Protecting Streamflows in Massachusetts under the Water Management Act

KEY RESEARCH FINDINGS

Massachusetts's Water Management Act (WMA) program, which governs water withdrawals from rivers within our state, requires significant improvements in order to restore diminished streamflows and improve resilience in degraded watersheds. Our in-depth review of water withdrawal permits issued since 2015 revealed that:

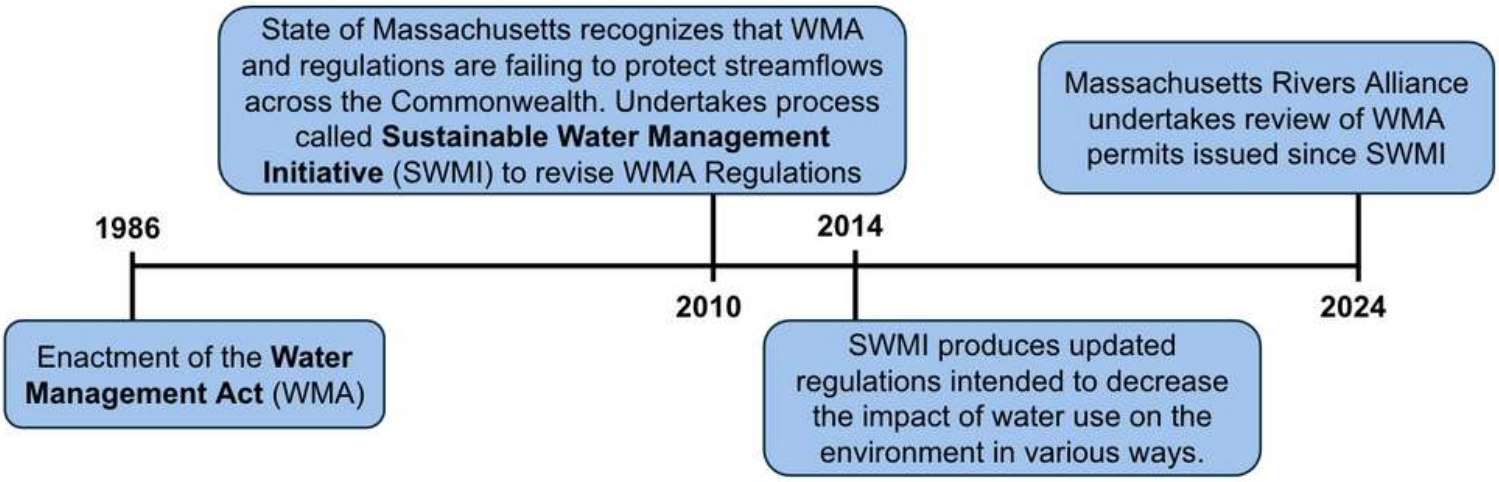
- Determinants of water withdrawal amounts, such as baseline and safe yield, are improperly applied to reduce water stress in rivers.
- Water withdrawal ameliorating strategies, such as mitigation and minimization, are rarely used by permittees.
- Water users whose withdrawals cause significant damage to streamflows and aquatic ecosystems are not compelled to evaluate alternative water source use.

BACKGROUND

The Massachusetts Department of Environmental Protection (MassDEP) is responsible for striking a balance between the water needs of humans and the health of the environment through its implementation of the Water Management Act. The WMA authorizes MassDEP to allow large water users to withdraw water for municipal water supply or other commercial, agricultural, or industrial uses in the form of 20-year permits and 10-year registrations. (Mass. Gen. Laws ch. 21G)[1]

In 2010, after recognizing that the WMA and its regulations were failing to protect streamflows across the Commonwealth, the state undertook a nearly four-year process called the Sustainable Water Management Initiative (SWMI) to revise the WMA regulations. The key goals of SWMI were **"to bring about clear, predictable science-based permitting, ensure prudent and sustainable use of water, maintain healthy watersheds, and gradually improve degraded ones."** (Massachusetts SWMI Framework).

Sustainable Water Management Initiative (SWMI) Timeline



The 2014 SWMI regulatory updates required **water users to look for less-damaging water supply sources, mitigate water use impacts on streams by creating water recharge through stormwater and wastewater to return water to impacted basins, and increase water use restrictions during periods of low flows.** This was the first time in MassDEP's history that the agency was specifically directed to protect streamflows through its water allocation permitting.

ISSUE ANALYSIS

Is Massachusetts successfully meeting the SWMI goals and protecting streamflow through the WMA permit program?

