AGRICULTURAL SOURCES OF WATER POLLUTION: HOW OUR HISTORY INFORMS CURRENT DEBATE

Chuck Ross and Marli Rupe[*]

* Chuck Ross began service as Secretary of the Vermont Agency of Agriculture, Food and Markets in 2011, during which time he served as the President of the National Association of State Departments of Agriculture. Prior to his position as Secretary, he served as U.S. Senator Patrick Leahy's State Director, State Representative in the Vermont Legislature, and as a manager of his family's farm. In addition, he has served on many boards relating to agriculture, education, and natural resources, including: Trustee for the University of Vermont; Trustee for Fletcher Allen Health Care; advisory boards of the Rubenstein School of Environmental and Natural Resources and the College of Agriculture and Life Sciences at the University of Vermont; advisory member of the Vermont Council on Rural Development; and on the Board of Directors at Shelburne Farms.

Marli Rupe is currently the Assistant Program Manager for the Clean Water Initiative Program in the Vermont Department of Environmental Conservation. She has been with DEC for four-and-a-half years and previously worked with farmers in southern Vermont for twenty-three years as a University of Vermont Extension Dairy Specialist and District Manager of the Poultney Mettowee Conservation District. She managed two dairy farms prior to this, including the UVM Research Farm in Burlington, Vermont.

INTRODUCTION

Humans have been present in Vermont and the Champlain Valley for thousands of years and have relied upon the bounty of its ecology for support and sustenance. Prior to the colonization of the United States, human activity was small in scope and characterized by hunting and gathering in dense woods and small-scale agricultural activities consistent with their small population and impermanent locations.[1] The ecological footprint of Native Americans was small and their impact negligible in terms of fundamentally changing or altering the ecology of the region.[2]

Things changed with European colonization of North America and a human population that arrived with a distinctive set of cultural beliefs, strategies and practices for engaging with the natural environment. These strategies relied upon the restructuring of the existing agrarian relationship and human impact on the landscape with a focus on turning natural resources into food and goods for their immediate needs and marketable products beyond their immediate needs.[3] The enormous forests that covered Vermont's landscape at the time provided a range of products needed by the emerging state and markets to the south.[4] The dramatic clearing of these forests and the many fertile soils that then became available for agricultural pursuits made the region a rich resource for its inhabitants and to the growing population of the United States.[5] The bounty of this ecological system and the resources of water, soil, sun, and proximity to the early cities and population centers enabled Vermont to become a prominent provider of resources to support our new country.[6]

Vermont's history was like many other states and countries where its early development and success depended upon maximizing the potential of the environment. Unfortunately, intensive use and exploitation of that environment created negative consequences, which seemed minor given the vast wealth of the land, but which were eventually recognized and slowly understood as creating an array of costs and impacts that would need to be addressed at a future time.[7] In the 1800s, Vermont recognized that actions were needed to ameliorate or reverse these negative consequences. While people expressed concern and took actions during that century, George

---

1. CHARLES W. JOHNSON, THE NATURE OF VERMONT: INTRODUCTION AND GUIDE TO A NEW ENGLAND ENVIRONMENT 50–51 (New & Expanded ed. 1998).
2. *Id.* at 51.
3. *Id.* at 50–52.
4. *Id.* at 51–54.
5. *Id.* at 52–53.
6. *Id.* at 53.
7. *See id.* at 52–53, 55–56, 64 (recounting Vermont's history of poor faming and logging practices and environmental degradation).

Perkins Marsh, the most enduring voice to focus on these issues, wrote about the significance of the damage to the environment.[8] The 1900s saw policies put in place to address soil erosion, establish national agricultural policy to improve farm profitability, and assure food was affordable.[9] In the 1970s, the federal government passed landmark legislation like the Clean Water Act, Safe Drinking Water Act, and the National Environmental Policy Act. These acts represent key elements of the "environmental" movement beginning in the 1970s and leading to further action and involvement on the part of citizens, including Vermont.

In the last ten years, Vermont's efforts have been characterized by an increasingly collaborative effort between federal and state regulatory agencies, landowners and citizens, and technical experts and scientists. Much of this effort has been aimed at identifying sources, reducing source levels to assimilative levels, and changing practices throughout society to achieve goals for water quality including Lake Champlain.

I. HISTORY

Vermont's forested landscape in the early 1800s was so vast and valuable and the demand for wood products was so strong that the lumbermen of the day established Vermont as a premier source of logs and lumber. One of the most important activities that characterized the early years of colonial settlement was the harvesting of trees for the production of potash and pearl ash, greatly in demand to the British market,[10] and the creation of charcoal, a fuel source increasingly in demand by the colonial towns and cities.[11] By 1873, Burlington, Vermont, was the third largest lumber port in the world.[12] With the cutting of trees came the clearing of the land for agricultural cultivation necessary to support the settlement lifestyles being sought and established by the colonists and modeled upon countries from which they came.[13] The clearings became gardens, pastures, and fields to raise crops and livestock necessary to sustain the growing population and markets to the south.

The mid-1800s also saw the rise of a sheep industry that dominated Vermont agriculture. By 1840, the demand for wool was at a peak and 1.5

---

8. *Id.* at 56–57.

9. *See id.* at 58 (describing the conservation forestry practices championed by Theodore Roosevelt and others).

10. FROM POTASH TO READY CASH: VERMONT'S FIRST CASH CROP, http://vermonthistory.org/images/stories/articles/greenmountaineer/frompotashtoreadycash.pdf [https://perma.cc/U75A-7HB2] (last visited Apr. 18, 2016).

11. JOHNSON, *supra* note 1, at 53.

12. *Id.* at 54.

13. *Id.* at 52–53.

million Merino sheep thrived on the Vermont landscape.[14] Sheep helped clear the Vermont hillside as trees were felled for the potash markets, including its use as a fertilizer and an ingredient in soap for cleaning raw wool.[15] The clearing of trees amplified the value of Vermont's water and waterways, which were used as a means of transporting wood to markets to the south, an activity increased by the construction of canals, which enhanced the ease of transportation.[16]

These activities permanently altered the landscape of the region. By the 1850s, seventy to seventy-five percent of the land in Vermont was open due to sheep pastures, croplands, and cleared forests.[17] Vermonters used this open land to support an agricultural economy that served the greater United States through the raising and exporting of wool and forest products demanded by southern markets.[18]

As Vermont reached its peak in wool and timber production, changes in national trade policy and expansion of settlements in the western United States began to drive a change in Vermont's agricultural sector. Wool prices dropped in the mid-1800s when the tariffs on imported wool were eliminated and lower production costs in western states hurt the Vermont producers.[19] New transportation methods and infrastructure opened farming options in other parts of the United States where land degradation had not yet occurred, rivers were not muddy from erosion, and land was flatter and more productive.[20] Over time, as sheep farming declined, dairy became a stronger factor in Vermont agriculture where the cool growing season allowed for good grazing and hay production. By the 1900s, few farms did not have milk cows.[21]

At first, the transition to butter and cheese production was not smooth, mainly because of poor dairy cow genetics. Over time, production quality and volume improved in part due to the importation of Jersey breed cattle

---

14. *Id.* at 53.
15. *Id.*
16. *Id.*
17. JOHNSON, *supra* note 1, at 53.
18. *Id.*
19. Roger Albee, *The Sheep Craze in Vermont's Agricultural History*, WHAT CERES MIGHT SAY (Mar. 24, 2011), http://whatceresmightsay.blogspot.com/2011/03/sheep-craze-in-vermonts-agricultural.html [https://perma.cc/JF5K-KN63].
20. JOHNSON, *supra* note 1, at 55.
21. Bob Parsons, *Vermont's Dairy Sector: Is There a Sustainable Future for the 800 lb. Gorilla?* 2–3 (Univ. of Vt. Ctr. for Rural Studies, Food Sys. Research Collaborative, Opportunities for Agriculture Working Paper Series Vol. 1, No. 4), http://www.uvm.edu/crs/reports/working_papers/WorkingPaperParsons-web.pdf [https://perma.cc/R9JV-U4WY].

by Fredrick Billings.[22] Individual farmers produced most of the butter on the farm until the mid-1800s when commercial production began and the Vermont legislature supported the establishment of the Vermont Dairymen's Association (1872), the first in the nation.[23] By the 1920s, Vermont had about 14,000 dairy farms, 166 creameries, and 66 cheese factories and St. Albans was known as the "butter capital" of the world.[24] Vermont was a major supplier of milk to regional markets and about 50% of the milk purchased in Boston originated in Vermont.[25] Still, diversified agriculture existed with apples, potatoes, poultry, and maple all contributing to the Vermont farm economy.

The mid-1800s also saw the beginning of systematic education for farmers when Vermont Senator Justin Morrill oversaw the creation of the Land Grant System in 1862.[26] The Board of Agriculture that began in 1872 was later responsible for the Vermont Agricultural Experiment Station (1886) that was charged with working on soil fertility and farm practices.[27] During this time, commercially processed fertilizers were being used extensively to increase soil fertility. In 1882, the State of Vermont began to regulate and license fertilizer sales and authorized the University of Vermont ("UVM") to test fertilizer samples.[28] The Board of Agriculture also began to hear about and discuss environmental concerns. Their first annual report in 1872 acknowledged that early settlers had believed soil was inexhaustible. Several speakers, including Jonathan Lawrence of St. Johnsbury, a farmer himself, spoke to the Board of how to improve soil fertility and the need to plant trees to decrease erosion.[29]

II. CONSERVATION'S BEGINNINGS IN VERMONT

22. Roger Albee, *The Slow Movement to Commercial Butter Production*, WHAT CERES MIGHT SAY (Apr. 12, 2011), http://whatceresmightsay.blogspot.com/2011/04/slow-movement-to-commercial-butter.html [https://perma.cc/D5RT-EP4P].

23. Roger Albee, *Timeline of Changes in Vermont*, WHAT CERES MIGHT SAY (Mar. 1, 2011), http://whatceresmightsay.blogspot.com/2011/03/timeline-of-changes-in-vermont.html [https://perma.cc/6VXK-AY28].

24. Albee, *The Slow Movement to Commercial Butter Production*, *supra* note 22.

25. Roger Albee, *Lessons Learned from the Past: Looking to the Future After a Major Disaster—The Vermont Story*, WHAT CERES MIGHT SAY (Oct. 11, 2011), http://whatceresmightsay.blogspot.com/2011/10/lessons-learned-from-past-looking-to.html [https://perma.cc/6PQA-U5L2].

