IPSWICH RIVER WATERSHED ASSOCIATION

GREENSCAPES

PIE RIVERS

A Recipe for

Water Resiliency

Water Conservation Solutions for North Shore Communities

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The Recipe for Water Resiliency is an enhanced water conservation plan, based on the experiences of water-stressed communities on the North Shore of Massachusetts. The report goes beyond the water conservation programs that already exist in many cities and towns to increase water supply resiliency in light of climate change. It is a tool to help local leaders make informed decisions on water use, and incentivize residents and businesses to conserve even more water than traditional conservation practices typically achieve.

This report highlights the need for the whole community to get involved — and provides practical steps for municipal Planning Boards, Zoning Boards, Water Suppliers, and other local leaders. It examines land use concepts; incentives for different stakeholders including homeowners, renters, and developers; and beneficial changes to local bylaws and regulations to reduce demands on local water resources.

Above: *Children stand in an empty river bed during the 2016 drought*

INTRODUCTION

Water Resiliency is a Three-Fold Challenge

Water is society's most important resource. As the climate changes, most of us will experience alarming impacts to our water supplies, which is a significant public health and safety concern, as well as a threat to the natural areas we cherish.

Regions here in New England are no exception. On Massachusetts's North Shore, the Parker, Ipswich and Essex Rivers (PIE-Rivers) region has suffered multiple severe droughts over the last decade and the frequency of drought is increasing. Long term climate change will play/is playing a huge role in where and how we get water.

Water resources in this area are already stressed, with local cities and towns, as well as private entities, frequently pumping more than the watershed can sustainably supply while maintaining a healthy riverine habitat. Droughts make existing problems worse, causing severe ecological damage and threatening the reliability of our already-limited water supplies.

Supply

The Ipswich River's watershed is already over-allocated, with 13 communities all drawing from the same bucket. This is indicative of many watersheds in the region. While this report is intended for all North Shore communities, the data present primarily comes from the Ipswich River watershed. State law limits how much water can be safely and sustainably withdrawn using a calculation method called Safe Yield. Since the Ipswich River's Safe Yield has already been exceeded, every community must work to balance future water needs while increasing the resiliency of our limited water supply.

Usage

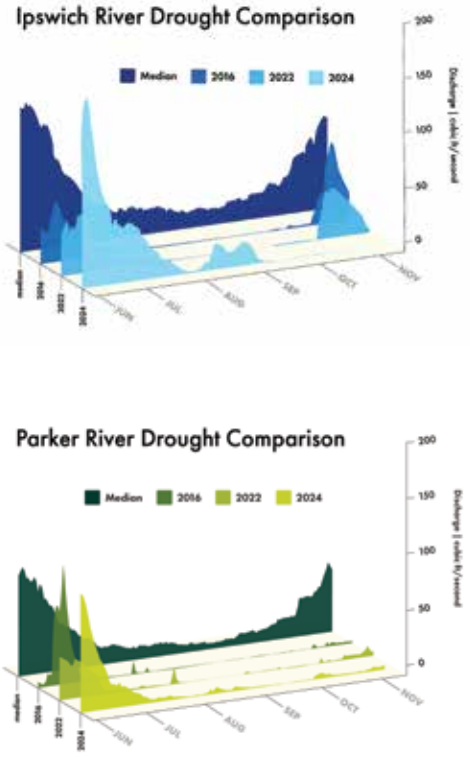
Unfortunately, water use tends to increase at the same time communities are hitting their supply limits. The same story plays out across the Commonwealth. According to the Water Resources Commission, 20% of all watersheds in Massachusetts are highly stressed, even in non-drought years.[1] Water use in some communities doubles in the summer. In watersheds like the Ipswich, 15 million gallons are wasted each day during summer months, mostly for non-essential uses like lawn watering.[2]

Climate

Due to climate change, we can expect increased frequency of both extreme heat and drought. This will maximize stress on aquifers, with severe ecological impacts. In 2021, the Ipswich River was designated one of America's Most Endangered Rivers® for the second time, due to water withdrawals made worse by climate change.

Communities need a plan in the face of these challenges. In response, the Ipswich River Watershed Association (IRWA) developed the #EndangeredIpswich campaign.[3] The campaign, which launched with remarks from then U.S. Special Presidential Envoy on Climate John Kerry, proposes solutions for stakeholders at every level. As you will see in this report, a multi-level approach is key to growing healthier, more resilient communities.

Our experiences dealing with drought, regulatory limits, and overuse have been challenging, but they are also an opportunity for city and town leaders to rethink conservation measures. Done right, water conservation can help prepare our communities for the future. With strong local leadership and an engaged public, we can build a more resilient Massachusetts that avoids conflict and can adapt to the impacts of the climate crisis.



Above: *Yearly drought comparisons for the Ipswich and Parker Rivers*

STEP 1

Gathering Information and Getting Started

INGREDIENTS

Local Leadership

The Water Use Profile

Bylaw Review

Underground Leak Detection

In order to successfully implement an enhanced water conservation program, it is important to assess where your community is now. Current water use statistics, knowledge of local bylaws and regulations, and an assessment of public water infrastructure are an essential starting point. This recipe can be initiated by anyone, but full implementation will require a coalition approach of water users, town government officials, water utility decision makers, and local activists.

