Uncertainty and Unpredictability:

Climate Change, Competing Water Uses, and the Future of Vermont's Surface Waters

A report prepared by the Environmental Advocacy Clinic at Vermont Law School, Winter 2021

Low-water drought conditions on the West River in Southern Vermont. Photo by Kathy Urffer, River Steward, Connecticut River Conservancy, summer 2020.

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Since its founding, Vermont has been known, both regionally and nationally, as a state with abundant water resources because of its pristine high mountain streams, historically routine spring snow runoff, and frequent precipitation events throughout the year. As a result, and for good reason, Vermonters have taken this seemingly infinite amount of water resources for granted. Tragically however, we are starting to see that Vermont's water resources do have limits—climate change is altering Vermont's historic weather patterns and precipitation events are becoming more erratic. Simultaneously, there is an increasing demand for the state's finite surface water—including transfers from one watershed to another—from industry (both new and old), agriculture, residential usage, etc. Such uses pose numerous threats, including introducing invasive species and other pollutants, decreasing water quantity needed for habitat and human consumption, and creating conflicts amongst water users.

Put another way, Vermont's waters are at risk and the state is ill-prepared because it does not have adequate laws and protections in place to effectively manage this rising problem. Vermont's patchwork regulatory scheme—paired with its common law recognizing a riparian right to use surface water—is not designed, nor prepared, to fully address statewide surface-water diversions, transfers, and major conflicts amongst users. In sum, there is a sizeable hole in existing law and Vermont remains in the dark about how withdrawing surface water impacts water quality, riverine health, and surface water resources generally. Fortunately, solutions to this problem exist: there are multiple exemplary and proactive state-based regulatory frameworks that Vermont can learn from.

We begin this report by analyzing the impact climate change and increased usage has on Vermont's water resources and users. Next, the report outlines Vermont's existing regulatory and legal frameworks—concluding that they are inadequate to effectively manage the rising problem(s) associated with Vermont's surface waters. In particular, we conclude that existing state regulations predominantly focus on *water quality*, not *water quantity*, and therefore fail to provide the necessary protections to sufficiently weather the storm looming on the horizon. Similarly, the report concludes that the existing riparian rights scheme is also ill-suited to adequately address the complexities facing Vermont's surface-water management. The report finally investigates plausible existing frameworks outside of Vermont, along with other viable options, that may offer a solution. We end with recommending that Vermont proactively adopt a statewide program to ensure that all Vermonters—industry and citizens alike—have fair access to water in an uncertain future.

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Figure 1: A surface-water diversion intake pipe and pump operation on Southern Vermont's West River near the Town of Newfane during low-water drought conditions of Summer 2020. Photo by David L. Deen, Connecticut River Valley Chapter of Trout Unlimited, 2020.

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II. INTRODUCTION

A hypothetical to begin: It is summer 2020. You are one of the last remaining commercial dairy farmers in your Vermont township. Your family farm of seven generations sits on the banks of a prominent river flowing through one of Vermont's most fertile valleys. For decades, as riparian landowners, your family seasonally pumped water from the river for crop irrigation and to supplement watering your herd from the farm's well. It is a resource that you depend on and may have taken for granted.

However, this summer is different. The state is drought stricken and the river is the lowest on record. As the water levels rapidly decrease, you begin to worry. You learn that upstream there is a new hemp-cannabis operation that is withdrawing sizeable amounts of water per day (equating to more usage than several-thousand people), a golf course withdrawing water for irrigation, and a slew of other smaller farm operations who draw water for miscellaneous activities.

The state does not oversee those water users. You are concerned that there will not be enough water for your crops and cows in the coming weeks. So, being neighborly, you decide to speak civilly to those other river users upstream. However, they tell you that their business relies on the water just as much as your farm operation. What now? In the state of Vermont, your only recourse is to hire an attorney and challenge the upstream users under Vermont's common law. This doctrine requires you to show that the upstream water use is "unreasonable" and has harmed you and your farming operation. Litigation will be expensive and there is no guarantee of success. Even more broadly, the underlying problem remains: there is a lack of proactive measures protecting surface waters in Vermont that could prevent similar situations from happening again in periods of water shortage.

This hypothetical exposes several unfortunate realities:

(1) Vermont is not immune to the effects of climate change; drought conditions and erratic weather patterns are becoming more frequent. As a result, the state can no longer take its water resources for granted.

(2) Except in a few specific instances, there is no direct oversight of surface-water diversions[1] in Vermont. Rather, surface-water usages are primarily governed by old common law (i.e. judge-made law derived originally from England) in addition to a few select regulatory regimes that only inadvertently address surface-water withdrawals.

(3) The existing framework is ill-equipped to proactively manage and conserve the State's surface-water resources into the future.

[1] Surface-water resources include streams, rivers, and larger bodies of water (e.g. lakes). A "surface-water diversion" occurs when an entity or individual withdraws, or diverts, water from a surface-water resource. In addition, an "interbasin transfer" of surface water is a particular type of surface-water diversion where water is transferred from one watershed basin to another.

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Below, we address each of these issues in turn, along with an investigation into viable solutions to the problem(s).

III. Climate Change and Competing Water Uses Threaten Vermont's Surface Water Resources

Climate change is altering Vermont's surface waters more than ever.[2] The state's historic patterns of precipitation are now becoming more erratic, resulting in more frequent drought conditions, low lake levels, and unreliable stream flows.[3] Precipitation patterns in Vermont are changing from historical norms—becoming unforeseeable in a way that will likely continue to cause inconsistent water levels. As a result, Vermont's water users are increasingly forced to divert more surface water to compensate for this unpredictability, especially for irrigation and snowmaking.[4] This uncertainty, in turn, can lead to economic, health, and ecological concerns if not proactively planned for and managed.

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[2] *See What Climate Change Means for Vermont,* U.S. Env't Prot. Agency (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-vt.pdf ("Rising temperatures and shifting rainfall patterns are likely to increase the intensity of both floods and droughts . . . [, which] will [also] melt snow earlier in spring and increase evaporation, and thereby dry the soil during summer and fall. [F]looding is likely to be worse during winter and spring, and droughts worse during summer and fall."); *see also* Radley Horton et. al., Ne. Climate Change Impacts in the U.S.: The Third Nat'l Climate Assessment 374 (J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, eds., U.S. Global Change Research Program 2014) [hereinafter Horton, Ne. Climate Change Impacts], http://s3.amazonaws.com/nca2014/low/NCA3_Full_Report_16_Northeast_LowRes.pdf ("Seasonal drought risk is also projected to increase in summer and fall as higher temperatures lead to greater evaporation and earlier winter and spring snowmelt.").

[3] *See What Climate Change Means for Vermont,* U.S. Env't Prot. Agency (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-vt.pdf; *see also* Horton, Ne. Climate Change Impacts, *supra* note 2, at 374; *see also* Quarterly Climate Impacts and Outlook, Northeast Region, Nat'l. Oceanic and Atmospheric Admin. 1–2 (Sept. 2020) [hereinafter, Quarterly Climate Impacts], https://www.drought.gov/drought/sites/drought.gov.drought/files/media/reports/regional_outlooks/Northeast%20Summer%202020.pdf.