26. Roger Albee, *Historical Importance of Agriculture Education in the United States and in Vermont*, WHAT CERES MIGHT SAY (Aug. 1, 2011), http://whatceresmightsay.blogspot.com/2011/08/historical-importance-of-agricultural.html [https://perma.cc/2G4U-87VP].

27. Roger Albee, *Brief History of Agriculture, the Environment, and Land Use in Vermont*, WHAT CERES MIGHT SAY (June 30, 2012), http://whatceresmightsay.blogspot.com/2012/06/brief-history-of-agriculture.html [https://perma.cc/DN2K-NNXM].

28. *Id.*

29. *Id.*

In 1847, well-known author, conservationist, and Vermont Congressman George Perkins Marsh called for recognition of environmental stewardship and "zealous efforts" toward farming improvements.[30] In 1864, Marsh wrote of environment challenges in his book *Man and Nature* when he stated, "the operation of causes set in action by man has brought the face of the earth to a desolation almost as complete as that of the moon," a reference to the deforestation and sheep farming that were eroding the soils of Vermont's fields into its rivers and streams.[31] But it was not until the Dust Bowl of the early 1930s that the American public's attention was captured. For years, farmers had plowed up the deep rooted Midwest grasses to grow wheat. Persistent drought in Oklahoma, Texas, Kansas, Colorado, and New Mexico left land bare to blowing winds and resulted in dust storms.[32] In 1934 and 1935, the dust storms darkened the skies across the country—including Washington, D.C.—devastating human and animal health and causing long-term agricultural effects.[33] This public and environmental health challenge emphasized the severity of the situation enough to create the first major national effort toward natural resource protection.[34]

As a result, soil and water conservation were priorities in the Franklin D. Roosevelt administration. Federal funds were first allocated through the Soil Conservation Act for demonstration projects in the most critically eroded areas of the country to show the value of soil conservation.[35] Hugh Hammond Bennett, who became the first Chief of the Soil Conservation Service ("SCS"), influenced this with his early writings and later urged the creation of a permanent federal agency that would address soil conservation.[36] In 1935, SCS was established as part of the U.S. Department of Agriculture ("USDA").[37] While created to address erosion concerns, watershed planning and related water quality and quantity issues were also priorities of SCS.[38] As a result, the USDA saw the benefits of locally led action to educate and bring farmers together. The Standard State

---

30. George Perkins Marsh, Address Delivered Before the Agricultural Society of Rutland County (Sept. 30, 1847), *in* U. OF VT. LIBRARIES: CTR. FOR DIG. INITIATIVES, http://cdi.uvm.edu/collections/item/pubagsocaddr [https://perma.cc/KR4C-754G] (last visited Apr. 19, 2016).

31. GEORGE PERKINS MARSH, MAN AND NATURE 42 (1864).

32. *80 Years Helping People Help the Land: A Brief History of NRCS*, U.S. DEP'T OF AGRIC. NAT. RESOURCE CONSERVATION SERV., http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/about/history/?cid=nrcs143_021392 [https://perma.cc/YJD7-QHGY] (last visited Apr. 4, 2016).

33. *Id.*

34. *Id.*

35. *Id.*

36. *Id.*

37. *Id.*

38. *Id.*

Soil Conservation Districts Law in 1937 created the Soil and Water Conservation Districts, with the first District created in Vermont in 1942.[39] The Natural Resources Conservation Service ("NRCS"), as the SCS was renamed in 1994, and the Natural Resources Conservation Districts ("NRCDs") have been pivotal in Vermont agricultural history for development and implementation of critical conservation and pollution control practices.[40]

In 1933, the Roosevelt Administration created the first Farm Bill, known as the Agricultural Adjustment Act, to compensate farmers for not using their land for crop production.[41] During the Depression, farm incomes had decreased by more than 50%[42] and the purpose of the act was primarily to support farmers through higher grain prices. This act was formalized in 1938 and, at that time, required to be updated every five years.[43] In 1995, federal legislation responsible for incentivizing comprehensive conservation practice implementation was introduced and passed.[44] It was called the "Environmental Quality Incentives Program" ("EQIP") and it was championed by a bipartisan group of Senators led by Vermont Senator Patrick Leahy, a member of the Senate Agriculture Committee.[45] By 2002, the Farm Bill, retitled the Farm Security and Rural Investment Act, increased EQIP funding from $400 million dollars to over $1 billion, with the emphasis on environmental protection and less on market stabilization.[46] The EQIP allocation in the most recent Farm Bill, now known as the Agricultural Reform, Food and Jobs Act of 2013, allocated approximately $9 million in 2015 to Vermont.[47]

From the outset, the Farm Bill has initiated many agricultural programs. Unfortunately, many of the agricultural activities done in the early 1900s

---

39. *Id.*

40. *Id.*

41. Gilbert C. Fite, *Farmer Opinion and the Agricultural Adjustment Act, 1933*, 48 MISS. VALLEY HIST. REV. 656, 659 (1962).

42. Rosemary D. Marcuss & Richard E. Kane, *U.S. National Income and Product Statistic: Born of the Great Depression and World War II*, 87 SUR. CURRENT BUS. 32, 32 (2007).

43. CAF DOWLAH, INTERNATIONAL TRADE, COMPETITIVE ADVANTAGE AND DEVELOPING ECONOMIES: HOW LESS DEVELOPED COUNTRIES ARE CAPTURING GLOBAL MARKETS 54 (2016).

44. Otto Doering, *An Overview of Conservation and Agricultural Policy: Questions from the Past and Observations About the Present* 6 (Am. Farm & Tr. Ctr. for Agric. in the Env't Working Paper, 1998), http://www.farmlandinfo.org/sites/default/files/AGRICULTURAL_AND_CONSERVATION_POLICIES_2002_AND_BEYOND_1.pdf [https://perma.cc/U7SF-FFSX].

45. Press Release, U.S. Senator Patrick Leahy of Vermont, Vermont Highlights of 2008 Farm Bill (May 14, 2008), https://www.leahy.senate.gov/press/vermont-highlights-of-2008-farm-bill [https://perma.cc/7SNH-7HQF].

46. MEGAN STUBBS, CONG. RESEARCH SERV., R40197, ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP): STATUS AND ISSUES 3 (2010).

47. Personal communication with Obediah Racicot, Vt. Nat. Res. Conservation Serv. (Feb. 15, 2016).

that were seen as beneficial for increasing farm production and profitability ultimately proved detrimental to conservation and protection of water and natural resources. Wetlands, which are critical to water quality and flood resiliency, were routinely drained (sometimes with state and federal funding support) to increase crop production on marginal lands.[48] Trees and shrubs were cleared along riverbanks to allow for planting row crops in the rich, alluvial soils. Farming turned from mostly perennial grass-based practices to annual crop production and deep and continuous tillage—again exposing bare soils to fall and winter erosion. In Vermont, the 20th century was a time of dramatically changed crop production on farms coupled with increased negative impacts on the environment and natural resources of the state. Eroding soils carried phosphorus-laden soils to rivers, streams, and lakes. The lack of wetlands affected flood resiliency as more intense rainfall events occurred and non-forested buffers left streambanks without strong root systems to keep them secure.

The federal programs of the 1930s provided the architecture for the future of agriculture in the United States. Vermont's farming economy evolved through the mid-1900s and was characterized by a diversified farm economy with an increasing presence and focus on dairy.[49] The farms were typically small family operations with subsistence activities and products aimed at the New England and New York dairy markets.[50] These farms covered Vermont's diverse landscape and maintained much of the open land created in the 1800s, supporting the village countryside pattern of land use that has become the state's hallmark. Those farms produced the maple and dairy products that have become the marquee-brand food products for which Vermont is renowned. Dairy became the primary agricultural product in terms of revenue and land use and, by the 1960s, there were more than 6,000 dairies in Vermont averaging 6,000 pounds of milk per year,[51] achieving production rates that were never thought possible by the early subsistence farmers. These family farms are what helped create the self-reliant, independent Vermonter that cared about community and understood that their livelihood depended upon their natural environment. These farmers and the business people who supported them were also the people who served as community leaders, selectmen, and legislators. These small, grass-based, diversified dairy farms and supporting businesses were the

48. FARM DRAINAGE IN THE UNITED STATES. HISTORY, STATUS, AND PROSPECTS 8–9 (George A. Pavelis ed., 1987), http://files.eric.ed.gov/fulltext/ED295043.pdf [https://perma.cc/HS3A-RGXE].

49. Parsons, *supra* note 21, at 2.

50. Email from Roger Albee to Chuck Ross, Secretary, Vt. Agency of Agric., Food & Mkts., & Marli Rupe, Assistant Program Manager, Clean Water Initiative Program, Vt. Dep't of Envtl. Conservation (Jan. 31, 2016) (on file with authors).

51. Parsons, *supra* note 21, at 3.

economic and cultural bedrock of Vermont in the 1940s and early 1950s. They were the "essence of Vermont" at that time, but Vermont was changing and so would the face of agriculture.

III. CHEAP FERTILIZER, CHEAP FOOD, AND SAFE FOOD

The change that was afoot included a march toward greater productivity and efficiency supported by national cheap food policies advanced during the Great Depression and World War II. The national dairy policies developed during and after the Depression were of particular importance because they influenced the evolution of dairy farming and the prices received by farmers and paid by consumers.[52]

The federal government's support for agricultural productivity grounded in scientific analysis encouraged the farmers to become more efficient and productive, exemplified by the importation of freight trains of phosphorus fertilizer paid for by the federal government—a program implemented nationally, including in Vermont.[53] The cheap phosphorus was aimed at increasing soil fertility and crop yields and was applied liberally by farmers all over the state. At the same time, federal funds through the former USDA Agricultural Stabilization and Conservation Service helped farmers drain wet fields, often wetlands, to increase the acreage available for annual crop production.[54] These early practices encouraged by government policy and subsidies and supported by academic research contributed to—and now conflict with—the water quality anti-degradation and phosphorus reduction policies of today.