We recommend everyone start at this phase of gathering information. However, no city or town is the same. Each community and stakeholder will have a different set of priorities and capacity for change. While we would hope all communities would implement the full recipe for resiliency, any action is better than none and we encourage you to start implementing these changes however you are able. Should you have questions about a particular step, we encourage you to contact regional entities like the PIE-Rivers Partnership and the Greenscapes Coalition for technical assistance and support.[4]

Local Leadership

Our recommendations start and end by focusing on the transformative power of local leadership. We don't need to wait for a big change at the state level, or a Green New Deal at the federal level. Local leaders can work proactively with their community to take charge. The more stakeholders you can get involved in efforts to improve water resiliency, the more success you will have with the steps in this Recipe.

It isn't just one department in your city or town that needs to take charge but several working together, combined with public input.

Community engagement is the key to successfully implementing this Recipe. The working group should create a process for gathering public input and sharing progress updates. You can boost civic participation by following our suggestions by engaging youth, collaborating with local creatives and storytellers, and highlighting the important of water conservation for public health.

Pay special attention to who is not seated at the table. Certain groups are more impacted by local decisions than others, yet their voices are often absent. To be meaningful, efforts at improving water resiliency should incorporate concepts of justice, equity, diversity and inclusion. Common causes, like figuring out how to better share and conserve water resources, are a chance to bring people together.

The Water Use Profile

To understand how to reduce water demand, you should start by studying how your community is already using water. A water use profile analyzes your town's overall water usage over a given time, typically a period of two or more years when both rainfall and water use were at average levels. Using data from your water supplier/DPW/relevant department, the profile identifies who is drawing from your public water supply, as well as how, when, and how much water they use. Your team can then use this analysis to efficiently focus efforts where you can have the most benefit, and at the lowest cost. The Greenscapes Coalition and PIE-Rivers Partnership can assist communities in conducting the profile. This will also help determine who you need in your working group to tackle your community's most pressing issues.

Once you have your baseline profile, we recommend offering a further audit for the top 10–15% of residential users and top 10% of business users. Collaborating with an outside consultant, state agency, or partner organization can make this step easier. For example, the Massachusetts Department of Ecological Restoration worked with the Town of Ipswich to conduct a Water Use Profile for two representative years, 2017 and 2018.[5]

Your core team should involve representatives from most (if not all) of the following departments:

- ☐ Planning Boards & Planning Staff
- ☐ Zoning Boards of Appeals
- ☐ Building Departments
- ☐ Water Departments
- ☐ Town Managers
- ☐ Select Board or City Council Members
- ☐ Department staff that manage municipal-owned properties that use water (e.g. Public Works, Parks & Recreation, Schools)
- ☐ Department staff charged with protecting water resources, aquatic habitats and public health (e.g. Conservation Commission, Board of Health, Open Space Committee)

Above (left to right): *Students and community members discuss water conservation issues at a Climate Café; students learn about the watershed at a Resilient Newburyport event*

COMMUNITY ENGAGEMENT

Engage Youth. Younger residents are already leading on climate. They understand the consequences of delayed action. Getting younger residents involved in local resiliency planning is a great way to turn an internal municipal discussion into a public forum and help build the support you will need for steps in the Recipe that may require votes at Town Meeting. Topics like upgrading stormwater bylaws or replacing parking lots with permeable surfaces may not trigger public input if you don't engage the segments of the population who care the most. You can look to other examples of youth engagement happening at the municipal and watershed levels for ideas.

Partner with Creatives. It's hard to get people excited about local governance structures or changes to the appearance of their water bills. By approaching artists and learning about their skills for communicating ideas, you may discover ways to help your community talk about and think about water.

Don't Forget Public Health! Board of Health officials are often left out of the discussion, even though they typically have the authority to regulate water-intensive activities like the installation and use of private wells. One of the reasons we don't see as much water conservation as we might expect is because people often think of water as an environmental issue, and it gets pushed aside in light of other pressing issues. However, ensuring people have enough clean water for drinking, cooking, and cleaning is critical for public health.

Build Consensus. As communities in Massachusetts continue to grow, our leaders will have to make difficult decisions. Climate emergencies like increased droughts or flooding are testing our ability to protect natural resources and make them accessible to everyone. One way to avoid conflict is being proactive in bringing everyone into the discussion and follow the practical steps outlined in this report to reduce how much we compete for resources like land and water.

Bylaw Review

In addition to pinpointing areas of high water usage, it is also important to study local regulations. Communities in New England are old and, in many cases, so are the rules they have on the books. Newer concepts like Low Impact Development (LID) or open space preservation are not always reflected in local laws. As a result, one of the highest priority recommendations in virtually every local, regional and statewide plan is for communities to comprehensively assess their development bylaws, ordinances, and associated regulations to reduce the impact of development on the environment and the natural resources upon which we all depend. There are many ways in which development patterns mandated by bylaws can affect local water resources, from impacting the recharge of groundwater resources to contributing pollution from runoff to local water bodies.

Updating municipal bylaws, ordinances, and regulations can be a big task. Thankfully, the North Shore already has a head start on this process as Greenscapes undertook a review of stormwater bylaws for 29 communities and has already developed specific recommendations for each of these communities.[6] The review and recommendations have utilized Mass Audubon's Bylaw Review tool and associated training program.[7] Please be in touch with Greenscapes to discuss findings in your community to inform implementation of recommended changes.

