



CLIMATE ACTION PLAN 2022



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INTRODUCTION

Climate change is a challenge of sobering magnitude and urgency, which requires us to draw on our extraordinary capacity for resilience and innovation. Across the nation in 2021, we saw record heat, record drought, and super storms and fires that took significant economic and human tolls. In Harvard, we also saw record heat, record rainstorms and environmental impacts, such as algal blooms in Bare Hill Pond, the spread of invasive species, and forests under stress. In 2022 these trends have continued and intensified. What's more, the science of climate change indicates we should expect more of what we have seen in 2021 and 2022 in the years ahead. We can rise to the challenge by tapping into the creativity, volunteerism, and entrepreneurial spirit of Harvard. As a small town, but with the exceptional talent and experience of our people, we can be a model for how small towns can address climate change and environmental sustainability.

Municipalities must play a vital role in addressing climate change. The design of cities and towns—how we use our land, how we design our buildings, how we get around—significantly impacts the amount of energy we use, greenhouse gas (GHG)

emissions we produce, the health of our residents, and the resiliency of our natural resources. While large cities often get the most attention due to their scale and impact, small communities are more numerous, and a model framework for climate change can and should be developed for them. It is critical, therefore, that towns like Harvard demonstrate that it is possible to address climate change and the changing landscape, while creating a more vibrant and prosperous place to live, play, and work.

The changing climate impacts our lands, water resources, plants and animals, and ourselves, in terms of our health and well-being. We have already seen some of the impacts, and we must do things, both large and small, to address our future, through two different avenues:

- Adaptation (also called resilience): how to adapt to or withstand the negative impact of climate change.
- Mitigation (also called sustainability): how to prevent or reduce the adverse impact of climate change, usually by taking actions to reduce GHGs.

INTRODUCTION

T O W N R E S O L U T I O N

In October 2021, at a Special Town Meeting, Harvard residents approved a climate change resolution. The resolution tasked the Select Board to commit to the following actions:

1

Harvard affirms its support for the greenhouse gas reduction goals established by the Commonwealth of Massachusetts and for any subsequently adopted modifications of those goals, and affirms its willingness to change its practices, policies, and procedures in support of achieving the goals established by the Commonwealth in order to mitigate the impacts of climate change.

2

Harvard commits to evaluating and mitigating the potential negative impacts of climate change associated with all purchases, public projects, planning processes, and policies.

3

Harvard commits to developing and requiring an environmental assessment process to review all purchases, public projects, planning processes and policies and to make this information readily available to town residents specifically on warrants requiring citizen approval.

4

Harvard commits to addressing climate resiliency and adaptation by coordinating the work of Town boards, committees, commissions, and other entities to plan together how to respond to the threats climate change may have on the built environment.



Bare Hill Pond, Harvard., MA

natural resources, and the health of its residents.

The Harvard Climate Action Plan is a roadmap to meet the commitments the Harvard Community made at 2021 Special Town Meeting to reduce Greenhouse Gas emissions. Our plan is in alignment with the Commonwealth of Massachusetts goals in its report titled the "2050 Decarbonization Roadmap and Clean Energy and Climate Plan for 2030" and the 2020

INTRODUCTION

T O W N R E S O L U T I O N

legislative session “Act Creating a Next Generation Roadmap for Massachusetts Climate Policy.”

It is expected that the Select Board will communicate to town administration and all boards and committees that climate impacts are to be a part of the evaluation and implementation of policies, projects and purchases. It is also expected that residents will be made aware that climate impacts were taken into account. The commitment of the residents is to not only reduce greenhouse gas emissions but to continue to uphold the values of the community including, protecting its natural resources, its biodiversity, and its people. This will necessitate communal goals and actions for residents that would

encourage adapting to the change in climate, as well as mitigating these changes based on the actions they can take in their homes and lifestyles.

The most recent 2022 laws at the state level (Act Driving Clean Energy and Offshore Wind) and federal level (Inflation Reduction Act) will provide much needed resources the Town can pursue to implement the many actions to achieve the goals of this plan. The commitment at the state and federal level, and the expected distribution of funding for many climate change reduction actions, highlights the seriousness of climate change.

Bare Hill Pond, Harvard., MA

INTRODUCTION

V I S I O N S T A T E M E N T

The Town of Harvard will be a sustainable community that is resilient to the impacts of a changing climate by reducing greenhouse gas emissions, stewarding natural resources, and supporting health and quality of life.



*Weather patterns are changing dramatically due to climate change.
This ice storm is an example of the changing climate.*



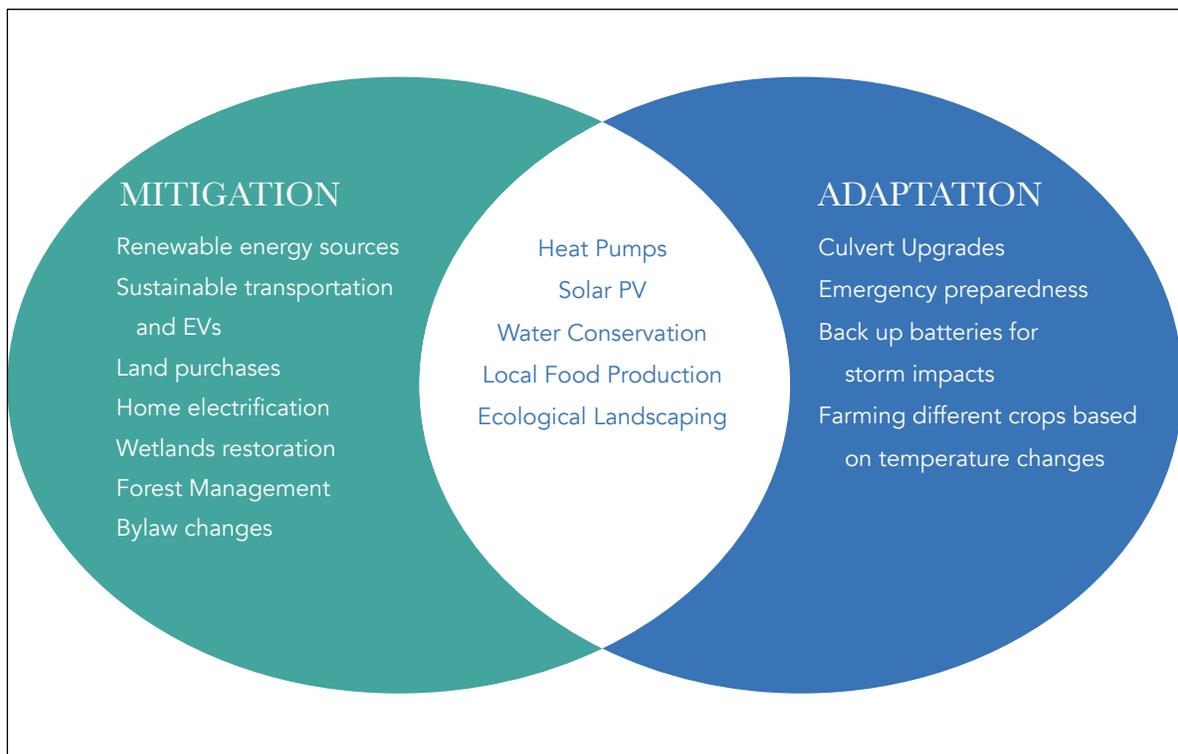
INTRODUCTION

Harvard Climate Action Plan

At the special town meeting in October 2021, the residents voted to adopt a resolution on climate change and part of that resolution is to create a Climate Action Plan (CAP). The Harvard Climate Initiative Committee (HCIC) was formed in January 2022 with the charge to create the plan that would help guide the town in meeting the Commonwealth of

Massachusetts greenhouse gas emissions goals by 2050. The HCIC has framed this CAP around mitigation and adaptation.

This chart is an example of mitigation and adaptation scenarios, and the overlaps show how the two elements of the plan come together.



Reference: Climate Action Planning Guide, Climate Smart communities of New York State

INTRODUCTION

P L A N A T A G L A N C E

The Harvard Climate Action Plan is organized into six focus areas: buildings, energy, transportation, natural resources, agriculture, and preparedness.

Each focus area consists of a series of goals and actions that represent the town's prioritized response to climate change, in the form of mitigating local contributions to global warming, or in preparation for the consequences of climate change. The goals and actions are for both town government and residents.

These goals will be best achieved through the leadership of the Select Board coordinating the activities of both town administration and committees. This level of direction would range from budget prioritization to staffing resources, from progress on goals and actions to considering climate impacts in future board and committee decisions. Additional, critical success factors should also include broader community engagement and collaboration with other towns, state agencies, and federal efforts.

The focus areas and the associated goals are as follows. Specific actions are described later in the plan.



INTRODUCTION

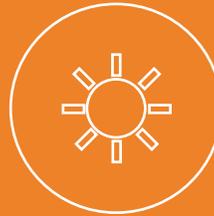
G o a l s A t A G l a n c e

BUILDINGS



1. Convert Harvard's municipal buildings from carbon-based fuel combustion to high efficiency electric heating.
2. Replace residential buildings' fossil fuel consumption with high efficiency electric heating and cooling.
3. Reduce waste through recycling and reuse.

ENERGY



1. Convert all electricity to 100% renewable energy sources.
2. Increase the number of residential solar arrays and battery storage systems.

TRANSPORTATION



1. Convert Harvard's municipal vehicles from carbon-based fuel combustion vehicles to electric vehicles or other low carbon options.
2. Reduce the climate impact of Harvard's residential transportation activities.

INTRODUCTION

G o a l s A t A G l a n c e

NATURAL RESOURCES



1. Increase the resilience of Harvard's ecosystems and community through the coordinated implementation of nature-based solutions.
2. The town's plans, policies, bylaws, and regulations encourage sustainable land use and development.
3. Reduce the climate impact of our homes and yards on the local environment.

AGRICULTURE



1. Support the sustainability of the agricultural community and implement the 2020 Agriculture Climate Action Plan.
2. Strengthen community support for Harvard's agriculture and encourage innovative approaches to farming.

PREPAREDNESS



1. Prepare for and reduce the risk of impact to people, property, and natural resources from storms, fire, flooding, vector borne diseases, and other hazards.
2. Educate residents on how to prepare for impacts of climate change to mitigate negative outcomes.

THE PROBLEM

A WARMING PLANET



Background:

Scientists know with certainty that increasing greenhouse gas concentrations tend to warm the planet. In computer-based models, rising

concentrations of greenhouse gases are producing an increase in the average surface temperature of the earth over time. The imbalance between greenhouse gas emissions and the ability for natural

THE PROBLEM

A WARMING PLANET

processes to absorb those emissions has resulted in a continued increase in atmospheric concentrations of greenhouse gases. Rising temperatures will likely produce changes in precipitation patterns, storm severity, and sea level. Collectively, this is commonly referred to as climate change. Reference (<https://www.eia.gov/energyexplained/energy-and-the-environment/greenhouse-gases-and-the-climate.php>)

From an international perspective, one can see we are not immune from these changes. The recent and 6th edition of the Intergovernmental Panel on Climate Change (IPCC), describes the risk of climate change on the planet as well documented and its impacts on the planet and humankind are clear:

“All life on Earth – from ecosystems to human civilization – is vulnerable to a changing climate. Since the first IPCC reports, the evidence has become stronger: our world is warming and dangerous climate change and extreme events are increasingly impacting nature and people’s lives everywhere. This can be seen in the depths of the ocean and at the top of the highest mountains; in rural areas as well as in cities. The extent and magnitude of climate change impacts are larger

than estimated in previous assessments. They are causing severe and widespread disruption in nature and in society; reducing our ability to grow nutritious food or provide enough clean drinking water, thus affecting people’s health and well-being and damaging livelihoods.

