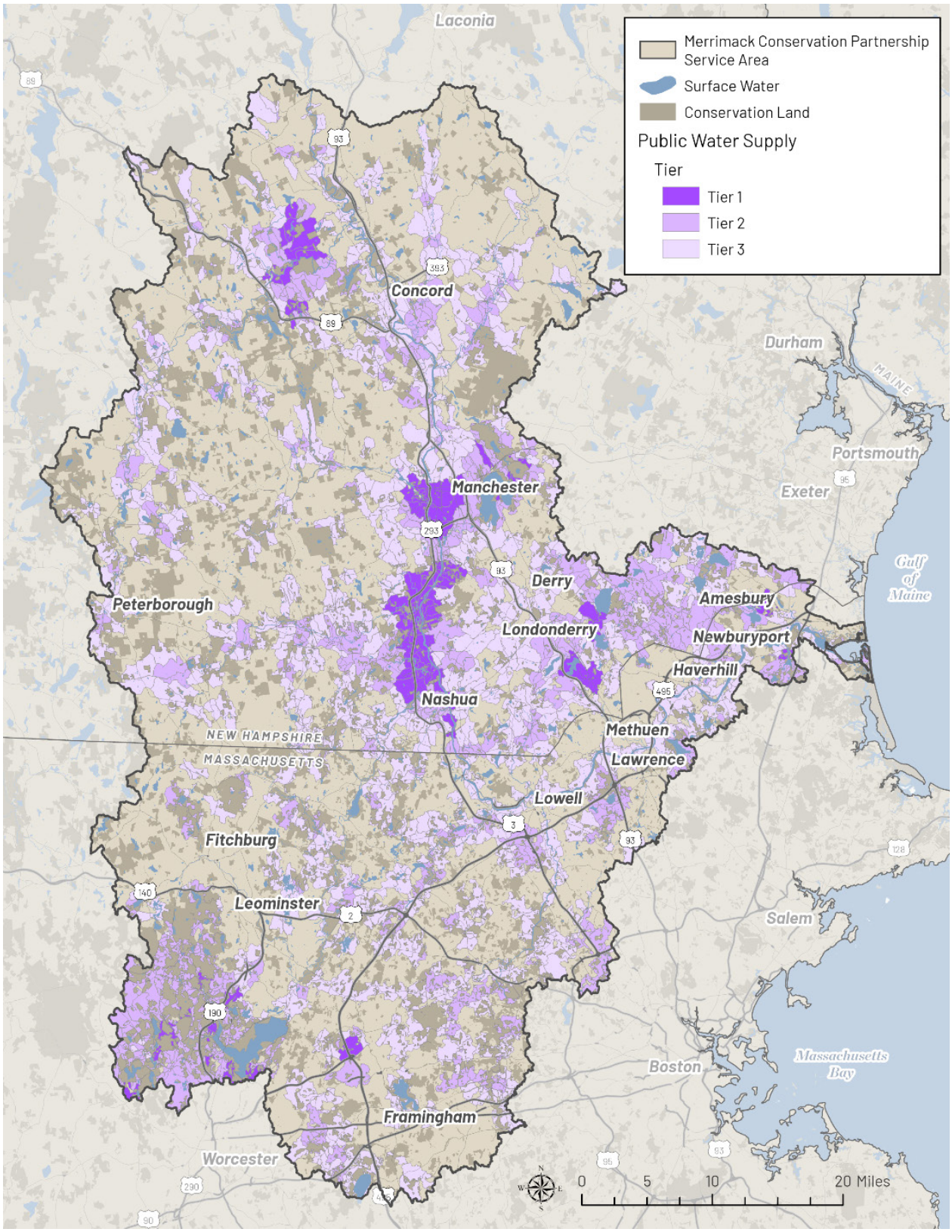
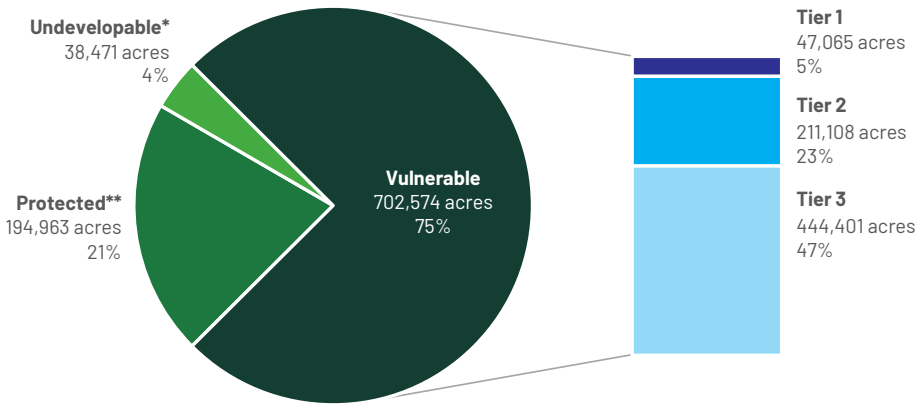


Figure 18: Public water supply areas within the MCP Service Area. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Conservation and Vulnerability Status of Public Water Supply Areas within MCP Service Area

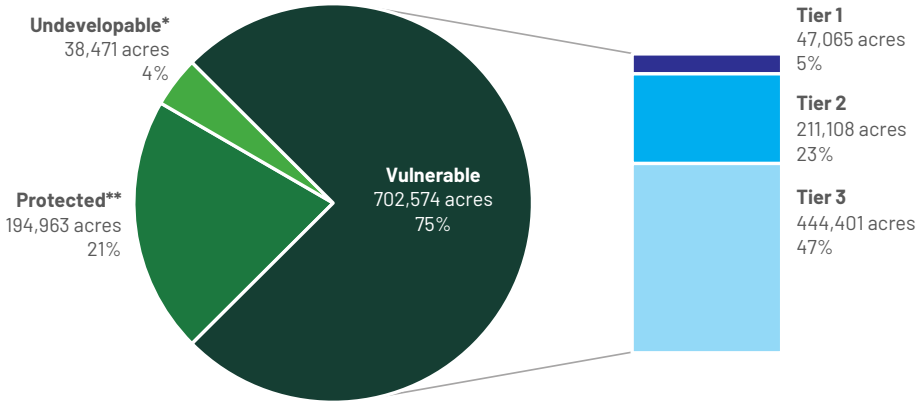


Total Water Supply Areas within the MCP Service Area: 936,008 acres

Figure 19: Protection and vulnerability status of Public Water Supply Areas within the MCP Service Area. Tier breakdowns highlight varying levels of conservation priority across the service area.