This recipe also recommends the addition of a Water Neutral Use Bylaw and a Private Well Bylaw. Therefore, this bylaw review should include an analysis of whether your community has these or similar bylaws on the books already. Most New England communities will not have these bylaws unless they have been very recently updated.

Above: *Drought conditions at Middleton Pond (photo by Judy Schneider)*

Underground Leak Detection

Many municipalities in New England were first incorporated in the 1600s. While sewage and water supply systems came a little later, much of our region's water infrastructure is more than a century old. One of the biggest challenges local water departments have is figuring out how to maintain old systems with limited funds.

Old municipal water systems often experience high volumes of leakage through aging pipes. Across the U.S., municipalities lose an estimated 6 billion gallons of water every day to underground leaks, as well as the sunk cost of treating and pumping that water.[8] And New England has, on average, the oldest municipal drinking water systems in the country.

In Massachusetts, towns are required to measure and report on their "unaccounted for water" (UAW) each year. The UAW is the percentage of water that enters a distribution system that cannot be accounted for by meter readings or unmetered uses. Common causes of unaccounted for water include:

- leaks in the distribution system
- incorrectly calibrated meters
- unmetered uses that are not documented
- slow meters

The goal is for all towns to achieve a UAW rate of 10% or lower. All communities are already required to do leak detection to help identify some of the problems, but a full, modern audit can be a game-changer. Your city or town can partner with state agencies to conduct an American Water Works Association M36 Audit and expand your leak detection program, often with funding provided by the state.[9] Doing so will also increase the ability to repair small leaks, often overlooked or delayed until they deteriorate into larger, more urgent leaks.

As you move forward with the Recipe, you may discover a need for new decision-making procedures. Implementing all of the recommendations in this report will likely require some increase in municipal capacity, as well as support from other groups outside your community. You can optimize collaborations with regional coalitions and partnerships (such as PIE-Rivers and the Greenscapes Coalition). Many offer free technical services for municipal partners to help manage water supplies, improve groundwater recharge, and increase public outreach and education.

Once your team has reviewed your bylaws, figured out who is using water, minimized leaks, and formed a local group to implement these changes, you are ready to move forward with the rest of this Recipe for Water Resiliency.

PROTIP!

Mass Audubon's Bylaw Review Tool is an excellent resource.

massaudubon.org

Above: *IRWA staff stand in a dry river bed during the 2024 drought*

THE DRY DAYS OF SUMMER

Climate change is increasing the risk to our communities. Over the last decade, Massachusetts experienced multiple severe droughts that made national news. In one notable event, journalists interviewed local leaders as they sipped coffee while standing in the middle of a dry Ipswich River riverbed. The Ipswich River experienced the two lowest flows on record in 2016 and 2020; no water reached the sea for weeks at a time.

2016-2017 Drought

The 2016-2017 drought was the most significant drought to occur in Massachusetts since the 1960s, with record low stream flow and groundwater levels (reported by USGS).

2018-2019

The Ipswich River's aquifer temporarily recharged to healthy levels, thanks to two wet springs. Volunteer river monitors recorded signs of the watershed recovering from drought-caused ecological damage. The State also reassessed its Drought Management Plan, using data from the recent drought.

2020 Flash Drought

Another severe drought hit the state. This time, the drought arrived suddenly. In a few weeks the flash drought covered all of New England. During the midst of the COVID pandemic, outdoor recreation became especially important. Those seeking recreation on the Ipswich found a river in crisis.

2021 The Ipswich River Named One of America's Most Endangered Rivers

Due to excessive water withdrawals made worse by climate change, the national organization American Rivers declared the Ipswich one of its 10 Most Endangered Rivers in America®. Then special Presidential Envoy on Climate John Kerry gave remarks at the Ipswich River Watershed Association's annual meeting, urging for local advocacy.

2022 & 2024 Droughts

Critical drought occurred again in 2022 and 2024, further emphasizing the dire need to implement long term water conservation practices throughout the region. The Drought of 2022 was the worst in recorded history of the Ipswich River, with both the lowest flow and longest low flow period in 92 years. Thanks to a dry summer and abnormally dry fall, the watershed — as well as the majority of Massachusetts — experienced severe drought conditions during the fall of 2024. The dry conditions also sparked area wildfires.

STEP 2

On the Books: Bylaw Revisions

INGREDIENTS

Adopt a Water Neutral Use Bylaw and Establish a WUMP (Water Use Mitigation Program)

Amend Stormwater, Subdivision, Wetlands and Zoning Bylaws and Regulations

Adopt A Private Well Bylaw

Groundwater Protection Overlays

Amending local bylaws requires cooperation across municipal departments and garnering public support. For some steps, like passing a new bylaw, public outreach will play a key role. You can work with your local watershed association or stormwater collaborative for technical assistance and outreach support. Before you get started, we recommend reviewing the Metropolitan Area Planning Council's Climate Resilient Land Use Strategies, an online library with sample bylaws and regulations on everything from water conservation and wetlands protection to zoning and open space.[10]

Adopt a Water Neutral Use Bylaw and Establish a WUMP

Out of all the steps in this Recipe, adopting what's known as a Water Neutral Use Bylaw may be the most important. This bylaw, and the various provisions it contains, will let development continue in your community without increasing water use.