Since the Fifth IPCC Assessment Report, published in 2014, a wider range of impacts can be attributed to climate change. In particular, increasing heat and extreme weather are driving plants and animals on land and in the ocean towards the poles, to higher altitudes, or to the deeper ocean waters. Many species are reaching limits in their ability to adapt to climate change, and those that cannot adjust or move fast enough are at risk of extinction. As a result, the distribution of plants and animals across the globe is changing and the timing of key biological events such as breeding or flowering is altering. These trends are affecting food webs. In many cases, this reduces the ability of nature to provide the essential services that we depend on to survive – such as coastal protection, food supply or climate regulation via carbon uptake and storage

We now know that a healthy planet is fundamental to secure a livable

THE PROBLEM

A WARMING PLANET

future for people on Earth and that's why we say that the needs of climate, nature and local communities have to be considered together and prioritized in decision making and planning - every day and in every region of our world."

Locally, Massachusetts created the 2050 Decarbonization Roadmap which aims to reduce the state's production of greenhouse gases in the coming decades. As stated in the Roadmap: "The climate crisis is a generational challenge that, without decisive action, leaves residents and communities across the state on the front lines. Recognizing the urgency of this crisis Massachusetts is on an aggressive path to Net Zero greenhouse gas emissions by 2050. Reducing emissions to achieve Net Zero by 2050 is the Commonwealth's primary and most important line of defense in preventing the significant threats presented by a changing climate."

Reference: (<https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download>)

To achieve this goal Massachusetts will require that its cities and towns do the work to address climate change. In addition to identifying how they can reduce greenhouse gases, municipalities will need to

develop plans to protect the biodiversity of their communities, be it their forests, lands, diverse wildlife, and water resources, as well as assure the health and safety of their residents.

The most recent passage of laws at the federal and state level will give municipalities and residents the funds they need to implement the Commonwealth's roadmap at the local level and many of the goals and actions set forth in this plan.

Harvard's Role:

Greenhouse gases are an important measure of the town's role in climate change, but as noted above, it is more than these emissions that the town needs to address when it comes to our land, water resources, and health. In 2020, a report of Harvard's greenhouse gas (GHG) emissions was conducted based on community wide activities of residents, businesses, and municipal operations in the year 2018. The findings also highlighted GHGs from agricultural activities. The town's forested areas were identified for their carbon sequestration potential. Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide, thus reducing the amount of carbon

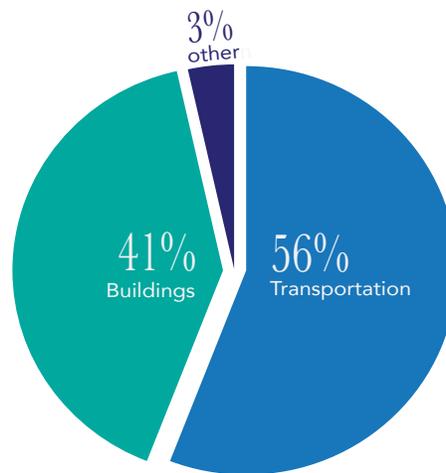
THE PROBLEM

A WARMING PLANET

dioxide in the atmosphere that causes global warming. Carbon sequestration can occur with vegetation, soils, woody products, and aquatic environments, particularly wetlands. Reference (<https://www.>

from on-road transportation and building energy use. Approximately 3% of those emissions are attributable to municipal operations. Agricultural activities are relatively small (< 1%) contributors to the GHG

HARVARD GHG INVENTORY



[harvard-ma.gov/sites/g/files/vyh-lif676/f/uploads/harvard_ghg_inventory_report.pdf](https://www.harvard-ma.gov/sites/g/files/vyh-lif676/f/uploads/harvard_ghg_inventory_report.pdf)

The inventory of GHG emissions for calendar year 2018 was the most recent year in which energy utility data was available. It considered three primary GHGs: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), all presented in terms of CO₂e or CO₂.

Total greenhouse gas emissions for the Harvard community total 57,453 metric tons carbon dioxide equivalent (MTCO₂e) in 2018, primarily

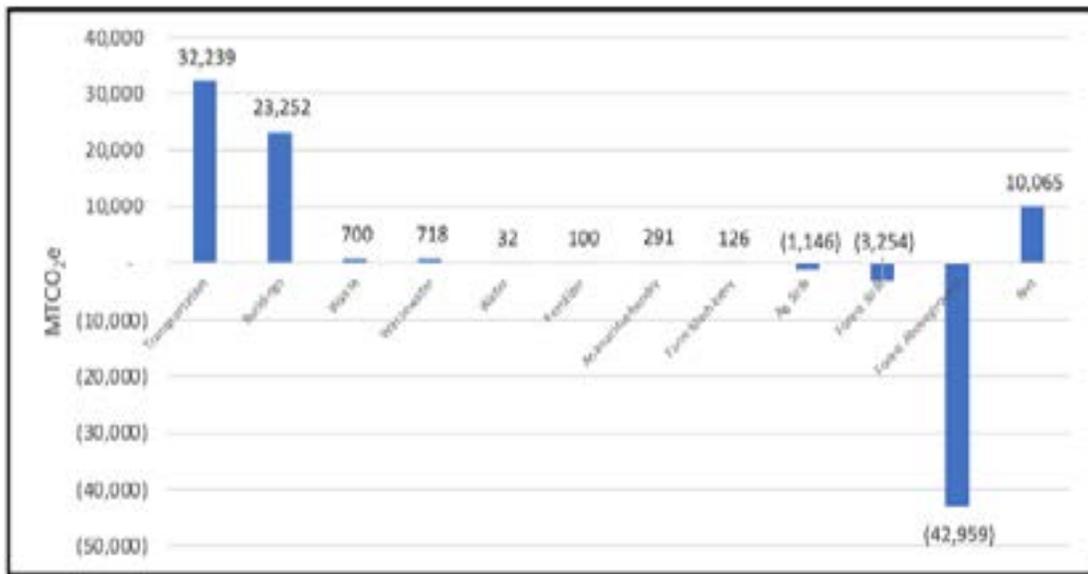
footprint of the community and come from unique sources related to fertilizer use, animal husbandry, and farm machinery use.

With 1864 households, this is approximately 25-30 metric tons per household, given there are few commercial enterprises that account for much of the total. The average metric tons per household in the United States from several sources puts it at 20 metric tons. The average worldwide is 4 metric tons. Reference (<https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>)

THE PROBLEM

A WARMING PLANET

The figure below identifies the sources of GHGs in Harvard as well as the offsets of carbon from our forested areas and wetlands.



Harvard benefits greatly from these extensive forested areas and wetlands as they capture and store carbon from the atmosphere; upwards of 80% of the Town's annual emissions.

But as fortunate as Harvard is to be so well forested, over the years, these areas have been shrinking due to housing and commercial development. The Commonwealth's pressure to create more affordable housing will impact the town's ability to maintain this level of carbon sequestration and it adds to the decisions the town will need to make in its zoning bylaws that respect the environment and meets the Town's resolution on climate. The current bylaws are not up to date to address the environmental impact of such development, particularly on biodiversity (flora and

fauna protection), the availability of water resources, wastewater management, stormwater protections, and agriculture and forest protection.

The significant positive impact provided by trees and undeveloped land also represents significant potential for release of carbon should the land be developed. On a per acre basis, the release of GHGs from development would create a significant increase in emissions of 403MTCO₂ that would need to be overcome but also would permanently reduce the

THE PROBLEM

A WARMING PLANET



rate at which tree cover in Harvard sequesters carbon by 4.26 MTCO₂ per year.

Harvard also needs to reflect on climate justice. It has the good fortune of its forests, open spaces, wetlands, and agriculture, but it also has a responsibility to help the state, country, and world by protecting and, if feasible, enhancing these resources in order to reduce greenhouse gases produced by homes and cars. In our own state, low-income and marginalized communities are disproportionately negatively impacted by a changing climate. We cannot ignore the capacity of our natural resources and our ability as a community to take actions to mitigate the climate impacts of

GHGs thus contributing beyond our borders to those with lesser means and opportunities.

Reducing GHGs from its sources will require action on the part of residents to improve the efficiency of their homes, electrify their heating systems, drive electric vehicles, care for the land and take other actions both big and small. It is understood that many of the changes that need to be made are financially difficult, but the long-term impacts of not making changes will be financially devastating.

It is the goal of the Harvard Climate Action Plan to seek educational, financial and other support to give residents the tools to make a difference. To date, the Harvard Climate Initiative Committee (HCIC) has created a website, harvardsclimateinitiative.org, and joined with other towns to create an "Actions" page on the website that provides significant resources on both small and large actions families can take. HCIC hopes every family in town will register to take action on some component of the Plan because it is doable and because individuals truly want to contribute to addressing the environmental impacts which will be exponentially growing if we don't take action.

SHORT HISTORY



Addressing climate change in Harvard began in 2018 with a grant from the Massachusetts Executive Office of Environmental and Energy Affairs, Municipal Vulnerability Program. Through public meetings, hazards and vulnerabilities of concern to residents regarding climate change were identified. The top four were:

1. Pests and Invasive Species
2. Extreme Precipitation
3. Extreme Temperatures and Temperature Swings
4. Ice Storms

Following the work of the MVP, additional grant funds were obtained to establish the town's greenhouse gas inventory and to begin work on a climate action plan. This work was coordinated by the Community Resilience Working Group (CRWG). An

Agriculture Climate Action Plan was drafted and the Town Resolution on Climate was brought to Town Meeting.

Working with Bolton and Devens, the Apple Country Report on recommendations for nature-based solutions to climate change was also completed.

The Town Resolution on Climate required that a new committee be formed to report to the Select Board: The Harvard Climate Initiative Committee, which is currently charged with implementing the town resolution. The work completed by the MVP and CRWG is a significant contribution to the HCIC mission.

Footnote: For more history on the prior committees' work go to Appendix 3.

T H E P L A N

GOALS, ACTIONS AND MEASUREMENT

All of the work described above has led to the development of this plan: a goal setting and action plan that is timely, realistic, implementable and attainable, in that it can reach the town's goals as outlined in the town resolution. It will require municipal and resident participation

and commitment.

The plan targets six areas that reflect the Commonwealth's goals, the data on GHGs, the input the community provided to date and the desire to achieve both sustainability and resilience.

The areas include:



These six areas typically have one goal for municipal operations and one goal for residents and a small number of action items per goal. As actions are completed, new ones will be added, thus

making it a living document.