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*
***(GAP 1–3; State Board Lands and State Trust Lands)*

Conservation and Vulnerability Status of Public Water Supply Areas within MCP Service Area



Total Water Supply Areas within the MCP Service Area: 936,008 acres

Figure 20: Conservation and Vulnerability Status of Public Water Supply Areas within the MCP Urban Area. The figure illustrates the distribution of public water supply areas by conservation status and vulnerability. Of the total 411,910 acres (44 percent of the MCP Urban Area), 84 percent (347,526 acres) are vulnerable, 11 percent (45,743 acres) are protected and four percent (17,474 acres) are undevelopable. The call-out bar chart shows vulnerable lands by priority tier: Tier 1 (31,267 acres, 8 percent), Tier 2 (100,226 acres, 24 percent) and Tier 3 (209,463 acres, 51 percent).

**NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.*
***(GAP 1–3; State Board Lands and State Trust Lands)*

Table 9: Vulnerable public water supply areas within the four focal communities. Values are shown in acres with the percentage of total vulnerable Public Water Supply that each tier represents.

Vulnerable Public Water Supply Areas within the Focal Communities				
Prioritization	**Manchester** *Acres (percent)*	**Nashua** *Acres (percent)*	**Lowell** *Acres (percent)*	**Lawrence** *Acres (percent)*
Tier 1	8,260 (46%)	4,422 (29%)	0	0
Tier 2	4,553 (25%)	4,529 (30%)	653 (15%)	0
Tier 3	5,338 (29%)	6,121 (41%)	3,795 (85%)	2,114 (100%)
Total Acreage of Vulnerable Public Water Supply Areas	**18,151**	**15,071**	**4,448**	**2,114**

Table 10: Vulnerable Public Water Supply Areas in Focal Communities as a proportion of MCP service area Total. This table shows the total acreage of vulnerable public water supply areas within each focal community and the percentage each represents of the MCP's service area overall vulnerable public water supply acreage (702,574 acres).

Vulnerable Public Water Supply Areas in Focal Communities as a Proportion of MCP service area Total		
Total MCP Vulnerable Public Water Supply Acreage: 702,574 acres		
Community	**Vulnerable Public Water Supply Areas** *(Acres)*	**Percent of MCP Vulnerable Public Water Supply Areas**
Manchester	18,151	2.58%
Nashua	15,071	2.15%
Lowell	4,448	0.63%
Lawrence	2,114	0.30%

COMMUNITY CLIMATE RESILIENCE

The Community Climate Resilience (CCR) theme (Figure 21) identifies focus areas and supporting lands within the MCP Service Area that reflect community priorities for reducing flood risk, mitigating urban heat and improving access to green space. The analysis integrates spatial data on heat severity, flood storage potential, green space and census blocks at higher risk for flooding and heat exposure with local assets and experiences gathered through community engagement. By combining these factors, the results highlight places where investments in trees, green infrastructure and open space can deliver multiple benefits—enhancing climate resilience, reducing vulnerability and improving quality of life for residents.

The CCR theme results are organized into two tiers divided by quantiles. **Tier 1: Focus Areas** represent the top 20 percent of values, where multiple community climate resilience priorities—such as flood storage potential, heat mitigation and recreational access—overlap most frequently. These areas indicate the highest potential for delivering combined benefits through conservation and green infrastructure investments. **Tier 2: Supporting Lands** include the next 20 percent of values (60–80 percent quantile), which provide important opportunities for resilience but with less overlap of priority factors than Tier 1. While Tier 1 areas should be considered for near-term action, Tier 2 lands remain essential for building a connected network of climate-resilient spaces and supporting long-term community goals.

The Community Climate Resilience theme identifies 210,135 acres within the Merrimack Conservation Partnership service area (11 percent) as priority lands for enhancing climate resilience through nature-based solutions (Table 11). This includes 78,536 acres of focus areas and 131,599 acres of supporting lands, together representing 11 percent of the MCP service area. Notably, 92 percent of these lands—totaling 193,121 acres—are identified as opportunity areas, meaning they are neither protected nor undevelopable and offer the greatest potential for strategic interventions. These areas are ideal for implementing nature-based solutions such as tree planting, green infrastructure development, floodplain restoration and the creation of parks or open spaces. Only seven percent of the CCR priorities are currently protected and one percent are undevelopable. Targeting opportunity areas can help reduce urban heat, improve stormwater management and expand access to green space—especially in areas identified as vulnerable to flooding and extreme heat through spatial analysis and public engagement. These findings underscore a critical path forward for building long-term resilience across the Merrimack River watershed.

A total of 177,215 acres of the Community Climate Resilience (CCR) priorities fall within the MCP Urban Area representing 84 percent of all CCR priority lands *(*Table 11*)*. This includes 69,495 acres of focus areas (89 percent of all CCR focus areas) and 107,720 acres of supporting lands (82 percent of all CCR supporting lands), highlighting the concentration of resilience needs within urban environments. Of these urban CCR lands, only five percent are currently protected and one percent are undevelopable, leaving a substantial 94 percent classified as opportunity areas—lands that are available for strategic investments in nature-based solutions. These figures emphasize the critical role urban areas play in regional climate resilience efforts and the significant potential for targeted interventions to reduce heat, manage stormwater and expand access to green space.

Urban areas are central to climate resilience strategies and the project's four focal communities of Manchester, Nashua, Lowell and Lawrence offer thousands of acres (12 percent of all CCR opportunities within the MCP Urban Area) for strategic investment (Table 12). These lands offer prime locations for nature-based solutions that can reduce flood risk, mitigate urban heat and expand access to green space. Manchester and Nashua each contribute roughly 4% of the total, with 6,977 and 7,154 acres respectively, split between CCR Focus Areas and Supporting Lands. Lowell adds another 4,256 acres (3%), while Lawrence contributes 2,671 acres (2%). Notably, each city has a significant area with potential for CCR opportunities. Lawrence has the highest proportion at 56 percent, followed by Lowell (46 percent), Nashua (35 percent) and Manchester (31 percent). These figures underscore the potential for targeted-CCR investment that can deliver benefits for both people and nature.

