How Conserving Open Space Provides Economic Benefits to Massachusetts Communities

PRIMROSE RESEARCH GROUP LLC

MassLand
MASSACHUSETTS LAND TRUST COALITION

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Prepared by Primrose Research Group for the Massachusetts Land Trust Coalition

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Executive Summary

Land conservation has the potential to provide returns to communities by generating benefits with an economic value that outweighs the direct or perceived costs of conservation. There are many categories of value that directly benefit residents, local businesses, and the municipality.

Land conservation improves quality of life for residents by:

- Allowing for and encouraging recreational use. Local recreational access is important because most recreational activities are conducted within five miles of home.
- Providing numerous health benefits. Research indicates that people with access to the outdoors show long term health improvement.
- Improving air quality, helping to avoid the costs associated with pollution (e.g., medical expense and lost work because of asthma attacks).
- Keeping temperatures cooler in the summer and warmer in the winter, avoiding a range of health problems and reducing energy bills.
- Helping to address disparities in access to nearby open space.

Land conservation generates local jobs and bolsters businesses by:

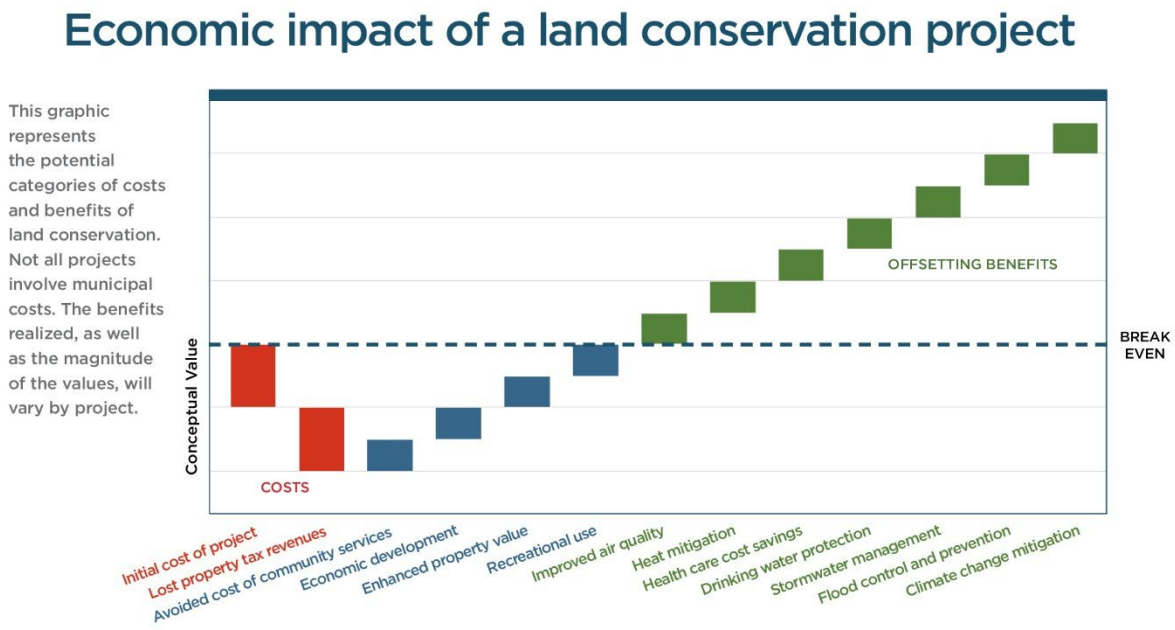
- Supporting tourism-related businesses.
- Recruiting new residents who may be business owners, entrepreneurs, or workers, supporting growth in earnings per job across a community.
- Protecting working landscapes and improving water quality and habitat that are vital to the farming, forestry, and commercial fishing industries.

Land conservation benefits municipalities by:

- Avoiding increased costs of public services that would have been required if the conserved property had been developed, such as increased school, public works, and public safety services.
- Positively impacting local employment outcomes and economic growth thereby improving the commercial tax base.
- Enhancing nearby property values by creating an amenity value, increasing tax revenue collected as assessments are adjusted.
- Protecting clean drinking water from contamination, filtering and cleaning drinking water, and enhancing infiltration and replenishment of groundwater resources, reducing treatment costs.
- Naturally infiltrating and managing stormwater, lowering the levels of phosphorus, nitrogen, and total suspended solids that end up in waterbodies, and thereby lowering management costs.
- Storing and slowing runoff from storms, thereby reducing the frequency and magnitude of floods. Conserving land in floodplains helps avoid property damage and infrastructure losses by preventing development in flood-prone areas where property damage is most likely during flood events.

The specific benefits and costs of conserving a parcel of land will depend on characteristics of the land and community in question. A municipal investment is sometimes requested to acquire a specific parcel of conservation land. Sometimes conserving a piece of land will remove it from property tax rolls, but in

the case of a conservation restriction or agricultural preservation restriction over land that remains in private hands, the property will still be subject to property taxation.



Land Conservation Benefits Residents

Land conservation improves quality of life for residents. Employees in today's economy consider more than salary when choosing where to work and reside. For example, focus groups conducted by Carnegie Mellon University have found that young creative workers, particularly those in high-technology fields, consider lifestyle factors, such as environmental and recreational quality, more heavily than the job itself when choosing where to live.[1] Additional research on local economic development has focused on quality of life and concerns about the natural, social, and cultural environment as well as on lifestyle affordability. Conserved land contributes to local economic development by making communities more attractive to new residents while also providing low-cost opportunities for recreation and improving health, including reducing air pollution and moderating temperature for all residents.[2]

Enabling recreation

Conserved lands with public access allow for and encourage recreational use by residents. The most recent State Comprehensive Outdoor Recreation Plan (SCORP) provides helpful context about the recreational use and needs of residents, highlights of which are included here.[3]

- Local recreational access is important because most recreational activities are conducted within five miles of home.[4]
- Recreation at municipal facilities is popular (e.g., beaches, hiking trails, and nature preserves). Four out of five residents visit either state or local facilities at least a few times a year, with 41 percent visiting state lands at least monthly and 32 percent visiting municipal facilities weekly.
- Top activities include running, jogging, or walking; hiking; swimming in freshwater or saltwater; road biking; swimming in pools; and canoeing, kayaking, rafting, or tubing.
- The most popular outdoor activities for youth are team activities, such as soccer. Most common outdoor youth activities were running, jogging, or walking; swimming (any type); and road biking.
- Top requests for municipal improvements include:
    - Water-based recreation (59 percent)
    - Neighborhood park-type amenities (52 percent)
    - Trails (48 percent)

Hunting and fishing are traditional outdoor recreation activities and remain important in the state. In 2021, there were over 55,000 hunting and 169,000 freshwater fishing license holders, predominantly Massachusetts residents.[5] The majority of Massachusetts game species rely on a landscape dominated by forests of diverse structure and age classes.[6] Fisheries also depend on forests to filter runoff for clean

[1] Florida, R., Cities and the Creative Class (New York: Routledge, 2005).
[2] Greenwood D., and R. Holt, Local Economic Development in the 21st Century: Quality of Life and Sustainability (New York: Routledge, 2015)
[3] Executive Office of Energy and Environmental Affairs. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2017. Submitted to the National Park Service. December 2017.
[4] Most drive a personal car to get to the activity. Two-thirds also walk or jog to get there. Very few make use of public transportation.
[5] U.S. Fish and Wildlife Service National Hunting License Data. Calculation Year 2021. Accessed at National Hunting License Data 2021 (fws.gov) on January 13, 2022. U.S. Fish and Wildlife Service National Fishing License Data. Calculation Year 2021. Accessed at National Fishing License Data 2021 (fws.gov) on January 13, 2022.
[6] Cardwell, Mary. 2021. Massachusetts State Forest Action Plan 2020. Executive Office of Energy & Environmental Affairs, Department of Conservation & Recreation, Massachusetts Bureau of Forest Fire Control & Forestry.

water and provide critical shade to cold headwater streams required by species like the iconic brook trout.