Ironically, federal policy aimed at a bountiful and safe food supply required dairy farmers to install bulk milk tanks and cement floors in their barns to protect the quality and safety of the milk they were shipping.[55] These infrastructure improvements were often difficult or impossible to implement because the cost was beyond economic capacity of many of the Vermont farms that were located on rocky hillsides with low acreage and marginal or wet soils.

The confluence of these policies and the economics of the time dramatically accelerated changes on the farm and thereby the economy,

---

52. ERIC M. ERBA & ANDREW M. NOVAKOVIC, THE EVOLUTION OF MILK PRICING AND GOVERNMENT INTERVENTION IN DAIRY MARKETS 9–10 (1995), http://dairy.wisc.edu/pubPod/pubs/EB9505.pdf [https://perma.cc/9NVF-AWM3].

53. Email from Roger Albee, *supra* note 50.

54. FARM DRAINAGE IN THE UNITED STATES, *supra* note 48, at 8.

55. Curt A. Gooch, *Considerations in Flooring*, DELAVAL MILKPRODUCTION.COM (Nov. 28, 2005), http://www.milkproduction.com/Library/Scientific-articles/Housing/Considerations-in-flooring/ [https://perma.cc/R3YV-9TJ8]; *Historical Timeline: History of Cow's Milk from the Ancient World to the Present*, PROCON.ORG, http://milk.procon.org/view.timeline.php?timelineID=000018 [https://perma.cc/W6LZ-SW24] (last updated July 10, 2013).

communities, and environment of Vermont. While the bulk tank and cement floor requirements were significant change agents in Vermont, they were manifestations of the unrelenting push for efficiency and productivity that characterized the United States after World War II, from which Vermont agriculture was not immune. The result was a steady increase in production driven by efficient techniques and economies of scale that rewarded larger farms with the financial ability to invest.[56] The federal government's support for commodity programs assured that farmers received enough money for their products. These programs and various subsidies coupled with education and technical assistance helped farmers to modernize, stay in business, and continue to increase production.

In Vermont, smaller farms (less than 100 cows) had traditionally emphasized pasturing and smaller herds, but the development of larger farms, soon over 1,000 cows, changed the landscape, with more annual crops and less ground cover of grasses and trees. It also changed animal management. Both had water quality effects. As herd size increased, pasturing was more difficult and land was needed for crops that produced more feed per acre. Animals were contained in barns full-time, with limited access outside, usually on a small, concrete or beaten down dirt barnyard.[57] The resulting concentration of manure led to further pollution concerns. Manure's value as a fertilizer was a key reason for animals to be part of early agriculture. Today, manure increases in quantity on a per cow basis as milk production increases; these increasing volumes of manure need to be moved, managed, and distributed efficiently around the farm.[58]

The on-farm changes were matched by changes in the businesses and industries supporting agriculture. Up and down the supply chain of the United States food system, business and industry (and the political system, in partnership with the farmers) made changes that enabled American agriculture to significantly increase the quantity of food available for domestic use and export.[59] Like the rest of the nation's economy, the food system did not always assess or penalize the production of negative externalities, especially intangible values not easily captured in the market place. Agriculture was part of the same economic system that allowed industry to discharge wastes to the air, water, and soil—the system that allowed the Cuyahoga River to catch fire, acid rain to sterilize lakes in the

---

56. CAROLYN DIMITRI ET AL., THE 20TH CENTURY TRANSFORMATION OF U.S. AGRICULTURE AND FARM POLICY 2 (2005), http://www.ers.usda.gov/media/259572/eib3_1_.pdf [https://perma.cc/RM7C-RB4K].

57. Gooch, *supra* note 55.

58. JAMES M. MACDONALD ET AL., MANURE USE FOR FERTILIZER AND FOR ENERGY iii, 1, 4, 18 (2009), http://www.ers.usda.gov/media/377377/ap037fm_1_.pdf [https://perma.cc/8U3V-UYTZ].

59. DIMITRI ET AL., *supra* note 56, at 2.

Adirondacks, and the Love Canal to poison groundwater. American agriculture as part of the American economy was part of a system that used pesticides that poisoned our birds, plowed and tilled fields in ways that eroded our soils, tiled and filled our wetlands, and allowed excess nutrients and chemicals to run-off our farms and pollute our waters.

Vermont agriculture reflected this national system. Farm productivity increased dramatically and farms consolidated. For example, in Franklin County the number of farms declined from 2,500 in the late 1800s to less than 800 in 1990.[60] As the declining number of farms demonstrates, many farmers could not sustain their businesses in the changing economic climate and chose—or were forced—to go out of business. To better navigate this economy in which corporations exercised economic strength in the market, farmers banded together to initiate and lead cooperatives that exercised the legal power of the Capper-Volstead Act of 1922.[61] Cooperatives provide farmers greater leverage in the market place by combining their economic power and enabling them to negotiate with other players in the supply chain. The strength cooperatives provided farmers increased in importance as the size and strength of the other businesses in the supply chain increased.[62]

Initially, the dairy cooperatives were dealing with many companies that bought and processed raw milk and retailers who sold the finished product to the consumer.[63] These businesses were ubiquitous within the supply chain and competitive with one another. But over the years, cooperatives, like the farms, consolidated and became or have nearly become oligopolistic enterprises. They have been accused of exercising leverage in the market place to suppress prices and/or to increase their profitability at the expense of the farmers.[64] Low prices and low margins constrain profitability and increase stress on farms already working on small margins. This is further exacerbated by a federal milk pricing system that few people understand, or can explain, and which has amplified price swings. The result has been a dairy economy in which margins are low, prices are highly volatile, and profitability is inconsistent and accompanied by long periods

---

60. KAREN HYDE ET AL., HISTORY OF PHOSPHORUS LOADINGS TO ST. ALBANS BAY, 1850-1990 9 (1994), http://www.lcbp.org/wp-content/uploads/2013/03/7B_History-of-Phosphorus-Loading-to-St.-Albans-Bay-1850_1990.pdf [https://perma.cc/Q7YM-9XY7].

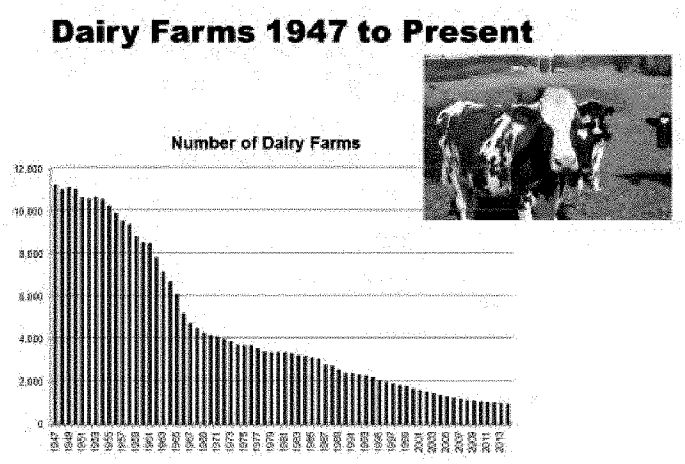
61. Donald M. Barnes & Christopher E. Ondeck, The Capper-Volstead Act: Opportunity Today and Tomorrow (Aug. 5, 1997) (unpublished manuscript), http://www.uwcc.wisc.edu/info/capper.html [https://perma.cc/LPY5-7DEM].

62. *Id.*

63. *Id.*

64. Complaint at 2, 12, United States v. Dean Foods Co. (E.D. Wis. 2011) (No. 10-C-0059).

of low-profit or below-cost-of-production operations.[65] This has created a nearly irresistible need to decrease cost, increase revenues, increase efficiency, and build economies of scale through expansion. The result over time has been the dramatic decline in the number of dairy farms in Vermont. Nationally, this includes the ongoing pressure to consolidate and get big to compete, the loss of small and medium sized farms, and the loss of good agricultural land.[66] The forces that accompanied the modernization of Vermont agriculture and dairying and the changes they induced can be seen in the charts below:



> The structure of Vermont agriculture changed over time with a large reduction in farm numbers as many small and inefficient farms went out of business and those that remained got larger and more efficient.[67]

A. National Response to Low Prices and Decline in Farms

Society has responded to the problem of low milk prices by passing a range of new public policies. In 1986, the federal government established a program called the "Whole Herd Buyout," which bought farmers' herds in

65. *See* JEFFREY WEISEL, THE NEED FOR CHANGE IN THE DAIRY INDUSTRY, www.justice.gov/atr/public/workshops/ag2010/001/AGW-00006-a.doc (last visited Apr. 4, 2016) (describing how the complex pricing system for dairy has created ranges in production costs and consumer prices).

66. DIMITRI ET AL., *supra* note 56, at 3.

67. Presentation by Dan Scruton, Dairy Section Chief, Vt. Agency of Agric., Food & Mkts., to Vt. Agency of Agric., Food & Mkts. staff (data on file with Vermont Journal of Environmental Law), (the date of the presentation is not available).

an effort to reduce production and thereby increase prices.[68] More recently, the federal government has included the Milk Income Loss Contract ("MILC") and the Dairy Security Act ("DSA") provisions. The MILC program was designed to augment poor prices after they fell to a certain level.[69] The DSA provision was designed to replace MILC with an insurance program that provides coverage when profitability margins become too small.[70]

In the early 1990s, following the Whole Herd Buyout and prior to the MILC, Vermont also helped by leading the effort to pass the New England Interstate Dairy Compact. This program, passed as part of the 1996 Farm Bill, allowed the six New England states to band together to set prices for Class 1 fluid milk[71] sold in the region and thereby increase the financial returns to producers.[72] Because the operation of the New England Interstate Dairy Compact triggered the Interstate Commerce Clause, this program required Congressional approval.[73] Senator Leahy, who sat on both the Agriculture and Judiciary committees in the U.S. Senate, led a coalition of senators and representatives of both parties to get Congress to take the necessary action to support this program. In 2006, Vermont also passed legislation that provided direct support from Vermont taxpayers to supplement the income of dairy farmers.[74] This program only lasted one year and paid out approximately $11 million.[75]

B. The Vermont Response to Farm and Farmland Losses

In 1988, Vermont established policies impacting land use that in turn had dramatic effects on agricultural economics and sustainability. In 1986, concern about the development pressure and sprawl on valuable agricultural

---

68. Scott Brown, Food & Agric. Policy Research Inst., Univ. of Mo., History of Federal Dairy Programs: Presentation to the Dairy Industry Advisory Committee 17 (Apr. 13–15, 2010), http://www.fsa.usda.gov/Internet/FSA_File/1_2_overview_brown.pdf [https://perma.cc/RRR7-5GUZ].