The key goals of SWMI were "to bring about clear, predictable science-based permitting, ensure prudent and sustainable use of water, maintain healthy watersheds, and gradually improve degraded ones." (Massachusetts SWMI Framework). The resultant revised regulations established pathways intended to improve protection of water resources and riverine habitat which included:

1. Safe yield methodology
2. Streamflow criteria
3. Mitigation
4. Minimization
5. Alternative source analyses

Despite the revised regulations, rivers, streams and groundwater have hit record-low levels in recent years.

Withdrawals for municipal and private use continue to be the driving force for extreme low flows in several major river basins and have diminished groundwater supplies across the state. Groundwater provides streams and rivers with baseflow, but increased pumping reduces the amount of groundwater that flows directly to streams and rivers. Climate change is exacerbating this problem by bringing more frequent and intense droughts to the region.

To understand if MassDEP was failing to meet the goals of SWMI through its updated water allocation permitting, Mass Rivers reviewed new and renewed WMA permits issued since 2015 and studied the extent of compliance with the SWMI regulatory pathways. Mitigation tracking logs obtained from MassDEP were also utilized to analyze the permitting program as described below, and to cross-check the data retrieved from the permit review. Permits were assessed for mitigation and minimization requirements, as well as for alternative source use. Preliminary permit data were also cataloged (i.e. total permitted use, total registered use, prior allocation, renewed allocation, and baseline volume).

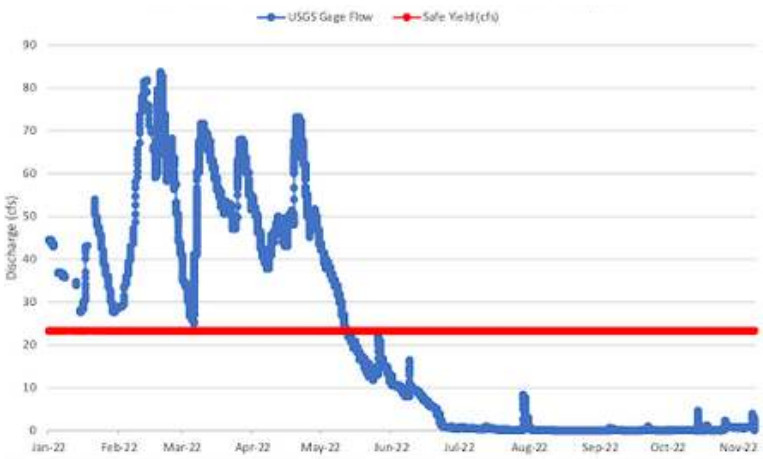
Safe Yield

The revised regulations established the safe yield of a water source, defined as "the maximum dependable withdrawals that can be made continuously from a water source during a period of years in which the probable driest period or period of greatest water deficiency is likely to occur" (310 CMR 36.03).

Safe yield is calculated using a percentage of streamflow and reservoir capacity averaged over the year and over the entire hydrological basin. The SWMI-created safe yield calculation does not cohere with scientific principles for safe yield, as it allows for the maximum volume of water to be withdrawn at any location in the watershed on any day of the year. In reality, streamflow of water sources can vary widely by both location within the river basin and by season.

This discrepancy results in a calculated safe yield that can be greater than the *entire* amount of water in a river or stream at certain times of the year; this problem is particularly apparent in the Parker River. There, the flawed application of safe yield has resulted in withdrawals that vastly exceed the available water in the river for more than half of the year.

2022 Streamflow vs. Safe Yield for the Parker River at Byfield



Baseline

The revised regulations created a "baseline" standard, which serves as a reference point in determining a new or increasing withdrawal. Baseline is defined as "the volume of water withdrawn during calendar year 2005 plus 5%, or the average annual volume withdrawn from 2003 through 2005 plus 5%, or the registered volume, whichever is greater," with certain exceptions (310 CMR 36.03). Baseline determines whether or not a permittee is required to mitigate withdrawal impacts. **This baseline standard is arbitrary since it is based on water use from nearly 20 years ago, failing to account for current river basin and climatic conditions**. Baselines often exempt many water users from mitigation requirements because users are only required to mitigate or offset ecological impacts of groundwater and surface withdrawals if their total allocation is greater than their baseline volume.

Forty-one percent of permits renewed since the regulations were revised do not require any mitigation of withdrawal impacts, due to a permittee's total water allocation being equal to, or less than, baseline.