People are willing to pay for recreational access to trails, parks, and even private facilities. Users derive value even if they do not have to pay to access these amenities (e.g., pay an entry fee). The benefit accrues to the user in one of two ways: by providing cost savings to individuals who were willing to pay to recreate but did not have to, or by providing travel cost savings to individuals who do not have to travel to access a substitute site. Following the U.S. Army Corps of Engineers' Unit Day Value methodology, it is possible to estimate recreation benefits by specific activity, assigning each activity a dollar value. Oregon State University's Recreation Use Values Database contains values for more than 20 activities and is based on over 420 economic studies that estimated the use value of recreation activities in the United States and Canada from 1958 to 2015.[7]

Illustration of the Range in Values for Recreational Activities in Massachusetts	
Activity	**Value per Person per Day (2016$)**
Backpacking	$23
Camping	$25
Freshwater Fishing	$16-87
Hiking	$91
Hunting	$11-244
Picnicking	$41
Sightseeing	$36
Wildlife Viewing	$8-98
General Recreation	$10-57
Recreational Shellfishing	$53
Snowmobiling	$35
Source: A selection of activities based on the availability of recent Massachusetts studies. See the Recreation Use Values Database for a complete list http://recvaluation.forestry.oregonstate.edu/database.	

Providing health care cost savings

Conserved lands provide numerous health benefits. Research indicates that people with access to the outdoors show long term health improvement. For example,

- Nature reduces symptoms of attention-deficit disorder[8] and post-traumatic stress disorder,[9] and improves mental health.[10]

[7] Oregon State University, Recreation Use Values Database, accessed January 13, 2022, http://recvaluation.forestry.oregonstate.edu/database.

[8] Kuo, F. and A. Faber Taylor. 2004. A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a National Study. American Journal of Public Health 94, no. 9 September 2004.

[9] Anderson, C., M. Monroy, and D. Keltner. 2018. Awe in Nature Heals: Evidence from Military Veterans, At-Risk Youth, and College Students. Emotion 18, no. 8.

[10] Alcock, I., M. White, B. Wheeler, L. Fleming, and M. Depledge. 2014. Longitudinal Effects on Mental Health of Moving to Greener and Less Green Urban Areas. Environmental Science and Technology 48, no. 2 (2014): 1247–1255; Astell-Burt, T. R. Mitchell, and T. Hartig. 2014. The Association Between Green Space and Mental Health Varies Across the Lifecourse. A Longitudinal Study. Journal Epidemiology and Community Health. 68, no. 6 June 2014; Kuo, M. 2015. How Might Contact with Nature Promote Human Health? Promising Mechanisms and a Possible Central Pathway. Frontiers in Psychology 6 2015: 1–8;

- Spending just 20 minutes connecting with nature can help lower stress hormone levels.[11]
- Access to parks and recreational resources can reduce child obesity.[12]
- Proximity to more green space is associated with reduced mortality and increased longevity.[13] For example, women living with a higher amount of greenness around their homes had a 12 percent lower rate of death from non-accidental causes compared to women living with the least amount of greenness. Another study found a reduced COVID-19 mortality rate with higher greenspace access.[14]

Recreational use by residents improves health and reduces health care spending. The Centers for Disease Control and Prevention (CDC) recognizes that physical activity helps improve overall health and reduces the risk for chronic diseases. As such, the CDC promotes physical activity guidelines, defining sufficient activity as at least 150 minutes of moderate-intensity activity per week or at least 75 minutes of vigorous-intensity activity per week, along with muscle-strengthening activities at least two days per week.[15] The recent SCORP survey found that people who run, jog, or walk do that activity much more frequently than other activities' participants. Forty percent of them run, walk, or jog multiple times per week.[16] Local publicly accessible open space can provide residents with the opportunity to engage in active recreation that improves their health and reduces health care spending.

Improving air quality

Air pollution is a significant and expensive problem that injures human health and damages structures. Human cardiovascular and respiratory systems are affected, with broad consequences for health care costs and productivity.[17] In addition, acid rain, smog, and ozone increase the need to clean and repair buildings and other infrastructure.[18] The vegetation in conserved lands plays a role in improving air quality, helping nearby areas avoid the costs associated with pollution.[19] Trees and shrubs have the

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Marselle, M., K. Irvine, and S. Warber, 2014. Examining Group Walks in Nature and Multiple Aspects of Well Being: A Large-Scale Study. Ecopsychology 6, no. 3 2014: 134–147; Sturm, R. and D. Cohen. 2014. Proximity to Urban Parks and Mental Health. Journal of Mental Health Policy and Economics 17, no. 1 2014: 19–24.

[11] Harvard Medical School, Harvard Health Publishing, Mind & Mood: A 20-Minute Nature Break Relieves Stress. Accessed January 19, 2022, https://www.health.harvard.edu/ mind-and-mood/a-20-minute-nature-break-relievesstress.

[12] Wolch, J. et al., Childhood Obesity and Proximity to Urban Parks and Recreational Resources: A Longitudinal Cohort Study, Health & Place 17, no. 1 (January 2011), https://www.sciencedirect.com/ science/article/abs/pii/S1353829210001528?via%3Dihub; Veugelers, P., F. Sithole, and S. Zhang. 2008. Neighborhood Characteristics in Relation to Diet, Physical Activity and Overweight of Canadian Children. International Journal of Pediatric Obesity 3 2008: 152–159.

[13] James, P., J. Hart, R. Banay, and F. Laden. 2016. Exposure to Greenness and Mortality in a Nationwide Prospective Cohort Study of Women. Environmental Health Perspectives 124, no. 9 2016: 1344–1352; Ji, J. et al., "Residential Greenness and Mortality in Oldest-Old Women and Men in China: A Longitudinal Cohort Study," Lancet Planetary Health 3, no.1 (January 2019), https://www.thelancet.com/ journals/lanplh/article/PIIS2542-5196(18)30264-X/ fulltext.

[14] Russette, H. et al. 2021. Greenspace Exposure and COVID-19 Mortality in the United States: January-July 2020. Environmental Research. Volume 198 July 2021.

[15] Centers for Disease Control and Prevention, "How Much Physical Activity Do Adults Need?"

[16] Executive Office of Energy and Environmental Affairs. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2017. Submitted to the National Park Service. December 2017.

[17] Kampa, M. and E. Castanas, "Human Health Effects of Air Pollution," Environmental Pollution 151 (2007): 362–367; Currie, J., "Pollution and Infant Health," Child Development Perspectives 7 (2013): 237–242.

[18] Butlin, R. "Effects of Air Pollutants on Buildings and Materials," Proceedings of the Royal Society of Edinburgh. Section B. Biological Sciences 97 (1990): 255–272; U.S. Environmental Protection Agency, The Plain English Guide to the Clean Air Act, EPA-456/K-07-001, Office of Air Quality Planning and Statistics, 2007.

[19] Nowak, D., S. Hirabayashi, A. Bodine, and R. Hoehn, "Modeled PM2.5 Removal by Trees in Ten U.S. Cities and Associated Health Effects," Environmental Pollution 178 (2013): 395–402.

ability to remove pollutants from the air. Leaves absorb gases such as nitrogen dioxide, sulfur dioxide, carbon monoxide, and ozone. As it adheres to plant surfaces, particulate matter (PM), which includes small particles of dust, metals, chemicals, and acids, can also be removed. Breathing air pollutants, including fine particles and ozone, can lead to premature death, nonfatal heart attacks, aggravated asthma, and lost days of work and school.[20]

Carbon storage and sequestration

Massachusetts forests accumulate and store carbon, removing carbon dioxide emissions from the atmosphere.[21] In New England, forests offset more than 20 percent of the region's carbon dioxide emissions. In addition, New England's forests remove over 760,000 tons of air pollution each year, which is worth an estimated $550 million in health benefits.[22] When forests are permanently cleared for development, they lose this ability to sequester and store carbon.

The U.S. Forest Service's i-Tree tool estimates the air pollution removal benefits for Massachusetts' counties based on the tree cover data for the year 2010. Air pollution removal values ranged from $53,000 in Nantucket County to $66.9 million in Middlesex County. See Appendix A for the complete list of values for Massachusetts counties.

Naturally moderating temperature

Studies have shown that trees around residences keep homes cooler in the summer and warmer in the winter which reduces cooling and heating costs and improves human health and comfort.[23] The phenomenon of urban areas experiencing elevated temperatures relative to surrounding non-urbanized areas due to alteration of natural land-cover is known as the Urban Heat Island (UHI). Less attention has been given to temperature elevations in low density residential areas, but trees significantly reduce temperatures even in low-density residential areas.

Trees are an effective means of offsetting the energy-intensive urban heat island effect. Worcester's urban forest has been greatly degraded by large climatological, biological, and anthropogenic disturbance events, including a recent Asian Longhorned Beetle infestation. To exterminate the Asian Longhorned Beetle, from 2008 to 2010 30,000 mature trees were removed decreasing urban tree cover by 21 percent. The loss in urban tree canopy increased peak temperatures by an additional 1 to 6 degrees Celsius and extended the summer warm period by up to 15 days. This leads to increased energy bills for home cooling. To give a sense of the order of magnitude of these costs, as of 2008 Worcester had 17,113 street trees providing nearly $1 million in energy savings benefits.[24]

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[20] U.S. Environmental Protection Agency, "Benefits Mapping and Analysis Program: How BenMAP-CE Estimates the Health and Economic Effects of Air Pollution," accessed January 14, 2022, https://www.epa.gov/benmap

[21] Cardwell, M. 2021. Massachusetts State Forest Action Plan 2020. Executive Office of Energy & Environmental Affairs, Department of Conservation & Recreation, Massachusetts Bureau of Forest Fire Control & Forestry.