The Water Neutral Use Bylaw requires developers to calculate how much water a new development, or redevelopment, project will use and requires that use to be minimized. In addition, the remainder of water use must be offset elsewhere in town. It provides the legal and procedural backing to make this important shift to a water neutral future, as well as incentives that encourage everyone in your community to conserve water. The Greenscapes Coalition offers member communities a bylaw building tool customized to your community.[11]

The following are key aspects we recommend you include in your bylaw:

Defining Development

Your Water Neutral Use Bylaw should define development broadly. The definition should include not only new subdivisions or houses, but also certain types of redevelopment and land disturbances. Your bylaw should require applicants to offset new demand if the project: includes renovations above a certain threshold (e.g. 25%); disturbs a certain amount of land.

It's important to make sure the bylaw applies to all types of development, whether residential, commercial, or agricultural. A level playing field is the best way to ensure cooperation and avoid conflict between users!

Creating a WUMP

One proven way to both incentivize development projects that conserve water and raise funds to achieve your water resiliency goals is for your bylaw to establish a Water Use Mitigation Program (WUMP), commonly called a Water Bank. A WUMP requires project developers to pay a fee into a fund corresponding to the net increase in new water demand after they have minimized use to the extent possible on the new development. The fund is then used to finance other water-saving projects and activities elsewhere in your community.

WUMPs are analogous to the affordable housing in-lieu fee programs that already exist in many communities, which require developers to pay a fee if their projects do not increase the amount of affordable housing. Your community can then use your WUMP fees to offset new projected water demand by paying for water savings elsewhere in the community. To make sure residents interact with the fund and get the greatest benefit, you can also develop and maintain a prioritized list of WUMP-eligible projects and activities that can qualify for using the funds.

Understanding the role of fees taken in by WUMP.

While the fees probably won't be enough to invest in large capital projects, they could support activities such as hiring a part-time program

manager, financing rebate incentives, conducting water audits or doing advanced leak detection. This makes it easier for developers to offset their projected use under the Water Neutral Use Bylaw. Your community can also use this list to pursue grant funding to help implement water use reduction projects. You can help start the discussion, with neighboring towns and partners, on how creating a regional WUMP could amplify the impact of your program and reach even more people.

Build Public Support

As you develop the bylaw, it is important that residents understand the financial benefits it will bring to the town. One way to do this is to look backwards, evaluating a few years of development projects to calculate how much revenue you would have raised had the new bylaw already been in place. At the same time, you can estimate how much additional water you would have kept in the ground for each of those years as a result of the WUMP. This number will go up even further if you factor in how much additional water you could have saved if you had used funds from the WUMP to implement and support a comprehensive water protection and savings program. For example, the Town of Ipswich estimated in 2020 that $80,000 could have been generated, looking only at projects subject to Planning Board Review for the last five years, which would be enough to hire a part-time program manager to implement water saving projects.

Prohibit Residential Irrigation Systems

One of the biggest threats to water resources in the PIE-Rivers region are underground lawn watering systems. These systems have proliferated in recent years, and use large amounts of water even when used properly. Added to that, these systems are virtually guaranteed to fail and leak over time. Irrigation systems become especially strained as they age and when transferred to new owners (who may not have owned or maintained an irrigation system before). Moisture sensing and timer technologies on these systems are notoriously unreliable. Such technology is not an acceptable hedge against the risk to municipal water supplies associated with these systems. Because lawn irrigation systems are not necessary and pose a risk to public water supplies, new systems should not be allowed. You can also consider rebate programs for helping homeowners decommission their existing systems.

Detox your community

A decommissioned golf course purchased by the Town of Middleton (pictured above left at the 2022 Middleton Earth Day Festival) will become the site for new public buildings and open space. Without chemicals and over-watering, the landscape is returning to native and naturalized groundcover. Residents like Bob Lemoine (above center) maintain beautiful lawns and gardens with only rainwater.

Water Use Bylaw Checklist

Before moving on, complete this checklist to make sure you've included all the most important parts.

- ☐ The WUMP offset fee is sufficiently high to incentivize water conservation and generate adequate revenue for meaningful investments in water savings projects.
- ☐ Does not exempt commercial or agricultural water use.
- ☐ Includes all projects that potentially impact community water sources and aquifers including installation of private wells.
- ☐ Prohibits residential installation of irrigation systems.
- ☐ Requires the community develop and maintain a prioritized list of WUMP-eligible projects and activities that can qualify for fees collected through the WUMP.
- ☐ Leaves open the possibility of merging your municipal Water Use Mitigation Program and other incentives with a larger regional program once they are established.

One of the biggest threats to water resources in the PIE-Rivers region are underground lawn watering systems.

Amend Stormwater, Subdivision, Wetlands and Zoning Bylaws and Regulations

In addition to creating a new Water Neutral Use Bylaw, existing regulations should be reviewed and amended to improve water conservation and efficiency. As with other steps, it's important to make sure your regulations apply to everyone when it comes to saving water. Expanding stormwater bylaw coverage to the entirety of your community creates a level playing field. Residents and businesses are more inclined to save water if they know their neighbors are subject to the same rules. Increasing fairness to residents is also a great way to unite towns to become water resilient together.