69. *Id.* at 20.

70. LINNEA CARLSON, MILKING THE TRUTH: THE FACTS ABOUT DAIRY FARMING IN THE UNITED STATES, https://apps.carleton.edu/curricular/posc/assets/Carlson_Milking_the_Truth.pdf [https://perma.cc/4RZ6-ZLWL] (last visited July 22, 2016).

71. NE. DAIRY COMPACT COMM'N, http://dairycompact.org/ [https://perma.cc/RF7G-DWDK] (last visited Apr. 11, 2016).

72. ED JESSE & BOB CROPP, BASIC MILK PRICING CONCEPTS FOR DAIRY FARMS 19 (2008), http://future.aae.wisc.edu/publications/basic_milk_pricing.pdf [https://perma.cc/WKS4-3WK6].

73. RALPH M. CHITE, CONG. RESEARCH SERV., 96-814 ENR, THE NORTHEAST INTERSTATE DAIRY COMPACT 2 (Oct. 7, 1996), http://dairy.wisc.edu/PubPod/Reference/Library/Chite.10.1996.pdf [https://perma.cc/ECS9-B5K7].

74. H.406, 2005-2006 Leg. Sess. (Vt. 2005).

75. Email from Diane Bothfeld, Deputy Secretary, Vt. Agency of Agric., Food & Mkts., to Marli Rupe, Assistant Program Manager, Clean Water Initiative Program, Vt. Dep't of Envtl. Conservation (Feb. 17, 2016) (on file with authors).

lands and availability of affordable housing caused the legislature to enact the Vermont Housing and Conservation Trust Fund Act and fund it with $3 million.[76] Since then, the Vermont Housing and Conservation Board ("VHCB") has used state and federal funds to buy development rights from farmers, thereby paying the farmland owner for their equity while conserving the land and restricting its future use to agriculture through conservation easements.[77] This program has enabled VHCB to conserve almost 400,000 acres of land, but it has also made land acquisition a possible option for new farmers who could never afford to purchase agricultural land at development value.[78]

In 1978, Vermont passed the state-funded Use Value or "Current Use" program. This program provided substantial tax benefits to farmers and forest landowners to keep their land in agriculture and forest production.[79] The land is then taxed at its "current use" rather than its highest market value rate.[80] Enrollment in the Current Use program saved thousands of dollars every year in abated property tax dollars for those farmland owners who enrolled and many considered it to be Vermont's most important farmland conservation program.[81]

While these programs have helped to bolster income at various times and provided property-tax breaks to reflect the broader societal importance of farming and farmland to Vermont, they did not stop the loss of farms and farmland or the devastating price swings experienced by dairy farmers. These programs did not address the emerging issue of Vermont's declining water quality or the role of agriculture's contribution or responsibility as part of the solution.

IV. RECOGNITION OF WATER QUALITY CHALLENGES

Programs have been developed to assist farmers in their manure management, including the installation of manure pits to collect and manage the liquid manure being generated by an increasing number of farms. Many of these farmers were increasing grain inputs and

---

76. *VHCB Conservation Programs*, VT. HOUSING & CONSERVATION BOARD, http://www.vhcb.org/conservation.html [https://perma.cc/V8SF-SSKJ] (last visited Apr. 5, 2016).

77. *Id.*

78. *Id.*

79. VT. STAT. ANN. tit. 32, §§ 3750–3777 (2016).

80. *Current Use*, RURAL VERMONT, http://www.ruralvermont.org/issues-main/current-use/ [https://perma.cc/6ZQA-Z6RC] (last visited Mar. 29, 2016); VT. STAT. ANN. tit. 32, § 3756.

81. JAMEY FIDEL ET AL., COMMUNITY STRATEGIES FOR VERMONT'S FORESTS AND WILDLIFE: A GUIDE FOR LOCAL ACTION 19–20 (2013), http://vnrc.org/wp-content/uploads/2013/08/VNRC-Forestland-Conservation-10-1-links.pdf [https://perma.cc/AV5R-3NF5]; *Current Use*, *supra* note 80.

concentrating cows onto larger farms in order to increase efficiency and production and, in many cases, greater revenues and profitability.[82] The increased milk production also required increased grain use, resulting in increased manure generation and a need for new management systems and equipment.[83] The need to feed high-energy grain containing corn imported from outside the region incentivized farmers to raise their own corn in order to reduce costs. This led to further water quality impacts as perennial grassland was turned over into annual corn ground. In Franklin County alone, acreage in corn increased from between 4,000 and 6,000 acres (1900–1930) to over 17,000 acres in 1980.[84] Heavy applications of manure and commercial fertilizers were applied to assure the fertility required for high corn yields, which were necessitated by the market demand for increases in efficiency and production.[85]

In early agriculture, manure was a relatively dry product, combined with bedding in cow stalls and removed from barns by scrapers that cleaned the gutters behind the cow stalls and carried the manure to a mechanical spreader outside the end of the barn. It was distributed around fields during the growing season and often in winter too, spread on snow and frozen ground, with no chance to infiltrate soil and causing winter runoff to streams and lakes. Some winter manure was stacked in fields to be used in the spring as soon as the ground thawed.

As farms grew in size, changes in dairy feed management that greatly increased protein intake and barn designs that required less bedding, resulted in a more liquid manure and that transition from stackable bedding manure to a contained slurry-like waste marked a dramatic change in water quality impacts. Liquid manure flows more easily across the sloped fields of Vermont and wastes in barnyards that were built for short daily animal exercise became problematic as they ran to nearby small ditches and brooks.[86]

V. LAKE CHAMPLAIN BASIN PROGRAM—A MULTI-JURISDICTIONAL EFFORT

82. DIMITRI ET AL., *supra* note 56, at 2.

83. *See generally* Mary Beth de Ondarza, *Manure Evaluation*, DELAVAL MILKPRODUCTION.COM (Oct. 10, 2000), http://www.milkproduction.com/Library/Scientific-articles/Nutrition/Manure-evaluation/ [https://perma.cc/8VX7-J9EU] (explaining how grain affects cow manure).

84. HYDE ET AL., *supra* note 60, at 9.

85. *Id.* at 8–9 (explaining how changes in agricultural practices led to increased phosphorus yield on farms).

86. Author's personal knowledge.

The decade of the 1990s would see an increase in concern and efforts to address what was becoming understood as a real challenge to the water quality of Lake Champlain, specifically to its smaller sub-watersheds of the South Lake, Missisquoi Bay, and St. Albans Bay. In 1990, Lake Champlain was designated as a resource of national significance[87] by a law drafted by Senators Jeffords and Leahy and supported as co-sponsors by New York Senators Moynihan and D'Amato. The goal of this law was to bring together the varied interests concerned with Lake Champlain to develop a comprehensive pollution prevention, control, and restoration plan for the lake.[88] The Lake Champlain Basin Program ("LCBP") was created and composed of representatives from many stakeholder groups and citizens including the Vermont Secretary of Agriculture and other agriculturally oriented representatives.[89] The stakeholder representatives governed the operations of the LCBP and subsequently developed Memoranda of Understanding ("MOUs") with the United States and Canadian governments.[90] In 1996, the LCBP wrote the first water quality plan coordinating the efforts of Vermont, New York, and Quebec around their shared waterbody. The collaborative plan was called *Opportunities for Action* ("OFA").[91] It examined the water quality problem, helped identify the significance of the problem, and proposed an array of mitigating actions that could be taken by various stakeholders in the two states and Canada.[92] The most recent update to OFA was in 2010, but the plan is maintained on LCBP's website as an interactive and dynamic site where chapters, goals, actions, and tasks are listed and continuously updated.[93]

The Vermont Statehouse also voiced public and scientific concern about water quality. The first conservation laws were passed in 1967, including the Soil Conservation Act and the Conservation and Development statute under Title 10, which established policies of the NRCDs.[94] Other related policies on wetlands, land conservation, and watershed protection, largely administered by the Agency of Natural Resources ("ANR"), were also included. It was under Title 6, however, where the first agricultural

87. Lake Champlain Special Designation Act of 1990, 33 U.S.C. § 1324(d)(2) (2012).

88. *Id.* § 1270(a)(1).

89. *Mission*, LAKE CHAMPLAIN BASIN PROGRAM, http://www.lcbp.org/about-us/mission/ [https://perma.cc/MX63-C3BQ] (last visited Apr. 19, 2016).

90. *Id.*

91. *Lake Champlain Opportunities for Action Management Plan*, LAKE CHAMPLAIN BASIN PROGRAM, http://plan.lcbp.org/ [https://perma.cc/AMN6-KJ85] (last visited Apr. 19, 2016).

92. *Opportunities for Action: An Evolving Plan for the Future of the Lake Champlain Basin: A Strategy for Implementing the Plan*, LAKE CHAMPLAIN BASIN PROGRAM, http://plan.lcbp.org/ofa-database/chapters/a-strategy-for-implementing-the-plan [https://perma.cc/NTJ5-DV94] (last updated Mar. 18, 2015).

93. *Lake Champlain Opportunities for Action Management Plan*, *supra* note 91.

94. VT. STAT. ANN. tit. 10, § 701 (2016).

water quality regulations were created and administered by the Agency of Agriculture.[95] This separation established in the law impacts how agricultural policy is developed, administered, and enforced separately than other sectors (even today) and reflects the strong historic support for agriculture by lawmakers in Vermont. Title 6 requires inspection of farms for sanitation and public health concerns.[96] However, environmental concerns were not addressed until 1991, when the Vermont Commissioner of Agriculture was first given a mandate to require certain agricultural land use practices to protect water quality.[97] Four years later, Vermont's first agricultural water quality regulations were created.