The plan, though drafted by the HCIC is not the work of HCIC but the outcomes of discussions, interactions, input and feedback

T H E P L A N

GOALS, ACTIONS AND MEASUREMENT



received from town committees, municipal operations, and residents. It comprises the ideas of many; those most knowledgeable about what can be accomplished and the timeframe in which the actions can be achieved.

Some of the work has already begun due to the commitment of a key group of stakeholders in town. These accomplishments are noted and celebrated. Much of this work relies on the many volunteers who are devoted to this work and to giving back to

the community.

Each Focus Area contains the following:

- Introduction of each climate consideration being addressed
- Municipal Goal, Actions to Date, and Priority Actions to undertake for each climate consideration
- Residential Goal, Actions to Date and Priority Actions to undertake for each climate consideration
- Measurement of progress for each climate consideration

The following committees are tasked with successful completion of the goals and actions described in this Plan:

- AAC: Agricultural Advisory Commission
- BHPWM – Bare Hill Pond Watershed Management
- BoH: Board of Health
- COA: Council on Aging
- ConCom: Conservation Commission
- DPW: Department of Public Works
- HCIC: Harvard Climate Initiative Committee
- HEAC: Harvard Energy Advisory Committee
- PB: Planning Board
- SB: Select Board
- SC: School Committee
- TAC: Transportation Advisory Committee

BUILDINGS



BUILDINGS

CLIMATE CONSIDERATION

BUILDINGS



Forty-one percent of greenhouse gas emissions in Harvard are due to its buildings – both municipal and residential.

Town buildings utilize fossil fuels. Harvard has 12 facilities with about 337,648 square feet that burn natural gas, oil, and propane for heat and domestic hot water (DHW). With Green Communities funds, energy efficiency and energy reduction projects, such as heating systems improvements and maintenance and weatherization have improved the buildings' performance. However, to reduce greenhouse gases to the levels in the Commonwealth's roadmap, the buildings would need to be converted to non-fossil fuel sources.

Most residential buildings are heated by oil; a small percentage by natural gas, propane or electricity. Harvard homes are larger than the state average and thus emit more GHG. Residential buildings make up 99% of Harvard's building inventory and thus is the single largest area of focus for this plan to have significant opportunity for carbon reduction.

The HeatSmart program in 2017 provided incentives for air source and ground source systems. State data (which is assumed to be undercounted) notes 15 ground source systems installed between 2015 - 9/2020 and 80 air source systems between 2015 - 10/2019. This is a growing but insignificant number of homes that have been converted to non-fossil fuel systems.

Therefore, the following goals and actions are designed to be the most relevant and applicable to achieving electrification of Harvard municipal buildings and residential homes and reducing greenhouse gasses.

In addition to electrification, the amount of waste, items that are not recycled or reused, is significant in municipal operations and in our homes. From the US Environmental Protection Agency: "Among industrialized nations, the U.S. is one of the largest generators of municipal solid waste per person on a daily basis. Municipal solid waste landfills are the third-largest source of human-related methane emissions in the U.S., accounting for approximately

BUILDINGS

CLIMATE CONSIDERATION

BUILDINGS



Electrifying buildings and homes with air source or ground source (geothermal) heating and cooling systems.



Reducing waste through recycling and composting decreases greenhouse gases



BUILDINGS

CLIMATE GOALS & ACTIONS

BUILDINGS



16 percent of these emissions in 2016.

Even with recycling options at the Transfer Station, there is significant waste that is incinerated which alternatively could have been re-used, recycled or never consumed. Food waste, in particular, if com-

posted, would have a significant impact on reducing overall waste. The US Environmental Protection Agency states: "Food waste is the single most common material land-filled and incinerated in the U.S., comprising 24 and 22 percent of landfilled and combusted municipal solid waste, respectively."

Municipal:

Goal: Convert Harvard's municipal buildings from carbon-based fuel combustion to high efficiency electric heating.

Actions to Date:

The Town of Harvard was designated a MA Green Community in 2010. The Town has implemented significant energy reduction projects paid for with Green Community grants and Utility funding (approximately \$1M) every couple of years. These energy reduction projects have reduced emissions. Recent projects include:

- Bromfield School - Lighting LED Retrofit
- Public Library - Lighting LED Retrofit
- Building controls improvements
- Weatherization of Bromfield and Public Library
- Replacement of transformers in Bromfield heating system to improve efficiency

Priority Actions to Implement	Target	Lead Committee/ Entity
Develop a detailed electrification, upgrade and financial analysis plan of municipal heating systems	2023	HEAC
Adopt the updated Massachusetts Stretch Energy Code	2023	SB/Building Inspector

BUILDINGS

CLIMATE GOALS & ACTIONS



Goal: Reduce waste in town operations through recycling and reuse.

Actions to Date:

- Town Administration memo to departments, committees and boards to recycle and use recycled products.
- Schools implemented composting in cafeterias.

Priority Actions to Implement	Target	Lead Committee/ Entity
Reduce municipal town waste by reusing and recycling construction, office and school supplies and materials by 10% per year	10% reduction per year	SB/SC
Expand purchasing of recycled office supplies through joint purchasing across all municipal and school departments	10% increase per year	SB/SC

Residential:

Residential buildings make up 99% of Harvard’s building inventory and thus is the single largest area of focus for this plan and significant opportunity for carbon reduction.

Goal: Replace residential building’s fossil fuel consumption with high efficiency electric heating

Actions to Date:

- HeatSmart program - A state grant program that provided incentives for homeowners to convert to air source or ground source heat pumps with vetted contractors. 31 homes converted in 2018-19

- HarvardEnergize - a website that provides access to information and goal setting for households to undertake climate actions, including energy saving options. As of Oct. 2022, a total of 107 Harvard households have joined Harvard Energize.
- Harvard Climate Initiative - website, events and resources (harvardsclimateinitiative.org)
- Earth Day Show and Tell Around Town 2022 – A community event of 15 locations that exemplified air source and ground source heating and cooling systems, solar arrays, electric vehicles and house/lawn equipment, native gardens, food production, and composting.

BUILDINGS

CLIMATE GOALS & ACTIONS

BUILDINGS



Priority Actions to Implement	Target	Lead Committee/Entity
Educate and assist homeowners to evaluate the costs and benefits of efficient electric heating and cooling systems including available financial incentives.	2023	HCIC

Goal: Reduce waste through recycling and reuse.

Actions to Date:

- Town Transfer Station introduced "Pay by Bag" to incentivize recycling
- Public outreach to residents on recycling

Priority Actions to Implement	Target	Lead Committee/Entity
Encourage residential composting by requiring private haulers to provide the option and/or by providing a facility on town-owned land	2024	BoH
Significantly reduce residential waste through changes to consumption practices and by supporting options to "buy local," recycle and reuse/repair	2023	HCIC



BUILDINGS

CLIMATE GOALS & ACTIONS



Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Electrification plan	No plan exists	2022	Plan created	2023
Town/School dumpster loads	Number of dumpster loads per year	2022	10% reduction per year	2030
Office supply purchases	Purchase volume of recycled items	2022	10% increase per year	2030
Residential Ground Source systems	Number of homes with ground source systems	2022	10% increase per year	2030
Residential Air Source systems	Number of homes with air source systems	2022	10% increase per year	2030
Composting by private haulers	Investigate current options	2022	Contract in place	2024

E N E R G Y



E N E R G Y

C L I M A T E C O N S I D E R A T I O N

ENERGY



Electricity that Harvard purchases from National Grid includes electricity generated from fossil-fuel and renewable energy. National Grid's electricity generation sources in 2021 were 82% fossil fuel (mostly natural gas) and 18% renewable energy. (Class 1: Solar, Wind, Hydro) State legislation requires National Grid to increase the percent of renewable energy generation 2% each year. The rate of conversion to renewable sources through National Grid will not meet the targets set by the state which have escalated in the last round of state legislation to meeting higher levels by 2030 though they do include a wider range of what is considered renewable (e.g. waste-energy, nuclear).

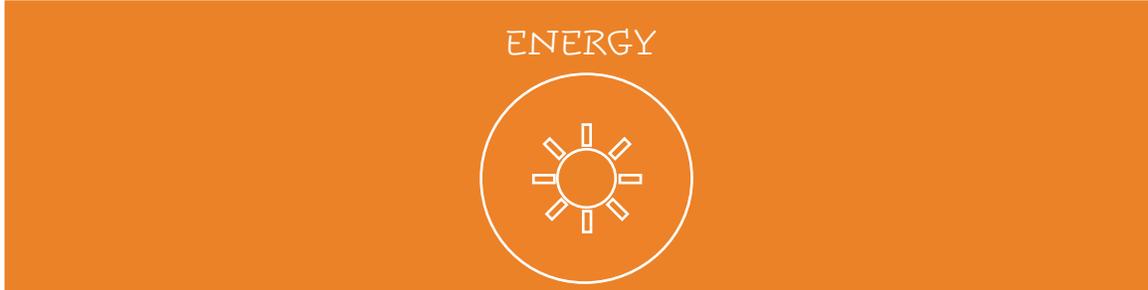
Harvard has 12 municipal facilities with about 337,648 square feet that burn natural gas, oil, and propane for heat and hot water. Total energy use for these facilities in fiscal year 2019 was: Natural Gas – 133,878 therms, Oil – 3,606 gallons, and Propane – 1,246 gallons.

Harvard's use of electricity for its buildings, other structures, streetlights, and other services in fiscal year 2019 was 1,936,032 kWh or about 6,606 MMBtu.

For residential buildings, in 2019, the Town signed a contract for town-wide electricity (excluding municipal buildings) to be 100% wind renewable energy credits (REC's) thus converting most of the residential buildings in town to a renewable source, unless a family opted out of the program. As of 2021, 86% of households participate. This significantly reduces fossil fuel use, and thus greenhouse gas emissions for home electricity, including those homes that have heat pumps, and for those with electric vehicles who charge their cars at home. Conversion of heating and cooling systems to heat pumps in more homes would accelerate the positive impacts of this renewable energy source. In addition, homes in Harvard that have solar arrays also reduce the use of fossil fuels.