[4] Because Vermont has no reporting or permit requirement for surface water diversions other than for snowmaking, it is difficult to estimate how much these increases have actually been for other users. At the very least, evidence of increased diversions for snowmaking is clear. *See* Laura Medalie & Marilee A. Horn, U.S. Geological Survey, Estimated Water Withdrawals and Return Flows in Vermont in 2005 and 2020 33 (2010) https://pubs.usgs.gov/sir/2010/5053/pdf/sir2010-5053.pdf ("Increases in surface-water withdrawals of at least 1 Mgal/d [from 2005 to 2020] are projected in the Winooski River (1.82 Mgal/d), the Black-Ottauquechee River (1.58 Mgal/d), and the Deerfield River (1.13 Mgal/d) watersheds. These increases are due largely to estimated increases for snowmaking at ski areas."); Anne Wallace Allen, *Southern Vermont Ski Areas Seek to Expand Snowmaking*, VTDigger (Jun. 7, 2019) https://vtdigger.org/2019/07/07/southern-vermont-ski-areas-seek-to-expand-snowmaking/ (reporting that Magic Mountain, Killington/Pico (the state's largest ski area), and Mount Snow all have plans to increase their snowmaking potential).

A. Climactic Impacts and Uncertainty Within Vermont's Water Resources

Climate change is a grave threat to Vermont's surface waters. Between 1895 and 2011, temperatures in the Northeast have risen by over 2° F.[5] Under current trends, temperatures are projected to continue rising to over 4.5° F by 2080.[6] In fact, in July 2020, Burlington recorded its hottest month ever,[7] beating the record just set in 2018.[8] Lake Champlain, too, also saw record high water temperatures.[9] In addition, Essex County just had its driest summer on record during 2020.[10] Simultaneously, during Fall 2020, over 300,000 Vermonters (48% of the state's population) experienced a daunting drought, while the other half lived in abnormally dry areas.[11]

Climate change is negatively affecting Vermont's water resources. Vermont's 800 lakes and rivers experienced a water-level decline during Summer 2020 and are below average by a range of six inches to two feet.[12] Despite a small increase in precipitation, drought conditions have been steadily on the rise since 1895.[13] Precipitation patterns are changing, marked by more sporadic, heavy downpours instead of frequent, light rain showers.[14] More frequent and heavy downpours cause water to merely run off the land directly into waterways, thereby preventing both groundwater recharge and river levels to rise.[15] All of this creates immense uncertainty about Vermont's surface water resources, especially for the State's economic sector (i.e. agriculture and industry) and for municipal users.

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[5] *See* HORTON, NE. CLIMATE CHANGE IMPACTS, *supra* note 2, at 373.
[6] *Id.* at 374.
[7] QUARTERLY CLIMATE IMPACTS, *supra* note 3, at 2.
[8] Henry Epp, *July 2018 Was the Hottest Month on Record in Burlington*, VT. PUB. RADIO (Aug. 1, 2018) https://www.vpr.org/post/july-2018-was-hottest-month-record-burlington#stream/0.
[9] QUARTERLY CLIMATE IMPACTS, *supra* note 3, at 1.
[10] QUARTERLY CLIMATE IMPACTS, *supra* note 3, at 2.
[11] *Drought in Vermont*, https://www.drought.gov/drought/states/vermont https://web.archive.org/web/20200925182318/https://www.drought.gov/drought/states/vermont ("The most intense period of drought occurred the week of September 29, 2020 where [severe drought] affected 29.39% of Vermont land." (last visited Sept. 25, 2020).
[12] Emma Cotton, *Statewide Water Levels Low; Drought Conditions Develop in Southern Vermont*, VTDIGGER (Aug. 23, 2020) https://vtdigger.org/2020/08/23/statewide-water-levels-low-drought-conditions-develop-in-southern-vermont/.
[13] *See Climate at a Glance: Statewide Time Series*, NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION, https://www.ncdc.noaa.gov/cag/statewide/time-series/43/pdsi/all/1/1895-2020?trend=true&trend_base=10&begtrendyear=1895&endtrendyear=2020 (select "Palmer Drought Severity Index" under Parameter, "All Months" under Time Scale, "January" under Month, "1895" under Start Year, "2020" under End Year, and "Vermont" under State).
[14] *See What Climate Change Means for Vermont,* U.S. ENV'T PROT. AGENCY (Aug. 2016), https://19january2017snapshot.epa.gov/sites/production/files/2016-09/documents/climate-change-vt.pdf.
[15] *Extreme Precipitation and Climate Change*, CTR. FOR CLIMATE AND ENERGY SOLS., https://www.c2es.org/content/extreme-precipitation-and-climate-change/ (discussing the threats posed by heavy precipitation) (last visited Oct. 23, 2020).

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Figure 2: A indoor cannabis operation

B. Vermont's Increasing Water Needs

In Vermont, preexisting industries (e.g. skiing and agriculture), new water-intensive industries (e.g. hops, hemp, cannabis, large-scale consolidated dairy operations, breweries, and golf courses), as well as residential areas all rely on stable water availability. Preexisting industries, like ski resorts, rely on a consistent supply of water for snow-making purposes.[16] For example, in the winter, Killington can pump 720,000 gallons of water per hour for snowmaking,[17] while Okemo Resort typically uses between 350 and 450 million gallons of water per season.[18] In addition, agriculture and dairy are some of Vermont's most valued and water-dependent industries.[19] In 2019, the average Vermont dairy farm housed 185 cows.[20] Typically, a single dairy cow consumes between 30–50

[16] Snowmaking requires intensive use of water resources. James MacDonald, *The Real Problem with Artificial Snow*, JSTOR DAILY (Mar. 2, 2018) https://daily.jstor.org/the-real-problem-with-artificial-snow/. To cover a 200- foot stretch of a ski run with just six inches of snow requires 74,600 gallons of water. *Snowmaking Basics, How is Snow Made?*, SMI SNOWMAKERS, http://www.snowmakers.com/snowmaking-basic.html (last visited Oct. 20, 2020).

[17] *It's the Snow: Snowmaking, Grooming and Other Mountain Ops*, SKI VT. (Nov. 5, 2018), https://skivermont.com/its-the-snow-snowmaking-grooming-and-other-mountain-ops-10-31-18.

[18] *Id.*

[19] *Water Quality*, VT AGENCY OF AGRIC., FOOD & MARKETS, https://agriculture.vermont.gov/water-quality (last visited Oct.20, 2020).

[20] Diane Bothfeld, *Vermont Dairy Data*, VT GEN. ASSEMBLY (July 15, 2019), https://legislature.vermont.gov/Documents/2020/WorkGroups/Senate%20Agriculture/Reports%20and%20Resources/W~Diane%20Bothfeld~Vermont%20Dairy%20Data~7-15-2019.pdf.

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gallons of water a day.[21] Thus, in order to remain viable, an average Vermont dairy farm requires between 5,550 and 9,250 gallons of water per day.[22] One acre of farmland used for hemp can hold about 1,500 plants,[23] and a single hemp plant at peak season requires 2.5 gallons of water per day.[24] Based on these figures, a 10-acre hemp farm would need to withdraw approximately 37,500 gallons of water per day to successfully cultivate its crop. In addition, breweries—another industry strewn throughout the Green Mountain State—require, on average, seven gallons of water to produce one gallon of beer.[25] With over 60 breweries in Vermont,[26] producing about 261,654 barrels (or 10,989,468 gallons) of beer,[27] this translates to an estimated 76,926,276 gallons of water used each year by the brewing industry.