VI. THE ACCEPTED AGRICULTURAL PRACTICES AND STATE WATER QUALITY REGULATION

In 1995, the Accepted Agricultural Practices ("AAPs") were first adopted.[98] As written in the AAPs,

> Recognizing the need to protect and improve water quality through improved agricultural practices, the Vermont legislature charged the Agency of Agriculture, Food and Markets with creating a comprehensive Agricultural Nonpoint Source Pollution Reduction Program including Accepted Agricultural Practices and Best Management Practices. The legislature also recognized the need to balance water quality improvements with the need to sustain a healthy, economically viable agricultural industry.[99]

This desired balance of public health, agricultural viability, and the requirement that practices be both technically feasible and cost effective for farmers to implement became a point of contention when future regulations were developed. The AAPs were not designed, nor intended, to eliminate pollutants entering surface water, but were expected to decrease practices that would pollute or impact water quality. Nonetheless, the AAPs served as the regulatory floor with respect to water quality protection for all Vermonters engaged in agricultural practices and this constituted the first

---

95. VT. STAT. ANN. tit. 6, § 4810 (2016).
96. *Id.* § 4851(h).
97. VT. STAT. ANN. tit. 10, § 1679(c).
98. *Required Agricultural Practices (RAPs): Current Accepted Agricultural Practices*, VT. AGENCY OF AGRIC. FOOD & MKTS., http://agriculture.vermont.gov/water-quality/regulations/rap [https://perma.cc/R4UR-7QEJ] (last visited Apr. 19, 2016).
99. VT. AGENCY OF AGRIC., FOOD & MKTS., ACCEPTED AGRICULTURAL PRACTICE REGULATIONS § i (Apr. 24, 2006) (updating the language from the 1995 AAPs), http://agriculture.vermont.gov/sites/ag/files/ACCEPTED%20AGRICULTURAL%20PRACTICE%20REGULATIONS.pdf [https://perma.cc/Y2VP-SBW8].

major regulatory effort focused on agriculture to conserve and protect water quality.

At this time, there were approximately 2,000 dairy farms, ensuring dairying was still by far the dominant farming activity in the state and the sector of agriculture most affected by the AAPs.[100] These new rules dramatically changed the landscape of agricultural practices. The AAPs established that spreading of wastes (manure) was prohibited between December 15 and April 1.[101] This increased the number of farms that needed to install manure storage pits. Many smaller farms continued to stack manure with the intention of creating storage away from waterways. The AAPs also required the establishment of vegetative buffers between annual cropland and streams to filter nutrients and sediment from field erosion.[102] The rules also established minimum distances between stacking sites and water and required that waste management systems did not discharge into water.[103] Farms were now required to do soil tests, apply nutrients only according to crop needs, and manage soil erosion.[104]

These regulatory standards required farmers to change how they farmed and, in many circumstances, make substantial investments in order to comply, such as building manure storage pits and improving barnyard areas and silage storage systems. The AAPs were intended to reduce agriculture's adverse impact on water quality. While the intentions were well-founded, and many farmers did change how they farmed and made investments to mitigate their impacts, the knowledge and adoption of these regulations was not uniform and waned overtime.

A key part of the AAPs was the clarification of roles for the Vermont Agency of Agriculture, Food and Markets ("VAAFM") and ANR, which were, as mentioned, distinctly identified in separate titles of state statutes.[105] ANR is the agency delegated by the federal Environmental Protection Agency ("EPA") as the lead state water quality agency, thereby responsible for the management and enforcement of all water quality and water pollution control.[106] The Vermont legislature required that VAAFM cooperate with ANR in developing the Agricultural Nonpoint Source Pollution Reduction Program.[107] In 1999, the first MOU was developed between the two agencies to outline agricultural water quality oversight and

---

100. Authors' personal knowledge.
101. ACCEPTED AGRICULTURAL PRACTICE REGULATIONS, *supra* note 99, § 4.03.
102. *Id.* §§ ii, 4.06.
103. *Id.* § 4.02.
104. *Id.* §§ i, 4.04.
105. *Id.* § iii (explaining the roles of the agencies in implementing the AAPs).
106. *Vermont Agency of Natural Resources*, ENVTL. COUNCIL STATES, http://www.ecos.org/section/states/?id=VT [https://perma.cc/84LZ-ZTLQ] (last visited Apr. 4, 2016).
107. VT. STAT. ANN. tit. 6, § 4810.

enforcement.[108] While ANR retained its overall water quality authority, it clearly delegated responsibility for agricultural water quality and enforcement to VAAFM.[109]

A. Large Farm Permits

Nationally, EPA focused attention on the dramatic increase in large agricultural operations. Vermont followed suit with the creation of the Large Farm Operations ("LFO") program in 1995 and LFO rules in 1999.[110] The Vermont LFO initiative provided a distinct alternative to the Confined Animal Feeding Operation ("CAFO") permit process being advanced nationally by EPA. The LFO permit was more restrictive than the CAFO permit but allowed farmers to avoid publicly sharing their nutrient management plans as required of CAFO permit holders.[111] The LFO program required all farms with more than 700 mature cows (or comparable numbers of other species) to be individually permitted by VAAFM, have no nutrient discharges, be regularly inspected, and meet a higher standard of water quality protection than smaller farms by including lower soil erosion tolerance and wider stream buffers.[112] LFOs also had to request permission to build new structures from the Secretary of Agriculture, who then had the authority to call for a public informational meeting addressing the request.[113] This process addressed a dramatic change in authority of farm management in a state where landowners historically cherished their personal rights and privacy. In 2016, there are twenty-six LFOs in Vermont.[114]

---

108. Memorandum from Roger Albee, Sec'y, Agency of Argic., Food & Mkts., to George Crombee, Sec'y, Agency of Nat. Res., Act 78 Memorandum of Understanding (Sept. 17, 2007), http://legislature.vermont.gov/assets/Documents/2016/WorkGroups/Senate%20Natural%20Resources/Bills/S.49/Witness%20Testimony/S.49~ANR-Department%20of%20Environmental%20Conservation~2007%20AAFM%20-%20Large%20Farm%20MOU%20with%20DEC~4-9-2015.pdf [https://perma.cc/Z3R3-FR2A].

109. *Id.*

110. VT. STAT. ANN. tit. 6, §§ 4849–4852; VT. AGENCY OF AGRIC., FOOD & MKTS., LARGE FARM OPERATION REGULATIONS (1999), http://agriculture.vermont.gov/sites/ag/files/LFO%20Rules.pdf [https://perma.cc/8YVU-9XJS]; *Regulations for Large Farm Operations (LFOs)*, VT. AGENCY OF AGRIC., FOOD & MKTS., http://agriculture.vermont.gov/water-quality/regulations/lfo [https://perma.cc/A77H-NR96] (last visited Apr. 19, 2016).

111. *Regulations for Large Farm Operations (LFOs)*, *supra* note 110.

112. *Id.*

113. *Id.*

114. Email from Nathaniel Sands, Vt. Agency of Agric., Food & Mkts., to Marli Rupe, Assistant Program Manager, Clean Water Initiative Program, Vt. Dep't of Envtl. Conservation (Oct. 9, 2015) (on file with authors).

In 2006, when dairy farm numbers had declined to 1,182 farms,[115] but the size of the remaining farms continued to grow, the AAPs were revised to recognize changes in farm management and amendments to Title 6 statutes.[116] The AAP regulations were then amended to include requirements related to the management of streambanks, animal mortalities, groundwater contamination, and setbacks for manure storage and land application.[117] It was at this time that the Medium Farm Operations ("MFO") program was passed in state law creating a general permit for medium sized farms, which for dairy was between 200 and 700 mature cows.[118] The MFO law also allowed for covering smaller farms identified as contributors to water quality impairment, but no small farms were ever brought under this rule.[119]

A major concern following the passage of these MFO and LFO rules was the lack of funding to support their implementation. LFOs were inspected annually and MFOs at least once every five years.[120] VAAFM was able to meet these requirements and address citizen-driven complaints on smaller farms, but the agency had little capacity to provide additional outreach and technical assistance to small farms. Because of the clear scientific link between ongoing water quality impairments and increasing intensity of agricultural activities, policy makers, scientists, farmers, and water quality practitioners all agreed additional measures were needed on the farm. Best management practices ("BMPs") were developed and consisted of a range of farming practices and infrastructure improvements that could be used on farms to mitigate or eliminate negative impacts on water quality. As a result, the 1990s and 2000s saw the start of the extensive collaborative partnerships between state agencies and non-governmental organizations ("NGOs") that have since brought millions of dollars of assistance to farmers and built the capacity of important non-profit organizations.

It was understood that BMPs would likely cost farmers more money to implement than the simpler, cost effective AAPs. Consequently, additional funding was appropriated through federal and state budgets. The federal Farm Bill appropriated resources to NRCS and deployed both financial and

---

115. Dan Scruton, The Number of Dairy Farms in Vermont (on file with Vermont Journal of Environmental Law), (last updated 2016).

116. ACCEPTED AGRICULTURAL PRACTICE REGULATION, *supra* note 99.

117. *Id.*

118. *Regulations for Medium Farm Operations (MFOs)*, VT. AGENCY OF AGRIC., FOOD & MKTS., http://agriculture.vermont.gov/water-quality/regulations/mfo#A2 9 [https://perma.cc/8RXS-DWYV] (last visited Apr. 3, 2016).

119. VT. STAT. ANN. tit. 6, § 4858(a), (d).

120. *Regulations for Medium Farm Operations (MFOs)*, *supra* note 118.

technical assistance through their EQIP program.[121] By 2000, the EQIP program was funding $2.5million of BMPs per year in Vermont, and the allocations increased over time.[122] These funds were contracted on a voluntary basis, but state regulatory oversight helped encourage farmers to apply for and take advantage of the technical and financial assistance being offered through EQIP. The state and federal programs worked together with other partner non-profit organizations to allocate funding to the highest priority and most cost-effective projects. While the assistance and resources led to effective on-farm conservation practice implementation, the complexity associated with the multiple programs, processes, and funding at times made it difficult for the applicants to access the funds and for the organizations to allocate the funding in the most effective way. The partnerships and collaborations with NGOs remained critical to addressing these concerns.

Another challenge to on-farm improvement is the variability between farms. Every farm in the state is different with respect to management, layout, infrastructure, and finances and application of these resources required individual evaluation. Production areas (main barnyard, housing, and feeding areas) were the first targets for BMP implementation, as VAAFM staff began required inspections in the 1990s on MFOs and LFOs.[123] For many farms, installation of in-ground or above-ground manure storage tanks or pits were a necessary investment to comply with the winter spreading ban, costing as much as $500,000 for the larger lined manure pit.[124] As livestock moved inside and off pasture, hay and corn had to be harvested and preserved (ensiled) for efficient feed management. The ensiling process produces a high quality feed for animals, but it can also result in liquid seepage as the silage "cooks." The seepage, known as leachate, is a highly concentrated brew of nutrients with high biological oxygen demand ("BOD") that quickly consumes oxygen when it hits

---

121. *Environmental Quality Incentives Program*, NAT. RESOURCES CONSERVATION SERV., http://www.nrcs.usda.gov/wps/portal/nrcs/main/vt/programs/financial/eqip/ [https://perma.cc/J88R-7KWT] (last visited Apr. 5, 2016).