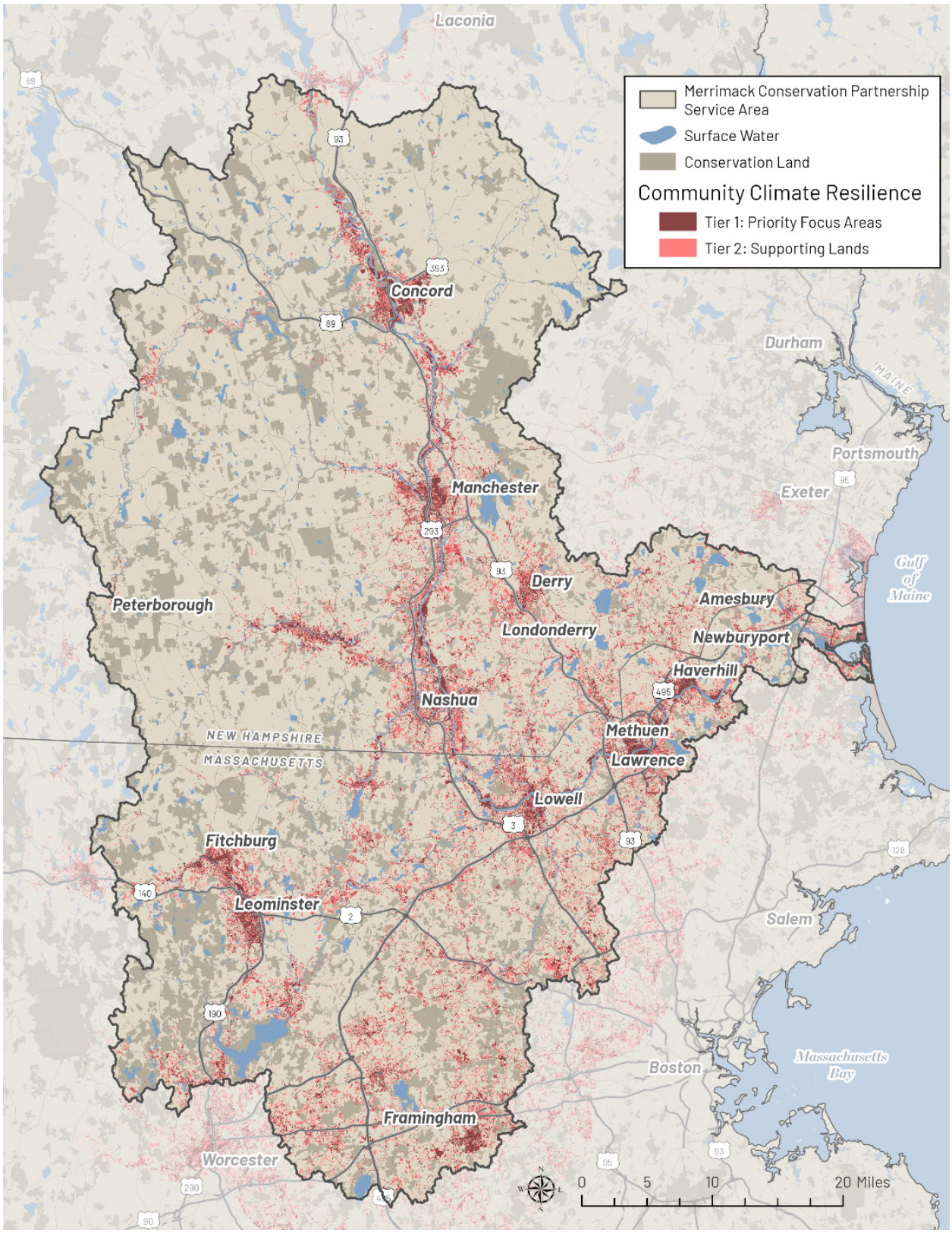


Figure 21: Community climate resilience priority focus areas and supporting lands. To see this dataset in more detail, please visit the full interactive map & plan at www.nature.org/merrimack
Map credit: Anna Ormiston/TNC

Table 11: Conservation and Opportunity Stus of Community Climate Resilience Priorities. This table summarizes the conservation status of Community Climate Resilience (CCR) priorities within the MCP Service and Urban Areas, showing acres and percentages of Focus Areas and Supporting Lands that are protected, undevelopable or available for future investment. Over 90% of CCR lands in both areas are classified as opportunity areas, indicating substantial potential for strategic actions to reduce flood risk, mitigate heat and enhance access to green space.

Conservation and Opportunity Status of Community Climate Resilience Priorities in MCP Service and Urban Areas

Conservation and Opportunity Status	*Within MCP Service Area*			*Within the MCP Urban Area*		
	Focus Area Acres *(percent)*	Supporting Lands Acres *(percent)*	Total Acres *(percent)*	Focus Area Acres *(percent)*	Supporting Lands acres *(percent)*	Total Acres *(percent)*
Protected	4,670 (6%)	9,661 (7%)	14,331 (7%)	3,439 (5%)	6,061 (6%)	9,500 (5%)
Undevelopable	1,042 (1%)	1,641 (1%)	2,683 (1%)	797 (1%)	1,186 (1%)	1,984 (1%)
Opportunity	72,824 (93%)	120,297 (92%)	193,121 (92%)	65,259 (94%)	100,473 (93%)	165,731 (94%)
Total Community Climate Resilience	78,536 (4%*)	131,599 (7%*)	210,135 (11%*)	69,495 (89%**)	107,720 (82%**)	177,215 (84%**)
	*(*Percent of total MCP Service Area)*			*(**Percent within MCP Urban Area)*		

NOAA Coastal Change Analysis Program (C-CAP) Regional Land Cover Database (NOAA Office for Coastal Management 2021) classes used for portion of Coastal Conservation Focus Areas that are surface water or undevelopable wetland include the following: Palustrine Emergent Wetland, Estuarine Forested Wetland, Estuarine Scrub/Shrub Wetland, Estuarine Emergent Wetland, Unconsolidated Shore, Water, Palustrine Aquatic Bed and Estuarine Aquatic Bed. Forested wetlands are not included.

Table 12: Community Climate Resilience Opportunity Areas in Focal Communities. This table shows the extent of CCR opportunity areas within four focal communities, including acres and percentages for CCR Focus Areas, Supporting Lands and total CCR priority areas, as well as the share of each city's area with CCR opportunities.