E N E R G Y

CLIMATE GOALS & ACTIONS



Municipal:

- **Goal: Convert all electricity to 100% renewable energy sources**

Actions to Date:

Hildreth Elementary School

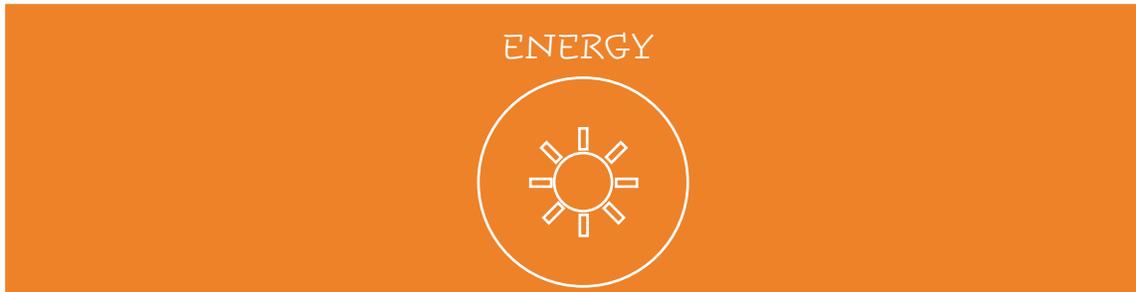
- Prior HES – A 6 kW PV solar array installed in 2009 until its demolition
- New HES (2022) - Solar Power Purchase Agreement for a 245 kW photo voltaic rooftop array

Priority Actions to Implement	Target	Lead Committee/Entity
Negotiate a 100% renewable energy electricity supply contract for all municipal use.	as determined by existing contract	Town Admin/HEAC
Increase the number solar installations on municipal buildings or property, either as directly owned or leased (such as power purchase agreement (PPA)).	3 by 2025	HEAC
Add battery storage to PV solar systems.	1 by 2026	HEAC



E N E R G Y

CLIMATE GOALS & ACTIONS



Residential:

Goal: Increase the number of residential solar arrays and battery storage systems

Actions to Date:

Hildreth Elementary School

- Solarize Harvard, as state funded program for residents, added approximately 200 solar installations on homes since 2000 through mid-2021.
- Harvard developed the first

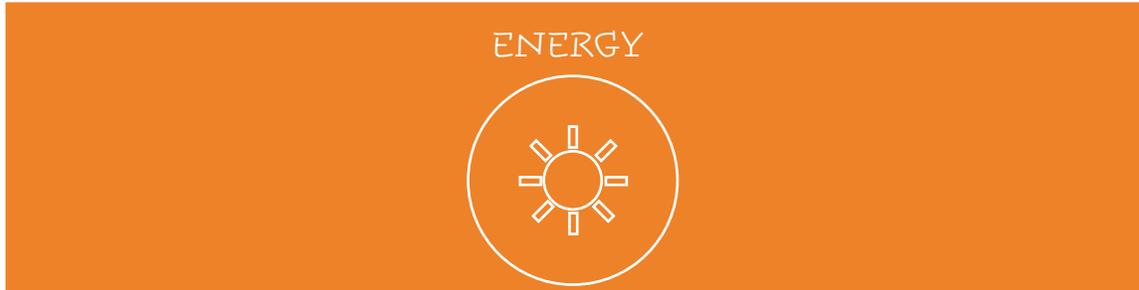
Community Solar Garden in the state with homeowners purchasing shares to offset their electricity use. These homeowners did not have suitable placement of their homes to individually benefit from a solar installation. Two gardens now have 60 participants.

- Community Choice Aggregation (CCA) - Town residents electricity supply converted to 100% renewable wind recs. 86% of town residents receive electricity from CCA.

Priority Actions to Implement	Target	Lead Committee/Entity
Assist homeowners to evaluate the costs and benefits of PV solar and battery storage systems and educate homeowners on available grants and incentives.	ongoing	HCIC
Advocate for use of community solar for homeowners to receive credits or offsets on electricity bills from a solar system installed at another location.	2025	HCIC

E N E R G Y

CLIMATE GOALS & ACTIONS



Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Negotiate 100% renewable supply for town bldgs.	Percent of supply that is renewable 100%	2022	Class 1 Recs	2030
Increase solar installations on town buildings	1 building – HES (or % electricity that is solar)	2022	3 solar installations	2025
Add battery storage to town PV solar systems	No battery storage in any town building	2022	1 battery storage system	2026
Educate residents on solar, battery storage	Number of residents with solar – 203 through 2021	2021	10% per year	2031
Advocate for community solar for residents	Number of residents in community solar – 60 participants	2021	Alternative solar garden option	2025

TRANSPORTATION



TRANSPORTATION

CLIMATE CONSIDERATION

TRANSPORTATION



Transportation is the biggest producer of GHGs in Harvard. As a semi-rural community with limited commercial enterprises, particularly the most common needs, such as a full-service grocery store, a pharmacy, a hardware store, etc., most residents leave the area in their cars. There may be no change in services in town, but how residents get to these services can change. Electrification of vehicles would greatly reduce GHGs. As the adoption of electric vehicles grows, public charging stations around town will be necessary to continue to support both out of town visitors and residents.

Town residents have access to commuter rail to Boston in Littleton and Ayer. Harvard is also a member community of the Montachusett Regional Transit Authority (MART) and currently makes use of its Council on Aging transportation services for elderly residents. Future expansion of public transportation options in Harvard would likely be coordinated with MART. In general, use of public transportation reduces GHG emission impacts.

As for the municipal operations, Harvard has 48 vehicles and other equipment that have gasoline or diesel-powered internal combustion engines. Total energy use for these vehicles in fiscal year 2019 was:

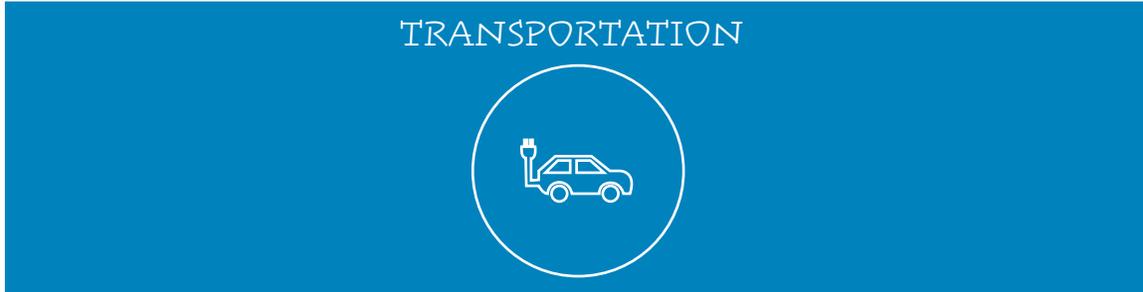
- Gasoline – 14,995 gallons or $133,260 \times 10^{-3}$ metric tons of CO_2
- Diesel – 12,202 gallons or $124,216 \times 10^{-3}$ metric tons of CO_2

Replacement of municipal vehicles comes to town meeting for approval from the Capital Projects and Investment Committee each year. A few of the town vehicles have been replaced with hybrid versions. There has been an increasing interest at town meeting in the type of vehicles being purchased, though heavy duty electric vehicles are not yet on the market in the United States.

Lastly, the School Committee is responsible for the bus contract, of which 7 buses operate fully on diesel fuel. The continued lack of bus service providers has prevented the committee, so far, from selecting a company that offers an electric fleet.

TRANSPORTATION

CLIMATE GOALS & ACTIONS



However, should electric buses become an option in the future, the gains in reducing emissions would be of significant value. The 2022 Inflation

Reduction Act has funding designated for electrification of school buses which should increase the likelihood that this should be possible in the

Municipal:

- **Goal: Convert Harvard’s municipal vehicles from carbon-based fuel combustion to electric vehicles or other low carbon options 27.**

Actions to Date:

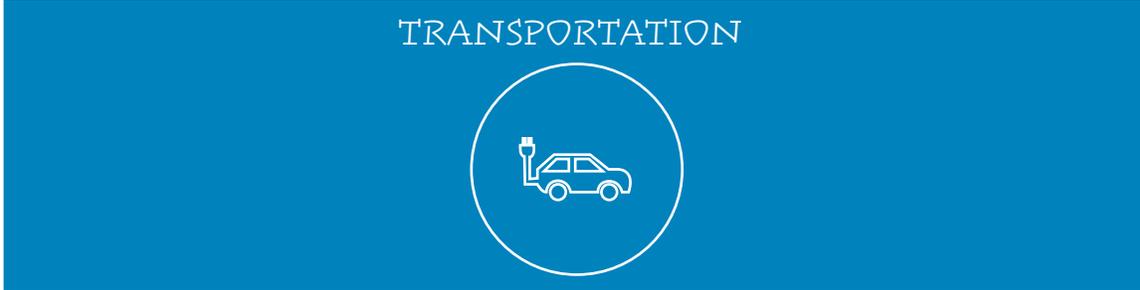
- HEAC Decarbonization plan
- School Committee added language to its request for bus transportation proposals to include a schedule for bus conversion to electric vehicles
- EV charging stations added to the Hildreth Elementary School parking lot

Priority Actions to Implement	Target	Lead Committee/ Entity
Implementation of a de-carbonization plan for the town’s municipal vehicle fleet, including: <ul style="list-style-type: none"> • Conversion of light-duty vehicles to EV’s • A mid- to long-term strategy for heavier-duty vehicles • Explore options for electrification of school buses 	2040	HEAC/SC



TRANSPORTATION

CLIMATE GOALS & ACTIONS



Residential:

- **Goal: Reduce the climate impact of Harvard’s residential transportation activities**

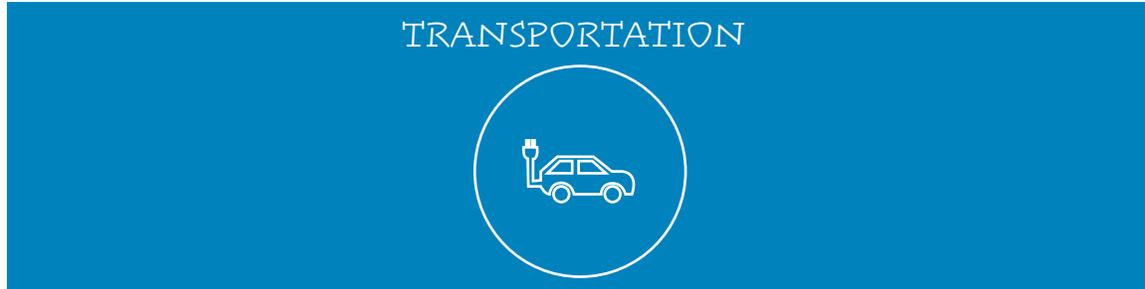
Actions to Date:

- Transportation Advisory Committee established in 2021. This committee coordinates local transportation planning efforts and promotes collaboration in the development of collective transportation goals and priorities

Priority Actions to Implement	Target	Lead Committee/Entity
Encourage the adoption of electric vehicles amongst residents and businesses through education on incentives and options, promotional events, and expediting permits.	2035	HCIC
Develop a high quality, high frequency regional electric shuttle service to and from town center, commuter rail stations, and future park-and-ride locations.	2027	TAC/SB
Explore options to increase adoption of school busing over individual cars	2024	SC
Improve the reach of Harvard’s bicycle and walking paths to provide a realistic, healthy, and zero carbon alternative to driving.	2030	TAC

TRANSPORTATION

CLIMATE GOALS & ACTIONS



Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Municipal vehicles all (or hybrid) electric	One police car - 2022	2022	All vehicles	2040
EV charging stations on municipal sites	One at HES	2021	Municipal sites identified and installed	2025
Adoption of electric vehicles by residents	Number of electric vehicles owned by residents unknown	2022	All new purchases are electric	2035
Regional shuttle service	none	2022	Regional service in place	2025 service 2027 electrified
Bicycle routes and walking trails expanded	Number of miles of routes/trails	2022	10% increase in number of miles per year	2030

NATURAL RESOURCES



NATURAL RESOURCES

CLIMATE CONSIDERATION

NATURAL RESOURCES



The Harvard Climate Action Plan will implement recommendations from the 2021 Apple Country Report. That report noted that the preponderance of land in Harvard in its natural state of forests, fields, and especially wetlands is the town's greatest asset in terms of sequestering and storing carbon. By far the greatest impact we can have in nature-based solutions to climate change and increasing resilience is to retain as much of this ecologically functioning land as possible and to minimize conversion to pavement, buildings, septic systems, or traditionally landscaped areas.