[22] Foster, D., et al., "Wildland and Woodlands Farmlands and Communities Broadening the Vision for New England." Harvard University Press, Cambridge, Massachusetts. 2017.

[23] Elmes, A., J. Rogan, C. Williams, S. Ratick, D. Nowak, and D. Martin. 2017. Effects of urban tree canopy loss on land surface temperature magnitude and timing. ISPRS Journal of Photogrammetry and Remote Sensing. 128

[24] Freilicher, M., B. Kane, H. Ryan, and D. Bloniarz. 2008. A Report on the Status of Street Trees in Worcester, Massachusetts Trees in Peril: Responding to the Asian Longhorned Beetle.

Extreme heat also causes a range of health problems including heat exhaustion, heat stroke, even death. In New England, an estimated 2,302 deaths are attributable to heat annually.[25] Many of these premature deaths are preventable by simply increasing tree canopy cover.[26] This is especially important for households that lack access to air conditioning.

Supporting environmental justice

Additional local land conservation is necessary to address current disparities in access to nearby open space. Studies have shown significant disparities in access to open space. Lower income neighborhoods generally have less greenspace and trees; fewer, smaller, more crowded, and warmer parks; and more summer heat.[27] Participation in outdoor recreation is also lower for reasons including institutional discrimination and structural inequality in leisure time and access to transportation, as well as personal experiences of racism, limited access points, or congestion of park spaces.[28]

A recent study of New England found substantial disparities in the percentage of nearby protected land for more vs. less socially marginalized communities. Households in census tracts within the lowest income quartile have just half as much nearby protected land as those in the highest income quartile and communities with the highest proportions of people of color have less than 60 percent as much protected land as those with the lowest proportions.[29] They found that disparities by income persist within urban, exurban, and rural census tracts and within all states in the region. Lack of access to transportation can exacerbate access challenges, and emphasize the importance of local protected open space.

Improving environmental justice also requires attention to the processes of priority setting and decision-making within municipalities to ensure inclusion of all stakeholders and balancing of multiple

[25] Weinberger, K. et al., 2020. Estimating the Number of Excess Deaths Attributable to Heat in 297 United States Counties. Environmental Epidemiology 4, no. 3. June 2020, https:// journals.lww.com/environepidem/fulltext/2020/06000/ estimating_the_number_of_excess_deaths.1.aspx.

[26] Kondo, M. et. al. 2020. Heat Impact Assessments of Philadelphia's 2025 Tree Canopy Cover Goals. Lancet Plant Health. 4. April 2020.

[27] Schell, C., K. Dyson, T. Fuentes, S. Des Roches, N. Harris, D. Miller, M. Lambert. 2020. The ecological and evolutionary consequences of systemic racism in urban environments. Science, 369(6510); Jennings, V., C. Johnson Gaither, and R. Gragg. 2012. Promoting environmental justice through urban green space access: A synopsis. Environmental Justice, 5(1), 1-7; Trust for Public Land. 2020. The Heat is On: A Trust for Public Land Special Report; Chapman, R., L. Foderaro, L. Hwang, B. Lee, S. Muqueeth, J. Sargent, and B. Shane, 2021. Parks and an equitable recovery. Trust for Public Land, May 27, 2021; Rigolon, A., M. Browning, and V. Jennings. 2018. Inequities in the quality of urban park systems: An environmental justice investigation of cities in the United States. Landscape and Urban Planning, 178, 156-169.

[28] Flores, D., G. Falco, N. Roberts, and F. Valenzuela III. 2018. Recreation equity: Is the Forest Service serving its diverse publics? Journal of Forestry, 116(3), 266-272; Winter, P., W. Crano, T. Basáñez, and C. Lamb, 2020. Equity in Access to Outdoor Recreation—Informing a Sustainable Future. Sustainability, 12(1), 124; Taylor, D. 2000. Meeting the challenge of wild land recreation management: Demographic shifts and social inequality. Journal of Leisure Research, 32(1), 171-179; Roberts, N., and D. Rodriguez. 2008. Use of multiple methods: An examination of constraints effecting ethnic minority visitor use of national parks and management implications. Ethnic Studies Review, 31(2), 35-70; Erickson, B., C. Johnson, and B. Kivel. 2009. Rocky Mountain National Park: History and culture as factors in African-American park visitation. Journal of Leisure Research, 41(4), 529-545; García, R., and E. Baltodano. 2005. Free the Beach-Public Access, Equal Justice, and the California Coast. Stan. JCR & CL, 2, 143; Sister, C., J. Wolch and J. Wilson. 2010. Got green? Addressing environmental justice in park provision. GeoJournal, 75(3), 229-248; Finney, C. 2014. Black faces, white spaces: Reimagining the relationship of African Americans to the great outdoors: UNC Press Books.

[29] Sims, K., L. Lee, N. Estrella-Luna, M. Lurie, J. Thompson. Environmental justice criteria for new land protection can inform efforts to address disparities in access to nearby open space. Submitted manuscript. Available at: https://www.amherst.edu/people/facstaff/ksims/research.

priorities.[30] Future land protection efforts can satisfy multiple community priorities. The study found that prioritization based on clean drinking water also had positive potential to decrease racial or income disparities in land protection. The Incorporating Environmental Justice Criteria in Land Conservation map created by researchers at Amherst College, Harvard Forest, and StarLuna Consulting shows census tracts in New England with a high degree of social marginalization and low amount of open space.[31] Environmental justice areas have both high social marginalization and little land protection.

Land conservation builds partnerships and cultivates equity
Northampton

In 2017, the City of Northampton, acquired 54 acres of working farmland, wetlands, and forest that abutted the Fitzgerald Lake Conservation Area. The project also included 4 acres of adjacent farmland located just across the municipal line in the Town of Hatfield. Kestrel Land Trust partnered with Northampton to acquire the 4 acres in Hatfield in order to keep the farm whole and to manage the farmland on the Northampton side. The primary source of funding was Community Preservation Act funds.

The approximately 46 acres of important wetlands and recreational land were added to the Fitzgerald Lake Conservation Area while the remaining 9.5 acres were leased to the Pioneer Valley Workers' Center. The Pioneer Valley Workers' Center established La Colmena Community Farm which consists of the Riquezas del Campo Farm Coop, an independent majority immigrant-led LLC, and La Colmena Community Garden.[32] The Coop grows herbs and vegetables, which are sold locally (within 25 miles) to wholesale buyers, and to individual customers at farmers markets, where they feature traditional ingredients from a variety of cultures like cilantro, tomatillos, collard greens, and a wide variety of peppers, and where they accept SNAP/HIP. The half-acre community garden provides members with access to small plots of land to grow food for their families, as well as gather to cultivate community and share knowledge through a variety of workshops. Pioneer Valley Workers' Center has also made portions of the field available to other farmers until Riquezas del Campo grows into full use of the field, including through All Farmers, a local organization supporting refugee and immigrant farmers.

[30] Estrella-Luna, N. 2010. Public participation and communicative interaction: The structural mechanisms of institutional bias. Environmental Justice, 3(4), 135-140; González, R. 2018. The Spectrum of Community Engagement to Ownership. Facilitating Power, https://www.facilitatingpower.com/tools.

[31] Dimensions of social marginalization include median household income, percent people of color, and percent English-language isolated. Data is from the 2014-2018 American Community Survey. The data can be viewed here: http://bit.ly/EJ-OS-NE.
Protected land includes all permanently protected public and private land according to the Highstead/Harvard Forest dataset.

[32] Pioneer Valley Workers Center. La Colmena Community Farm. Accessed January 21, 2022, https://pvworkerscenter.org/community-farm/; Kestrel Land Trust. 2019. Immigrants' Dreams Take Root on Conserved Farmland. Your Valley. Fall-Winter 2019.