122. Personal communication with Obediah Racicot, Vt. Nat. Res. Conservation Serv. (Oct. 20, 2015).

123. *Regulations for Large Farm Operations (LFOs)*, *supra* note 110; *Regulations for Medium Farm Operations (MFOs)*, *supra* note 118.

124. *See, e.g.*, U.S. DEP'T OF AGRIC., NAT. RES. CONSERVATION SERV., COSTS ASSOCIATED WITH DEVELOPMENT AND IMPLEMENTATION OF COMPREHENSIVE NUTRIENT MANAGEMENT PLANS: PART I—NUTRIENT MANAGEMENT, LAND TREATMENT, MANURE AND WASTEWATER HANDLING AND STORAGE, AND RECORDKEEPING 82 (2003), http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_012131.pdf [https://perma.cc/HX4M-3EJ3] (explaining the cost per gallon of a lined storage pond).

surface water, dramatically affecting living organisms in the water.[125] Because of the significant impact of leachate on water quality, BMPs are often installed at a significant cost to manage and treat the leachate. BMPs varied from containment in manure pits or independent structures or in-field treatment areas where leachate was absorbed by growing vegetation. Barnyards that eroded dirt and manure to ditches or water sources needed to be managed and controlled with concrete infrastructure where manure could be scraped and collected. Heavily used animal walkways that quickly turned into mucky, manure-rich mud that ran off into ditches needed to be graded, elevated, and surfaced with gravel for stability. Between 1996, when the program began, and 2000, $1.7 million was spent on BMP improvements to bring these primary production areas into regulatory compliance.[126] Because these improvements were so widely needed and costly to implement, the need far exceeded the available funding. Consequently, not all farms received the financial assistance needed to install and implement the necessary BMPs. This shortfall in BMP implementation was further exacerbated by the ongoing shortage of funding and personnel necessary to reach out to the hundreds of small dairy operations (smaller than 200 milk cows) and beef and horse farms also in need. Consequently, only about 50% of the dairy cows in Vermont fell under proactive regulation with attendant outreach, education, and technical assistance. The remaining dairy cows and tens of thousands of other animals only received attention on a complaint driven basis from VAAFM.

B. Clean and Clear and Collaboration

The technical and financial assistance required by the agriculture industry were only part of the water quality problem and other sectors found similar challenges. A new era of collaboration began in 2003 with the creation of the Clean and Clear Program, which had the goal to accelerate the reduction of phosphorus pollution in Lake Champlain.[127] In 2008, a Clean and Clear coordinator was hired and worked with both secretaries of Natural Resources and Agriculture. Funding for water quality improvement increased by coordinating activities and using increased state funds to

---

125. *See CAFO Glossary*, SIERRA CLUB, http://www.sierraclub.org/michigan/cafo-glossary [https://perma.cc/7DYM-2FAA] (last visited Apr. 19, 2016) (explaining how BOD affects oxygen levels in water).

126. Email from Jeff Cook, Vt. Agency of Agric., Food & Mkts., to Marli Rupe, Assistant Program Manager, Clean Water Initiative Program, Vt. Dep't of Envtl. Conservation (Feb. 17, 2016, 3:43 PM EST) (on file with Vermont Journal of Environmental Law).

127. Vt. Governor James H. Douglas, Clean and Clear Water Action Plan (Sept. 30, 2003) (transcript available at https://votesmart.org/public-statement/23255/clean-and-clear-water-action-plan-remarks-of-governor-james-h-douglas [https://perma.cc/A54W-GKLU]).

leverage additional federal resources. Opportunities for farmers and their partners also increased. While organizations like NRCDs and the University of Vermont Extension System had a long history of working with farmers, the breadth of the technical-assistance need and opportunity for allocation of new funding increased the capacity and activities of many new groups into agricultural assistance. Many of these groups have since become critical to the ongoing implementation of agricultural improvements. Some were watershed groups who increased their technical ability and with funding from state and federal programs, passed funding directly to farmers for BMP installation. In some cases, farmers who chose not to use governmental cost-share programs were able to get assistance through various non-profit groups to help with expensive project installations. The abilities of these watershed groups have increased greatly in the past ten years and, with state budget restrictions on increasing staff, their assistance and ability to receive funds to provide technical assistance is immeasurable. These groups also face the challenge of continuing to support themselves with limited administrative dollars. Both ANR and VAAFM work closely with these partners to help address these concerns as much as possible.

C. Critical Source Areas and Prioritization

An agreement between the governments of the United States and Canada in 2008 resulted in funding to the International Joint Commission to conduct the *Missisquoi Bay Critical Source Area Study*, a pivotal study that, for the first time, quantified the value of a targeted approach to BMP implementation.[128] Previously, NRCS funds were allocated primarily on a first-come, first-served basis and state dollars funded the most critical priority issues. This study showed that far greater improvements would be made by focusing resources on the critical source areas (the highest areas of phosphorus contribution to the lake). The study, conducted by Stone Environmental for LCBP, demonstrated that by addressing twenty percent of the problem (implementing practices on the areas of highest potential

128. *Missisquoi Bay Critical Source Area Study*, INT'L JOINT COMM'N, http://ijc.org/missisquoibayreport/ [https://perma.cc/Y8TL-KVLR] (last visited Apr. 19, 2016). The International Joint Commission prevents and resolves disputes between the United States of America and Canada under the 1909 Boundary Waters Treaty and pursues the common good of both countries as an independent and objective advisor to the two governments. In particular, the Commission rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes. Find more information at *IJC Mission and Mandates*, INT'L JOINT COMM'N, http://www.ijc.org/en_/IJC_Mandates#sthash.sk8ET58B.dpuf [https://perma.cc/82H6-KUKJ] (last visited Apr. 19, 2016).

phosphorus runoff), 80% of the agricultural water quality problem could be addressed in the Missisquoi River basin.[129] This study started a state-wide effort to find these "hot spots" on farms and provide assistance to address these concerns first.[130] Stone Environmental and NRCS used Geographical Information Systems ("GIS") to map the Missisquoi River Basin throughout the rest of the state over the next eight years.[131] This, coupled with the new Light Detection and Ranging ("LIDAR") mapping technology, gave state agencies and partners access to this new data, thus increasing the understanding in the farming community of the impacts of agriculture and the specific benefits that could be gained by targeted improvements.[132] By 2015, this focus influenced federal funding sources, which for the first time were allocated to priority watersheds and the highest benefit practices.

In 2011, in response to a lawsuit brought by the Conservation Law Foundation, EPA disapproved the Vermont portion of their prior approved 2002 Lake Champlain Total Maximum Daily Load ("TMDL") and required the state agencies to look at new options, new research, and new ideas to meet the phosphorus reduction needs of the Lake.[133] The State had already attempted to address these concerns with the creation of the Clean and Clear Program and new collaborations with partners, but the updated TMDL modeling showed the phosphorus problem was greater than before and additional reductions were needed. Governor Shumlin's administration had just begun and new leaders of both AAFM and ANR/Department of Environmental Conservation ("DEC") took office in early 2011. The first conversation between new Secretary Chuck Ross and new DEC Commissioner David Mears focused on the challenges of water quality, but neither knew that extreme weather events would increase their need for intensive collaboration and communication.

On April 13, 2011, Lake Champlain reached flood stage (100 feet above mean sea level) and remained above this level for 67 days, causing extensive impacts on the upper Lake Champlain Basin.[134] In August of

---

129. MICHAEL WINCHELL ET AL., IDENTIFICATION OF CRITICAL SOURCE AREAS OF PHOSPHORUS WITHIN THE VERMONT SECTOR OF THE MISSISQUOI BAY BASIN 78 (2011), http://www.lcbp.org/techreportPDF/63B_Missisquoi_CSA.pdf [https://perma.cc/7C4G-TVF7].

130. *Id.* at xvi.

131. *Id.* at 5.

132. *Id.* at 47.

133. Press Release, Envtl. Prot. Agency, EPA Takes Steps to Improve Lake Champlain Water Quality (Jan. 24, 2011), https://yosemite.epa.gov/opa/admpress.nsf/0/73DB2705E25A948B85257822006EEF39 [https://perma.cc/835P-RN7A].

134. *2011 Flooding*, LAKE CHAMPLAIN BASIN PROGRAM, http://www.lcbp.org/water-environment/water-quality/flooding/2011-flooding/ [https://perma.cc/72WD-22PS] (last visited Apr. 19, 2016).

2011, Tropical Storm Irene devastated parts of Vermont, including the southern Lake Champlain Basin, where small streams destroyed property and infrastructure and resulted in untold damage to water quality.[135] Both events brought the concept of "flood resiliency" to the forefront of agency planning and discussions. Both the Secretary of Agriculture and the Commissioner of DEC forged a partnership that was recognized throughout the state—by farmers and water quality partners—as a pivotal change needed for water quality improvement.[136]

The Shumlin administration quickly took an "all in" approach, directly and honestly recognizing the challenges ahead, but also acknowledging the value of previous efforts and the major improvements currently underway. The agencies began to integrate their efforts to break down historic silos and divergent cultures. The agencies worked jointly with over thirty groups and established the Agricultural Work Group to provide advice on the best methods to address the dramatic phosphorus reductions needed for agriculture in many Lake Champlain watersheds.[137] Many of the Agricultural Work Group recommendations were incorporated into the implementation plan for the pending EPA TMDL for Lake Champlain. These recommendations were included in 2015 in Vermont's Clean Water Act, Act 64.[138] The goal was to support sensible, cost-effective, innovative, and highest-priority practices to reduce agriculture's phosphorus pollution.