Rainwater is an essential resource. But it can't help our communities save water if it hits the pavement and flushes out to rivers or the sea. While stormwater bylaws are often designed primarily to minimize pollution, they can also be amended to help with groundwater recharge. Incentives to capture rainwater on-site facilitate replenishment of groundwater aquifers and increase the resiliency of our water supplies. Cities and towns are already required to have a stormwater bylaw in place for areas served under their state-issued stormwater permit (known as an MS4 permit). However, while local stormwater, subdivision, and wetlands regulations usually require infiltration and measures to prevent runoff, many development projects aren't subject to these regulations, especially if they lie outside a community's MS4 district.

Bylaw revisions should ensure that all development and redevelopment projects must implement LID strategies. Traditional subdivision regulations typically include large amounts of pavement, as well as large areas of land disturbance. LID is a design technique that mimics a site's natural hydrology while minimizing the use of non-permeable pavement. Thus, LID attempts to work with nature instead of against it. Traditional subdivisions without LID should only be approved via Special Permit. Open Space (also known as cluster) development should be listed in the regulations as the default form of Development.

While not exhaustive, the checklist on the previous page will make sure your new and improved regulations incorporate best practices on use of LID and other nature-based solutions. For recommendations specific to your town, see Municipal Stormwater Codes: A Regional Review for NE Massachusetts provided by the Merrimack Valley Planning Commission.[12]

Above (left to right): *A pollinator garden with native plants; the Ipswich river is buffered from runoff by a permeable sidewalk; students learn about water through IRWA's Keeping Water Clean program*

Adopt A Private Well Bylaw

Public water supplies are increasingly put at risk due to the growing number of private wells. Often, private wells pull from the same water source as public water supplies. Many wells, particularly newer ones, are used mostly or entirely for non-essential lawn watering. Unfortunately, state regulations in Massachusetts currently do not cover private wells, meaning private well owners do not have to follow the same conservation rules that municipal systems do. It is up to municipal leadership to create a level playing field. Implementing a well bylaw will deter the drilling of new wells by removing their exemption from local water conservation regulations. With less discretionary water use, residents that rely on well-water for their household supply will also be less at risk of a dry well.

Implementing a well bylaw likely falls to your community's Board of Health.[13] As public health officials, the people who serve on these boards have wide discretion to regulate the construction and use of private wells. A new bylaw can support them in their efforts to make sure private well owners are conserving water without impacting the ability of your municipal water supply to make sure there's enough water for everyone.

Groundwater Protection Overlays

Everyone knows what sprawl looks like. Absent planning, in many regions sprawl becomes the default. City and town planning departments must be proactive if they want to drive development patterns in a different direction.

Traditionally, as development increases in a community, so does the size of impervious surfaces like pavement. This reduces the amount of rainwater infiltrating the ground, putting water supplies at risk. Communities with large (and especially contiguous) areas of non-permeable areas are also more vulnerable to flooding and stormwater pollution.

Creating or updating groundwater protection overlays can help your community plan for the future. It's important to make sure development practices that negatively impact groundwater are prohibited within the Groundwater Protection Overlay.

This includes preventing building on soils that have high permeability to rainwater, as these areas are critical to replenishing the aquifer. Working with local organizations like land trusts and other conservation groups, you can also prioritize the protection of these critical recharge areas through land acquisition and other means.

Best Practices for Subdivision and Zoning Regulations:

- Require use of naturalized and native vegetation and groundcover in landscaped areas, especially drought-tolerant options like fescues and clover. Native and naturalized plants keep our neighborhoods green, even during drought. They also serve as pollinator pathways, and create habitat for birds and other predators that significantly reduce mosquitoes and other harmful pests.
- Ban topsoil stripping and earth removal to protect future homeowners from unscrupulous developers. Regulations should require a minimum 6-inch depth of topsoil on all cleared areas to retain moisture.
- Restrict alterations to topography. Require natural topography be maintained to the maximum extent feasible.
- Use techniques like Low-Impact Development and Open Space Design Development to preserve or restore a site's natural hydrology.
- Require low water-use landscaping techniques.
- To the extent feasible, prohibit installation of sod for lawns. Sod mostly consists of water-needy grasses, and requires huge amounts of water to establish and maintain.
- Make sure your regulations reflect the new Water Neutral Use Bylaw, in particular the provision that prohibits underground irrigation systems for residents.

STEP 3

Water Utility Efforts

INGREDIENTS

Fix Your Water Billing

Engage Homeowners and Other Water Users

Above: *A water pipe discharges water*

Opposite page (top to bottom): *Rain barrels are an excellent way to conserve water; volunteers plants native plants at the Ipswich River Watershed Association's headquarters; plants waiting to be added to a green roof*

Fix Your Water Billing

Water bills are one of the few touchpoints most homeowners have with their water suppliers. As such, they should be used to effectively communicate the need for water conservation. One proven and effective measure to protect limited water supplies is for your water department to change the methodology and amount it charges for water. Water rates that help incentivize conservation can be broadly sorted into two groups: block rates and seasonal rates. Ideally, your water department will use both. Changes to your fee structures help address both current and future usage. Additionally, issuing water bills monthly, instead of quarterly (as is common) will more closely tie user's water use patterns to their bills and make any changes to rate structures more effective.

Block Rates

A block-rate fee structure enables a water utility to charge more for high-volume water use, while maintaining an affordable rate for essential uses like drinking, cooking and cleaning. It effectively allows for "luxury" high volume water uses, like lawn watering and pool filling, to be more expensive, and as such, uses financial tools to discourage these high volume uses.