Harvard's Select Board, Planning Board, Zoning Board of Appeals, Conservation Commission, Open Space Committee, Parks & Recreation Commission, Board of Health, Water and Sewer, and Bare Hill Pond Watershed Management committees each have jurisdiction and a role in the oversight of land use in town and can have

a significant impact on climate mitigation. Harvard Conservation Trust, Sudbury Valley Trustees and Nashua River Watershed Association also play a very significant role in the purchase and protection of major undeveloped lands. All of these entities working together should find ways to identify and significantly protect important carbon sequestration parcels as well as parcels that can meet the needs of agriculture and recreation.

Many of the town bylaws that protect these valuable resources are outdated and were not developed at a time when the impact of climate change needed to be reflected in the bylaws. The Conservation Commission's Wetland Protection bylaw and Planning Board's Open Space bylaw are places to start in order to conserve natural landscapes. Many surrounding towns are reviewing all of their bylaws in light of climate change and there is the ability for Harvard to learn from and utilize what they have developed.

NATURAL RESOURCES

CLIMATE GOALS & ACTIONS

NATURAL RESOURCES



Municipal:

Goal: Increase the resilience of Harvard's ecosystems and community through the coordinated implementation of nature-based solutions.

Actions to Date:

- MVP Prioritization Plans
- 2021 Apple Country Report
- 2016 Open Space and Recreation Plan
- 2016 Master Plan, Chapter 3

- The Conservation Commission, Harvard Conservation Trust, Sudbury

Valley Trustees and other local partners have helped to protect over 1,900 acres of conservation land directly and an additional 523 acres under conservation restrictions and agriculture preservation programs. In 2022, 75 acres was added to land holdings for the Community Harvest Project and surrounding land.



NATURAL RESOURCES

CLIMATE GOALS & ACTIONS



Priority Actions to Implement	Target	Lead Committee/Entity
Preserve Harvard wetlands through the following: <ul style="list-style-type: none"> • Update the Harvard Wetlands Protection Bylaw and/or regulations to reflect and adapt to changing climate conditions • Educate and advise residents on the management of private land near/in wetlands • Work with DPW to protect wetlands from road run-off 	2025	ConCom
Amend erosion control by-law to include tree clearing	2025	PB
Address Invasive plants and insects: <ul style="list-style-type: none"> • Develop or expand programs for Bare Hill Pond, Town conservation land, and other municipally controlled lands where invasives are a risk • Educate and provide resources to residents to manage invasives on private land 	2024	ConCom/BHPWM/DPW
Improve soil health through education and best management practices	2024	AAC
Improve habitat for pollinators and beneficial insects with protection and cultivation of native plants	2023	HCIC
Implement flood control through ranking and prioritization of town-owned culverts replacement and upgrades	2024	DPW
Monitor for water health, algae blooms and biodiversity of waterways. Provide education and outreach to the public regarding these issues.	ongoing	BoH/BHPWM

Land Use Goal: The Town’s plans, policies, bylaws, and regulations encourage sustainable land use and development.

Actions to Date:

- Established an Open Space Residential Development Bylaw in response to 2002 Master Plan.
- Created a mixed-use overlay zoning district to facilitate smart growth.
- Land purchases by Conservation Commission, Harvard Conservation Trust and Sudbury Valley Trustees.
- Erosion Control Bylaw approved by Town Meeting 2021.

NATURAL RESOURCES

CLIMATE GOALS & ACTIONS



Priority Actions to Implement	Target	Lead Committee/ Entity
Rewrite the Protective (Zoning) Bylaw and include <ul style="list-style-type: none"> • Local resilience and carbon reduction • More zoning districts that are sustainable and smart growth models • An updated Open Space Residential Development Bylaw that promotes open space and natural resource protection 	2026	PB
Educate and inform the public about sustainable land use patterns	2025	PB
Include climate change and sustainability as a consideration in all future Planning Board, Zoning Board of Appeals, Parks and Recreation Commission, Conservation Commission, and Open Space Committee proposals and decisions	2023	SB
Ensure land use and transportation planning are coordinated	2028	SB/PB/TAC

Residential:

- **Goal: Reduce the climate impact of our homes and yards on the local environment.**

Actions to Date:

- HarvardEnergize information on native plantings
- Harvard Press Garden Column on environmentally friendly options

NATURAL RESOURCES

CLIMATE GOALS & ACTIONS



Priority Actions to Implement	Target	Lead Committee/ Entity
Educate residents on sustainable practices for lawn care, landscaping, tree care, invasive species management, and water management during drought conditions	2024	HCIC/ConCom/BoH
Encourage the conversion of lawn care equipment from gas-powered to electric.	2025	HEAC



NATURAL RESOURCES

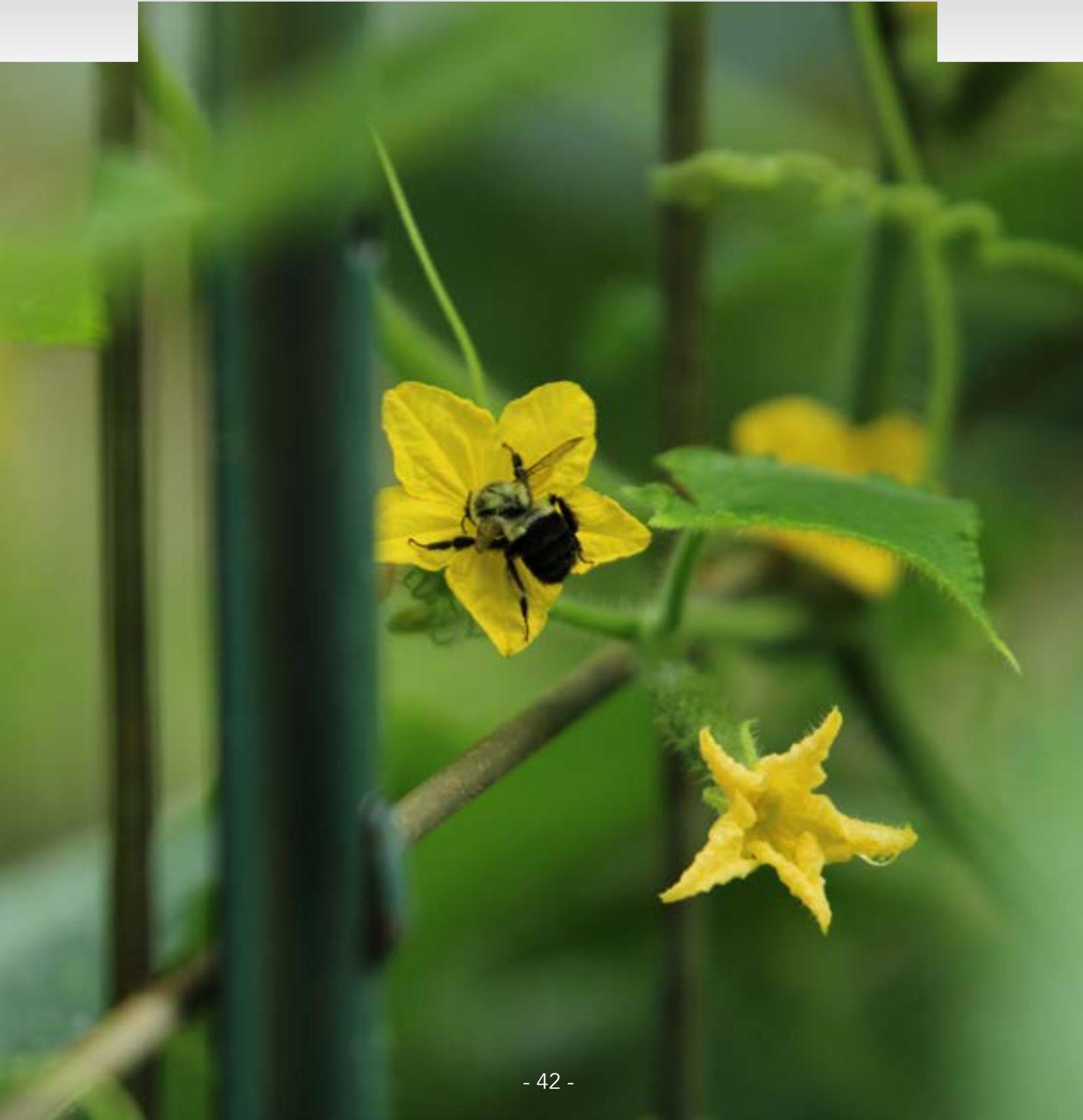
CLIMATE GOALS & ACTIONS



Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Wetlands updated bylaws complete	Existing bylaws	2022	Updated bylaws	2025
Amend bylaw re: tree clearing	Existing bylaw	2022	Updated bylaw	2025
Programs and education on invasives	Yearly garlic mustard pull	2022	Reduction in invasives	2026
Improved soil health	Current soil health – identify how to measure	2022	Improved soil health	2026
Improved habitat for pollinators	Current habitat-identify how to measure	2022	Increase in acres for pollinators	2026
Flood control via culverts	Current culverts status	2022	Culverts replaced where needed	2030
Protective bylaw rewrite	Existing bylaw	2022	Reviewed/updated bylaw	2026
Climate change part of decision-making	Not part of current decision-making	2022	Environmental assessment process and climate inclusion	2023
Land use and transportation coordination	Not currently coordinated	2022	Formal interactions in place	2023
Education of residents on sustainable practices	Some through HCIC newsletter	2022	Educational campaign	2024
Residential lawn-care electric equipment	Some in use. Volume unknown	2022	Capture and monitor growth in electric equipment	2025

AGRICULTURE



AGRICULTURE

CLIMATE CONSIDERATION

AGRICULTURE



In 2020, with a grant from the Municipal Preparedness Program, Harvard's Climate Resiliency Working Group used the resources to focus on the agricultural community. Harvard's farms and orchards have always been viewed in survey after survey of town residents as an important asset of the community. In Harvard's Agricultural Climate Action Plan of 2020, a separate report focused entirely on Harvard's agricultural community. It stated: *"Agriculture is a fundamental part of Harvard's character and sense of community. The impacts of climate change simultaneously place agricultural activities at risk while also elevating the critical nature of local food supplies."*

Climate change presents significant risks to the agricultural community as identified in the report:

- **Rising Temperature Impacts:**
New and more pests/pathogens
Unsafe outdoor working conditions
Change in crop viability

- **Changes in Precipitation Impacts:**
Flooding: soil erosion, fertilizer/pesticide/manure runoffs, plant disease
Drought: crop losses, irrigation demands
- **Storm Impacts:**
Crop losses
Damage to buildings and equipment

Although the number of farms in Harvard is estimated to be 100 or more, three are large and the remainder are small with approximately 2500 acres in total. It is known that several farms in Harvard use organic and regenerative practices on their fields. This includes additions of organic matter for fertilizer, reduced tillage, and other actions that lead to improved soil carbon storage.