Figure 3: Drought conditions affecting corn crops

[21] *Drinking Water for Dairy Cattle: Part 1*, DAIRY HERD MGMT. (May 23, 2011), https://www.dairyherd.com/article/drinking-water-dairy-cattle-part-1; Hannah Himmelmann & Donna M. Amaral-Phillips, *Water Needs for the Dairy Herd*, UNIV. OF KY C. OF AGRIC., FOOD, AND ENV., DEP'T OF ANIMAL & FOOD SCI., https://afs.ca.uky.edu/content/water-needs-dairy-herd (last visited Oct. 20, 2020);
[22] This figure is an approximate calculation based off of the average amount of water a dairy cow consumes per day (30-50 gallons). The lower amount (30 gallons) is multiplied the average number of dairy cows in the state (185) to obtain 5,550 gallons. The upper amount (50 gallons) is also multiplied by 185 cows, arriving at 9,250 gallons as the upper water-usage estimate.
[23] CHEYENNE MOUNTAIN SEED CO., *Hemp Field Irrigation - How to Farm Hemp*, https://cheyennemountainseedcompany.com/hemp-farming-resources/irrigation/ (last visited Oct. 20, 2020).
[24] *Id.*
[25] Michael Agnew, *The Thirsty Business of Beer: How Breweries are Confronting the Industry's Water Problem*, THE GROWLER (Mar. 2, 2016), https://growlermag.com/the-thirsty-business-of-beer-how-breweries-are-confrontingthe-industrys-water-problem/.
[26] *Discover our Breweries*, VT BREWERS ASS'N, https://www.vermontbrewers.com/breweries/ (last visited Oct. 20, 2020).
[27] Emma Marc-Aurele, *Beer is Big Business in Vermont*, VT BUS. MAG., (Sept. 2, 2016), https://vermontbiz.com/news/september/beerbig-business-vermont (providing Vermont beer-production estimates from 2015).

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While industry relies on water for a variety of uses, Vermont residents, too, require water for daily life. The average Vermonter uses up to 75-gallons of water a day for domestic uses.[28] Vermont municipalities supply this water to users. For example, Burlington (Vermont's largest city) sources its water from Lake Champlain.[29] Vermont's capital, Montpelier, sources its water from Berlin Pond to supply approximately 7,500 residents.[30] Cumulatively, all of these water uses—from industry to local residents—have an immense impact on Vermont's surface-water quality and quantity. But these users don't solely use Vermont's surface waters—many use groundwater or a combination of the two. However, the state neither monitors how many users draw from the water nor at what quantities. What we do know is that collectively, there is increasing strain on the resource.

Unfortunately, ever-increasing uses coupled with unpredictable weather extremes continue to cause stresses on surface waters in the state.[31] In the face of water shortages, interbasin water transfers are likely to increase in order to transfer water from one watershed to another to provide relief to dry localities.[32] These transfers, however, come at a cost, and can permanently deprive the donor water basin of the return flow. Thus, it is important to understand, monitor, and manage water consumption to ensure water availability into the future for Vermont industries, including agriculture, as well as residents, stream ecological health, and habitats.

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[28] *How We Use Water*, U.S. ENVTL. PROT. AGENCY, https://www.epa.gov/watersense/how-we-usewater#Understanding%20Water%20Use (last visited Oct. 20, 2020).

[29] *FY 20 Water Resources Budget Presentation*, BURLINGTON PUB. WORKS (May 23, 2019), https://www.burlingtonvt.gov/sites/default/files/WaterRes_%20Budget%20Presentation_FY20_final_V2%2B5-23-19.pdf.

[30] Thomas J. McArdle, *City of Montpelier Water System-VT #5272 Consumer Confidence Report: Water Quality Report for Calendar Year 2018*, MONTPELIER PUB. WORKS, (2017) https://www.montpelier-vt.org/DocumentCenter/View/3073/City-of-Montpelier-Water-Quality-Report-PDF?bidId=; *see also City of Montpelier v. Barnett*, 191 Vt. 441 (2012) ("Berlin Pond has supplied Montpelier with a gravity-fed water supply since 1884. The City's reliance on the pond for water dates back to the Village of Montpelier's purchase of the rights to take water from the pond, pursuant to authority granted in a charter amendment in 1872.").

[31] *VT's Changing Climate*, VT CLIMATE ASSESSMENT, http://vtclimate.org/vts-changing-climate/ (last visited Oct. 20, 2020).

[32] For example, other states with rapid intensive development are experiencing the need for more interbasin water transfers. *See e.g.,* David Pendered, *Water War: Georgia Asked to Consider Importing Water to Chattahoochee Basin, Which Now Exports Millions of Gallons a Year*, SAPORTAREPORT (Jan. 30, 2017), https://saportareport.com/war-war-georgia-asked-consider-importing-water-chattahoochee-basin-now-exports-millions-gallons-year/ ("Georgia is already implementing interbasin transfers to meet the water needs of counties in which half the state's residents. Most of the transfers are used to meet the demands of metro Atlanta."); Bruce Finley, *Climate Warming May Hit Colorado River Basin Farmers Hardest as Shrinking Snowpack Leads to Less Irrigation Water,* THE DENVER POST (Apr. 21, 2020), https://www.denverpost.com/2020/04/21/colorado-river-basin-snowpack/ ("'If water is not being supplied by snowmelt, it has got to be supplied by another mechanism . . . . In some places, it will depend on inter-basin transfers of water.'").

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IV. VERMONT LACKS A PROACTIVE SYSTEM TO PROTECT THE SURFACE-WATER NEEDS OF ITS PEOPLE, BUSINESSES, AND ECOSYSTEMS

Broadly speaking, there are two frameworks that touch on Vermont's surface-water resources: Riparian rights (governed by a body of judge-made common law) and a handful of regulations promulgated by the Agency of Natural Resources (ANR). Those ANR regulations, however, primarily concern water *quality*—not water *quantity*—and only distantly touch surface-water diversions. In this Part of the report, we explain those two frameworks as they relate to surface-water diversions, revealing that Vermont is ill-equipped to effectively manage its surface waters into the future. Combined, these two schemes are not capable of protecting the state's surface waters in the face of climate change and competing uses.

A. Vermont's Existing Legal Framework: Riparian Rights

The common law legal doctrine of riparian rights is the primary body of law governing Vermont's surface waters and their users. That is, "riparians"—or property owners appurtenant (next) to water—have a right to a "reasonable use" of that water.[33] This "reasonable use" aspect of riparian rights is determined by a combination of factors that consider both the interests of the riparian property owner and society as a whole.[34] In particular, under the current common law framework, riparian owners possess great latitude to access and use water as they see fit, so long as the riparian owner does not inflict substantial injury on upstream *or* downstream riparians.[35] This doctrine grants riparians an almost unbridled authority to use water.

[33] The common law in Vermont allows non-riparian owners to lease rights and riparian owners to grant rights to non-riparians.
[34] Reasonableness factors include: (a) The purpose of the use; (b) the suitability of the use to the watercourse or lake; (c) the economic value of the use; (d) the social value of the use; (e) the extent and amount of the harm it causes; (f) the practicality of avoiding the harm by adjusting the use or method of use of one proprietor or the other; (g) the practicality of adjusting the quantity of water used by each proprietor; (h) the protection of existing values of water uses, land, investments and enterprises; and (i) the justice of requiring the user causing harm to bear the loss. RESTATEMENT (SECOND) OF TORTS § 850A (AM. L. INST. 1979).
[35] *Johns v. Stevens*, 3 Vt. 308, 315–16 (1830) ("The general principle with respect to the rights of proprietors of lands through which a stream passes, is, that each has an equal right to the use of the water, in its natural course, without diminution or alteration; and neither has a right to use or obstruct the water to the prejudice of other proprietors.")