Conservation Land Benefits Local Businesses

Land conservation contributes to local economies in terms of jobs, business growth, taxes, and other revenue. Outdoor recreation drives many economic benefits, including support for tourism-related businesses and recruiting new residents who may be business owners, entrepreneurs, or workers, supporting growth in earnings per job across a community.[33] Protecting working landscapes and improving fish habitat and water quality contribute to the farming, forestry, and commercial fishing industries. Together these industries employ hundreds of thousands of workers and generate billions in value add in communities across the state.[34]

Tourism and outdoor recreation economy

Land conservation supports a thriving tourism and outdoor recreation economy. The outdoor recreation tourism economy includes spending by visitors.[35] Travelers to conserved lands with public access, such as parks and trails, spend money locally supporting local income and jobs. In fiscal year 2020, 7.1 percent of domestic visitors came to Massachusetts with the primary trip purpose of outdoor recreation.[36] They spent $1.48 billion resulting in $37.9 million in local tax receipts. Suffolk County had the highest domestic visitors' expenditures at $730 million, while Middlesex County had the most jobs with 1,700. See Appendix B for a breakout of tourism spending impacts by county. Many visitors who come to Massachusetts for educational or cultural events, from the Berkshires to the Cape and Islands, are also attracted by the landscapes and open space recreational opportunities.[37]

The overall outdoor recreation economy includes spending by both residents and visitors. According to the Bureau of Economic Analysis outdoor recreation accounted for $7.69 billion in value added, representing 1.3 percent of the Commonwealth's GDP, and 90,600 jobs.

[33] Headwaters Economics. 2019. Recreation Counties Attracting New Residents and Higher Incomes: Recreation, especially in non-metro places, draws residents, higher incomes, and faster earnings growth than places without recreation. January 2019. Accessed February 1, 2022 https://headwaterseconomics.org/wp-content/uploads/recreation-counties-attract-report.pdf.

[34] Value-added (also known as gross regional product, or GRP) is the sum of labor income, other property income (e.g., rents and profits) and indirect business taxes (e.g., excise and sales taxes). It is the difference between an industry's total output and the cost of its intermediate inputs.

[35] Outdoor recreation spans many activities, from traditional activities like hunting, fishing, camping, and hiking to more casual outdoor activities like gardening and outdoor festivals. BEA defines outdoor recreation to include all recreational activities undertaken for pleasure that generally involve some level of intentional physical exertion and occur in nature-based environments outdoors. A visitor is defined as someone who travels at least 50 miles one way or stays overnight in paid accommodations.

[36] Massachusetts Office of Travel & Tourism. 2020 Annual Report. Published April 2021.

[37] While the primary purpose of outdoor recreation accounts for 7.1 percent of domestic visitation, visitors with other primary purposes (e.g., visiting friends and family 47.7 percent, or entertainment and sightseeing 14.7 percent) frequently combine outdoor recreation activities with their trip such as going to a beach (11.9 percent), rural sightseeing (10.1 percent), urban sightseeing (10.7 percent), and enjoying State and National parks (10.3 percent). Massachusetts Office of Travel & Tourism. 2020 Annual Report. Published April 2021.

Capturing flood waters and providing recreation opportunities
Scouting Woods Recreation Area in Peabody

Peabody Square has experienced significant flood events since the 1950s, including three floods that were declared Federal Disasters. The city studied flood mitigation alternatives for the impacted area for several years and recently began aggressively implementing several stormwater improvement projects upstream.[38] One of those projects was creating the 3.5 acre Scouting Way detention basin that can hold 2.8 million gallons of stormwater.[39]

In 2008, the city acquired Scouting Woods, 11.46 acres of land formerly owned by Eastman Gelatin Corporation, using $550,000 in Community Preservation Act funding.[40] In 2013, the city constructed a stormwater detention basin and 9-hole disc golf course on the property.[41] The city spent $2.2 million on the project. The alternative was a costly, $18 million, multi-phase gray infrastructure project to install new culverts and widen the North River canal.[42]

In 2020, Scouting Woods was further protected with a conservation restriction held by Greenbelt, Essex County's Land Trust.[43]

The city is considering purchasing abutting land and developing a trail network linking Scouting Woods to Flume Pond and the Higgins Middle School, extending the recreational benefits of the project.[44]

Forest products industry

The main threats to the productive capacity of Massachusetts forests are development/conversion of forest to non-forest (including forest clearing to build ground mounted solar arrays), climate change, fire and natural disasters, herbivore browsing, pests and disease, and economic factors (e.g., additional costs associated with increasing distance to pulpwood processors).[45] A recent study of forest loss in New England found that 'distance to nearest developed land' was the greatest predictor of forest conversion to low-density development, followed by 'distance to roads'.[46] In Massachusetts, population density was also an important factor in conversion to low- and high-density development. As suburbanization increases in Massachusetts, parcels at the suburban-rural interface may be most vulnerable to

[38] Executive Office of Energy and Environmental Affairs. 2009. Flood Mitigation Facilities for the City of Peabody.
[39] Castelluccio, J. New Reservoir Helps to Prevent Flooding in Peabody. The Salem News. Accessed January 19, 2022 https://www.salemnews.com/news/local_news/new-reservoir-helps-to-prevent-flooding-in-peabody/article_81433aa1-e87a-5e50-bc97-9a3300639bac.html.
[40] Community Preservation Coalition. CPA Projects – Detailed Report: Scouting Way. Accessed January 19, 2022, https://www.communitypreservation.org/databank/projectsdatabase/access.
[41] City of Peabody Recreation and Open Space Plan. 2015.
[42] Castelluccio, J. New Reservoir Helps to Prevent Flooding in Peabody. The Salem News. Accessed January 19, 2022 https://www.salemnews.com/news/local_news/new-reservoir-helps-to-prevent-flooding-in-peabody/article_81433aa1-e87a-5e50-bc97-9a3300639bac.html.
[43] Personal communication with Maggie Brown. Greenbelt, Essex County's Land Trust. January 2022.
[44] City of Peabody Recreation and Open Space Plan. 2015.
[45] Cardwell, M. 2021. Massachusetts State Forest Action Plan 2020. Executive Office of Energy & Environmental Affairs, Department of Conservation & Recreation, Massachusetts Bureau of Forest Fire Control & Forestry.
[46] Thompson J., J. Plisinski, P. Olofsson, C. Holden, and M. Duveneck. 2017. Forest loss in New England: a projection of recent trends. PLoS One, 12(12). https://doi.org/10.1371/journal.pone.0189636.

conversion. Additionally, in Massachusetts, the average parcel size for nonindustrial private forestland is less than 20 acres and as parcel size decreases, so does the likelihood of timber harvesting.[47] Social factors for landowners, as well as minimum sizes for profitability for loggers, contribute to this trend.[48] Therefore, conservation of forestland can help to preserve the viability of forestry.

The forest products industry employs 16,100 workers directly, with labor income of $1.55 billion.[49] For a total value added of $1.44 billion and output of $5.35 billion.[50] Multipliers capture the indirect and induced economic activity generated by the re-spending of income or sales revenues in a regional economy. When multipliers are considered, the forest projects industry provides 37,800 jobs indirectly, with $3.10 billion in labor income, $3.81 billion in value-add, and $9.23 billion in output.

Approximately 98 percent of the wood that Massachusetts residents use is imported, suggesting there are likely opportunities to increase the amount of sustainably managed locally harvested wood products.[51]

For the most up to date statistics on land use change (between 2012 and 2017) and total area of development, natural land, and open land for each of the 351 towns and cities in Massachusetts see Mass Audubon's *Losing Ground: Nature's Value in a Changing Climate*

https://www.massaudubon.org/our-conservation-work/policy-advocacy/shaping-climate-resilient-communities/publications-community-resources/losing-ground

Agriculture

Across Massachusetts, farmland loss threatens food security, local economies, ecological integrity, climate resiliency, and the very fabric of communities.[52] According to American Farmland Trust Massachusetts is the 9th most threatened state for farmland loss in the country.[53] From 2001 to 2016, 6,750 acres of state significant farmland was converted to urban and highly developed land uses.[54] Land