Community Climate Resilience Opportunity Areas within Focal Communities

Focal Community	CCR Focus Areas in acres *(percent*)*	CCR Supporting Lands in acres *(percent**)*	Total CCR priority areas in acres *(percent***)*	Percent of city area with CCR opportunities
Manchester	3,687 (6%)	3,290 (3%)	6,977 (4%)	31%
Nashua	3,238 (5%)	3,915 (4%)	7,154 (4%)	35%
Lowell	2,437 (4%)	1,818 (2%)	4,256 (3%)	46%
Lawrence	2,041 (3%)	630 (1%)	2,671 (2%)	56%

**Percent is based on 69,259 acres of CCR Focus Area Opportunities in the MCP Urban Area.*
***Percent is based on 100,473 acres of CCR Supporting Land Opportunities in the MCP Urban Area.*
****Percent is based on 165,731 acres of total CCR Opportunities in the MCP Urban Area.*

Integrating Community Climate Resilience Data: Inputs and Insights

This section outlines the integration of multiple input datasets that collectively form the Community Climate Resilience theme. Each dataset represents a distinct dimension of local community climate challenges including flooding, extreme heat and green space accessibility. Subsequent sections provide a detailed breakdown of each input, enabling practitioners to examine the underlying data and identify priority areas for targeted interventions. This structured approach is intended to support informed decision-making and guide the development of effective conservation and climate resilience strategies.

Describing Community Member Experiences

Over 320 residents participated in community mapping events to identify areas affected by flooding, extreme heat and limited access to green space. Through these sessions, described in more detail in the "Community Mapping_" section, participants located points of interest and rated their experiences, generating more than 700 unique data points. Each point represents a personal story tied to climate challenges—struggling with heat, coping with flood impacts or seeking improved green spaces or better access to green space—providing a powerful foundation for understanding community needs. Community input directly informed the plan's scientific analysis to identify priority areas for community climate resilience solutions, ensuring that local experiences shape actionable strategies.

To read the comments and other qualitative input provided alongside the points and rankings, refer to Appendix 3a.

Green Space Ranking System

To assess the quality and resilience potential of green spaces—and to reflect community perspectives—we used a five-tier ranking system from A to F, similar to academic grades. Community members applied this scale to qualify their experiences and perceived needs for green space improvement or expansion in areas within their community.

While the format resembles academic grading, the rankings are subjective and represent a blend of ecological value and community priority. They help identify where nature-based solutions can have the greatest impact.

- A – Exceptional quality; examples of community desires for green space
- B – High quality with some need for improvements
- C – Moderate quality; may require restoration or improvement
- D – Poor quality; requires restoration or improvement
- F – Very poor quality of existing green space or need for additional green space

Green spaces identified by community members were initially ranked using an A–F scale, where A represented exceptional quality and minimal need for improvement. To streamline analysis, these rankings were converted to a numerical scale from 1 to 4, excluding A-rated spaces due to their high quality. The conversion is as follows:

- B - 1 (minor improvements needed)
- C - 2 (moderate improvements neeed)
- D - 3 (significant improvements needed)
- F - 4 (severe improvement or new green space needed)

Tree Coverage Ranking System

To assess tree coverage and reflect community perspectives, community members applied a four-tier numerical ranking system,1 to 4, to express their experiences with tree presence and shade in specific areas of their community. Tree coverage was used as a proxy for urban heat exposure as tree canopy has a significant influence on temperatures and cooling. Individuals are more readily able to observe tree coverage than heat islands, which are hard to conceptualize outside of extreme heat events.

The rankings are subjective and represent a blend of ecological value, community priority and vulnerability to urban heat. Tree coverage plays a critical role in reducing surface temperatures and providing shade. These rankings help identify where tree planting or maintaining existing trees could have the greatest impact.

- 1 – High tree coverage: Area has abundant shade and ecological benefits; canopy maintenance would be beneficial
- 2 – Moderate tree coverage: Some shade and benefits present, but additional trees could improve conditions
- 3 – Low tree coverage: Limited shade; area would benefit from tree planting
- 4 – Very low or no tree coverage: Area in need of significant tree planting

Flood Hazard Ranking System

To assess flood vulnerability and reflect community perspectives, the project team had community members apply a four-tier numerical ranking system, 1 to 4, to express their experiences with flooding in specific areas of their community.

The rankings are subjective and represent a blend of community priority, observed flood impacts and frequency of flooding events. These scores help identify areas where flood mitigation strategies—such as green infrastructure, improved drainage or restoration—could have the greatest impact.

- 1 – Occasionally a problem: Flooding occurs infrequently and causes minimal disruption; monitoring and minor improvements may be sufficient
- 2 – Intermittent problem: Flooding happens from time to time and may affect access or infrastructure; targeted mitigation could improve conditions
- 3 – Frequent problem: Flooding occurs regularly and poses challenges to mobility, safety or property; area is a candidate for significant intervention
- 4 – Chronic problem: Flooding is persistent and severe, often disrupting daily life or causing damage; area is a high priority for flood resilience solutions

This simplified scale to score community experience helps prioritize areas based on the severity of community-identified needs.

Community Input Highlights

These concepts help translate community stories into actionable data, guiding the identification of priority areas for climate resilience strategies.

Scores: *The scaled values community members used to rate their experiences with access to green space, tree coverage and flooding within their neighborhoods. Scores reflect perceived conditions and needs to help prioritize areas for improvement.*

Records: *Individual data points collected from a participant during the community mapping process. Records include a location and a score of green space accessibility or quality, tree coverage or flooding. Records capture specific experiences and observations that inform the broader analysis.*

Counts: *The number of times a specific location was identified and scored for the same climate-related concern. Counts are provided when multiple community members cite the same location in unique records to highlight areas of shared concern and recurring issues.*

Manchester

The Manchester community input dataset includes a total of 74 records, categorized into three conservation target types: Flood Hazard (27 records), Improved or Additional Green Space (26 records) and Tree Coverage (21 records). Twenty-one locations received multiple ratings based on community experiences with flooding, heat and the need for improved or additional green space. *Livingston Park* stands out with the highest count (5), reflecting frequent community recognition and potential for impactful conservation efforts that meet the need for improved green space. Twenty locations received scores of four, including six areas with severe heat identified through lacking tree coverage, one site needing improved green space and 13 flood hazard areas.

Nashua

The Nashua community input dataset includes 97 records across three conservation target types: Flood Hazard (41 records), Improved or Additional Green Space (32 records) and Tree Coverage (24 records). Twenty-one locations were scored 4, reflecting strong community concern and need for conservation. These top-scored locations span all three conservation targets: severe heat vulnerability (lacking tree coverage), need for green space improvements and high flood risk zones. Notably, the community recognized *Mine Falls Park* in eight different records, indicating potential for impactful conservation action. Twenty-one locations received scores of four, including nine areas with severe heat identified through tree coverage, one area needing improved green space and 11 flood hazard areas. Community members identified flood-prone areas most frequently as high-priority, followed closely by locations with heat vulnerability due to limited tree coverage.

