

OPPORTUNITIES FOR ACTION 2022

EXECUTIVE SUMMARY

While Lake Champlain remains a vibrant lake with many assets, several serious environmental problems demand action. High phosphorus levels, harmful algae blooms (HABs), toxic substances and pathogens, and aquatic invasive species continue to threaten the Lake ecosystem and reduce the human use and enjoyment of Lake Champlain. Natural resources are threatened by invasive species, wetland loss, habitat degradation and fragmentation, and diminished water quality. Other issues that face the Lake Champlain Basin include changes in hydrology, habitat and biodiversity, climate, impacts from continued land-use changes and habitat fragmentation, public access to the Lake, recreational user conflicts, and loss of cultural resources.

Improvements in wastewater management and sewage treatment (point sources) have greatly reduced the contamination of beaches and shorelines and continue to ensure that drinking water supplies in all parts of the Lake are safe. Partners continue to work together to address nutrient pollution from nonpoint sources that come from our interaction with urban, agricultural, and forested landscapes to Lake Champlain. Many challenges exist to protect the watershed's ecosystem functions so that it is best prepared to adapt to continuing climate change and the impacts of society.

Opportunities for Action 2022 identifies a suite of task areas to address these concerns that reflect a stakeholder prioritization effort to identify high priority task areas for the restoration of Lake Champlain. The 2022 plan outlines priority goals, objectives, and strategies for the LCBP to support over the next five years. Sound science is critical to these efforts, and it forms the basis of the work described in this plan. Long-term monitoring of the Lake Champlain ecosystem's health is the foundation of this scientific approach and is critical for conducting research and measuring the success of the plan.

The achievement of numeric phosphorus load reductions (TMDLs) to achieve in-lake concentration standards are established as jurisdictional obligations in Vermont and New York. The LCBP authorization provides an important role for LCBP to support the goals of the States to meet the numeric standards identified in the phosphorus TMDLs for Lake Champlain and to facilitate collaboration among the many agencies responsible for meeting their common goals.

The current *Opportunities for Action* plan was approved in 2017. In that time, the LCBP has awarded over 500 grants and contracts, summing to more than \$13 million to for-profit, not-for-profit, municipalities and academic institutions across the basin to accomplish the goals of the 2017 *OFA* plan. New projects installed best management practices, conducted surveys and assessments, and supported engineered designs to reduce pollutant loading into Lake Champlain. Research projects helped to inform management decisions at the local and regional scales. More than 300,000 people were reached in outreach work across the spectrum of the Plan, to help individuals take measures to reduce their impact on nutrient loading, prevent the spread of invasive species, to learn about the culture and heritage of the region, and more. Over

\$22 million was dedicated to implementation of the 2016 TMDLs in Vermont to reduce phosphorus loading.

Significant U.S. Federal resources will be directed to the LCBP through the 2021 Bipartisan Infrastructure Law (BIL) during the timeframe of the 2022 *OFA* plan. In recognition of the goals of BIL, the 2022 plan includes a renewed focus on projects and programs that address and mitigate impacts of climate change, including forecasted temperate changes, rainfall, and flooding. The Plan also includes new actions that will engage underserved communities to increase the role of these groups in restoring and protecting Lake Champlain. Tasks that mitigate climate change impacts, and engage underserved communities are woven into elements throughout the Plan.

The four action goals of *OFA* are Clean Water, Healthy Ecosystems, Thriving Communities, and Informed and Involved Public. A summary of each is provided below.

CLEAN WATER

Work in this goal will use knowledge from scientific research to inform resource management decisions and projects to address nutrient and contaminant concerns in the Lake Champlain basin, including changing climate impacts to the lake. Objectives in this goal will support work to improve understanding of water quality conditions and trends to inform management decisions, support work to reduce contaminants and pathogens, to reduce nutrient loading, and to support research to understand and adapt to the impact of climate change on clean water. Research programs will support monitoring programs and management-oriented research and help interpret research to inform management decisions. Nutrient reduction work will address all land use sectors – agriculture, streambanks, urban, and forested lands. Clean water work also will implement recommendations from the bi-national Missisquoi Bay phosphorus reduction task force, coordinated by the LCBP.

HEALTHY ECOSYSTEMS

This goal addresses Lake Champlain ecosystem concerns, through restoration and protection of habitat that is critical to native species, biodiversity, and ecosystem functions. Objectives in this goal focus on climate change, with a focus on research toward mitigation of climate impacts of increasing temperatures in the tributary network and reducing flooding in the Basin; assessment of ecosystem management programs and policies; research of, and conservation of habitat for, ecosystem function; protection and preservation of biodiversity; and reducing the prevalence of aquatic invasive species in Lake Champlain.