Other farmer-led efforts were also initiated around this time. In Franklin County, the Farmer's Watershed Alliance ("FWA") was established by farmers to help other farmers understand opportunities for water quality improvement, to help facilitate more on-farm research in coordination with the UVM Extension System, and to facilitate the transfer of funds to farmers for small, discrete projects.[139] Over several years, FWA funded grants of almost $500,000 to farmers, implementing 72 different

---

135. NAT'L OCEANIC AND ATMOSPHERIC ADMIN., SERVICE ASSESSMENT, HURRICANE IRENE, AUGUST 21–30, 2011 iv, 12 (2012).

136. Jacob Park & Christopher Brooks, *Local Flood Resiliency in an Era of Global Climate Change: Understanding the Multisectoral Policy Dimensions*, 17 VT. J. ENVTL. L. 160, 173 (2015).

137. VT. AGENCY OF AGRIC. ET AL., FINAL REPORT OF THE AGRICULTURAL WORKING GROUP 4 (2013), http://www.emcenter.org/wp-content/uploads/2012/10/Final-Report-of-the-AWG.pdf [https://perma.cc/W3CW-74G9].

138. *Id.*; U.S. ENVTL. PROT. AGENCY, PHOSPHORUS TMDLS FOR VERMONT SEGMENT OF LAKE CHAMPLAIN 60 (2015), http://winooskinrcd.org/wp-content/uploads/phosphorus-tmdls-vermont-segments-lake-champlain.pdf [https://perma.cc/MM7K-4BMY]; VT. STAT. ANN. tit. 10, § 1386.

139. *Mission of the Farmers' Watershed Alliance*, FARMER'S WATERSHED ALLIANCE (Apr. 3, 2011), http://farmerswatershedalliance.com/?p=33 [https://perma.cc/997T-KXSE].

water quality improvement projects.[140] In 2012, the Champlain Valley Farmer Coalition formed as an advocacy group for farmers, providing testimony at the statehouse and input to agencies and doing extensive farmer outreach and education.[141] In 2015, another farmer-led group, the Connecticut River Farmers' Watershed Alliance, was created with the primary goal of providing technical and mentoring assistance to other farmers on the eastern side of the state.[142]

These organizations, along with state agencies, UVM, and non-profits, recruited millions of dollars in grant funds to help with farmer projects and education. NRCS Conservation Innovation Grants funded at least three agricultural research projects each year. Other federal funding, provided by the National Institute of Food and Agriculture, offered extensive technical assistance. Furthermore, the Great Lakes Fishery Commission funded the LCBP in 2010 to hire three agronomists to work one-on-one with farmers in the Lake Champlain basin.[143]

In 2014, U.S. Secretary of Agriculture Tom Vilsack and Vermont Senator Patrick Leahy announced new and re-allocated funding of $45 million to NRCS to be used for Lake Champlain water quality improvement efforts over the next five years.[144] In their announcement, they said, "not just agriculture, but landscape, and sewage treatment . . . have impacted and affected the health of this great lake . . . we at USDA, we in Vermont and across the country have to do a better job of investing in this extraordinary piece of Mother Nature."[145] Six months later, the State of Vermont received an additional $16 million dollars through the USDA's Regional

---

140. Email from Susan Brouillette, Farmer's Watershed All., to Marli Rupe, Assistant Program Manager, Clean Water Initiative Program, Vt. Dep't of Envtl. Conservation (Feb. 11, 2016) (on file with authors).

141. *About CVFC Inc.: Farmers Working Together for a Clean Champlain & Thriving Agriculture in Vermont*, CHAMPLAIN VALLEY FARMER COALITION INC., http://www.champlainvalleyfarmercoalition.com/about-us.html [https://perma.cc/RWW4-3HBT] (last visited Apr. 4, 2016).

142. Press Release, New England Dairy Promotion Board, Farmers Launch Connecticut River Farmers' Watershed Alliance (Dec. 30, 2015), http://vtdigger.org/2015/12/30/farmers-launch-connecticut-river-farmers-watershed-alliance/ [https://perma.cc/R3KT-QTTK].

143. LAKE CHAMPLAIN BASIN PROGRAM, 2015 STATE OF THE LAKE AND ECOSYSTEM INDICATOR REPORT (2015), http://sol.lcbp.org/images/State-of-the-Lake_2015.pdf [https://perma.cc/DH7N-GFPA].

144. Press Release, U.S. Dep't of Agric., USDA to Invest $46 Million to Improve Water Quality in Lake Champlain (Aug. 28, 2014), http://www.usda.gov/wps/portal/usda/usdahome?contentid=2014/08/0190.xml [https://perma.cc/ZY8Q-KL86].

145. *Vilsack Announces Water Quality Funding for Lake Champlain*, NE. PUB. RADIO (Aug. 28, 2014), http://wamc.org/post/vilsack-announces-water-quality-funding-lake-champlain#stream/0 [https://perma.cc/9YVT-YTT4].

Conservation Partnership Program ("RCPP").[146] This grant was written jointly by DEC and VAAFM to provide additional EQIP dollars for the next five years to fund BMPs in the Lake Champlain Basin and also wetland restoration, forestry improvements, and land conservation practices.[147] The $16 million of RCPP funding were also matched by over $20 million from Vermont sources.[148]

The RCPP, a new effort in the 2014 Farm Bill, was a grant opportunity specifically designed to leverage new partners, new funds, and new creative ways to address agricultural water quality using traditional NRCS funding programs.[149] Vermont was awarded the second largest RCPP national grant in the country in 2015 and is coordinating with the Vermont Association of Conservation Districts, which was awarded a state grant of $700,000. Connecticut is also coordinating a $10 million Long Island Sound grant that will provide over $1.5 million to Vermont.[150] In 2016, NRCS awarded the Orleans County Natural Resources Conservation District the 2016 Vermont State RCPP for $674,000 for the Memphremagog watershed.[151]

D. TMDL and Act 64

The challenge in 2016 and going forward is to reach out to all Vermonters to explain expectations by virtue of the 2016 TMDL for Lake Champlain and Act 64. Vermonters from all sectors of society, including forestry, developers, municipalities, waste water treatment plants, and agriculture, are required to comply with new rules and regulations. Many of the new regulations are based upon the EPA's Phase I TMDL plan, which establishes significant new phosphorus reduction goals for each section of the lake.[152] These goals and the plan of action set forth in the TMDL have been operationalized in Act 64. Act 64 provides the state laws and resources necessary to successfully implement the TMDL and improve water quality in Vermont.

---

146. *Regional Conservation Partnership Program*, U.S. DEP'T AGRIC., http://www.nrcs.usda.gov/wps/portal/nrcs/main/vt/programs/farmbill/rcpp/ [https://perma.cc/PBA7-8VHZ] (last visited Apr. 5, 2016).

147. *Id.*

148. *Id.*

149. *Id.*

150. *RCCP 2014/15 All Projects*, U.S. DEP'T ARGIC., http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/farmbill/rcpp/?cid=stelprdb1267978 (last visited Apr. 4, 2016).

151. 2016 RCPP Projects by State, U.S. DEP'T AGRIC., http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/farmbill/rcpp/?cid=nrcseprd598407 [https://perma.cc/L52U-5ZNP] (last visited July 28, 2016).

152. PHOSPHORUS TMDLS FOR VERMONT SEGMENT OF LAKE CHAMPLAIN, *supra* note 138, at 51.

Of particular importance to agriculture are the revisions to the AAPs that are required as part of Act 64. The AAPs will be renamed the Required Agricultural Practices ("RAPs") and the performance standard revision will be filed as Final Proposed Rule by September 15, 2016. The RAPs are intended to increase performance on farms with respect to water quality by mandating a higher level of agricultural practice. Many of the required practices emanate from the recommendations of the Agricultural Work Group.

The new RAPs will increase restrictions on manure application, require higher standards for nutrient management plans, increase livestock exclusion and conservation field practices, and require small farms to self-certify that they are in compliance with the RAPs.[153] The certification of small farms and the enhanced regulatory capacity of VAAFM will, for the first time, enable VAAFM to proactively and regularly engage and inspect small farm operations.[154] The RAPs will also require certification of manure applicators and training of technical service providers.[155]

E. Conservation Law Foundation ("CLF")

In addition to the federal and state decisions to raise the bar on water quality issues, environmental groups have also had an impact on agricultural water quality programs. In the summer of 2014, CLF submitted a petition to the Secretary of Agriculture to require mandatory implementation of BMPs, above the required AAPs, in the Missisquoi Bay watershed.[156] In July of 2014, the Secretary held a public hearing on the petition in St. Albans and, in November of that year, denied CLF's petition. The Secretary cited three basic reasons for the denial:

- the petitions provided insufficient data demonstrating where BMPs were necessary or what BMPs should be implemented;
- the implementation of the petition conflicted with the ongoing TMDL process; and
- there was insufficient funding available for farmers to implement the BMPs, as required by law.

---

153. VT. AGENCY OF AGRIC., FOOD & MKTS., REQUIRED AGRICULTURAL PRACTICE RULE FOR THE AGRICULTURAL NONPOINT SOURCE POLLUTION CONTROL PROGRAM 13, 20, 24–25 (Feb. 23, 2016), http://agriculture.vermont.gov/water-quality/regulations/rap#Q5 [https://perma.cc/9A5T-Q2XQ].

154. *Id.* at 10.

155. *Id.* at 24–25.

156. *Conservation Law Foundation (CLF) Petition*, VT. AGENCY OF AGRIC. FOOD & MKTS., http://agriculture.vermont.gov/water-quality/news-events/clf-petition [https://perma.cc/VH75-WBYE] (last visited Apr. 19, 2016).

In December of 2014, CLF appealed the denial.[157] While this appeal was being considered, Act 64 was passed into law, which changed the regulatory and legal landscape.[158] Most significantly was the passage of Act 64 requiring the RAPs to be established and eliminating the prior statutory provision that funding must be available to help a farm implement a BMP before it can be required by the Secretary of Agriculture. In addition, the TMDL plan and Act 64 both called for the use of more BMPs and additional resources became available through the RCPP and NRCS to support the implementation of BMPs.[159] After nine months of negotiation between VAAFM and CLF and a public hearing on a proposed settlement, VAAFM and CLF filed an agreement with the court for approval.[160] The agreement was approved and on February 3, 2016, Vermont's Secretary of Agriculture, Chuck Ross, issued his revised decision regarding the CLF petition to require mandatory BMPs for farms in the Missisquoi Bay Basin. The Secretary's Revised Decision makes a threshold determination that BMPs are necessary in the basin to achieve compliance with Vermont's water quality goals.[161]

The Revised Decision provides a framework for outreach, education, and assessment of farms in the watershed and a process for farm-specific development and implementation of a Farm Plan to address identified water quality resource concerns, where needed. Farm assessments may conclude that practices required by the RAPs are sufficient to protect water quality and that BMPs may not be required due to a farm's specific characteristics or management.[162]

The final agreement will require VAAFM to:

- educate all the farms within the Missisquoi River Basin of the new regulations;
- assess all farms in the basin to identify water quality issues;
- require water quality implementation plans to be developed and filed with VAAFM;
- require farmers to identify funding sources needed for implementation; and
- implement necessary BMPs within six years on all LFOs, MFOs, and certified small farms and within ten years on all other farms.