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However, the concept of riparian rights is nuanced. For instance, domestic uses[36] may be given priority over artificial uses.[37] Additionally, riparians may use water off-tract from the riparian parcel,[38] as long as the off-tract usage is not unreasonable.[39] However, even current reasonable uses can subsequently become unreasonable if those uses conflict with the reasonable use of another riparian.[40] Such conflicts commonly arise when issues of water quality are involved[41] or when other riparians are deprived of water. To resolve these conflicts, a court may enjoin a use if that use is found unreasonable.

The riparian-rights system raises multiple concerns as water demand begins to outpace availability and erratic flows become more frequent. In particular, the primary question remains: How will surface waters—including quantities and qualities—in Vermont fair under the riparian rights framework? There is no easy answer to this. For the past 200 years, generally speaking, the riparian-rights system has worked. However, that system was designed—and evolved—merely as a check to resolve disputes between users. It was never intended to proactively manage water resources on-the-whole (i.e. resembling a piece of legislation intended to manage and conserve the resource).

This leads to the first issue: riparian rights and Vermont's existing body of common law is reactive, not proactive. Under this legal framework, water rights are not clarified or managed until a riparian suffers a harm to their water use.[42] Unlike the legislative process, the courts are the only entities that may develop and change common law—and they may only do so through the resolution of a case that is immediately before them. Even though Vermont's caselaw interpreting riparian rights is dated, it cannot change until someone files a case and the court publishes a decision altering established precedent. Even if a

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[36] *Lawrie v. Sillsby*, 82 Vt. 505, 510 (1909) (holding a diversion which resulted in such a diminished flow "that at times it furnishes barely enough water for the [lower riparian's] domestic uses" is unreasonable.); *Johns v. Stevens*, 3 Vt. at 315–16 ("each proprietor may use and apply the water, while it runs over his own land, to domestic, agricultural, and manufacturing purposes, provided he uses it in a reasonable manner); *Roberts v. Martin*, 72 W. Va. 92, 94 (1913) (declaring that "it would be unreasonable and contrary to the universal sense of mankind to debar every riparian proprietor from the application of the water to domestic, agricultural, and manufacturing purposes"); THOMPSON ET AL., LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS 32 (6th ed. 2018) ("The most elemental is the right to use water for domestic purposes, such as drinking, bathing, and raising a small quantity of garden produce and livestock.").

[37] Artificial uses vary from state-to-state and reflect the needs of the particular community. These uses may include: power generation, raising dairy and livestock herds, manufacturing, and recreation.

[38] *Lawrie v. Sillsby*, 82 Vt. at 507 ("The fact that such orators were taking the water to their nonriparian lands did not per se make their use unreasonable."); *but Roberts v. Martin*, 72 W. Va. at 94 ("No legal right exists in a riparian owner for the use of the water beyond his riparian land").

[39] *Lawrie v. Sillsby*, 82 Vt. at 507 (though non-riparian use was not per se unreasonable "that fact, together with the size and character of the stream, the quantity of water appropriated, and all the circumstances and conditions, might make their use unreasonable.").

[40] *See, e.g.*, *State v. Morse*, 84 Vt. 387, 392 (1911) (upholding a conviction under an ordinance banning bathing in pond used as city water supply because, while bathing was typically a protected riparian right, reasonable use "depends, among other things, upon what use is made of the water by the lower owners, whose equal rights must be respected.").

[41] *Id.*

[42] *See* 1 Waters and Water Rights § 6.01 (2020) (providing examples of when people may sue, including a lack of a public right to challenge rights without standing).

Figure 4: A surface water diversion pump irrigation operation

water user brings a case to determine the "reasonableness" of a particular use to court, that particular case may be entirely fact-specific, and the outcome would apply only to that singular case (or water user)—not to other subsequent cases (or other water users). Put another way, riparian rights can result in individualistic outcomes rather than established and predictable results for all water users. Furthermore, it is not the court's primary role to make law; the court's role is to administer justice. Developing or changing water law, or its associated policy, is secondary to the judiciary's primary goal. Typically, when judges decide matters, they make a case-by-case determination in the context of the facts in the particular case and applicable established law. As a result, decades could pass before courts develop a robust, definite system of caselaw that creates enough clarity for Vermont's water users to fully understand the bounds of their usage rights.

The second issue is that the common law requires an adversarial approach to clarify and enforce water rights. Currently, filing a complaint in court is the only way to enforce riparian rights (i.e. determining another riparian's water use as "unreasonable") because no other enforcement mechanism exists.[43] For example, for a farmer to define his or her permissible water use, the farmer must either *sue* the upstream user based on some harm to the farmer's use *or be sued* by the upstream water user for harming that user's water use.[44] The farmer's rights are only determined in relation to the effects from the other riparian. Thus, riparians must take a water dispute to court in order to narrowly define the bounds a particular person or entity's water usage activity in Vermont as being "reasonable" or "unreasonable."

Unfortunately, that means that enforcement is up to the riparian water users themselves, rather than the State monitoring and regulating user withdrawals to ensure those uses are reasonable. As such, under the legal framework of riparian rights, broadly speaking, any kind of judicial action necessary to enforce one's rights is likely to involve significant litigation costs and lengthy proceedings for all parties involved.[45] These costs

[43] Common law doctrines can only be enforced through the judicial branch. *See generally* 1 Waters and Water Rights § 6.01 (2020) (providing an overview of how common law riparianism works).
[44] *Id.*
[45] Just filing a civil action in Vermont costs $295. *Vermont Judiciary Fees*, https://www.vermontjudiciary.org/fees (last visited Sept. 28, 2020).

can significantly burden smaller users.[46] And for businesses who rely on surface waters, the current legal regime creates uncertainty because, at any given time, they do not know *if* that resource will be available—let alone the quantity—into the future. Just as the hypothetical at the beginning of this report illustrates, because of these uncertainties associated with climate change and an increase in users, a generational Vermont farmer is no longer able to accurately predict their water availability.

The final noteworthy issue under the current riparian rights system is that the state cannot actively protect ecological systems that are dependent on the waterways. A judge can take ecological factors into consideration when issuing a riparian judgement,[47] but his or her judgement is, once again, reactive. As water levels decrease, these habitats become increasingly vulnerable,[48] and unchecked surface-water diversions could detrimentally impact these fragile habitats.

To summarize, the current riparian rights structure in Vermont is a historical approach; however, this approach leads to uncertainty because the law can be overruled at any point. Under the current common-law framework, users do not know the full extent of their rights. More importantly, their rights and usage remain vulnerable because at any given time a downstream user could challenge their activity.[49] This uncertainty is synonymous with unpredictability.

[46] Small businesses do not have thousands of dollars to take larger users to court—many Vermont businesses make less than $40,000 a year. Without intervention, smaller users will essentially have no access to remedies, and this could result into a major threat to Vermont's thriving small business sector. *See Id.*; *see also* Art Wolf, *Self-Employment in Vermont: Why is the Number Stagnant While the Nation's Grows?*, BURLINGTON FREE PRESS (Aug. 7, 2018), https://www.burlingtonfreepress.com/story/money/2018/08/07/self-employment-vermont-number-stagnant-while-nations-grows/881729002/.