[47] Kittredge, D., A. D'Amato, P. Catanzaro, J. Fish, and B. Butler. 2008. Estimating ownerships and parcels of nonindustrial private forestland in Massachusetts. Northern Journal of Applied Forestry, 25(2):93-98.
[48] Kittredge, D., J. Thompson, L. Morreale, A. Short Gianotti, and L. Hutyra. 2017. Three decades of forest harvesting along a suburban–rural continuum. Ecosphere, 8(7):e01882. https://doi.org/10.1002/ecs2.1882.
[49] Leefers, L., J. Poudel, D. Neumann, and Public Sector Consultants. 2020. Forest Products Industries' Economic Contributions in the Northeast and Midwest. Lansing: Public Sector Consultants.
Employment is the number of full- and part-time jobs associated with an industry. Labor income is the dollar total of employee compensation and proprietor income; the latter is associated with self-employed individuals.
[50] The sum of value added for all economic sectors within the region equals the total GRP. Output is the dollar measure of production within an area.
[51] De Le Cretaz, A. L. Fletcher, P. Gregory, W. VanDoren, P. Barten. 2010. An Assessment of the Forest Resources of Massachusetts, University of Massachusetts Amherst Department of Natural Resources Conservation and Massachusetts Department of Conservation and Recreation, Prepared for the USDA Forest Service. 2010.
[52] Pottern, J. and L. Barley. 2020. Special Report: Farms Under Threat: A New England Perspective: New Findings to Guide our Work and Inspire Action. American Farmland Trust.
[53] Freegood, J., M. Hunter, J. Dempsey, and A. Sorensen. 2020. Farms Under Threat: The State of the States. American Farmland Trust.
[54] State significant agricultural land is defined as all land with a productivity, versatility, and resiliency (PVR) value above the state median. The PVR model incorporates detailed maps of soil productivity and environmental limitations, land cover/use, types of crops produced, and length of growing season, and prioritizes them according to weights elicited from a group of national experts. Land with a high PVR score is best suited for long-term cultivation and food production.

conservation has an important role to play in sustaining the agriculture industry, with 21.6 percent of agricultural land in Massachusetts currently protected.[55]

With 7,240 farms and 492,000 acres in farmland, agriculture is a key part of the Massachusetts landscape and economy.[56] The agricultural industry in the state directly employs 25,920 individuals and produces an annual market value of over $475 million in agricultural goods.[57] The average Massachusetts farm produces $65,624 worth of agricultural products on 68 acres.

Direct market sales are a key feature of Massachusetts agriculture. Massachusetts ranks 5th in the nation for direct market sales with over $100 million and ranks 3rd in the nation for direct market sales per farm at $55,384. Direct market sales account for 21.1 percent of the state's total sales of agricultural products -- the highest proportion in the country. Additionally, Massachusetts ranks 8th in the nation for direct sales per capita. Direct sales are critical to sustainability for farmers because the farmer can eliminate costly intermediaries, such as distributors and retailers, and capture more of the revenue for their own businesses.[58] Farmers are also able to set prices that reflect the cost of production, a key to ongoing viability. Direct to consumer sales ripple through the local economy. According to Community Involved in Sustaining Agriculture (CISA), "If every household in Massachusetts spent $20 more on local food per month (and $20 less on non-local food), $234,768,540 more local income would be generated per year and 3,876 local jobs would be created in the State."[59]

Small and family orientated farm culture is prevalent in Massachusetts agriculture. However, there are differences by region. For example, as of 2017, Suffolk and Nantucket Counties tie for the smallest number of farms at 21, while the average size is one acre in Suffolk and 37 acres in Nantucket.[60] Worcester County has 1,568 farms, totaling 95,308 acres, with an average size of 61 acres. Key agricultural statistics by county can be found in Appendix C.

Massachusetts' large food processing industry, including agricultural production and processing, has $4.50 billion in direct sales, generates $7.14 billion in impact, and supports more than 36,000 jobs in Massachusetts.[61]

Commercial fishing

Coastal land conservation protects fish habitat and water quality contributing to the commercial fisheries industry and closely related economic sectors. The water quality in the state's estuaries near coastal areas is directly affected by the water purification, flood control, and stormwater protection provided by natural areas. Massachusetts commercial fishing and seafood industry is the third largest in the U.S.[62] In 2018, it generated the largest fishing and seafood industry employment impacts in the New England region with 143,902 full- and part-time jobs. Massachusetts also generated the largest sales

[55] Pottern, J. and L. Barley. 2020. Special Report: Farms Under Threat: A New England Perspective: New Findings to Guide our Work and Inspire Action. American Farmland Trust.
[56] U.S. Department of Agriculture. 2017 Census of Agriculture.
[57] Massachusetts Department of Agricultural Resources. https://www.mass.gov/info-details/agricultural-resources-facts-and-statistics
[58] Massachusetts Food Policy Council. 2015. Massachusetts Local Food Action Plan.
[59] Ibid.
[60] U.S. Department of Agriculture. 2017 Census of Agriculture.
[61] Farm Credit East. 2020. Northeast Economic Engine: Agriculture, Forest Products, Commercial Fishing. Farm Credit East.
[62] National Marine Fisheries Service. 2021. Fisheries Economics of the United States, 2018. Economics and Sociocultural Status and Trends Series. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration.

impacts ($16 billion), value-added impacts ($6.1 billion), and income impacts ($3.9 billion) of the fishing and seafood industry in New England.

Preserving farming and providing recreation opportunities
Sweetwilliam Farm in Upton

This 250-year-old farm was owned by Eli Whitney's grandfather.[63] The farmhouse was built by Eli's cousin Ephraim Whitney, a revolutionary war veteran. The Whitney Family owned the farm until about 1900. This 96-acre historic farm property was protected in 2011.[64] The Town of Upton, working in partnership with Sudbury Valley Trustees, a regional land trust, purchased 63 acres of the farm property creating the Whitney Conservation Area, and established a conservation restriction on another 33-acres, which became Fivefork Farms. The total project cost was $1.26 million, comprised of $688,500 in Community Preservation Act funds, a $500,000 LAND grant from the Massachusetts Division of Conservation Services, and $74,000 in private funds. Preservation of Sweetwilliam Farm also provided an opportunity for a conservation buyer to preserve an additional 70 acres of adjacent forest land.

The Whitney Conservation Area is a forested area with trails linking to Upton State Forest and the Warren Brook Watershed Conservation Area, and is part of the Miscoe, Warren, Whitehall Area of Critical Environmental Concern. Warren Brook is designated a high-quality cold-water fishery.[65]

Fivefork Farms specializes in growing cut flowers for the farm's CSA, area farmers' markets, retail stores, florists, and designers.[66] The farm currently has six full-time and two part-time employees.

If the farm had not been protected up 30 homes could have been built on the property.

Land Conservation Benefits Municipalities

Land conservation can potentially improve the municipal bottom line. Studies have shown that property tax revenue losses are often offset by other impacts of conserving the parcel, including:

- Avoiding increased costs of public services that would have been required if the conserved property had been developed, such as increased school, public works, and public safety services.
- Positively impacting local employment outcomes and economic growth thereby improving the commercial tax base.
- Enhancing nearby property values by creating an amenity value, increasing tax revenue collected as assessments are adjusted.

In addition, development of open space in Massachusetts leads to increases in impervious surface, increases in water runoff, increases in nitrogen and phosphorus loading, and lost filtration capacity.[67]

[63] Upton Open Space Committee. Sweetwilliam Farm Factsheet. November 8, 2010.
[64] Community Preservation Coalition. CPA Projects – Detailed Report: Scouting Way. Accessed January 19, 2022, https://www.communitypreservation.org/databank/projectsdatabase/access.
[65] Town of Upton. Upton Conservation Land and Trail Maps. Accessed January 19, 2022 https://www.uptonma.gov/land-stewardship-committee/pages/upton-conservation-land-and-trail-maps.
[66] Fivefork Farms. Accessed January 19, 2022, https://www.fiveforkfarms.com/.
[67] Thompson, J., K. Lambert, D. Foster, E. Broadbent, M. Blumstein, A. Almeyda Zambrano, and Y. Fan. 2016. The consequences of four land-use scenarios for forest ecosystems and the services they provide. Ecosphere 7(10):e01469.

This often translates to increased costs for municipalities to provide clean drinking water, manage stormwater, and protect infrastructure from flooding.

A comprehensive study of land conservation in New England from 1990 to 2015, including both ownership and easement-based protection, found that land protection did not have a substantial impact on property tax rates.[68] That is, on average, the tax impacts of land conservation were found to be small and dissipate over time, adding just a few dollars to the annual tax bill for most homeowners. In Massachusetts, the study found that on average, new protection resulted in small property tax rate increases of $0.58 to $0.88 per $100,000 of taxable property value for the average annual new area protected of 54 acres. This translates to an annual tax bill increase of $2.10 to $3.18 for a typical home with a tax bill of $4,828. They found no evidence that the impacts last over time or affect municipal expenditures. However, for towns that are growing slowly, have lower household incomes, or municipal land acquisition, they study estimated greater impacts, ranging from a $5 to $30 tax bill increase for each $100,000 of value.

Avoiding costs of community services

Often, since developed land has a higher assessed value than undeveloped land, people think increased development will enable a city or town to provide better services.[69] This focus on assessed value is understandable with Massachusetts municipalities relying on property taxes for a majority of local revenues. (See Appendix D for a look at an average municipal budget.)[70] However, new development brings not only more revenue, but also more expenses, particularly for residential development. In Massachusetts, education accounts for nearly half of municipal spending, on average.[71] Undeveloped land is frequently beneficial to communities because it may bring in more revenue than it uses in services.