157. *Id.*
158. *Id.*
159. *Id.*
160. *Id.*
161. *Id.*
162. *Id.*

These activities, practices, and outcomes align with the VAAFM work plan and goals as outlined in Act 64.

F. Organic Farming

In the background of this ongoing discussion of the many forces, issues, and actions affecting water quality in Vermont has been the emergence of another production system—organic agriculture. Some might say it is a "back to the future" system that incorporates many production practices utilized prior to the ubiquitous availability of commercial fertilizers, pesticides, mechanization, and other practices considered part of "modern or conventional" agriculture. Regardless of how it is characterized, it is now a significant and growing component of the agriculture economy governed by a set of national standards with sales of greater than $39 billion per year.[163] It is also a system of particular interest to Vermonters because it was U.S. Senator Leahy who worked with Vermont organic farmers and consumers to establish the national organic standards, which distinguish it from other forms of agriculture.[164] This system and economy continues to grow because of consumer demand and because it can reward producers with higher prices. It also can have beneficial attributes for water quality when practiced correctly because it focuses on cropping, tillage, and manure management practices as a way to build soil health. Organic's focus on soil health has helped raise the awareness of the importance of soil health to all forms of agriculture and to the public at large. Some of the practices required as part of organic farming are being incorporated into policies statewide, not only because of the benefits to water quality, but also the co-benefits of flood resiliency and climate change adaptation. In Vermont, organic agriculture continues to grow and with it so do soil practices and awareness supported by consumers in Vermont and in markets beyond.

G. The Final Factor—The Rising Voice of the Citizen Consumer

A final set of factors may now be at play, which could have the most profound and influential impact on the speed and degree of the agriculture community's approach to water quality concerns. This force is the

---

163. Press Release, Organic Trade Ass'n, U.S. Consumers Across the Country Devour Record Amount of Organic in 2014 (Apr. 15, 2015), https://www.ota.com/news/press-releases/18061 [https://perma.cc/QU5R-6KX6].

164. Press Release, U.S. Senator Patrick Leahy of Vt., Leahy Announces Farm Bill Funds To Help Small Farmers With Organic Certification Costs (July 17, 2014), http://www.leahy.senate.gov/press/-leahy-announces-farm-bill-funds-to-help-small-farmers-with-organic-certification-costs [https://perma.cc/HK5E-U93L].

emerging power of the citizen consumer. Their collective individual preferences are operationalized by their purchases in the marketplace and are sending economic signals to farmers and processors alike. These signals reward farmers and other players in the food system supply chain who produce what consumers want.

These consumers are increasingly interested in knowing what they are buying, where it comes from, how it is produced, and who produced the products. Their demand is building economy, community, new awareness in the food system, and supporting new businesses. Its roots may be traced back to the start and evolution of the organic farming movement and is now expressed through "buy local" activities like Community Supported Agriculture ("CSA"), farmer's markets, and farm stands. It also shows up through consumer preferences for local/regional food that is safe, healthy, and sustainably harvested. These same consumers are also demonstrating additional preferences for things such as humane handling, free range, and fair trade, to name a few. It has manifested itself in the growth of local markets all over the country by dramatic growth in companies like Whole Foods and the adoption of organic food products by companies like Walmart.

If and when these same consumers focus their attention on the environmental characteristics of the products they buy, they may become the most transformative force in changing the farm and food system to more effectively address water quality concerns. They may have the power to create a culture of land and water quality stewardship underwritten by their preferential purchases. Their power has already been demonstrated by the marketing of BST-free milk, the nationwide conversation about GMO labeling, the presence of local food in regional and national groceries, and the catering of local foods to college students. Twenty-five years ago organic farming did not have national standards, Whole Foods did not exist, and groceries bragged about California lettuce. Today, the conversation is about food safety, buying local, buying healthy, and the strength and opportunities of regional markets to support local and regional economies and communities. The market is fundamentally different and evolving rapidly with major businesses making calculations and adjustments to ensure they end up on the correct side of consumers' evolving preferences.

Large-scale agriculture will continue to play an enormous role in producing foodstuffs for Americans and people across the world, but as water quality concerns have become community discussions and climate change has increased the frequency and severity of precipitation events, farmers and communities are starting to look at these challenges through the same lens. This lens may give more attention to soil health, an increase of which can benefit the farmer, increase the ability of land to absorb the

greater quantities of water, and increase the ability of our communities to be more flood resilient. Perhaps it may be the new and emerging diversified farmers focused on building soil heath and the consumers in the local and regional markets leading the farm and food system conversation that is restorative for both people and the environment. These new voices may be establishing the farm and food system culture of the future, in which environmental and human health are critical drivers of the economy and stewardship practices on farms and within the supply chain. If and when this happens, a new culture around agricultural water quality that cares about and rewards water quality stewardship may rapidly emerge. When that day comes, we may see the most rapid, systemic, and sustainable change in our farm and food systems benefiting water quality.

CONCLUSION: THE VERMONT PERSPECTIVE

Agriculture as practiced by most people is not part of the natural ecosystem, but is rather an adaptation of our ecological system to fit the needs of humankind and our evolution in this place we have named Vermont. In Vermont, agriculture and its practitioners have responded to the changing needs of the purchasing public, evolving and adapting their practice of agriculture on top of and integrated with the underlying foundation of Vermont's natural resources and ecological systems. In so doing, they have also discovered the collective impact of the pricing markets and society's policy directives constrain, confuse, and limit their profitability and ability to adapt to the emerging ecological imperatives of our time. However, dairy, the largest agricultural industry in Vermont, is challenged to adapt due to the pricing structures and limitations of larger farms and infrastructure. During much of history, our needs have driven our actions with little concern and, in some cases, little knowledge of the impact on these ecological systems. Over time, our sensitivity and responsiveness to our influence on these systems has ebbed and flowed. At times, we have heard the clarion calls of people like George Perkins Marsh to change our ways. Only a few times have we altered course and even fewer of these changes have been sustained through time. Instead, we have soldiered on, doing what we needed to do to meet our immediate needs and almost unwittingly relied upon the strength and resiliency of our natural systems to sustain us, assimilate our waste, and accommodate our excesses. But now, with blue green-algae choking our bays and Lake Champlain's ecological balance at risk, it is time that we as a society: begin to recognize our over-reliance on these natural systems; react in ways that might reduce or ameliorate the stress we impose on them; and attempt to remedy the damage we have done.

Our agricultural history in Vermont is rich. We are part of the United States, a system that is considered by many to be the most productive, lowest cost, and safest farm and food system in the world. We rely upon it to feed us, to employ us, and to be a marketable resource for international trade and relations. At times, it has been one of the strongest elements of our economy and, over the decades and centuries, this system has imbued our culture with characteristics that have served us well, such as independence, self-reliance, a strong work ethic, physical strength, and a belief in ourselves. Many of our society's leaders have learned the lessons of life behind a plow, in the hay loft, or in the barn at 4:30 A.M. These, and many others, are the attributes our farm and food system has provided to our society. Without doubt and without hesitation, it is the farmers who we must recognize for the work they have done and continue to do that bring these values and attributes to our society and our communities.

But our agricultural history as a country, as a state, and as a people has not always been perfect. We have followed the lead and directions of our government policies, our academic leaders, our industry experts, and the needs, wants, and desires of our citizen consumers. This, in many cases, has not served us as well.

The creation, evolution, and operation of this system has also created our own society-wide dilemma: we have created an incredible system upon which we depend for our sustenance and growth, but that in too many circumstances erodes the very ecological system upon which we and that system depend. We have put in place markets, policies, subsidies, and practices that sometimes prevent the changes we need, where we need them, and at the rate we need them. This "catch 22" is exemplified by our own Lake Champlain—a natural resource we have used, abused, and exploited through ignorance and neglect—to serve our needs, which we now are trying to save through the implementation of a plan that will meet the pollution budget of the TMDL, the passage of state laws, and the creation of a new culture of clean water—a culture of which agriculture must be an integral part. The time has come for all of us to stand together to adapt our agricultural system once again. We must develop the new policies, incent the new practices, and develop the culture to enable the profitability that will help farmers to do the right thing on their farms and in their businesses. Most farmers understand their environment, their dependency upon our natural resources, and the importance of stewardship. They know and work with the natural environment and understand the importance of long term planning. They want to do the right thing. It is our collective responsibility to provide the cultural support and economic framework to enable them to succeed as farm businesses, which support their families and protect the natural systems upon which we all depend. It

is also our responsibility to address those who choose to not protect our natural systems with an effective, consistent, and respected enforcement system. All of these responsibilities and opportunities bring resource needs and challenges.

In Vermont, we have built and continue to build a community-based agricultural system. It is a system that connects our farms to our communities, helps our farms build our local economies, and enables our people to connect to the agricultural values and work ethic that undergird our collective culture. We celebrate agriculture's contribution to our quality of life. By and large, we continue to hold agriculture in high regard as a noble pursuit. The degrees of separation between farmer, friend, neighbor, and community are small to non-existent.

This closeness and proximity allows us the opportunity to have conversations and to be heard. If willing, it empowers us to be sensitive to our individual and collective needs. If we can commit ourselves to the challenges before us, it affords us the chance to chart a course together and do the work necessary. And as part of this process, the farming community can listen, take ownership for their part, take action to contribute to the solution, and take great pride in their role as part of this society-wide effort. In Vermont, our personal, economic, and environmental proximity allow us to understand that we are ALL IN THIS TOGETHER and therein lies the hope and opportunity for our future.