[47] Restatement (Second) Of Torts § 850A (Am. L. Inst. 1979).

[48] The effects of climate change as a whole also affect ecological stability, not just water levels. Climate effects such as water temperature, introduction of invasive species, and changing weather patterns all have an effect. Regardless, habitats are at risk and creating a proactive water management system can mitigate much of the damage. *See* US Global Change Research Program, *Climate Change in the United States ch. 16*, at 380 https://nca2014.globalchange.gov/report/regions/northeast.

[49] Users may make assumptions based on other state case law or the Restatement, but even with the help of legal counsel, 90-year-old Vermont case precedent lacks the modernity necessary to clarify the bounds of reasonableness under today's use. *Compare* Restatement (Second) Of Torts § 850A (Am. L. Inst. 1979) (defining reasonableness of water use) *with Fire Dist. No. 1 v. Graniteville Spring Water Co.*, 103 Vt. 89 (1930) to see the rule alongside the most recent Vermont riparian case.

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Figure 5: Crop irrigation

B. Piecemeal Existing Statutes & Regulations: The Lack of Surface-Water Oversight

To supplement the State's preexisting framework of common law riparian rights, Vermont's ANR has promulgated only a few regulations governing Vermont's surface waters pursuant to limited statutory authority. These regulations cover snowmaking,[50] stream alterations,[51] encroachments on public waters,[52] and large subdivisions. Although Vermont has delegated authority to administer the federal Clean Water Act (CWA) for water

[50] Snowmaking rule is the only codified regulation in Vermont that directly regulates surface water withdrawals.
10 V.S.A. § 1031. Permittees must report annually their seasonal water diversion volumes and the daily pumping rates and volume. Agency of Natural Resources Environmental Protection Rules, ch. 16. *Water Withdrawals for Snowmaking* § 16-04(2) (Feb. 15, 1996), https://dec.vermont.gov/sites/dec/files/documents/wsmd-water-withdrawal-snow-rule-1996-02-15.pdf. However, permits do not specifically contemplate interbasin transfers of surface water.
[51] 10 V.S.A. §§ 1021–1032. The stream alteration statute explicitly reserves the riparian rights of property owners abutting a surface water. Under the stream alteration law, riparian users are not required to obtain a permit to withdraw water from streams running through their property. *Id.* § 1021(g).
[52] 29 V.S.A. § 403(a)(1) (2017). These encroachment restrictions only apply to public lakes and ponds, not rivers or streams.

quality purposes,[53] water *quantity* is not fully considered. This also holds true for the State's Act 250 land-use law, which focuses solely on water quality.[54] In terms of water quantity, Act 250 requires only that permittees have "sufficient water available" for the needs of the project.[55] This leaves several statutory gaps for maintaining surface-water quantity and overseeing surface-water diversions.[56] ANR is tasked with acting in the public's interest to protect, regulate, and control Vermont's surface waters.[57] The State therefore has a responsibility to ensure both stability and reliability for Vermont's water users, as well as the ecological health of its water resources. This responsibility however is fundamentally frustrated by the regulatory holes that inevitably arise from the current riparian rights system.

Figure 6: Snowmaking

A recent example highlighting these regulatory holes is the Killington-Pico snowmaking interconnect: Vermont's first-ever interbasin diversion-transfer of surface water. In 2019, Killington Resort proposed a 16,850-foot snowmaking-interbasin water-transfer interconnect system between Killington and Pico mountain to improve snowmaking capabilities at Pico resort.[58] The proposed project, which was approved and is now operating, pulls water from the Ottauquechee River watershed (Connecticut River

[53] Clean Water Act, 33 U.S.C. §§ 1251–1388 (2018); Water Pollution Control, 10 V.S.A. §§ 1250–1389 (2018).
[54] 10 V.S.A. § 6086(a)(1) (2018).
[55] *Id.* § 6086(2).
[56] The Agency of Natural Resources (ANR) only restricts water diversions to preserve certain streamflow minimum in limited circumstances. *Agency Procedure for Determining Acceptable Minimum Stream Flows*, VT AGENCY OF NAT. RES., DEP'T OF ENVTL. CONSERV. (July 14, 1993), https://dec.vermont.gov/sites/dec/files/documents/wsmd-stream-flow-procedure-1993-07-14.pdf [hereinafter *Agency Procedure*]. These include: issuing permits for dams, Clean Water Act water quality certificates, and stream alteration or stream flow regulation; for licensure of the Federal Energy Regulatory Commission (FERC) projects; for projects approved by the Commissioner of Fish and Wildlife; and for pre-Act 250 decisions on projects affecting stream flow. *Id.* However, *de minimis* diversions do not trigger 401 water quality certifications to assess Water Quality Standards. *Vermont Water Quality Standards*, VT AGENCY OF NAT. RES. DEP'T OF ENVTL. CONSERV. (Oct. 30, 2014), https://www.epa.gov/sites/production/files/2014-12/documents/vtwqs.pdf.
[57] 10 V.S.A. § 1001 (2018).
[58] *Pico Mountain Announces Major Snowmaking Upgrades to Double Capacity for 2019-20 Season,* Killington (Mar. 6, 2019), https://www.killington.com/media-room/press-releases/all-press-releases/pico-mountain-announces-major-snowmaking-upgrades ("Rather than relying on the streams . . . , [Pico] will build a 16,850 foot pipeline to source water from Killington [to give the resort the] ability to make more snow, for longer periods of time . . . .").

Basin) up Killington mountain and over to Pico mountain and discharging it into the Otter Creek watershed (Lake Champlain Basin). The project triggered several state and federal permits—ANR Stream Alteration, CWA § 401 Water Quality Certification, CWA § 404, and Act 250—but none of those permits directly addressed the interbasin transfer of withdrawn surface water. As a result, the project dramatically highlighted two main issues:

(1) Vermont lacks knowledge and data on surface-water usages, quantities used, impacts to river and stream health; and

(2) a sizeable regulatory hole in Vermont's laws and regulations exists regarding oversight of the state's finite water resources.

In addition, this case study illuminated and reinforced that a lack of clear and comprehensive laws or regulations specifically addressing the issue of surface-water management, diversions, and interbasin transfers threatens the health and quantity of the state's surface-water resources. In particular, diversions like Killington's can transfer invasive species and pathogens, impact water quality, and decrease watershed basin quantities. By proactively monitoring surface-water diversions and interbasin transfers, Vermont can ensure that water quality *and* quantity are adequately protected for the entire state and all its users.

V. Determining the Best Fit for Vermont: Adopting a Proactive and Reliable System that Balances Competing Water Uses and Unpredictability

Due to the sizeable gaps in the State's existing body of common law and surface-water-related regulations, broadly speaking, Vermont has three options moving forward:

(1) Vermont can simply stay the current course and refrain from adopting any new program or protections;

(2) Vermont can attempt to expand its existing regulations to encompass water-quantity issues and certain surface-water diversions;

(3) Vermont can thoughtfully and methodically plan for the future and develop a new proactive water-management program—comparable to those adopted in many other eastern states—that fits its needs.

In our opinion, the third option is the best fit for Vermont moving forward, given climate pressures, urgency, competing uses, and the necessity for a reliable water source and water resources protections, generally.