Seasonal Rates

In New England, summer water rates should always be higher than the base rate. Seasonal rates will further encourage residents to reduce non-essential uses during the summer.

We recommend an overall annual rate structure that is fee-neutral so that the winter rate offsets the summer rate increase. Setting up a seasonal rate structure is also a great time to revisit when your community establishes use restrictions during periods of drought. Water restrictions should be triggered by local stream flow levels, rather than a fixed calendar date, so that restrictions are tied to local climate conditions.

Together these two forms of tiered pricing help residents keep their water bills reasonable, while at the same time use price to incentivize water conservation and generate a public benefit by collecting higher fees from top users.

Billing Monthly

Communicating with municipal water users via monthly water bills has the advantage of making the connection between water use behavior and bills clearer. In addition, it's important to make water use data available to users more frequently to help them reduce leaks within the home. Monthly billing avoids sticker shock and gives both residents and businesses the chance to quickly report spikes in bills that may signal a leak. For example, the Town of Ipswich bills on a monthly basis and includes usage graphs with each bill. Monthly graphs give people a more frequent and timely indication of their water use, and can also be used to show how your water use compares to others in town.

Engaging Homeowners and Other Water Users

There are several ways that homeowners can reduce water usage by changing behaviors. We encourage homeowners to adopt these behaviors and spread the word within their communities about the need for water conservation. Cities and towns can adopt various measures to incentivize these behavior changes.

Water Efficient Appliances

Homeowners and landlords should be using water efficient appliances—dishwashers, washing machines, and showerheads. Working in partnership with EPA's Water Sense Program[14], your municipality can offer rebates for residents who upgrade inefficient water appliances. You can also offer a generous rebate program for the decommissioning of existing underground irrigation systems. A great way to encourage residents to take advantage of these rebates is to include educational materials in their monthly water bills.

Rain Barrels

Rain barrels are fun, visible, and easy ways to rethink how we use water for outdoor purposes. But the one-time costs of purchasing them may be prohibitive for some residents. In response, the Town of Ipswich partners with a local plant nursery to provide rain barrels to its customers at a steep discount. Other towns offer discounted rain barrels through their Department of Public Works.

Reducing Leaks at Home

Some Water Departments offer water audits for residents and businesses. Unlike the IRS, these audits are a good thing! They can help you fix leaks and reduce other inefficiencies in your households, yards, and businesses at little to no cost. The Ipswich Water Department also helps residents avoid water disruptions by conducting an annual system check to find and repair leaks before they turn into bigger problems.

Water Smart Landscaping

Much of the North Shore's excessive water use stems from landscape irrigation, especially for lawns. Reducing lawn watering will go a long way towards improving our water resiliency. Thankfully, we don't need residential irrigation systems in New England to keep our neighborhoods green. Frequent lawn watering has actually been shown to weaken the resiliency of lawns, resulting in grass with shallow roots that burns up more quickly during hot days and dry conditions. The truth is, green lawns don't need to be watered by anything but rain. Native grasses like fescues, along with a mix of groundcovers like clover, are hardy and low maintenance. Lead by example: convert town landscapes to native, drought-tolerant plants and grasses.

STEP 4

Implementing Your New Enhanced Water Conservation Plan

INGREDIENTS

Ensuring Future Success

Congratulations! Now all that's left is to implement your plan, monitor your progress, and share your work with neighboring communities.

At the residential level, the best metric for monitoring success is what's known as the Residential Gallons Used Per Capita Per Day (RGPCPD). The goal is to make progress towards a target of 40 RGPCPD. This is more than achievable with the changes outlined in this Recipe and normal household uses. A family of four, for example, will fall under this threshold even if you're using a whopping 150 gallons per day.

At the system-wide level, the most common metric is the Unaccounted for Water mentioned in Step 2. Make sure you stay on course to achieve a UAW well under 10%. If you discover you are not on track to make the infrastructure improvements needed to achieve this metric, we encourage you to re-visit your efforts as this is an achievable figure under this plan.

Ensuring Future Success

Additional tips for long-term success of your community's water conservation efforts include:

Build Capacity

WUMPs and other programs to reduce water use require guidance as they grow and adapt over time. When budgeting, communities should include administrative capacity to manage these water-saving programs in each town or collectively to share resources.

Such an investment will pay dividends by enhancing the program. Having a person dedicated to running an enhanced water conservation program puts a face to the program. Not only does it give residents and business leaders someone they can contact directly for help, it will also give your community a liaison to connect with regional coalitions like the PIE-Rivers Partnership to share best practices and scale up successful programs region-wide. Building relationships is particularly key for engaging directly with the town's highest water users, some of whom may not otherwise appreciate the value of working with local government officials.

Collaborate

Continue looking at regional strategies for achieving water resiliency. As mentioned previously in this report, watersheds like the Ipswich and Parker are under increasing stress. Regional groups like the PIE-Rivers Partnership and North Shore Water Resilience Task Force are exploring improvements that will help each of our communities save water in the long run while protecting current supplies. Some incentive programs simply work better at scale. While local communities can take on the burden of establishing and administering a WUMP on their own, a regional WUMP program would impose fewer costs per community. The Greenscapes North Shore Coalition could be a good vehicle to advance this exploration.