Lowell

The Lowell community input dataset includes 74 records, with the majority focused on Improved or Additional Green Space (35 records), followed by Tree Coverage (27 records) and Flood Hazard (12 records). The community assigned scores of 4 to 19 locations reflecting strong concern across all three conservation targets. These include 11 locations recorded for lack of Tree Coverage; seven locations for needed Improved Green Space, primarily labeled *Need More Green Space in Highlands*; and two locations noted as Flood Hazard, including *Claypit Brook*. The most frequently mentioned locations, each with counts of three, were *Fort Hill, Lowell Cemetery and Shedd Park* (Tree Coverage); and *South Common* and *Lowell Cemetery* (both under Improved Green Space). The data reflect community interest in conservation action at these locations.

Lawrence

The Lawrence community input dataset includes 63 records, 27 records each for Tree Coverage and Flood Hazard and nine records focused on Improved or Additional Green Space. A total of 13 locations were scored four, indicating strong community concern or potential conservation value. These top-scored locations span all three conservation targets: nine locations were identified for lacking Tree Coverage, reflecting areas with high heat vulnerability; three locations were flagged for Flood Hazard, highlighting flood-prone areas; and one location was recognized for its need for Improved Green Space. The most frequently mentioned locations, each with a count of four, include *Forest & Haverhill St & Tower Hill* and *Methuen St.* (both under Tree Coverage), *North Common Park* (Improved or Additional Green Space) and *Methuen St.* (Flood Hazard), highlighting these areas as key priorities for conservation action.

Heat Severity

The Trust for Public Land (TPL) developed a national Heat Severity dataset in 2024[10], which has been integrated into the Merrimack River Watershed Conservation Plan to identify areas most affected by urban heat and to prioritize opportunities for relief. Within the Merrimack Conservation Partnership's service area, this dataset helped pinpoint communities with the highest heat island severity—particularly in urbanized areas—where impervious surfaces and limited green space intensify heat exposure. For this analysis, heat severity categories were reclassified into five ranges: 0–20 as low severity, 20–40 as moderate severity, 40–60 as high severity, 60–80 as very high severity and 80–100 as maximum severity.

The plan emphasizes nature-based solutions such as increasing tree canopy and expanding park access, especially in densely populated cities like Manchester, Nashua, Lowell and Lawrence. These efforts aim to mitigate the urban heat island effect and promote climate resilience throughout the watershed's rural-to-urban gradient.

The MCP Service Area spans 1,895,082 acres, 524,149 acres (28 percent) are hotter than the average city temperature, these are classified under heat severity levels Table 13 shows that most of these areas experience low severity heat (53 percent) or moderate severity (28 percent). Higher severity levels are less common: high severity (13 percent), very high (five percent) and maximum severity (one percent). These figures indicate that while much of the service area faces minimal heat stress, 47 percent still experiences moderate to extreme heat conditions. This pattern reflects the rural-to-urban gradient of the Merrimack River watershed, where increasing urbanization—particularly in cities along the river corridor—correlates with higher heat severity due to dense development and reduced natural-land cover.

10 Trust for Public Land. "Heat Severity – USA 2024." GIS data, ArcGIS Online, 2025. https://tpl.maps.arcgis.com/home/item.html?id=55f3c64e35e04d39b0128dbaba9511c4. Accessed January 2025.

Within the MCP Urban Area, heat severity is far more concentrated. Table 13 shows that of the 524,149 acres classified under heat severity, 313,975 acres (60 percent) are located in urban areas. Severe heat levels are disproportionately urban:

- 81 percent of maximum severity and 81 percent of very high severity acres occur in urban areas.
- 72 percent of high severity and 63 percent of moderate severity acres are also urban.

Nearly half (47 percent) of urban land falls under moderate severity or higher, underscoring the vulnerability of urban communities to extreme heat. This increased exposure is largely driven by impervious surfaces—such as roads, rooftops and parking lots—which absorb and retain heat to intensify the urban heat island effect. These findings highlight priority areas for cooling strategies like tree canopy enhancement and green infrastructure.

The MCP Urban Area contains approximately 313,975 acres of heat severity levels, distributed across focal communities including Lawrence, Lowell, Manchester and Nashua (see Table 14). Among these, Manchester accounts for the largest share with 10,023 acres (three percent of the MCP total), followed by Nashua with 8,771 acres (3 percent), Lowell with 4,618 acres (one percent) and Lawrence with 2,677 acres (one percent). Within each city, the majority of heat severity areas fall under low and moderate severity levels, representing between 42–47 percent and 25–33 percent of their respective totals. High and very high severity levels make up smaller proportions, while maximum severity areas are minimal (1–2 percent). Overall, heat severity levels cover 43–56 percent of each city's total area, indicating significant exposure across all focal communities.

Table 15 summarizes the overlap between heat severity levels and Community Climate Resilience (CCR) priority areas within the MCP Service Area. Of the 524,149 acres classified under heat severity, 166,058 acres (32 percent) coincide with CCR priorities. Nearly all of the areas facing the most extreme heat are concentrated within CCR lands: 92 percent of very high severity and 91 percent of maximum severity heat areas fall within these areas. This pattern underscores that CCR priority areas align closely with areas of greatest heat vulnerability, highlighting a critical opportunity for targeted interventions such as tree canopy expansion, cooling infrastructure and green space development.

Table 13: Distribution of Heat Severity Levels within the MCP Service Area and Urban Area. The table compares acres and percentages for each heat severity level, illustrating how much of each heat severity level occurs within urban areas and the entire service area. For example, of the 5,915 acres classified as maximum heat severity within the MCP Service Area, 81 percent (4,764 acres) are located in the MCP Urban Area.

Area of Heat Severity Levels within the MCP Service Area and Urban Area				
Heat Severity Level	**Acres in MCP Urban Area**	**Acres in MCP Service Area**	**Percent in MCP Urban Area**	**Percent of Level in MCP Service Area**
Low severity	147,136	279,436	53%	53%
Moderate severity	93,016	146,578	63%	28%
High severity	48,390	66,823	72%	13%
Very high severity	20,668	25,396	81%	5%
Maximum severity	4,764	5,916	81%	1%
Total	**313,975**	**524,149**	**60%***	**–**

**The MCP Service Area spans 1,895,082 acres, of which 524,149 acres (28 percent) are classified under heat severity levels. Of the 524,149 acres classified under heat severity levels in the MCP Service Area, 60 percent (313,975 acres) are located within the MCP Urban Area.*

Table 14: Heat severity distribution across four focal communities within the MCP Urban Area, showing acreage and severity levels by city. As shown in the bottom row, between 43 percent and 56 percent of the total area of each focal community is within a severe heat level.