As explained in this report, the first option—that Vermont maintain the status quo—is insufficient for dealing with future challenges. The state's existing riparian rights common law will likely experience challenges to ensure water availability in times of water uncertainty. Despite the common law evolving over time, it is safe to predict that evolution may come too late and without the broad sweeping proactive protections needed to protect Vermonter's and the water resources themselves. In essence, staying the current course is unwise and could endanger the well-being of Vermonters, forcing them to bear the risk of harm in a new, uncertain era of water use.

Turning to the second option, if the state wishes to expand current regulations, it may face similar problems. The majority of regulations relating to Vermont's water were never designed to broadly monitor, control, or restrict water use based on quantity, especially within the context of climate change. Forcing them into that role would stretch them beyond their original intent and what they were designed to effectively handle. For example, Vermont's Act 250 law and Clean Water Act permitting authority were specifically designed to consider water *quality*, not quantity. Moreover, because of each regulation's narrowly tailored goal, any type of attempted expansion would still leave sizeable regulatory gaps. In short, this option is most analogous to a "band-aid" approach or attempting to fit a square peg in a round hole.

Based on the associated weaknesses of the first two options, we recommend option three: working to develop a new system of water management that is able to proactively consider the water needs of Vermont's surface-water users along with riverine healthy and integrity *before* diversions occur. Developing a new system like this can maintain efficiency, ensure certainty and predictability, and protect Vermont's environment. Then, Vermont will be prepared for whatever the future may bring—from climate change to increasing water use. Included below, is a closer examination and analysis of this third option, along with a preliminary look at what other states have done.[59]

A. Regulated Riparianism

After considering all viable frameworks for Vermont, we conclude that regulated riparianism is the most effective legal regime for addressing future threats to Vermont's waters. It is the water-management system used in a majority of other Eastern states and is able to implement the common-law riparianism framework into a proactive structure. Moreover, the system provides flexibility for changing water uses, especially in the context of climate change and competing uses.

1. Regulated Riparianism is a Proactive and Predictable System for Water Allocation

Regulated riparianism is a water-management system that evaluates the projected reasonableness of a proposed use *before* it occurs, yet still follows the general principles of common-law riparianism.[60] Instead of using the aforementioned patchwork of regulations coupled with the common law, Vermont can implement a proactive and predictable water-management system modeled on the principles already within common-law riparianism.

[59] Also mentioned below, if Vermont opts to pursue option three, we strongly recommend that the State perform further communications and research regarding other successful state frameworks. Also noteworthy here is that when considering viable options for Vermont's situation, we performed an in-depth review of other framework-systems not mentioned, which included Prior Appropriation and Water Markets. For a variety of reasons, mostly self-explanatory, these systems were quickly ruled out. However, we remain prepared to provide further analysis and explanation, if desired.
[60] ROBERT H. ABRAMS & LATRAVIA SMITH, WATER RIGHTS AND ENVIRONMENTAL REGULATION: A LAWYER'S GUIDE, 8 (2018).

Under such a system, a state agency would administer time-limited water licenses/permits based on the reasonableness of the proposed use at the time by allocating and reallocating water use rights through a cooperative decision-making process.[61] This enables the state to weigh the potential benefits to society, consider the use's harmony with current uses, and mitigate potential interferences before they take place.[62]

Though endless variations are imaginable, most functioning regulated-riparian models follow a general framework found in the Regulated Riparian Model Riparian Code (MRC).[63] The MRC framework has been adopted by many states and includes several beneficial regulatory mechanisms. First, it includes a mechanism for setting a minimum-flow baseline and determining which waters and quantities will fall under the regulatory system. Second, it has an umbrella-blanket-type permitting scheme that defines the "reasonable use" of the surface-water resource, sets durations for the permits, and identifies exempted uses. Third, it considers a scarcity resiliency plan to prepare for times of drought. And finally, a thoughtful regulated riparianism code will delineate effective enforcement and dispute-resolution mechanisms.

2. Benefits of Regulated Riparianism in the Wake of Vermont's Changing Water Availability and Needs

A robust water-management system will help resolve a host of challenges under Vermont's existing system. In a thoughtfully developed system, regulated riparianism is proactive,[64] less adversarial,[65] and better for environmental protection.[66] It can provide stability during the era of climate change and certainty for businesses and water users.

The first of these benefits is that regulated riparianism is foresighted, clarifying the boundaries of a user's diversion(s) before they even begin to divert.[67] Under riparian rights common law, a user may be able to guess the bounds of their rights, but a true clarification of rights can only occur after a user suffers some harm.[68] Regulated riparianism solves this issue by allowing users to anticipate what amount of withdrawal is reasonable, without having to suffer any economic loss.[69] A permit will detail what particular use(s) is reasonable.[70]

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[61] *Id.*
[62] *Id.*
[63] The Code contemplates model state permitting systems, permit procedures, standards, drought-management strategies, and coordination with water quality standards. REGULATED RIPARIANISM MODEL WATER CODE §§ 2R-2-31(2), 2R-2-29(2).7R-1-02(1), 7R-2-01(1) (AM. SOC'Y CIV. ENG'R 2004).
[64] 1 Waters and Water Rights § 9.03(a)(1.01) (2020).
[65] *Id.*
[66] *Id.* (explaining that the water permitting agency "can reserve water from use altogether in the interest of protecting public values").
[67] 1 Waters and Water Rights § 9.03(a)(1.01) (2020).
[68] *See* 1 Waters and Water Rights § 6.01 (2020).
[69] 1 Waters and Water Rights § 9.03(a)(1.01) (2020).
[70] Of course, new case precedent will arise under the current system if water becomes scarce and users start interfering with one another, but that new precedent will come at the cost of expensive litigation over many years. Smaller users will face many disadvantages under that approach.

This system can benefit businesses and industry because it allows the quantity of water to be predictable and consistent for all of Vermont's surface water users. That means, in a time of shortage, users will have less doubt about water availability for their needs. As a result, businesses can proactively plan and account for their water with definite certainty, leading to more secure investments and expenditures—even in an era of climate change.

Second, regulated riparianism is less adversarial than riparian rights common law. Users will not have to litigate in times of shortage to defend their diversion activities.[71] Instead, in a regulated-riparian system, a state agency will manage enforcement of reasonable-use standards, lifting that burden off other users.[72] Riparian rights depends on individual users enforcing reasonable use standards through litigation and lacks basin-wide oversight.[73] Regulated riparianism flips that system around. Users avoid having to engage in costly litigation to keep other users from abusing that lack of oversight. Disgruntled users may still seek a judicial remedy when conflict arises, but it will no longer be their sole remedy.

Finally, and importantly, regulated riparianism can be an effective tool for protecting Vermont's environment, especially in the era of climate change. With a proactive permitting system, an agency can maintain minimum stream flows and water levels to protect the environmental integrity of a water body.[74] It can take public interests and ecological risks into account *before* issuing permits.[75] It can require a public hearing for large water diversions, allowing Vermonters to advocate for the ecological integrity of their community or riverine system.[76] Currently, the environment has no voice in water diversions.[77] Regulated riparianism can provide ecological interests a seat at the table.