Be Public about Progress

Helping our neighborhoods go green without using water can be difficult if residents can't see what it looks like. Local governments can partner with businesses in the community or use municipal-owned land to create demonstration projects in highly visible areas. Be public about the work you are doing to test different programs. Connecting with a regional collaborative will also give you a platform to share the news with people in other communities.

Replace Aging Infrastructure

Continue prioritizing projects that replace aging and leaking infrastructure, with the long-term goal of eliminating outdated technology. As a part of this process, municipalities and water suppliers can work towards reducing water loss due to leaks and achieve a UAW (unaccounted for water loss) of 10% or less.

Keep Learning

Pursue additional tools available to communities to guide new development that accommodate growth without increasing overall water demand or disrupting the water balance. Smart growth practices like Low Impact Development, combined with the use of Green Infrastructure and Nature-based Solutions can manage rainfall and runoff at the source.

Local Leadership

Finally, local leadership is critical to the future of water. Unlike most states that have a centralized way to safeguard water resources, Massachusetts leaves much of its decision making up to our municipalities. Only one state law, the Water Management Act of 1984, regulates how we use our limited freshwater resources. Despite decades of science showing that our watersheds are drying up, state policy has made few improvements and in some cases even slipped backwards.

Changes Are On The Horizon

The Massachusetts Department of Environmental Protection has proposed updated regulations on water use and IRWA continues to push for the passage of the Drought Bill in the Massachusetts state legislature. Additional reforms—spurred by active and engaged residents—can build off those efforts. Improvements at the state level can take years to bring about, and require support and coordination from communities worried about water use across the Commonwealth.

Thankfully, we don't have to wait. Our communities can plan for the future now, without worrying about state budget debates or legislative battles between lobbyists. There is much our local leaders can do now, using existing tools. The only major ingredient they lack is public support.

We encourage you to share this report widely, to send it to your Planning and Zoning and Conservation board members. And to talk about these ideas with your children, your parents, and your neighbors. The more you help build consensus about the benefits of achieving water resiliency, the sooner these steps will happen.

Water, much like air and wildlife, does not care about municipal boundaries. Given the chance, a drop of water will travel from the mountains to the sea without worrying about who it passes along the way. As climate change disrupts the water cycle, it will become harder to put our heads in the sand. Water may not worry about us, but we would be foolish not to worry about water.

Above (left to right): *IRWA volunteers help install a green roof; outdoor showers; IRWA Executive Director Erin Bonney Casey, Massachusetts Senator Ed Markey, and Massachusetts Representative Kristin Kassner meeting to discuss regional water supply issues*

Above: *The green roof at Whipple Annex in Ipswich, MA helps protect the adjacent Ipswich River from pollution and erosion*

Water Conservation Success Story

The Town of Ipswich, MA

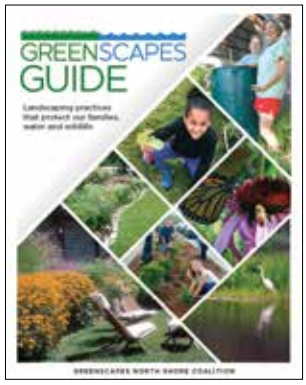
It's helpful to point to success stories in reducing water use when you're engaging your residents and businesses. The Town of Ipswich slashed about 20% off its use, from nearly 450 million gallons per year in the mid to late 90's to around 340 million gallons in 2014. How did Ipswich do it?

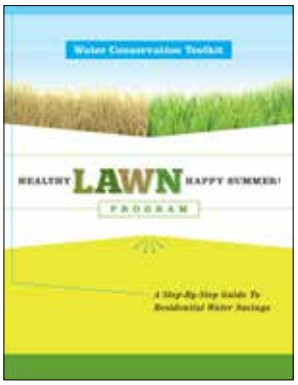
Four steps:

- Launching its water conservation program
- Switching from quarterly to monthly billing
- Installing smart meters
- Adopting a residential seasonal rate structure; and Infrastructure repairs.

Despite already being a leader in water conservation, the Town's recently completed Water Neutral Growth Plan (based on recommendations included in this Recipe) estimates an additional 14% could be saved, for a grand total of 30-40% through the adoption of an enhanced water conservation plan. Not only will saving this amount of water increase future resiliency, it will help accommodate new growth and development. The Town has also created a WUMP with a full time program manager.

WATER SAVING RESOURCES & TOOLS





There are many other landscaping choices homeowners can make to reduce water demands in their yards and gardens. These are all laid out in the Greenscapes Guide. A few key measures include reducing use by planting drought-tolerant species, mowing higher, infrequently, with a sharp blade, reducing or eliminating pesticide and fertilizer use, and using permeable materials for hardscaping.

The Massachusetts Department of Environmental Protection's Health Lawn, Happy Summer Toolkit also provides educational materials for water suppliers to send out to individual households to encourage reduced summer water use.

Contact the Greenscapes Coalition for more water conservation resources for homeowners, businesses, and municipal resources at **greenscapes.org**.

Don't forget your local flavor!

Sharing water saving tips and incentives with your community isn't a one and done deal. Work with partners and volunteers to perform neighborhood surveys and outreach. These community based social marketing techniques will make sure you're serving up important information that appeals to everyone's palette.