Heat Severity by Focal Community *313,975 acres of heat severity areas are within the MCP Urban Area*				
Heat Severity Level	**Lawrence** *Acres (percent)*	**Lowell** *Acres (percent)*	**Manchester** *Acres (percent)*	**Nashua** *Acres (percent)*
Low severity	981 (37%)	1,145 (25%)	4,210 (42%)	4,150 (47%)
Moderate severity	789 (29%)	1,505 (33%)	2,555 (25%)	2,466 (28%)
High severity	610 (23%)	1,310 (28%)	2,200 (22%)	1,254 (14%)
Very high severity	250 (9%)	570 (12%)	995 (10%)	821 (9%)
Maximum severity	48 (2%)	88 (2%)	63 (1%)	81 (1%)
Total	**2,677 (1%*)**	**4,618 (1%*)**	**10,023 (3%*)**	**8,771 (3%*)**
	**Percentage of city's heat severity area relative to the total heat severity area within the MCP Urban Area*			
Percent of city area with heat severity ranking	56%	50%	45%	43%

Table 15: Overlap of MCP Service Area heat severity levels with CCR priority areas. Percentages indicate the proportion of CCR focal and supporting lands within each heat severity category, highlighting areas most exposed to heat impacts.

Overlap of MCP Service Area's Heat Severity Levels with CCR Priority Areas							
Heat Severity Level	**Tier 1 CCR Focus Area Overlap** *(Acres)*	**Tier 2 CCR Supporting Lands Overlap** *(Acres)*	**Total CCR Priority Overlap** *(Acres)*	**Total MCP Service Area's Heat Severity Area** *(Acres)*	**Percent Tier 1 Overlap**	**Percent Tier 2 Overlap**	**Percent Total CCR Overlap**
Low severity	13,608	36,871	50,480	279,436	5%	13%	18%
Moderate severity	19,849	34,306	54,155	146,578	14%	23%	37%
High severity	17,518	15,212	32,730	66,823	26%	23%	49%
Very high severity	9,867	13,464	23,331	25,396	39%	53%	92%
Maximum severity	2,079	3,284	5,363	5,916	35%	56%	91%
Total	**62,921**	**103,137**	**166,058**	**524,149**	**12%**	**20%**	**32%**

Flood Storage and Risk Mitigation

The Flood Storage and Risk Mitigation analysis identifies areas within the MCP service area that are most vulnerable to flooding and prioritizes lands that can help reduce flood risk through nature-based solutions. This approach combines FEMA 100-year flood zone[11] mapping with models of pluvial flooding (rainfall-driven runoff) and fluvial flooding (river and stream overflow) and weights zones by development type and flood depth to assess potential impacts. It also accounts for future conditions by projecting sea level rise impacts under a 2050 100-year storm scenario and distinguishes developed from undeveloped flood-prone areas. Finally, the analysis highlights natural flood storage lands—such as wetlands and riparian zones with gentle slopes and pervious surfaces—that can absorb and slow floodwaters, providing critical opportunities for resilience strategies like wetland restoration and green infrastructure.

Flood Storage and Risk Mitigation (FSRM) areas within the MCP Service Area represent a significant portion of the landscape, offering critical opportunities to build resilience by intervention in these zones. Nearly one quarter (23 percent, or 431,706 acres) of the MCP service area is a flood storage and risk mitigation area. These lands are concentrated in the census-defined urban areas, with more than one-third (37 percent, or 159,212 acres) of the MCP Urban Area is a flood storage and risk mitigation area. This concentration underscores the importance of integrating flood mitigation strategies into developed landscapes, where impervious surfaces and dense infrastructure increase vulnerability to flooding. Protecting and enhancing these areas through nature-based solutions such as wetland restoration and green infrastructure can play a vital role in reducing flood risk and improving community resilience.

Table 16 highlights how much of these FSRM areas are included within Community Climate Resilience (CCR) priorities. Across the MCP Service Area, 16 percent of FSRM areas overlap CCR priority areas, including 10 percent in Tier 1 focal areas and six percent in Tier 2 supporting lands. Within the MCP Urban Area, the alignment is even stronger: 33 percent of FSRM lands fall within CCR priorities, with 22 percent in Tier 1 and 11 percent in Tier 2. These figures show that advancing CCR priorities can significantly contribute to flood risk reduction, as one-third (33 percent) of FSRM areas within the MCP Urban Area fall within CCR themes—creating opportunities for strategies that deliver both resilience and flood mitigation benefits.

The intersection of Flood Storage and Risk Mitigation areas with CCR priorities reveals strong alignment between resilience priorities and flood risk reduction opportunities within the project's four focal communities. At the community scale, Table 17 shows that Lawrence has the highest proportion of overlap, with 84 percent of its FSRM lands falling within CCR priorities—including 80 percent in Tier 1 focal areas. Lowell follows with 71 percent, while Nashua and Manchester show moderate alignment at 54 percent and 50 percent, respectively. This overlap indicates opportunities for dual-benefit projects such as wetland restoration, green infrastructure and park development that advance both climate resilience and flood mitigation goals.

Additionally, Table 17 highlights the proportion of each focal community's total land area that contains overlapping FSRM and CCR priorities. The frequency of this overlap in cities is 33 percent of land cover in Lawrence; 17 percent of Lowell; 11 percent of Nashua; and 10 percent of Manchester. These percentages highlight the scale of resilience opportunities within each community to guide municipal prioritization toward areas where integrated strategies—such as wetland restoration, green infrastructure and park development—can address both flooding and climate resilience. This overlap emphasizes the potential for targeted investments that deliver benefits to communities and nature.

11 Federal Emergency Management Agency. "National Flood Hazard Layer: 100-Year Flood Zone." GIS data, FEMA, 2025. https://msc.fema.gov/nfhl. Accessed January 2025.

Table 16: Overlap of Community Climate Resilience Priorities and Flood Storage and Risk Mitigation Areas. This table summarizes the extent to which Flood Storage and Risk Mitigation (FSRM) areas fall within Community Climate Resilience (CCR) priority areas across the MCP Service Area and MCP Urban Area. Overlap is reported for Tier 1 CCR focal areas and Tier 2 supporting lands, showing both acreage and percentage of FSRM areas within these CCR themes. The combined totals highlight where flood mitigation areas align most strongly with climate resilience priorities by showing how much of the FSRM areas are included within CCR themes.