Communities across Massachusetts and the country have used cost of community services studies to analyze the ratio of tax revenues to public service expenditures for different land uses. A recent study of four towns in Massachusetts (i.e., Great Barrington, Whately, Upton, and Haverhill) showed lower expense to revenue ratios for open space and commercial land than residential land. This means, for example, that for every dollar of tax revenue collected from open space in Great Barrington, $0.35 is spent providing services for that land, while every dollar of tax revenue collected from residential development requires $1.12 in municipal expenses.[72] The ratios calculated in this study are similar to previous cost of community services research. American Farmland Trust found that across 151 communities nationwide (including 13 in Massachusetts) residential development is a net fiscal loss for communities.[73] That is, for every $1 in property tax revenues it generates, residential development

[68] Kalinin, A., K. Sims, S. Meyer, and J. Thompson. Does land conservation raise property taxes? Evidence from New England cities and towns. Working Paper. January 2022. Available at: https://sites.google.com/view/alexey-kalinin/research?authuser=0.

[69] Murray, H., and C. Paul, 2019. Fiscal Impacts of Land Use in Massachusetts: Up-to date Cost of Community Services Analyses for 4 Massachusetts Communities. University of Massachusetts Amherst Extension.

[70] Massachusetts Department of Revenue Division of Local Services. Municipal Databank Revenue and Expenditure Data Fiscal Year 2021. Accessed January 28, 2022, https://www.mass.gov/service-details/revenue-and-expenditure-data.

[71] Ibid.

[72] A recent University of Massachusetts study of four towns found that for every dollar of revenue brought in from open space the following is spent providing services for that land: Great Barrington $0.35; Whately $0.46; Upton $0.34; and Haverhill $0.74.

[73] Farmland Information Center. 2016. Cost of Community Services Studies. Partnership between the U.S. Department of Agriculture Natural Resources Conservation Service and American Farmland Trust.

requires $1.16 in services (median value), while working and open lands require $0.37 in services. A meta-analysis of 125 cost of community services studies across the country again found that residential land uses tend to have ratios greater than one, while commercial/industrial and agricultural/open-space land uses tend to have ratios less than one.[74]

Strengthening economic development

Strong local economies have a stronger tax base. Conserved lands help communities cultivate a competitive advantage by enhancing quality of life and attracting talent, employers, and investment. The availability of quality open space and recreation resources helps to attract businesses.[75] Many workers choose a job based on an area's quality of life, which is increased by the availability of open spaces. Furthermore, small-business decision makers rated park, recreation, and open space amenities as being the most important factor in measuring quality of life. This shows how important the investment of open space is to the future economic well-being of Massachusetts communities.

Saving land can also help local economies. A recent study of all major towns and cities in New England found that land conservation moderately increased local employment numbers and the labor force, without reducing new housing permits.[76] This was found to be especially true in rural areas.

Enhancing home values

Conserved lands have a positive impact on nearby home values and associated property tax revenues.[77] Examples relevant to land protection in Massachusetts include:

- In Amherst, according to the American Planning Association, cluster housing with dedicated open space was found to appreciate at an annual rate of 22 percent, compared to a similar conventional subdivision's rate of 19.5 percent.[78]
- Vacant land that shares a border with a conserved parcel, through either fee simple or conservation easement, increases in value by 46 percent.[79] This benefit declines with distance, although the rate of decline is less with conservation easements. In addition, the study found separate, positive price effects from new land conservation of 3 percent for property that is within view.
- Open-space acquisitions increase home values across a municipality. An average expenditure on open space of$162 per housing unit, was found to increase the average house price by 0.6

[74] Kotchen, M. and S. Stacey. 2009. A Meta-Analysis of Cost of Community Services Studies. International Regional Science Review 32(3):376-399.
[75] Executive Office of Energy and Environmental Affairs. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2017. Submitted to the National Park Service. December 2017.
[76] Sims, K., J. Thompson, S. Meyer, C. Nolte, and J. Plisinski. 2019. Assessing the local economic impacts of land protection. Conservation Biology. Volume 33. No. 5. 1035-1044.
[77] Many studies have shown the positive impact of land conservation on property values, for example: Anderson, S., and S. West, 2006. Open space, residential property values, and spatial context. Regional Science and Urban Economics 36, 773–789. https://doi.org/10.1016/j.regsciurbeco.2006.03.007; Geoghegan, J., L. Lynch, S. Bucholtz, 2003. Capitalization of Open Spaces into Housing Values and the Residential Property Tax Revenue Impacts of Agricultural Easement Programs. Agricultural and Resource Economics Review 32, 33–45; Irwin, E., 2002. The effects of open space on residential property values. Land Economics 78, 465–480. https://doi.org/10.2307/3146847;Thorsnes, P., 2002. The value of a suburban forest preserve: Estimates from sales of vacant residential building lots. Land Economics 78, 426–441. https://doi.org/10.2307/3146900.
[78] Executive Office of Energy and Environmental Affairs. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2017. Submitted to the National Park Service. December 2017.
[79] Chamblee, J., P. Colwell, C. Dehring, and C. Depken, 2011. The effect of conservation activity on surrounding land prices. Land Economics 87, 453–472. https://doi.org/10.3368/le.87.3.453.

percent during the study period, even when controlling for other market forces. [80] Another national study that found positive impacts of open space expenditures on municipal home values investigated whether this increase in home price was due to the supply of developable land being more restricted due to land conservation.[81] It found that across 710 municipalities from 1997 to 2013, open space spending did not affect new development, as measured by annual number of new housing units permitted.

Protecting drinking water

About 90 percent of Massachusetts residents get their water from public water supplies; the rest have private wells.[82] Two thirds of those who use public water supplies rely on surface reservoirs, while the remaining depend on public wells. The Quabbin and Wachusett Reservoirs serve as the full, partial, or back-up water supply for 53 communities.[83] Many rural communities rely on groundwater.

Forested land protects drinking water from contamination, naturally filters and cleans water, and enhances infiltration and replenishment of ground water resources. Each acre of forest near a reservoir or well filters and protects 543,000 gallons of drinking water per year, with an annual value of $2,500, or $60,000 present value.[84] This value will likely increase over time. Increasingly frequent drought conditions combined with PFAS contamination is putting public water supplies at risk.[85]

In the greater Boston areas, EPA has estimated that natural vegetated areas provide ground water recharge at an average rate of approximately 450,000 gallons per acre per year. It is less costly to treat drinking water from ground water sources than from surface water sources. If ground water sources are degraded or inadequate, water suppliers may have to resort to using more costly surface water alternatives. Sustainable ground water reserves may help suppliers avoid purchasing potable water during times of low yield.

Naturally infiltrating and managing stormwater

The largest threat to Massachusetts waterways is from stormwater pollution.[86] Rain washes the pollution that collects on pavement into storm sewers that flow directly into rivers, ponds, and lakes. Conserved lands can reduce stormwater runoff and filter pollutants, lowering the levels of phosphorus, nitrogen, and total suspended solids that end up in waterbodies, thereby lowering management costs.[87] Conserved lands support water quantity as well as quality, because their pervious surfaces capture and absorb precipitation, slow runoff, infiltrate and recharge groundwater, and filter out pollutants. Meanwhile, vegetation on conserved lands provides a considerable surface area that intercepts and

[80] Vandegrift, D., and M. Lahr, 2011. Open space, house prices, and the tax base. Annals of Regional Science 46, 83–100. https://doi.org/10.1007/s00168-009-0336-1.
[81] Lang, C., 2018. Assessing the efficiency of local open space provision. Journal of Public Economics 158, 12–24. https://doi.org/10.1016/j.jpubeco.2017.12.007.
[82] Executive Office of Energy and Environmental Affairs. 2015. Looking to the Future – Massachusetts Land and Park Conservation and Their Future.
[83] Massachusetts Water Resources Authority. How the MWRA Water System Works. Accessed February 1, 2022, https://www.mwra.com/04water/html/watsys.htm.
[84] Executive Office of Energy and Environmental Affairs. 2015. Looking to the Future – Massachusetts Land and Park Conservation and Their Future.
[85] Personal communication with Mark Voorhees, Environmental Engineer, Environmental Protection Agency, February 1, 2022.
[86] Executive Office of Energy and Environmental Affairs. 2015. Looking to the Future – Massachusetts Land and Park Conservation and Their Future.
[87] The Trust for Public Land. 2021. The Economic Benefits of Conserved Lands, Trails, and Parks on the North Olympic Peninsula.

stores rainwater. In effect, these green spaces function like storage reservoirs, reducing peak flows of runoff during rain events.