3. The Regulated Riparianism Approach is Widely Adopted Throughout the Eastern United States

Presently, nearly every riparian jurisdiction has some type of regulated-riparianism permitting system. Some of these are exemplary, while others simply pay lip service to the system. Vermont is one of a dwindling number of pure riparian rights common law states remaining and has not evolved to deal with water-management problems.[78] Although no state has adopted the MRC in full, many have successfully implemented parts of the MRC

[71] 1 Waters and Water Rights § 9.03(a)(1.01) (2020).
[72] *Id.* at § 9.03(a)(5)(A).
[73] *See* 1 Waters and Water Rights § 6.01 (2020).
[74] *Id.* at § 9.03(a)(4).
[75] *Id.*
[76] *Id.*
[77] Again, no standing exists to sue on behalf of the environment without a personal—human or economic—harm. *Id.*; *See also Sierra Club v. Morton*, 405 U.S. 727 (1972).
[78] Joseph W. Dellapenna, *The Evolution of Riparianism in the United States*, 95 MARQ. L. REV. 53, 85–86 (2011). Our intent here is not to criticize Vermont. Rather, we fully acknowledge that historically, the state has yet to confront a major water-crisis and has typically experienced plentiful surface water resources, generally speaking.

into their own state-wide regulated riparianism schemes including Minnesota, Massachusetts, New Hampshire, Connecticut, Florida, and Hawaii. Three states that are particularly noteworthy—Minnesota, Massachusetts, and Florida—exemplify how implementing a permitting scheme has contributed to the overall protection of the state's surface-water resources for all users.[79]

Minnesota

Minnesota is a prime example to explore for implementing a successful Water Appropriation Permit Program (WAPP), which requires that a user withdrawing more than 10,000 gallons of water per day or 1-million gallons per year obtain a water-use permit.[80] Once permitted, water users must submit an annual water-use report.[81] The Minnesota Department of Natural Resources is authorized to manage and balance the state's water resources for multiple users including "domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes."[82] This helps the state "ensure an adequate water supply to meet long-range seasonal requirements" for waters in the state.[83]

Not only does Minnesota operate a top-of-the-line program, it also monitors the hydrology in the state: It provides real-time preliminary and historical stream-flow data,[84] routine overviews of statewide stream-flow conditions,[85] and the natural resource

[79] For purposes of this report, we opted to provide a preliminary overview of existing exemplary programs for Vermont to investigate. If Vermont opts to pursue regulated riparianism further, we recommend performing further detailed analysis of successful operating state programs, along with communications with state agencies implementing those programs.

[80] *Water Appropriations Permit Program*, MINN. DEPT. OF NAT. RES. [hereinafter, *Water Appropriations Permit Program*], https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/index.html (last visited Oct. 25, 2020); MINN. STAT. § 103G.2265; *see also* MINN. STAT. § 103G.271 (2019) (appropriation and use of waters); MINN. STAT. § 103G.285 (West 2019). There are several exemptions to the water appropriation permit requirements. The exemptions include: (1) domestic uses serving less than 25 persons for general residential purposes; (2) test pumping of a ground water source; (3) reuse of water already authorized by a permit; or (4) certain agricultural drainage systems. *Id.* In addition, if the withdrawal is from a well, an individual must have a preliminary well construction assessment. *DNR Water Permits*, MINN. DEPT. OF NAT. RES. https://www.dnr.state.mn.us/permits/water/index.html (last visited Oct. 25, 2020). Permits that exceed the threshold amounts allotted under the general permit are required to pay a fee based on the withdrawal amounts. MINN. STAT. § 103G.271(6) (2019). And fees collected are credited to the water management account in the natural resources fund. *Id.* Also, permits are transferrable to "successive owners of real property if the permittee conveys the real property where the source of the water is located." *Id.* § 7.

[81] *Water Appropriations Permit Program, supra* note 81.

[82] *Id.*

[83] *Id.*

[84] *See Minnesota Cooperative Stream Gaging Program (CSG)*, MINN. DEPT. OF NAT. RES., https://www.dnr.state.mn.us/waters/csg/index.html (last visited Oct. 25, 2020).

[85] In addition, the state has resources detailing water-use permits and permit location maps. *Minnesota Water Use Data*, MINN. DEPT. OF NAT. RES., https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html (last visited Oct. 25, 2020).

conditions through the Watershed Health Assessment Framework.[86] Furthermore, Minnesota statutes specifically contemplate surface-water diversions, whereby the commissioner must determine whether the water left in the basin of origin would "be adequate to meet the basin's water resources needs during the specified life of the diversion project."[87] Such transfers also include appropriations of "*any* amount of water from a designated infested water" to mitigate the spread of invasive species of aquatic plants and animals.[88]

Minnesota is an ideal model for Vermont to further investigate, and potentially emulate, its permitting system, monitoring program, and surface-water diversion framework.

Massachusetts

The Commonwealth of Massachusetts, Vermont's New England neighbor, regulates the amount of water withdrawals from surface-water resources for the well-being and safety of citizens, protection of the natural environment, and economic growth.[89] The Department of Environmental Protection implemented the Commonwealth's sustainable water-resource management program after receiving science and technical-based recommendations from various entities, including the Department of Fish and Game, the Department of Conservation and Recreation, public water suppliers, environmental organizations, scientists, policy-makers, and planners.[90] The water-resource management program began in 2014, and includes a registration program and a permitting program for water use.[91]

Massachusetts also provides Vermont with a model example to learn from and how the program effectively establishes enforceable standards, criteria, and procedures. These

[86] *Watershed Health Assessment Framework*, MINN. DEPT. OF NAT. RES., https://www.dnr.state.mn.us/whaf/index.html (last visited Oct. 25, 2020) (including watershed maps, health scores, and reports)
[87] MINN. STAT. § 103G.265(2) (West 2019).
[88] *Water Use Permits*, MINN. DEPT. OF NAT. RES., https://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/permits.html (emphasis added) (last visited Oct. 25, 2020).
[89] MASS. GEN. LAWS ANN. ch. 21G, § 3 (West 2020); MASS. GEN. LAWS ANN. ch. 30A § 2–3 (West 2020); 310 MASS. CODE REGS. 36.06 (West 2020) (providing that water users must register and provide the following information: the actual or estimated amounts of water withdrawn; the use for the withdrawn water; where the water withdrawal is being made; the volume of the withdrawal; conservation measures; location where water may be discharged; and any other info requested by the Department); 310 MASS. CODE REGS 36.02 (West 2020).
[90] *Massachusetts Sustainable Water Management Initiative Framework Summary*, MASS. EXEC. OFF. OF ENERGY AND ENV'T. AFF. (Nov. 28, 2012), https://www.mass.gov/doc/framework-november-2012/download (providing recommendations for the permitting of water withdrawals, safe yields, streamflow criteria, and permit tiers).
[91] *Water Management Act Program*, MASS. GOV'T., https://www.mass.gov/water-management-act-program (last visited Oct. 8, 2020).

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allow the state to comprehensively and effectively manage withdrawals, balance competing water uses, and ensure the preservation of water.[92]

New Hampshire

New Hampshire also maintains a robust and evolving water-management system.[93] New Hampshire requires all users who withdraw over 20,000-gallons in a day, or more than 600,000 over 30-days, to obtain a permit.[94] The Department of Environmental Services is tasked with setting most permitting requirements, including application requirements, permit conditions, and permit length.[95] This gives the agency vital flexibility to adapt to the changing needs of the state, and allows it to have discretion in setting related standards.

New Hampshire also began a special pilot research program for two of its rivers, which is now being implemented on other rivers in the state.[96] This program began by tracking instream flows in the Lamprey and Souhegan Rivers to ensure that they maintain "healthy, balanced ecosystems and robust water supplies for drinking water, business and other off-stream uses."[97] Further, the program "is a proactive planning tool that not only addresses current river use but establishes a process for managing the demand for future water uses."[98]

Vermont and New Hampshire share a common border and watershed—the Connecticut River. As neighbors with similar geography and natural resources, a closer look into New Hampshire's system—what has and hasn't worked, and why—is likely to help Vermont in developing a successful water-management system.