Overlap of Community Climate Resilience (CCR) Priorities and Flood Storage and Risk Mitigation (FSRM) Areas across MCP Service and Urban Ares

**Of the 431,706 FRSM acres in the MCP Service Area, 159, 212 acres are within the MCP Urban Area.*

FSRM Area Context*	Total FSRM Area *(Acres)*	Tier 1 CCR Focal Areas overlap *(Acres)*	Percent Tier 1 Overlap	Tier 2 CCR Supporting Lands overlap *(Acres)*	Percent Tier 2 Overlap	Total CCR Priority Overlap *(Acres)*	Percent Total CCR Overlap
MCP Service Area	431,706	41,614	10%	24,077	6%	65,691	16%
MCP Urban Area	159, 212	35,625	22%	17,433	11%	53,058	33%

Table 17: Overlap of CCR Priorities in Focal Community FSRM Areas. This table shows how Flood Storage and Risk Mitigation (FSRM) areas within the four focal communities overlap with Community Climate Resilience (CCR) priorities. It reports acreage and percentage of overlap for Tier 1 CCR focal areas and Tier 2 supporting lands and compares these figures to each community's total land area. These comparisons show opportunities to improve flood protection and climate resilience by using land in ways that serve multiple purposes—such as parks that also store stormwater or green spaces that reduce flood risk.

Overlap of CCR Priorities in Focal Community FSRM Areas

City	Total FSRM Area *(Acres)*	Tier 1 Overlap *(Acres)*	Percent Tier 1 Overlap	Tier 2 Over-lap *(Acres)*	Percent Tier 2 Overlap	Total CCR Priority Overlap *(Acres)*	Percent Total CCR Overlap	Total Area of City *(Acres)*	Percent of City Area with Overlap Areas
Lawrence	1,840	1,470	80%	79	4%	1,549	84%	4,753	33%
Lowell	2,158	1,227	57%	311	14%	1,538	71%	9,306	17%
Manchester	4,524	1,726	38%	552	12%	2,278	50%	22,355	10%
Nashua	3,998	1,591	40%	567	14%	2,158	54%	20,305	11%

Green Space Opportunities

The Green Space Opportunities input dataset for the Community Climate Resilience (CCR) theme uses several datasets to determine opportunities to create or improve green spaces in the Merrimack River Watershed. The Trust for Public Land's ParkServe Priority Areas[12] for New Parks dataset identifies locations where new parks and recreational spaces can deliver the greatest benefits. This dataset incorporates climate risk indicators and environmental variables—such as heat island intensity—to prioritize areas with the highest need for green space. The analysis considers non-canopy land and pervious surfaces to locate areas where tree planting and park development can reduce urban heat and improve community resilience. By focusing on these elements, the layer highlights opportunities to expand access to green space while addressing climate vulnerabilities.

Green Space Opportunity Areas represent a major component of the critical opportunities that advance climate resilience while improving community livability. More than one-third (34 percent, or 650,730 acres) of the MCP Service Area has opportunities for green space expansion or improvement. These lands are concentrated in the MCP

12 Trust for Public Land. "ParkServe." GIS data, Land and People Lab, 2025. ArcGIS Hub, https://hub.arcgis.com/maps/TPL::trust-for-public-lands-parkserve/explore. Accessed January 2025.

r an Area and frequently overlap with Community Climate Resilience (CCR) priorities, including 8 percent in Tier 1 focal areas and 14 percent in Tier 2 supporting lands (Table 18). Within the MCP Urban Area, the alignment is even stronger: 27 percent of Green Space Opportunity Areas fall within CCR priority lands, with 11 percent in Tier 1 and 17 percent in Tier 2. This overlap indicates that efforts to expand green space in urban areas can significantly contribute to climate resilience objectives.

At the community scale, Table 19 illustrates how Green Space Opportunity Areas intersect with CCR priorities and how these overlaps compare to each city's total land area. Lawrence shows the highest proportion of overlap, with 69 percent of its green space opportunity areas overlapping CCR priorities—51percent within Tier 1 focal areas. Lowell follows with 54 percent, while Nashua and Manchester show moderate alignment at 48 percent and 37 percent, respectively. Relative to total city area, these overlaps represent 21 percent of Lawrence's land base, 24 percent in Lowell, 26 percent in Nashua and 19 percent in Manchester. These figures inform municipal-scale prioritization of integrated strategies such as park development, habitat restoration and green infrastructure that deliver dual benefits for resilience and community well-being.

Table 18: Overlap of Community Climate Resilience (CCR) Priorities and Green Space Opportunity Areas. This table summarizes the extent to which Green Space Opportunity Areas within the MCP Service Area and MCP Urban Area overlap with CCR priorities. Overlap is reported for Tier 1 CCR focal areas and Tier 2 supporting lands, showing both acreage and percentage of green space areas that fall within CCR themes. The combined totals highlight where green space initiatives can advance climate resilience objectives, offering opportunities for integrated strategies such as park development, habitat restoration and green infrastructure in areas that also support CCR priorities.

Overlap of Community Climate Resilience (CCR) Priorities and Green Space Opportunity Areas.

**Of the 650,730 Green Space Opportunity acres in the MCP Service Area, 463,050 acres are within the MCP Urban Area.*

Green Space Opportunity Area Context*	Total Green Space Area (Acres)	Tier 1 CCR Focal Areas overlap (Acres)	Percent Tier 1 Overlap	Tier 2 CCR Supporting Lands overlap (Acres)	Percent Tier 2 Overlap	Total CCR Priority Overlap (Acres)	Percent Total CCR Overlap
MCP Service Area	650,730	55,028	8%	92,192	14%	147,220	23%
MCP Urban Area	463,050	49,085	11%	76,754	17%	125,839	27%

Table 19: Overlap of CCR Priorities in Focal Community Green Space Opportunity Areas. This table shows how Green Space Opportunity Areas within the four focal communities overlap with Community Climate Resilience (CCR) priorities. It reports acreage and percentage of overlap for Tier 1 CCR focal areas and Tier 2 supporting lands and compares these figures to each community's total land area. These comparisons highlight opportunities to integrate green space initiatives with climate resilience strategies such as park development, green infrastructure and habitat restoration.

Overlap of CCR Priorities in Focal Community Green Space Opportunity Areas

City	Total Green Space Opportunity in City (Acres)	Tier 1 CCR Overlap (Acres)	Percent Tier 1 Overlap	Tier 2 CCR Overlap (Acres)	Percent Tier 2 Overlap	Total CCR Priority Overlap (Acres)	Percent Total CCR Overlap	Total Area of City (Acres)	Percent of City Area with Overlap Areas
Lawrence	1,479	750	51%	269	18%	1,019	69%	4,753	21%
Lowell	4,082	1,250	31%	969	24%	2,219	54%	9,306	24%
Manchester	11,355	2,130	19%	2,078	18%	4,208	37%	22,355	19%
Nashua	11,092	2,390	22%	2,939	26%	5,329	48%	20,305	26%

Community Assets

The Community Assets input dataset for the Community Climate Resilience (CCR) theme identifies structures (such as dams and culverts) as critical community assets that can also pose significant flood risks. Culverts and dams influence water flow and storage and when undersized, aging or poorly maintained, they can become bottlenecks that exacerbate flooding during heavy rainfall or storm events. By mapping their locations and integrating them into the CCR analysis, the plan highlights areas where infrastructure improvements or nature-based solutions—such as riparian restoration or floodplain reconnection—can reduce vulnerability and enhance resilience. Recognizing these assets as potential causes of flooding ensures that resilience planning addresses both nature and infrastructure.