Baselines have been set too high to act as a protective threshold for triggering environmental protections. High water use in the early 2000s determined that the baselines were set much higher than current use levels, effectively guaranteeing little to no mitigation in cases statewide, including for many of the largest water users. The baseline concept additionally creates a whole new class of users – new withdrawers – that are exempt from some of the WMA's permitting requirements, like mitigation. New withdrawers do not have baseline standards since they were not withdrawing during the baseline period (2003 to 2005). Thus, the baseline standard shields almost all new water withdrawals from any meaningful mitigation that would improve streamflow and aquatic habitat.

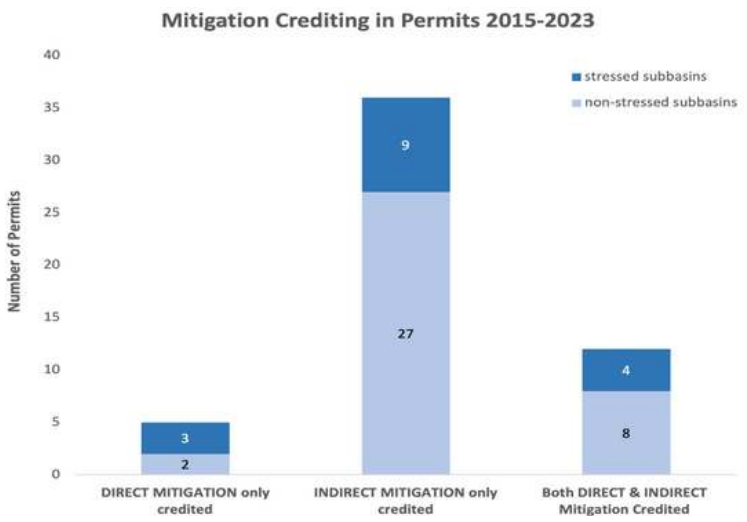
Mitigation

Mitigation was included in the revised regulations to ensure that permittees take action to offset the impacts of increasing withdrawals to improve streamflow or aquatic ecosystem health. The revisions give permittees discretion to determine how to meet mitigation requirements, including crediting mitigation activities completed since 2005 to meet the prescribed requirements. Under these flexible crediting parameters, the majority of mitigation activities implemented have been **retroactive and indirect, such that the actions implemented to directly improve streamflows have been minimal at best.**

Mass Rivers examined all permits issued between 2015 and 2023, and found that only three permittees proposed implementing a *new* mitigation project over the 20-year permit period.

MassDEP allowed all other permittees to credit activities already completed towards their permit renewals.

In addition to the problem of retroactive mitigation crediting, the prevalence of indirect mitigation, or activities that may benefit the aquatic environment but do not enhance streamflows, impedes flow improvement. In 91% of the permits reviewed that require mitigation, permittees plan to offset withdrawal impacts through indirect mitigation, such as through a previous land purchase or implementing a bylaw. Direct mitigation activities that improve streamflows, such as stormwater recharge projects, surface water releases, or inflow/infiltration repairs, were only implemented by 32% of permittees. Even within that 32%, many permittees are supplementing their mitigation obligation with indirect mitigation activities. **Less than 10% of permittees are fully offsetting withdrawals through direct mitigation.**



Thirty-three permittees, representing 38% of permits issued or renewed, have withdrawals in stressed subbasins - basins that have significantly impacted streamflow or riverine fish communities. Of those 33 permittees, 51% have no mitigation requirements whatsoever because they are not requesting more than their baseline standard. Of those permittees in stressed subbasins that must mitigate withdrawal impacts, 81% are crediting indirect activities for mitigation – measures that do not lead to direct improvement streamflows. Only three permittees are fully offsetting withdrawal impacts through direct mitigation.

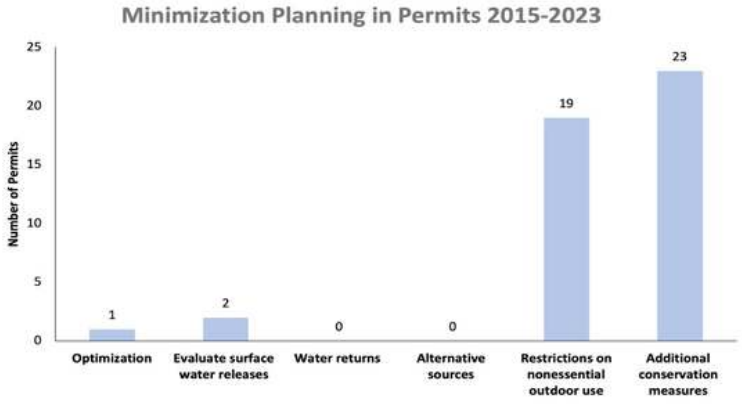
Minimization

Permittees are now expected to implement plans to minimize withdrawal impacts if pumping groundwater directly affects a coldwater fishery or occurs in a subbasin where groundwater is significantly stressed.[2] Groundwater is often a substantial source of in-stream flow because groundwater and surface water systems are hydrologically connected.