The farms do not produce a large amount of the town's GHGs but should they be sold for development, not only would it impact the feel of the community, it would substantially increase the GHG emissions.

AGRICULTURE

CLIMATE GOALS & ACTIONS



Municipal:

- **Goal: Support the sustainability of the agricultural community and implement the 2020 Agriculture Climate Action Plan**

Actions to Date:

- Agricultural MVP Prioritization Plan (2019)
- 2020 Agricultural Climate Action Plan

Priority Actions to Implement	Target	Lead Committee/Entity
Determine next steps on implementation of the 2020 Agriculture Climate Action Plan: <ul style="list-style-type: none"> • Grant writing assistance • Prioritize municipal initiatives to promote the economic sustainability of our farms • Review Harvard's zoning laws to allow flexibility for farm-related uses 	2025	AAC
Commit to "Buy Local" for town events and in Harvard's schools	2024	SB/SC

Residential:

- **Goal: Strengthen community support for Harvard's agriculture and encourage innovative approaches to farming**

Actions to Date:

- Participation in HCIC Earth Day Show and Tell with education about regenerative and sustainable farming
- Developed a map of local farms for promoting "buy local"

AGRICULTURE

CLIMATE GOALS & ACTIONS



Priority Actions to Implement	Target	Lead Committee/ Entity
Establish a forum for the sharing information and best management practices on: <ul style="list-style-type: none"> • Regenerative farm practices • Soil, pest, and disease management • Sustainable pasture management • Water management 	2025	AAC
Support “buy local” for local farms	2023	HCIC

Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Implementation of 2020 Ag Climate Action Plan	Plan actions	2020	Formalized plan on actions to take and who is responsible	2024
Increase town commitment to buy local	% of town and school food purchased locally	2022	10% increase	2024
Increase in best climate friendly practices	Number/size of farms using best practices	2022	10% increase in number / size of farms using best practices	2025
Increase in documented revenue at local farms	Need to determine if there is baseline data	2022	10% increase	2024

PREPAREDNESS



PREPAREDNESS

CLIMATE CONSIDERATION

PREPAREDNESS



Preparedness is more about adaptation than mitigation. It is hoped that actions taken in other parts of this Climate Action Plan to reduce greenhouse gasses, along with global efforts to do the same, will lessen the impacts of climate change. However, the effects of climate change are already being felt. Within the last two decades, Harvard has experienced extreme events, for example, the ice storm of 2009 and the increasing frequency of drought conditions.

The Ice storm left residents without electricity for up to 5 – 10 days. Though a warming climate may mean less snow events, it could mean more mixed precipitation, such as ice, which can do more damage to the town's tree cover threatening people, animals and homes.

The drought of 2015–17, 2020 and 2022 led to half of the fire ponds being

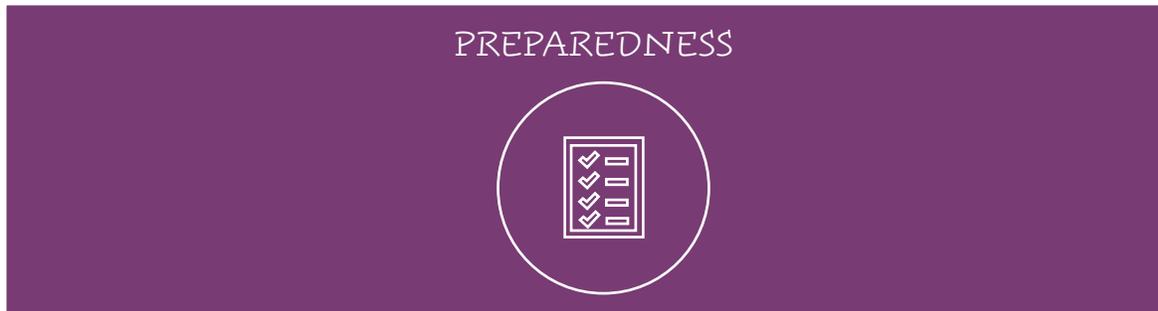
dry. In this case, it was an example of the impacts of one hazard leading to the possibility of another hazard – fire ponds being dry and not able to respond to fires that are more prevalent when conditions are dry.

The recent completion (August 2022) of the Harvard Hazard Mitigation Plan as required by US and the Massachusetts Emergency Management Agencies outlines a town's vulnerabilities to a range of climate and non-climate (e.g earthquakes) related events. It recommends actions to reduce the loss of life and property by lessening the impact of disasters.

Recommendations to mitigate the impacts of disasters is covered in many areas of this report. The goals and actions below for preparedness rely on the some of the report's recommendations.

PREPAREDNESS

CLIMATE GOALS & ACTIONS



Municipal:

- **Goal: Prepare for and reduce the risk of impact to people, property and natural resources from storms, fire, flooding, vector borne diseases and other hazards**

Actions to Date:

- 2022 update to Town Hazard Plan in accordance with federal and state emergency management agencies.

Priority Actions to Implement	Target	Lead Committee/ Entity
Identify and prioritize vulnerable populations for outreach and assistance regarding mitigation and preparation.	ongoing	COA
Formalize which town buildings will be used as a cooling and warming center for residents and their pets.	2023	SB/Fire
Support the implementation of climate-related priorities in the Hazard Mitigation Plan.	2027	SB/DPW

Residential:

- **Goal: Educate residents on how to prepare for impacts of climate change to mitigate negative outcomes**

Actions to Date:

- COA continually educates seniors on having preparations on hand in their homes in case of emergency storms.

PREPAREDNESS

CLIMATE GOALS & ACTIONS



Priority Actions to Implement	Target	Lead Committee/ Entity
Educate residents on preparations (72 hour and 7 day emergency kits) for natural hazards, the availability of town services and neighborhood approaches to mutual assistance and protection of vulnerable residents.	2023	Public Safety
Educate residents about how to mitigate risk to themselves and their properties such as vector borne disease protection, care of wells and septic systems, water use/preservation and wildfire risk.	2023	BoH/Public Safety

Measuring Progress

Measure	Baseline	Baseline Year	Target	Target Year
Identification of vulnerable population	COA has list	2022	Update and maintain list	yearly
Formalize building shelters	Bromfield	2022	Additional shelters in place	2023
Implement priorities of hazard plan	Plan updated in 2022	2022	Priorities implemented	2027
Education of residents on preparedness	Town messages to households as needed	2022	Education on emergency kits and town services	2023
Resident education to reduce climate change risks	BoH releases periodic information to residents	2022	Added information provided to all residents	2023

IMPLEMENTING THE PLAN

Harvard Climate Initiative Committee (HCIC) submits this Climate Action Plan on behalf of its committee members, the town boards and committees who contributed to it and input from the general public. We are dedicated to implementing the plan with the hopes that town leaders, administrators and residents will see the urgency in addressing climate change, being resilient, and creating a sustainable future.

This Plan is intended to be a dynamic document; one that can be readily amended and updated to meet the challenges of the coming years. Successfully addressing the issues before us will require town leadership and residents' personal commitment and action.

Starting with town leadership, all members of the municipal and school administrations should assess policies, regulatory decisions, and purchases through a climate impact lens. There are two major components: policy & accountability, and financial.

Policy and Accountability:

The Select Board is responsible for setting broad policies for the governance of the Town. As such, policies adopted by the Select Board will define the level of climate consideration to be included in all aspects of the town's operations. The Town Administration, as directed by the Select Board, will provide direction to town employees and town boards and committees to consider short and long-term climate impacts in their work. There are tools being developed that will aid employees, committees and boards on how to assess and ultimately reduce the climate impact of a policy, project or procurement.

In furtherance of this, the HCIC recommends that climate considerations be included in warrant articles that go before the Town Meeting, just as articles often have Select Board and/or Finance Committee recommendations. As other towns around the Commonwealth have moved forward with their climate initiatives, we can

IMPLEMENTING THE PLAN

also learn from them as to how they integrated climate change into municipal government actions. From a recent roundtable discussion, this is an example of how one Massachusetts town integrated climate impact into their town operations:

Integrate sustainability goals, metrics, and evaluation criteria into Town planning, including staff and department evaluations and budgeting. Under leadership of the Town Manager's Office and the Sustainability Division, the Town will review and update existing administrative policies related to purchasing and procurement to include sustainability and climate resilience considerations. Similarly, they will undertake a review of the Town's capital planning process to establish a decision-making framework, that considers sustainability and resiliency standards and guidelines. This could result in development of a sustainability and resiliency checklist for capital projects.

To measure the success of this Plan and its implementation, there needs to be a method of accountability to the public by town boards and departments. The HCIC recommends that the Select Board oversee preparation of an **Annual Progress Report on Climate Actions** as part of the Town's Annual Report. This will assure that the public is continually educated on the progress that is being made and that there is a commitment to

measurement of outcomes.

Financial:

There are two aspects of financial consideration: staffing and purchasing decisions. First, the town needs to have the appropriate staffing to shepherd this plan forward. Towns that have sustainability or climate focused staff not only work with town employees, committees, and boards to implement climate action plans, but also bring in grants to support the work. The Commonwealth has recently passed two climate bills that accelerate the need to reach the 2050 roadmap for net zero GHG emissions. The U.S. government has recently passed the Inflation Reduction Act to significantly address climate mitigation initiatives as well. There is money to support many of the goals and actions in this plan but without dedicated staff, there will be missed funding opportunities.