ABOUT US

Ipswich River Watershed Association (IRWA) is a community-based nonprofit in Massachusetts, working to safeguard the drinking water for more than 350,000 residents and businesses, and protect the ecological health of the Ipswich River. We use science, education, community outreach, coalition building and innovation to bring about practical solutions. Our team works with more than 20 cities and towns on the North Shore, assisting them with project implementation, bylaw and ordinance updates, and preparing for an increasingly uncertain climate.

IRWA is a founding member of the Parker, Ipswich and Essex Rivers Partnership (PIE-Rivers). PIE-Rivers opens communication between municipalities, nonprofits, academic institutions, state and federal agencies, and other stakeholders to increase the scale and frequency of restoration and resiliency projects across the North Shore. Founded in 2011, PIE-Rivers is one of the first watershed-scale collaborations in Massachusetts. Under the guidance of its Steering Committee of partner representatives, PIE-Rivers oversees, administers, and advises on work related to conservation, restoration, and improvement of the Parker, Ipswich, and Essex watersheds. Current PIE-Rivers Priorities include improving regional water quality, expanding water conservation efforts, promoting low-impact development patterns and strategies, and restoring stream continuity. Other partnerships, like the Greenscapes North Shore Coalition, are actively working to engage local leaders and make enhanced water conservation a key part of living with climate change on the North Shore.

Above (left to right): *The Ipswich River in summertime; boats waiting for paddlers at the Ipswich River Watershed Association's Riverbend headquarters*

CONTACT US

Send questions and share feedback on this report to **irwainfo@ipswichriver.org**.

Find more PIE-Rivers Partnership resources and projects at **pie-rivers.org**.

Access municipal, business, and homeowner resources at **greenscapes.org**.

ACKNOWLEDGMENTS

We are, first and foremost, grateful to all the municipal leaders working to advance enhanced water conservation efforts in their respective communities. In particular, we thank Vicki Halmen, Kristen Grubbs, and Jim Engel at the Town of Ipswich, as well as Sharon Clement at the Town of Danvers, for their foresight in experimenting with and implementing parts of this Recipe and sharing best practices. Their experience and guidance have been incorporated into this report.

This report was developed thanks to a generous gift from the ALCES Foundation. The ALCES Foundation helps people find pathways to a better life through education, access to healthcare, and fostering greater respect for the people and environment that surround us. A precursor of this report, which was part of the overall project, Water Neutral Growth in the Town of Ipswich, was funded through an earlier grant from the Metropolitan Area Planning Council's Accelerating Climate Resiliency Grant Program.

Portions of this report looking at bylaw reviews and revisions were funded by Essex County Community Foundation's Land and Environment Initiative (ECLEI). ECLEI seeks to improve the quality of life for Essex County residents by promoting stewardship of the county's land, water, and other natural resources.

We are also grateful to the regional leaders involved in the PIE-Rivers Steering Committee. This report resulted from the PIE-Rivers Strategic Planning effort, which concluded Water Conservation is one of four top priorities for restoring the watersheds that serve communities on the North Shore of Massachusetts.

This report incorporates many of the recommendations for enhanced water conservation found in the Massachusetts Water Conservation Standards, which set statewide goals for water conservation and water-use efficiency and provide guidance on effective conservation measures. We are grateful to the Water Resources Commission for their work compiling the 2018 version of the Standards.

Finally, this report pulls from ongoing efforts by the Greenscapes North Shore Coalition to educate residents about topics like water conservation and Low Impact Development.

PIE RIVERS

IPSWICH RIVER
WATERSHED ASSOCIATION

GREENSCAPES

For more information, visit
www.greenscapes.org

CITATIONS

1 mass.gov/orgs/water-resources-commission

2 allianceforwaterefficiency.org/resources/topic/net-blue-supporting-water-neutral-growth

3 www.ipswichriver.org/endangered/

4 For communities in the PIE-Rivers Region, Ipswich River Watershed Association and other PIE-Rivers partners are offering bylaw review training for town staff and board members.

5 MA Division of Ecological Restoration (DER) November 2019. Town of Ipswich Water Use Data Analysis Town of Ipswich Water Use Profile: mass.gov/doc/presentation-water-use-analysis-case-study/download

6 pie-rivers.org/portfolio-item/municipal-stormwater-codes-a-regional-review-for-northeast-massachusetts/

7 massaudubon.org/our-work/climate-change/local-climate-resilient-communities/land-use-rules

8 American Society of Civil Engineers. "Drinking Water Infrastructure Report Card." infrastructurereportcard.org/cat-item/drinking-water

9 awwa.org/resource/water-loss-control/#about

10 mapc.org/resource-library/climate-resilient-land-use-strategies/

11 mvpc.org/greenscapes-model-bylaw-toolkit/

12 pie-rivers.org/wp-content/uploads/2022/07/MS4-Grant-Report-FINAL-2.pdf

13 ecode360.com/30686579

14 epa.gov/watersense

Above: *Rain gardens are designed to collect and filter rainwater runoff, preventing it from flowing into storm drains and potentially polluting waterways*

This guide was created through the PIE-Rivers Partnership under the guidance of the Greenscapes Coalition and the Ipswich River Watershed Association. Credit to Wayne Castonguay, Erin Bonney Casey, Patrick J. Lynch, Rachel Schneider, Sadie Woodward, Molly Courson and Leah Feeney.