Minimization plans per the revised WMA regulations were to include a range of options to reduce impacts of withdrawals in groundwater-stressed basins, some of which directly impact streamflow more than others.

Our review of renewed permits' minimization plans shows that permittees very rarely implement optimization of water source use, alternative source use, water releases, or water returns to curb withdrawal effects. Any of these would have direct benefits for streamflow.

Nearly all minimization plans rely heavily on water conservation. While additional conservation measures will help lessen withdrawal impacts, **minimization plans are unlikely to reduce groundwater stress solely through demand management.** To make matters worse, 37% of water users have no minimization requirements at all because the state has never established streamflow criteria data for groundwater-driven coastal watersheds.



Alternative Sources

When withdrawals cause notably more environmental degradation, the revised regulations direct MassDEP to analyze and propose withdrawals from alternative water sources that are less environmentally harmful. **As of January 2024, MassDEP had yet to require a permittee to use an alternative source of water.** Permittees are required to perform an analysis of alternative source options if a permittee's withdrawals cause further degradation of the environment. MassDEP classifies increased degradation through the increase of streamflow criteria levels established for each subbasin through SWMI and revised regulations (310 CMR 36.14).

As a result, the WMA regulations keep water users whose withdrawals cause the most damage to streamflows and aquatic ecosystems from having to evaluate alternative sources, as there is no worse category defined to capture further degradation.

In addition, minimization plans often neglect to require implementation of alternative sources, despite the fact that withdrawals can occur in areas that are classified as depleted. When alternative sources are analyzed, the current practice only obligates permittees to explore existing sources/interconnections, which eliminates any new sources that may alleviate environmental stress from being evaluated.

CONCLUSIONS

The Massachusetts Rivers Alliance believes that we must achieve the original restorative promise of the SWMI. Achieving this goal will require significant improvements in the implementation of the WMA program. As the regulations stand today, MassDEP has the authority to address the impacts of withdrawals by imposing additional or alternative requirements through its water allocation permitting. This authority must be exercised to the greatest extent possible to restore streamflow and improve resiliency in degraded watersheds.

By requiring additional conditions of both permitted *and* registered water users in stressed subbasins, the state will put watersheds across the Commonwealth on a path towards restoration. An essential restorative path is even more urgently needed as the pace of climate change accelerates, bringing increases in the frequency and intensity of both droughts and floods.

Since 2016, Massachusetts has experienced three of the worst droughts on record, turning many rivers and streams into disconnected puddles or drying them up completely. The combination of extreme low flows from water withdrawals by municipal and private entities and climate-change related conditions have resulted in impaired water quality (especially for rivers that did not have water), threats to wildlife that rely on those waterways, and diminished recreational opportunities.

Now that nearly a decade has passed since the promulgation of the 2014 revised regulations, the time is right for new long-term solutions, such as the use of scientifically based safe yield calculations and the elimination of baselines and retroactive crediting options. These new approaches to water management should be a top priority for the state to ensure that the public has a resilient, equitable water management approach that improves the ecological health of rivers and streams and protects water sources for the Commonwealth's citizens and wildlife.

Endnotes

1 A Registration Statement authorizes an existing withdrawal in excess of 100,000 gallons per day filed before 1988, based on water use between 1981 and 1985. A Permit authorizes water withdrawals in excess of 100,000 gallons per day since 1988. Only permitted users are subject to the revised regulations resulting from SWMI. Currently, registered users have no water conservation requirements aside from restrictions on nonessential outdoor water use during state declared drought.

2 The subbasin has an August Net Groundwater Depletion (unimpacted August median streamflow due to 2000-2004 groundwater withdrawals, while also taking into account wastewater returns) more than 25%.

This research brief was prepared by Sarah Bower, former Technical Program Director for the Massachusetts Rivers Alliance. Edited by Lydia Olson, current Technical Specialist and Monica Driggers, Deputy Director at the Massachusetts Rivers Alliance. Any questions or comments can be directed to info@massriversalliance.org.

MASSACHUSETTS Rivers Alliance
(617) 714-4272
11 Curtis Avenue
Somerville, MA 02144

Graphic Design by Amanda Siow