Second, there needs to be a change in how financial impacts are measured. Operational purchases, ranging from paper to utilities, should be evaluated in terms of the environmental benefits. Major capital expenditures should be evaluated to reflect lifecycle costs and environmental costs, not just initial capital expenditures. Is a higher initial investment cost justified if it will result in a longer lifecycle at less cost that will also have less impact on the environment? The HCIC recommends that lifecycle and environmental costs be part of any analysis by the Finance

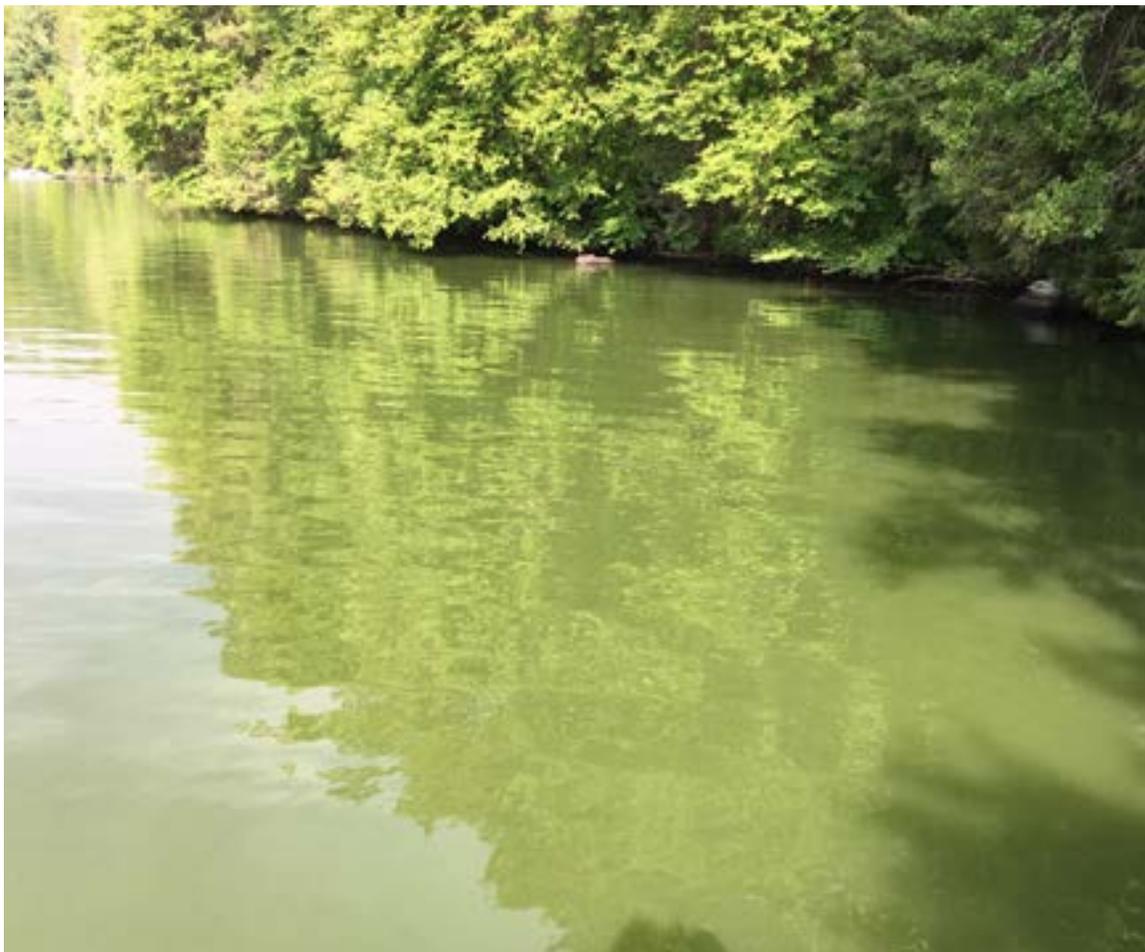
IMPLEMENTING THE PLAN

Committee, Capital Planning and Investment Committee, Permanent Building Committee and Town Administration.

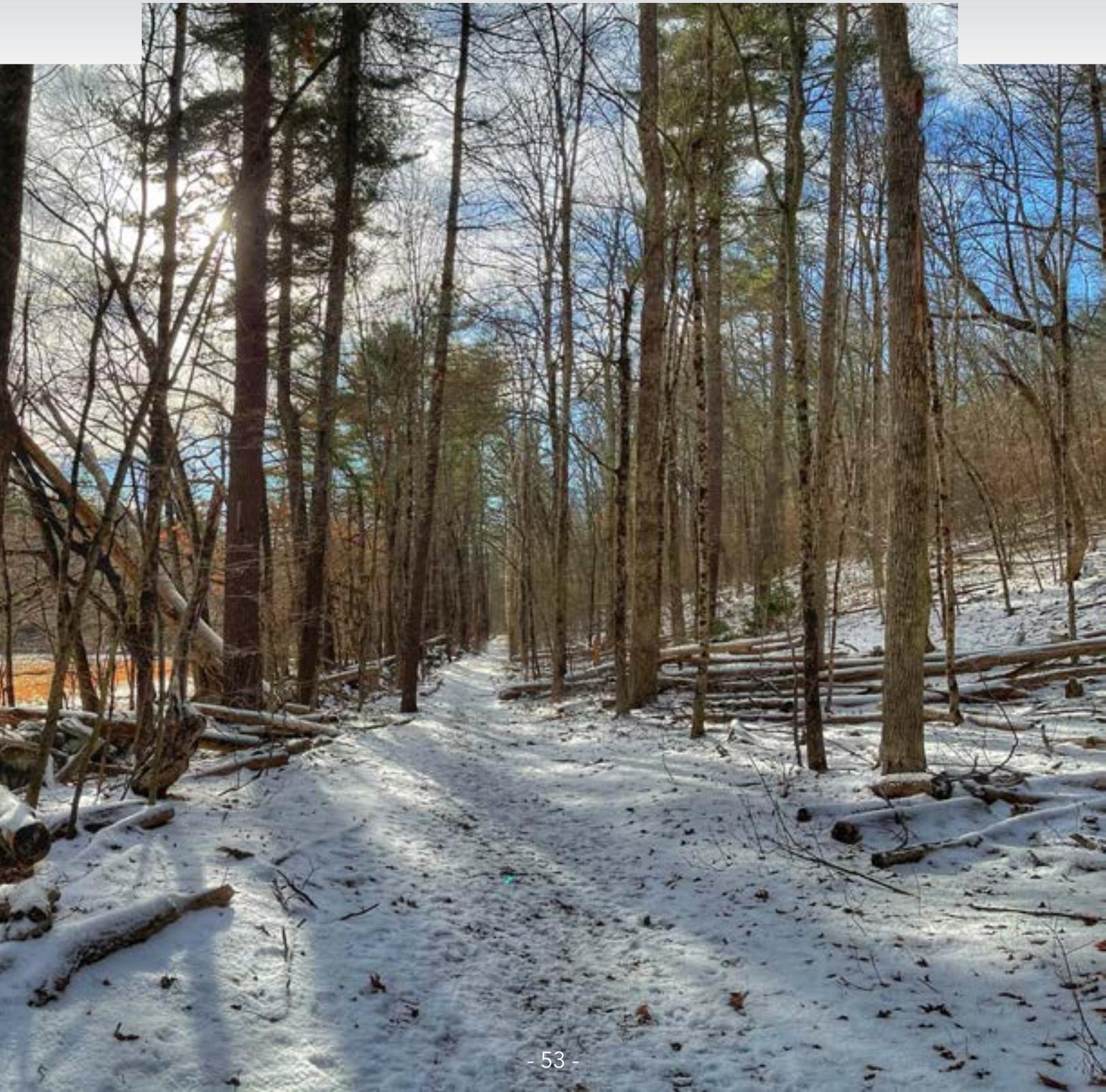
Resident Accountability:

As noted above, this plan is intended for town government and for town residents. Residents of the town produce more of the greenhouse gases than town government due to the number of residential homes and cars. As such, the town can adopt policies and implement plans, but it will take residents to commit to significant changes in the coming years to mitigate climate change. Residents

need to transition away from fossil fuels in how they heat and cool their homes and the cars they drive. Fortunately, and most recently, there are significant incentives from federal and state government to financially assist in the transition, as well as laws that will motivate manufacturers to produce fossil fuel free options. HCIC can educate, set goals and actions, and provide moral support, but it will take a concerted effort of each and every resident to meet the goals set forth in this report. It is HCIC's optimistic hope that residents will join with us to meet these goals.



ACKNOWLEDGMENTS



ACKNOWLEDGMENTS

The Harvard Climate Action Plan was developed through a collaborative process first driven by the Community Resilience Working Group (CRWG), a subcommittee of the Harvard Planning Board. It was completed by the Harvard Climate Initiative Committee. Major contributions were made from multiple consulting firms whose work was funded by generous grants from the Massachusetts Executive Office of Energy and Environmental Affairs Municipal Vulnerability Preparedness (MVP) program.

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Richard Sicard, Fire Chief

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Justin Brown, Planning Board

Kerri Green, Agriculture Advisory Commission

Sharon McCarthy, Board of Health

Kara McGuire Minar, Select Board

Community Resilience Working Group (2019 – 2021)

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Ellen Sachs Leicher, Citizen Member, HEAC and Acting Chair

Jefferson Burson, Planning Board Member

Alexandra Cronin, Citizen Member

Stacia Donahue, Planning Board

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ACKNOWLEDGMENTS

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Jefferson Burson, Vice Chair
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Rich Marcello, Citizen Member
Sharon McCarthy, Board of Health
Adam Meier, Harvard Conservation Trust, Associate Member
Deborah O'Rourke, Citizen Member
Brian Smith, Harvard Energy Advisory Committee
Christiane Turnheim, Agriculture Advisory Commission
Janet Waldron, Conservation Commission
Lucy Wallace, Citizen Member
Patricia Natoli, Public Safety (municipal staff)
Kara Minar, Select Board liaison
Stacia Donahue, Planning Board liaison

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- Harriman
- Kim Lundgren Associates
- BSC Group
- Linnean Solutions
- Regenerative Design Group

Other Contributors

HCIC greatly appreciates and thanks the many boards and committees in town who had one of their members participate in one or more of the meetings held by HCIC to obtain input to the plan.

Individual Contributors

HCIC thanks the following people for their help in creating a visually impactful document:

Cynthia Fontaine, Visual Communications Teacher, Bromfield School
Joe Donahue, Photography, Student, Bromfield School
Grace Beckett, Graphic Design, Student, Bromfield School

APPENDIX 1

REFERENCED DOCUMENT LINKS

AGRICULTURAL CAP: https://www.harvard-ma.gov/sites/g/files/vyhlf676/f/uploads/harvard_agricultural_climate_action_plan_final_0_0.pdf

APPLE COUNTRY REPORT: https://www.harvard-ma.gov/sites/g/files/vyhlf676/f/uploads/apple_climate_solutions_project_report.pdf

DECARBONIZATION PLANS: Check for decarbonization plans at <https://www.harvard-ma.gov/energy-advisory-committee>

GREENHOUSE GAS INVENTORY: https://www.harvard-ma.gov/sites/g/files/vyhlf676/f/uploads/harvard_ghg_inventory_report.pdf

MA CLIMATE ROADMAP: <https://www.mass.gov/doc/ma-2050-decarbonization-roadmap/download>

MVP REPORT: https://www.harvard-ma.gov/sites/g/files/vyhlf676/f/uploads/20190618_harvard_mvp_final_report_only_low-res.pdf

APPENDIX 2

D E F I N I T I O N S

GREENHOUSE GASES – Gases in the atmosphere that have an influence on the earth’s energy balance. Reports referring to greenhouse gases usually include carbon dioxide, methane and nitrous oxide. They are found naturally in low concentrations in the atmosphere.

ICLEI – Local Governments for Sustainability. A global network of more than 2500 local and regional governments committed to sustainable urban development. Active in 125+ countries, influencing sustainability policy and drive local action for low emission, nature-based, equitable, resilient and circular development.

MMBtu - acronym for Metric Million British Thermal Unit, and it is a unit traditionally used to measure heat content or energy value. It is widely associated with measurement of natural gas. It is equal to 1 million Btus. Btus represent the amount of energy required to raise the temperature of one pound of liquid water by one degree Fahrenheit. In practice, BTUs indicate how much heat something is able to produce. On ranges and cooktops, you’ll see that gas burners are labeled with a BTU value while elements on electric ranges use wattage to measure how hot they can get.