Land conservation is a proactive approach to avoiding stormwater management costs.[88] Converting natural vegetated areas in Massachusetts to impervious cover will decrease water quality by increasing phosphorus and nitrogen levels.[89] Decreased water quality will require implementing costly Best Management Practices (BMPs), such as infiltration trenches and enhanced biofiltration, to meet regulatory requirements. The range in potential control costs per acre of conversion to impervious cover is $62,000 to $79,000 for phosphorus and $48,000 to $58,000 for nitrogen. Therefore, protecting an acre of natural land provides stormwater management values ranging from $48,000 to $79,000.

The U.S. Forest Service's i-Tree tool estimates the annual hydrological benefits of avoided runoff for Massachusetts counties based on the tree and impervious cover data for the year 2010. Values range from $140,000 in Nantucket County to $49.1 million in Middlesex County.[90] See Appendix A for the complete list of annual values for Massachusetts counties.

Preventing and controlling flooding

Flooding is the most expensive natural hazard in Massachusetts, with $400 million in total losses from 2000 to 2019.[91] Forests and other natural landscapes help to store and slow runoff from storms, thereby reducing the frequency and magnitude of floods.[92] Conserving land in floodplains helps avoid these costs by preventing development in flood-prone areas where property damage is most likely during flood events.[93] Wetlands and natural areas near rivers and streams also prevent costly property damage by absorbing and storing potentially devastating floodwaters. Wetlands in Massachusetts have been estimated to prevent over $40 million in flood damage statewide annually.[94] Wetlands around Boston are estimated to prevent $42,111 of flood damage per acre.[95] Mass Audubon has estimated that fresh and salt water wetlands in Massachusetts provide $2.3 billion in annual ecosystem service value.[96] The Army Corps of Engineers has estimated that wetlands in the Charles River Watershed prevent $18 million in flood damage every year. Protecting these wetlands and the lands adjacent is necessary to preserve these values.

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[88] Massachusetts stormwater standards mitigate but do not eliminate the impact of new development on flooding and surface water quality. Meeting these standards assumes the perpetual maintenance and repair of stormwater management infrastructure such as detention basins, culverts, pipes, catch basins, and swales. Massachusetts Stormwater Handbook and Stormwater Standards, accessed March 1, 2022 https://www.mass.gov/guides/massachusetts-stormwater-handbook-and-stormwater-standards#-stormwater-handbook-volume-1-.

[89] Personal communication with Mark Voorhees, Environmental Engineer, Environmental Protection Agency, January 31, 2022.

[90] U.S. Forest Service. i-Tree Software Suite v5.x. (n.d.). Web. accessed January 17, 2022, http://www.itreetools.org.

[91] Hazards and Vulnerability Research Institute. 2021. How Hazardous is Your State? accessed January 18, 2022 https://public.tableau.com/app/profile/hvri/viz/Haz_Dash_New/FinalCompleteDashboard.

[92] Foster, D, et al., "Wildland and Woodlands Farmlands and Communities Broadening the Vision for New England." Harvard University Press, Cambridge, Massachusetts. 2017.

[93] The Trust for Public Land. 2013. The Return on Investment in Parks and Open Space in Massachusetts.

[94] Benedict, M., and E. McMahon. 2002. "Green infrastructure: smart conservation for the 21st century." Renewable Resources Journal. 20(3), 12-17.

[95] Myers, N. 1996. "Environmental services of biodiversity." Proceedings of the National Academy of Sciences, USA. 93: 2764-2769.

[96] Executive Office of Energy and Environmental Affairs. Massachusetts Statewide Comprehensive Outdoor Recreation Plan 2017. Submitted to the National Park Service. December 2017.

Providing clean drinking water and recreation opportunities
North Pond in Southwick

The lands around North Pond are a major source of water recharge for the aquifer that serves as the source of drinking water for residents of Southwick, Westfield, and West Springfield.[97] Deep layers of saturated material transmit large quantities of water that originate in the lakes and surrounding area then move through highly permeable sand and gravel deposits. The area in which the aquifer and aquifer recharge areas lie are seeing a significant amount of residential development and care needs to be taken to make sure that the area is not overloaded with septic systems, storm runoff, and increased flood potential which may severely damage drinking water quality.

Faced with these potential impacts the Town of Southwick, the Department of Fish and Game (DFG), and Franklin Land Trust worked together to conserve roughly 150 acres on North Pond. This land will continue naturally cleaning drinking water for thousands, while offering new recreation opportunities to the public.

Southwick owns 62 acres, with DFG holding a conservation restriction. Southwick allows public access creating many opportunities for hiking, swimming, and fishing. With 2,900 feet of pristine shoreline, it is a popular place for boating and fishing.

DFG added 83 acres to the Southwick Wildlife Management Area (WMA) in 2017.[98] The Southwick WMA is part of a larger effort to conserve grassland habitat in the Connecticut Valley.[99] DFG had acquired most of the WMA property in 2008 and has conducted extensive grassland restoration and forest management to promote healthy and vigorous growth of native grasses, shrubs, and trees. Several maintenance roads and unmarked trails wind through the WMA and can be used for walking, hiking, birding, cross-country skiing, and hunting.

The land is adjacent to conserved grasslands in Connecticut, which makes this area one of the largest areas of permanently protected grasslands in New England. Several threatened species of birds rely on these grasslands, such as the kestrel, woodcock, bobolink, grasshopper sparrow, vesper sparrow, and the upland sandpiper.

Mitigating climate change

Climate change is expected to have important impacts to forests, farms, and habitats across the state. Intense rainstorms are likely to occur more frequently causing more flooding, especially where existing paved and developed areas increase storm flows. Summer drought conditions will strain public water supplies. Invasive plants and insects will also expand in this changing landscape. Mosquito-borne diseases may become more prevalent. New England communities, states, and businesses will need to make major investments to combat and accommodate rising temperatures and sea levels and the increased frequency of flooding and severe storms.

[97] Town of Southwick. Southwick Open Space and Recreation Plan 2019. February 2020.
[98] Fitzpatrick, G. Habitat Project Underway at Wildlife Management Area. The Westfield News. July 10, 2018.
[99] Division of Fisheries and Wildlife. Lands User Guide Southwick Wildlife Management Area.

Studies have shown that municipal land use land cover decisions may have a lager impact on the magnitude of stormwater, flooding, and water quality impacts than climate change. For example, conserving and actively managing forestland, with some development, could result in less impervious area, protect water quality, and limit stormwater and flooding issues.[100] A study investigating both runoff and water quality, found as runoff increases, pollutants such as suspended solids, nitrogen, and phosphorus also increase.[101] Without land conservation costly BMPs may have to be employed to reduce runoff and treat pollutants such as nutrients and sediment through biological, chemical, and physical processes.

Conclusion

Land conservation is vital to Massachusetts communities. Conserving land does not have a substantial impact on net property tax revenues over time, with any costs often offset over time by the benefits provided to residents, businesses, and the municipality. Land conservation improves the quality of life for a community's residents by enabling recreation, providing health benefits, improving air quality, moderating temperatures, and supporting environmental justice. Land conservation contributes to local economies by generating jobs, business growth, taxes, and other revenue. Land conservation saves municipalities money by avoided costs of community services of new development, boosting the tax base by strengthening economic development and enhancing existing home values, protecting drinking water supplies, naturally infiltrating and managing stormwater, providing flood control and prevention, and mitigating climate change impacts.

[100] Thomas, J., K. Fallon Lambert, D. Foster, M. Blumstein, E. Broadbent, and A. Almeyda Zambrano. 2014. Changes to the Land: Four Scenarios for the Future of the Massachusetts Landscape. Harvard Forest, Harvard University.

[101] Alamdari, N., P. Claggett, D. Sample, Z. Easton, M. Nayeb Yazdi. 2022. Evaluating the joint effects of climate and land use change on runoff and pollutant loading in a rapidly developing watershed. Journal of Cleaner Production, 2022; 330: 129953 DOI: 10.1016/j.jclepro.2021.129953.