The community assets and their buffered areas cover just two percent of the MCP Service Area (31,769 acres), with more than half (53 percent, or 16,687 acres) falling within the MCP Urban Area. As shown in Table 20 within this footprint, over half—16,248 acres (51 percent)—overlap CCR priority areas, including 11,257 acres (35 percent) in Tier 1 focal areas and 4,992 acres (16 percent) in Tier 2 supporting lands. The overlap is even more pronounced in urban areas: 74 percent of buffered assets intersect CCR priorities, with 58 percent in Tier 1. This pattern underscores that urban communities face the greatest combined infrastructure and climate vulnerability, making them high-value targets for resilience investments.

At the focal community scale, the alignment is notable (see Table 21). Lawrence shows 90 percent overlap between buffered assets and CCR priorities, with 88 percent in Tier 1 focal areas. Lowell follows at 81 percent, Manchester at 76 percent and Nashua at 73 percent. These figures indicate that nearly all critical infrastructure in these communities is located within areas prioritized for climate resilience. For municipal decision makers, this means that infrastructure projects—such as culvert replacements or dam safety improvements—can be strategically paired with conservation actions to deliver multiple benefits: reducing flood risk, protecting community assets and enhancing ecological resilience.

Table 20: Overlap of Community Climate Resilience (CCR) priorities with buffered community asset areas in the MCP Service Area and MCP Urban Area. The table shows that buffered assets cover 31,769 acres (two percent of the MCP Service Area), with more than half located in urban areas. Overlap with CCR priorities is substantial—51percent across the service area and 74 percent within urban areas—highlighting where infrastructure improvements and conservation actions can be most effectively targeted.

Overlap of Community Climate Resilience (CCR) Priorities and Community Asset Buffered Areas							
**Of the 31,769 Community Asset Buffered Area acres in the MCP Service Area, 16,687 acres are within the MCP Urban Area.*							
Community Asset Buffered Areas Context*	**Total Community Asset Buffered Area** *(Acres)*	**Tier 1 CCR Focal Areas overlap** *(Acres)*	**Percent Tier 1 Overlap**	**Tier 2 CCR Supporting Lands overlap** *(Acres)*	**Percent Tier 2 Overlap**	**Total CCR Priority Overlap** *(Acres)*	**Percent Total CCR Overlap**
MCP Service Area	31,769	11,257	35%	4,992	16%	16,248	51%
MCP Urban Area	16,687	9,595	58%	2,761	17%	12,356	74%

Table 21: Overlap of CCR priorities with buffered community asset areas in focal communities. The table shows that nearly all critical infrastructure in these communities falls within CCR priority zones, with Lawrence at 90 percent overlap, Lowell at 81 percent, Manchester at 76 percent and Nashua at 73 percent. High percentages in Tier 1 focal areas (ranging from 60 percent to 88 percent) highlight opportunities to pair infrastructure upgrades with conservation actions for maximum resilience benefits.

Overlap of CCR Priorities and Buffered Community Asset Areas in Focal Communities							
Focal Community	**Total Community Asset Buffered Area within Focal Community** *(Acres)*	**Tier 1 CCR Focal Areas Overlap** *(Acres)*	**Percent Tier 1 Overlap**	**Tier 2 CCR Supporting Lands overlap** *(Acres)*	**Percent Tier 2 Overlap**	**Total CCR Priority Overlap** *(Acres)*	**Percent Total CCR Overlap**
Lawrence	167	147	88%	3	2%	150	90%
Lowell	296	202	68%	37	12%	239	81%
Manchester	563	337	60%	90	16%	427	76%
Nashua	432	270	62%	47	11%	317	73%

CONCLUSION: ADVANCING A SHARED VISION FOR THE MERRIMACK RIVER WATERSHED

The Merrimack River watershed is one of New England's most ecologically and socially significant landscapes—and one of the most threatened. With more than 2.6 million residents and over half a million people relying on the Merrimack for drinking water, the stakes for conservation and climate resilience are high. Accelerating climate change coupled with development pressures will intensify flooding, heat vulnerability and water quality risks. The 2025 Merrimack Watershed Conservation Plan responds to these challenges with a science-based, community-informed framework that identifies where conservation actions can deliver the greatest benefits for both people and nature.

This update builds on the 2014 plan by expanding its scope beyond undeveloped lands to include urban and developed areas—places where climate vulnerabilities and conservation opportunities converge. The rural-to-urban gradient within the Merrimack River watershed presents unique challenges: urban areas face heightened risks from flooding, extreme heat and loss of green space, yet they also offer significant opportunities for resilience through tree planting, green infrastructure and restoration of natural systems. These interventions strengthen ecological connectivity, reduce climate and flood risks, protect water quality and mitigate heat. By integrating community input, this plan ensures that potential interventions enhance quality of life, improve public health and support local economies.

FROM PLANNING TO ACTION

Building a climate-resilient Merrimack River watershed will require collaboration across sectors and sustained investment. Municipal leaders, conservation practitioners and community-based organizations can take the following steps:

- **Integrate nature-based solutions into municipal planning** to reduce flood risk, mitigate heat and improve stormwater management. While impactful throughout the watershed, Community Climate Resilience needs are greatest in urban areas.
- **Prioritize land protection and restoration in high-value areas** identified in the plan, especially those that deliver multiple benefits for people and nature that maintain biodiversity and connectivity.
- **Expand tree canopy and green space in urban areas** to address heat vulnerability and improve community health.
- **Safeguard drinking water sources** by conserving critical catchments and implementing restoration strategies in vulnerable areas. This will also reduce long-term treatment costs.
- **Strengthen partnerships with community-based organizations** to ensure conservation strategies reflect local priorities and build long-term support.

APPENDICES

Appendix 1: Project team Organization

Appendix 2: Polling Findings and Data

Appendix 3: Community Engagement

Appendix 4: Spatial Methodology

Appendix 5: Conservation Status and Trends