MTCO_{2e} – metric ton of carbon dioxide equivalent. At standard temperature and pressure, one metric ton of carbon dioxide (CO) would fill a sphere 32 feet in diameter. The average car in the U.S. will produce this over a three-month period. CO_{2e} accounts for carbon dioxide and all the other gases as well: methane, nitrous oxide, and others.

NATURE BASED SOLUTIONS - involve working with nature to address societal challenges, providing benefits for both human well-being and biodiversity. Specifically, they are actions that involve the protection, restoration or management of natural and semi-natural ecosystems.

RENEWABLE ENERGY CREDITS - Renewable energy credits are tradable, non-tangible commodities that represent proof that 1 MWh of electricity was generated from a renewable energy resource and was then fed into the shared system of power lines that transport energy.

THERMS – a unit of heat equal to 100,000 Btus.

APPENDIX 3

SHORT HISTORY OF CLIMATE ACTION IN HARVARD

2018 and 2019: With the establishment of Municipal Vulnerability Program (MVP) Subcommittee of the Energy Advisory Committee and state funding by the Executive Office of Environment and Energy Affairs (EOEEA), hazards and vulnerabilities of concern in the Town regarding climate change were identified. Thirteen (13) areas of concern were identified, with these being the top four:

1. Pests and Invasive Species
2. Extreme Precipitation
3. Extreme Temperatures and Temperature Swings
4. Ice Storms

Other hazards included flooding, large storm events, wind, drought, sea level rise, extreme thunderstorms, tornadoes, extreme heat, and wildfires.

The conclusion of the MVP subcommittee's work was three recommendations to improve resilience to the changing climate:

1. Create an implementation committee to manage the process of creating and monitoring implementation of a comprehensive Climate Action Plan
2. Establish a Climate Vulnerability Liaison within Town government responsible for capital planning oversight
3. Create an emergency response network and a medical professional network to coordinate professional and volunteer-based emergency and medical response teams.

The full report can be found at: <https://www.harvard-ma.gov/energy-advisory-committee/municipal-vulnerability-preparedness-sub-committee/pages/mvp-general-and>

With the designation as an MVP community, the Town became eligible for MVP Action Grants to support the implementation of climate adaptation and mitigation actions.

2020: With additional funds from EOEEA, a new subcommittee, the Community Resilience Working Group, reporting to the Planning Board, was established. The Greenhouse Gas Inventory discussed above was one of the outcomes of the 2020 funding. This identified the areas that Harvard needs to address to reduce GHGs. A survey was also conducted that asked residents about their concerns regarding climate change and where actions should be focused.

Three hundred fifty-four residents took the survey. Residents were most concerned about the impacts of climate change on natural resources, energy, agriculture and infrastructure/buildings. Drought and intense storms were the climate impacts residents felt would do the most harm and this would affect the town's agricultural business, degrade the town's natural resources, increase disease and illnesses, and disrupt the energy grid.

This same year, the Agriculture-specific Climate Action Plan was drafted to identify opportunities to proactively build resiliency while also being a model for sustainable agricultural practices. Harvard's Agricultural Climate Action Plan centers around a vision for sustaining the agricultural community through four key categories: economic viability, resource efficiency and greenhouse

APPENDIX 3

SHORT HISTORY OF CLIMATE ACTION IN HARVARD

gas reduction, natural based resilient and regenerative practices, and social cohesion and agricultural character.

2021 and 2022: The outcomes of the 2018 and 2020 committee work identified the problems facing Harvard in addressing climate change and the interest of its residents. Work began on the Climate Action Plan beyond agriculture impacts and priorities.

In October 2021, at Special Town Meeting, residents approved the Town Resolution on Climate.

In January 2022, as an outcome of the Town Resolution, a new committee, reporting directly to the Select Board was formed: The Harvard Climate Initiative Committee.

At the same time, several committees in town were creating plans to address some of the issues raised in the initial Municipal Vulnerability Preparedness (MVP) Project. These included:

1. Hazard Mitigation Plan - an update to FEMA/MEMA which is a required plan for all municipalities. Significant focus was on the identified risks from the MVP project
2. Transportation Advisory Committee Plan - a new plan to develop a safe and sustainable transportation system

The work of these two committees has helped define the goals and actions for this Climate Action Plan in the areas of Preparedness and Transportation.

In addition, the HCIC has:

1. Launched a website about Harvard's climate activities
2. Joined with MassEnergize to create a HarvardEnergize website that provides household level climate actions and education
3. Created a newsletter to distill national, state and local news and to provide information on local events and educational forums, particularly to help households make changes to reduce their carbon footprints
4. Held the first Earth Day Show and Tell around Town where residents in town showcased what they have done to reduce their carbon footprint from electrification of their heating and cooling systems, installation of solar systems, planting native gardens, and more.

APPENDIX 4

FUTURE ACTIONS

The following actions came from meetings held with town committees and boards on the goals and actions for the plan. In light of creating a plan that is time sensitive, that is capable of being implemented and that doesn't stretch the resources of the town and its residents, the following actions will be reviewed periodically and added to the plan as actions are completed.

Natural Resources:

- Implement tree and other vegetation enhancements to built environments for shade, improved buffer, bio-swales, etc.
- Prepare stewardship plans for Town-owned conservation lands
- Prioritize and implement forestry recommendations from Apple Country Report, including additional protections for forested lands

Transportation:

- Work to link Harvard trails and bike routes to various recreational opportunities outside of the town in cooperation with regional organizations and neighboring communities, such as the Nashoba Regional Greenway (NRG) Coalition and the Montachusett Regional Trails Coalition.

Agriculture:

- Explore options to reduce tax burden on farmers for their land, buildings, and equipment
- Pilot a collaborative purchasing initiative to take advantage of volume discounts which can enable wider use of organic fertilizer and other farm supplies. Over time, the initiative could get formalized to develop into a Coop or Grange model, which offers storage solutions for perishable farm produce, a commercial kitchen, organizes CSAs, a farmer market and/or manages a co-op store for local farms.
- Identify opportunities for large scale composting of community-wide food and green waste to reincorporate into agricultural soils.
- Pursue a state grant to establish a centralized shared processing facility with energy star appliances to reduce food processing energy and decrease regulatory requirements amongst individual farms.
- Plant what could feed humans, e.g. butternut trees, hazelnuts, burdock, blueberries, native grapes and other plants, which a) all bloom and help pollinators and b) could in the emergency case feed residents

CLIMATE ACTION PLAN

This document has been prepared by:



Harvard Climate Initiative Committee (2022 – present)

Ellen Sachs Leicher, Chair and HEAC

Jefferson Burson, Vice Chair

Paul Green, Past Associate Member

Rich Marcello, Citizen Member

Sharon McCarthy, Board of Health

Adam Meier, Harvard Conservation Trust, Associate Member

Deborah O'Rourke, Citizen Member

Brian Smith, Harvard Energy Advisory Committee

Christiane Turnheim, Agriculture Advisory Commission

Janet Waldron, Conservation Commission

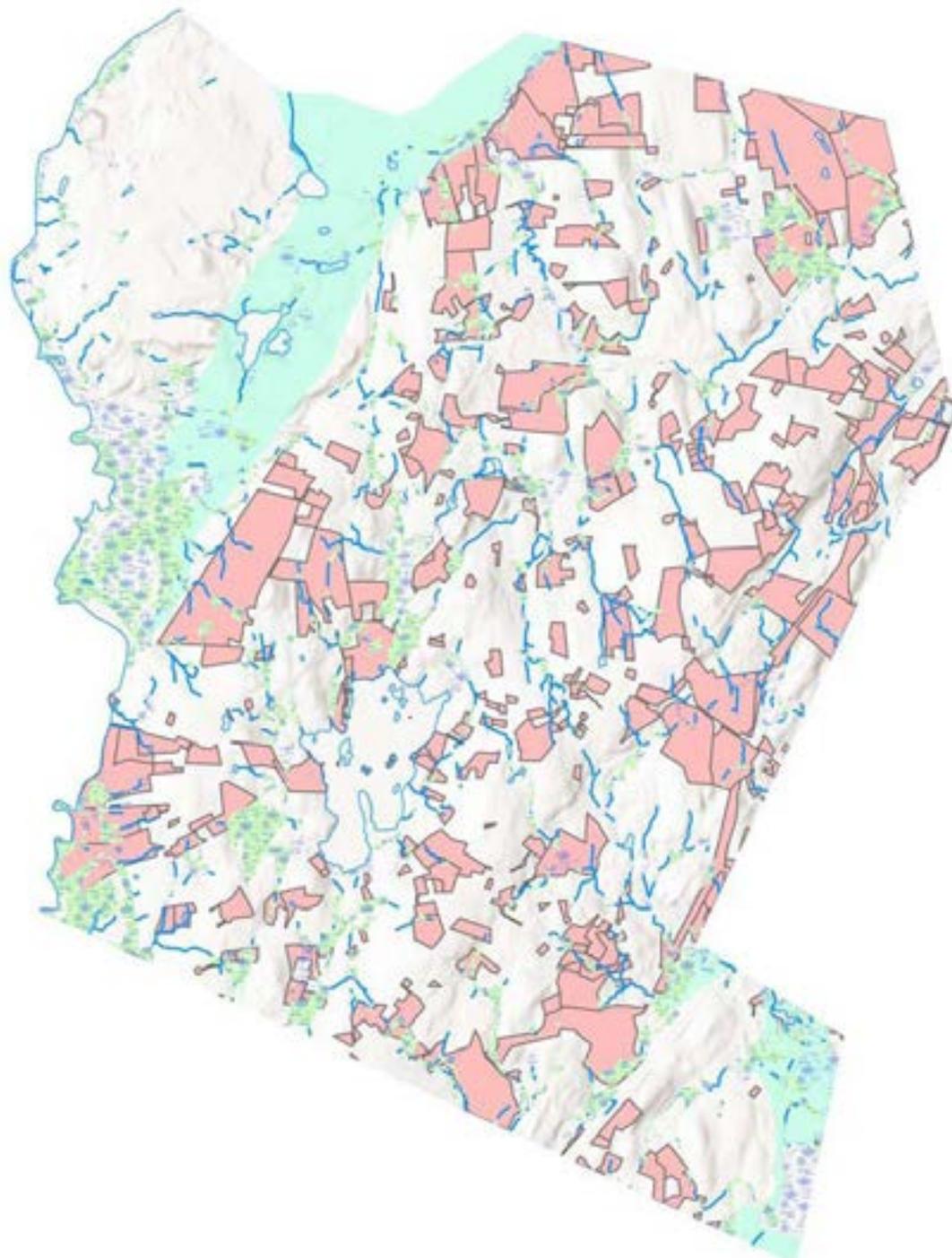
Lucy Wallace, Citizen Member

Patricia Natoli, Public Safety (municipal staff)

Kara Minar, Select Board liaison

Stacia Donahue, Planning Board liaison

HARVARD WATER MAP



- Aquifers
- Marsh/Bog
- Wooded Marsh
- Shoreline
- Stream
- Unprotected_QS