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Appendix A - Avoided Runoff and Air Pollution Removal Benefits by County

Avoided Runoff, Carbon Storage and Sequestration, and Air Pollution Removal Benefits by County							
County	**Total Acres**	**Canopy Acres**	**Impervious Acres**	**Avoided Runoff Value (Annual)**	**Carbon Storage Value**	**Carbon Sequestration Value (Annual)**	**Air Pollution Removal Value (Annual)**
Barnstable	835,543	114,359	34,648	$9,059,264	$704,597,909	$15,107,499	$17,732,619
Berkshire	605,713	428,838	11,636	$1,764,069	$3,955,384,188	$49,013,087	$2,127,448
Bristol	442,383	202,307	46,908	$16,248,451	$1,440,256,681	$28,240,085	$22,531,097
Dukes	314,215	30,198	2,236	$338,961	$157,363,147	$4,569,768	$301,203
Essex	530,222	153,606	56,407	$22,418,118	$1,118,899,930	$19,298,264	$42,366,851
Franklin	463,727	331,119	8,537	$2,582,717	$3,124,706,029	$42,190,563	$1,487,397
Hampden	405,920	253,664	32,578	$15,450,997	$2,253,149,501	$41,721,397	$32,766,088
Hampshire	348,933	230,285	10,104	$1,375,569	$2,012,570,205	$32,858,825	$1,100,840
Middlesex	542,117	278,211	106,419	$49,148,115	$2,271,287,142	$40,957,016	$66,909,919
Nantucket	194,339	6,209	2,099	$140,118	$31,168,860	$1,075,628	$53,042
Norfolk	284,382	137,092	51,725	$18,735,923	$1,052,092,473	$18,167,303	$42,746,112
Plymouth	699,681	234,911	42,414	$16,986,063	$1,797,021,653	$31,561,427	$24,906,595
Suffolk	76,940	5,812	22,898	$1,761,982	$37,568,235	$1,006,178	$6,336,046
Worcester	1,010,683	639,787	64,620	$7,704,931	$5,275,553,641	$73,937,631	$10,417,390
Source: U.S. Forest Service. i-Tree Software Suite v5.x. (n.d.). Web. Available at http://www.itreetools.org							

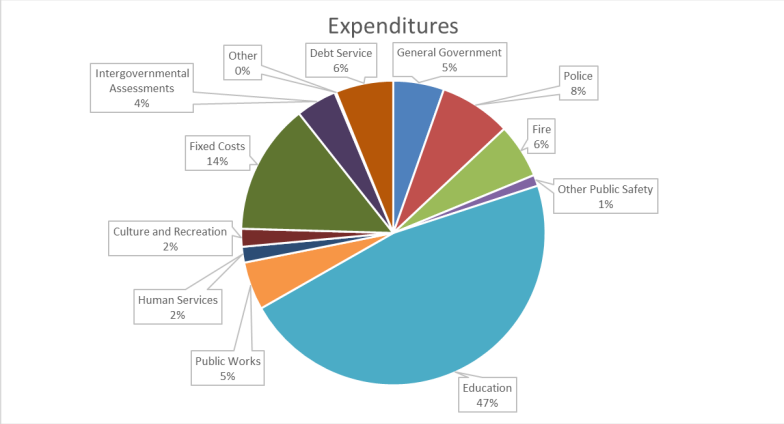
Appendix B - Key Outdoor Recreation Tourism Statistics by County

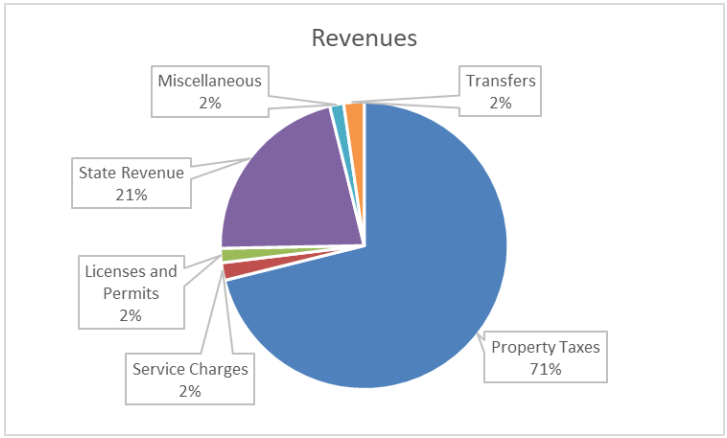
Economic Impact of Outdoor Recreation on Massachusetts Counties						
County	**CY19**					**FY19**
	Domestic Visitors Expenditures	**Payroll**	**Employment**	**State Tax Receipts**	**Local Tax Receipts**	**Room Occupancy Tax Collections**
	($ Millions)	**($ Millions)**	**(Thousands)**	**($ Millions)**	**($ Millions)**	**($Thousands)**
Barnstable	81.0	22.9	0.7	3.6	5.0	1,028.2
Berkshire	34.6	9.4	0.3	1.8	1.0	341.7
Bristol	37.2	8.4	0.2	2.0	0.8	251.1
Dukes	11.1	3.0	0.1	0.4	0.7	148.8
Essex	73.6	18.5	0.5	4.1	1.9	769.7
Franklin	4.8	1.0	0.0	0.3	0.2	36.8
Hampden	44.1	10.9	0.3	2.6	0.9	287.1
Hampshire	11.2	2.6	0.1	0.6	0.3	126.7
Middlesex	226.1	65.2	1.7	13.1	6.3	3,500.5
Nantucket	13.5	3.1	0.1	0.4	0.5	270.4
Norfolk	92.2	30.6	0.8	5.2	2.1	1,025.2
Plymouth	49.3	10.7	0.3	2.5	2.4	278.7
Suffolk	729.9	153.2	3.6	20.1	14.1	7,423.3
Worcester	73.0	15.3	0.4	4.1	1.7	615.9
Statewide	**1,481.8**	**354.8**	**9.2**	**60.8**	**37.9**	**16,104.0**
Source: Massachusetts Office of Travel & Tourism. 2020 Annual Report. Published April 2021.						

Appendix C - Key Agricultural Statistics by County

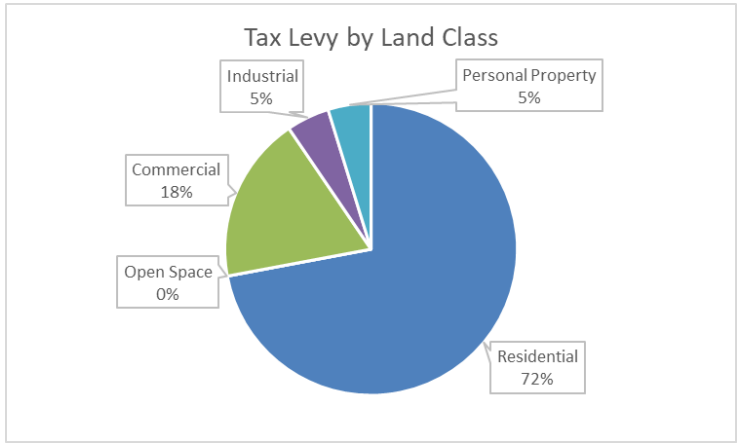
Snapshot of Massachusetts Agriculture by County					
County	**Number of Farms**	**Acres of Farmland**	**Average farm size (acres)**	**Market Value of Agricultural Products Sold**	**Average Value of Agricultural Products Sold Per Farm**
Barnstable	321	6,564	20	$23,119,000	$72,020
Berkshire	475	58,647	123	$23,491,000	$49,454
Bristol	688	32,025	47	$35,020,000	$50,901
Dukes	108	7,715	71	$5,391,000	$49,920
Essex	419	20,726	49	$32,866,000	$78,439
Franklin	830	88,247	106	$68,890,000	$83,000
Hampden	523	35,992	69	$25,892,000	$49,506
Hampshire	692	50,644	73	$46,026,000	$66,511
Middlesex	620	27,332	44	$63,350,000	$102,177
Nantucket	21	769	37	$1,950,000	$92,844
Norfolk	197	7,627	39	$11,538,000	$58,571
Plymouth	758	60,036	79	$71,935,000	$94,901
Suffolk	21	21	1	$522,000	$24,837
Worcester	1,568	95,308	61	$65,196,000	$41,597
Statewide	**7,241**	**491,653**	**68**	**$475,184,000**	**$65,624**
Source: U.S. Department of Agriculture. 2017 Census of Agriculture.					

Appendix D - A General Municipal Budget in Massachusetts





Average Homeowner	
Residential property tax levy as percent of total municipal revenue	51%
Residential property tax rate Per $1,000 assessed value	$14.88
Single family home value	$438,179
Single family tax bill	$6,148



Source: The percentages displayed in this graphic are averaged across all cities and towns in Massachusetts for FY2021. Data for specific municipalities can be found in the Databank. Massachusetts Department of Revenue Division of Local Services. Municipal Databank Revenue and Expenditure Data Fiscal Year 2021. Accessed January 28, 2022 https://www.mass.gov/service-details/revenue-and-expenditure-data

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