Connecticut

Connecticut also maintains a statewide regulated-riparian system. In Connecticut, all diversions that are 50,000-gallons or greater in any 24-hour period require a permit from the commissioner of the Department of Energy and Environmental Protection.[99] Permit requests must state the user's water need, reason for diversion, description of current water system, location of withdrawal, quantity of withdrawal, length of withdrawal, effect of withdrawal on water supply, alternatives to the withdrawal, and conservation measures to be adopted by applicant.[100] The commissioner then has the power to impose permit conditions, including its duration.[101]

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[92] 310 MASS. CODE REGS. 36.02.
[93] N.H. Rev. Stat. Ann. § 488:3.
[94] *Id.*
[95] *Id.* at § 488:9.
[96] N.H. Code Admin. R. Ann. Env-Wq 1900 *et seq.*
[97] Watershed Mgmt. Bureau & N.H. Dep't. of Envtl. Servs., *Report of the Instream Flow Pilot Program* R-WD-15-114 (2015).
[98] *Id.*
[99] Conn. Gen. Stat. §§ 22a-366, -368(b), -377(2).
[100] *Id.* § 22a-369(1)-(9).
[101] *Id.* § 22a-371(f).

Connecticut's permitting system of water diversion is another strong model for Vermont to glean from. Having a comprehensive library of each water user's need, type, and length of withdrawal can help the State understand where water is most needed, and then help it make an informed decision on the reasonability of new diversions.

Florida

Although Florida is geographically far from New England, it provides another model example of regulated riparianism. In Florida, the state Department of Environmental Quality delegates its water-management authority to the five Florida Water Management Districts (WMDs) that regulate different region's water resources in the state. This structure allows WMDs to make location-specific decisions such as granting permits based on the water availability in that region.[102] Each WMD has its own plan for the water sources in its region to address water supply, water quality, flood protection, floodplain management, and natural systems. During times of water shortages or water emergencies, WMDs must create plans for such contingencies.[103] In addition, WMDs establish their own minimum flow and minimum water level for all surface watercourses in the area.[104] These mechanisms ensure the reliability of water in the state for all users.

A well-thought-out system like Florida's could be extremely beneficial in Vermont, which does not have a reliable water-use system in place. Because water uses in Vermont vary greatly from region-to-region, local governments or designated districts, could determine their own water plan. Vermont could divide watershed planning into tactical watersheds, potentially resembling Vermont's existing Act 250 districts, except they would be for surface-water use.[105]

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[102] Generally, the water-use permits last for 20 years and the permit holder must provide a reasonable assurance that the permit conditions will be met; otherwise, permits can be issued for shorter durations. *Id.* § 373.236(1). Special permit terms provided by statute include permits for municipal water use or public works (for a term of up to 50 years), renewable energy generating facilities (for a term of 25 years), and the cultivation of agricultural products on lands of 1,000-acres or more (for a term of 25 years). *Id.* § 373.236(3). Also, Florida's water regulations include enforcement mechanisms to ensure water users comply with their permitted water use. The WMD may compel compliance reports at specific times during the permit period. *Id.* § 373. 236(4). Some uses may require compliance reports every ten years, others every five. *Id.* § 373.236(7).

[103]The WMD water plans classify water uses based on source of water supply; method of extraction, withdrawal or diversion; or the use of water or a combination thereof. *Id.* § 373.175(2). In the event of a water shortage, this allows WMDs to limit water use by one or more users. *Id.* § 373.175(2).

[104] *Id.* § 373.036(2)(a), 373.046. Minimum flow is defined as a water level below which further withdrawals would be "significantly harmful" to the health of the waterway. *Id.* § 373.042(1), (1) (a-b). These definitions do not apply to water bodies less than 25 acres in area unless otherwise significant to the state. *Id.* § 373. 0421(1)(b)(2).

[105] *Tactical Basin Planning*, VT. AGENCY OF NAT. RES., DEPT. OF ENVTL. CONSERVATION, https://dec.vermont.gov/water-investment/watershed-planning/tactical-basin-planning (last visited Oct. 23, 20 20).

Hawaii

The Hawaiian Model Water Code is a regulated riparian system with additional recognition of native Hawaiian water rights.[106] The code provides for "the adoption of a state water plan, the protection of instream uses, and the designation of water management areas when the total of existing or proposed withdrawals exceed the 'appropriate sustainable yield' of the source."[107] This designation of a water-management area replaces the common law and requires a user to obtain a permit to withdraw water similar to other regulated riparian codes.[108] The "protection of instream uses" covers "recreation, domestic uses, ecological interests, and the exercise of native Hawaiian traditional and customary rights."[109] The permitting agency must also balance the public interest against economic and efficient use of the proposed water use before granting a permit.[110]

Vermont could benefit from a similar system, because it allows the agency to set water-management districts in areas where water use and competition is high, avoiding burdensome regulation in areas with plentiful water. Further, it sufficiently accounts for conservation interests through a state water plan and its protection of instream uses. This plan could give Vermont flexibility in determining where water permitting is necessary while also proactively considering the water needs of economic, individual, and environmental interests on a statewide level.

In sum, the states mentioned above—particularly Minnesota, Massachusetts, and Florida—have exemplary water-management programs that serve as models for how Vermont can develop and integrate a more robust water-management system. Each model takes a proactive stance, rather than a reactionary one, for protecting the resource. The other states also appropriately assess water withdrawals, as well as the number of water users and may serve to offer important lessons. As a theme, each of these states have an adequate stream of information that allows them to understand the waters in their respective states, which informs decision-making and the overall protection of the resource for all users. This Report simply skims the surface of these various tested and implemented state programs to provide ideas to consider. We recommend that Vermont perform further research and analysis on these programs, and others. Further, our brief analysis of the state programs is not comprehensive, as we did not contact the respective state agencies regarding specifics of how their program has been successful in the state. However, moving forward, we fully recommend that the Study Committee take a deeper dive to investigate these other state programs and their efficacy as applied to the State of Vermont.

[106] 1 Waters and Water Rights § 10.01(c).
[107] *Id.*
[108] *Id.*
[109] *Id.*
[110] *Id.*

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Figure 7: Low-water drought conditions on Vermont's White River. Photo by Lancee Whetman, summer 2020

VI. Conclusion

Every approach presented in this report, in some way, aids in the protection of waters, especially in the midst of climate change. However, Vermont's existing framework falls short. It lacks a structure to not only effectively monitor the quantity of surface waters, but also the existing and competing number of water users and their usage amount(s). At this point we can revisit the hypothetical posted at the beginning of this report, but under the assumption that Vermont has adopted some type of water-permitting program to monitor surface waters. Now, the state would be carefully and proactively monitoring all those withdrawing from surface-water resources to ensure equitable and efficient uses. Importantly, our downstream farmer would now have an adequate understanding of his or her water supply for withdrawal purposes. Additionally, the hypothetical angler or paddler concerned about adequate streamflow and riverine health would also have peace of mind. Finally, the approaches offered in this report are merely a starting point but demonstrate the need for the state of Vermont to act now to understand and modify Vermont's current legal framework of riparian rights, especially while the effects of climate change become ever more omnipresent. A new framework will provide certainty and predictability for all riparian users, now and into the future.

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