THRIVING COMMUNITIES

This goal engages with the people of the Basin at the community level – targeting access points of community members to points of interest across the spectrum of different stakeholder groups. The LCBP utilizes the mission of the Champlain Valley National Heritage Partnership to interpret the rich cultural history of the Champlain Valley to engage stakeholders in conversations and learning opportunities and make connections to the water quality and health of the Basin. Objectives for this goal address engagement and support for communities, support water-wise economic development, support awareness and conservation of cultural heritage

resources, and to support recreation across the Basin. Work in this goal has been organized to expand engagement with traditionally underserved communities, including low-income communities, to improve and expand access to Lake Champlain resources for these groups. Flood resilience at the community level is also emphasized in this goal.

INFORMED & INVOLVED PUBLIC

Work in this goal is oriented around three objectives: formal learning programs, informal learning programs, and facilitating behavior change in individuals. Through these three objectives, LCBP will support staff-driven programs and issue awards to encourage public engagement and understanding of Lake Champlain Basin resource concerns. New programs to support outreach work to traditionally underserved communities are highlighted in this goal. Strategies to accomplish these objectives will include work such as communicating watershed science about the Basin in classrooms and in public forums, maintaining digital tools and resources about the Basin, supporting youth learning and engagement programs, and promoting actions people can take at the individual, family, or community-level to help achieve our goals for Lake Champlain.

RESPONSE METRICS

OFA is intended to be a plan that drives management responses to resource pressures that affect the state of Lake Champlain. In this plan, LCBP will track a suite of response metrics associated with strategies within each of the four goals. Response metrics across the four goals will include recording of the number of grants and funds awarded per goal, and topic areas addressed with those funds. Quantities of phosphorus retained on the landscape, or prevented from reaching Lake Champlain or its tributary network, also will be reported annually and in sum at the completion of this 5-year plan. Additional metrics will track work toward improvement of the Lake Champlain ecosystem, including acres of habitat restored or protected, the number of people reached about aquatic invasive species, number of communities engaged, people receiving professional trainings, educational programs offered, students engaged, and stakeholders reached through outreach programs across the basin through grant programs and by LCBP staff.

INTRODUCTION

BACKGROUND

LAKE CHAMPLAIN BASIN

The Lake Champlain Basin, stretching from the peaks of the Adirondacks to the Green Mountains and north into Québec, is renowned as one of North America's most beautiful and valued resources. Residents and visitors alike enjoy Lake Champlain for swimming, drinking, fishing, and recreation. At 120 miles (193 km) long and more than 400 feet (122 m) deep, the Lake supports a complex freshwater ecosystem with diverse plant and animal species. The biological riches of the basin, unparalleled beauty of the mountains, historic resources, agricultural landscapes, small towns and villages, and rivers that flow into the magnificent Lake provide experiences and

opportunities unique to the region. Although the benefits of healthy resources are difficult to quantify, well-functioning ecosystems support a rich economy for fishing, swimming, agriculture and forestry.

While Lake Champlain remains a vibrant lake with many assets, several serious environmental problems demand action. High phosphorus levels, harmful algae blooms (HABs), toxic substances and pathogens, and aquatic invasive species continue to threaten the Lake ecosystem and inhibit the human use and enjoyment of Lake Champlain. Natural resources, such as fish, wildlife, and plants, are threatened by invasive species, wetland loss, habitat degradation and fragmentation, and diminished water quality. Other issues that face the Lake Champlain Basin include changes in hydrology, habitat and biodiversity, climate, impacts from continued land-use changes and habitat fragmentation, public access to the Lake, recreational user conflicts, and loss of cultural resources.

Improvements in wastewater management and sewage treatment (point sources) have greatly reduced the contamination of beaches and shorelines and continue to ensure that drinking water supplies in all parts of the Lake are safe. Partners continue to work together to address nutrient pollution from nonpoint sources that come from our interaction with urban, agricultural, and forested landscapes to Lake Champlain. Many challenges exist to protect the watershed's ecosystem functions so that it is best prepared to adapt to continuing climate change and the impacts of society.

THE LAKE CHAMPLAIN SPECIAL DESIGNATION ACT

On November 5, 1990, the *Lake Champlain Special Designation Act* was signed into law [<http://www.lcbp.org/appenda.pdf>]. Sponsored by Senators Leahy and Jeffords from Vermont and Senators Moynihan and D'Amato from New York, this legislation designated Lake Champlain as a resource of national significance. The goal of the Act was to bring together people with diverse interests to create a comprehensive plan for protecting the future of Lake Champlain and its surrounding watershed. The Act specifically required examination of water quality, fisheries, wetlands, wildlife, recreational, and cultural resource issues. The challenge had been both to identify problems requiring management action and to chart an integrated plan for the future of the Lake Champlain Basin. The Special Designation Act created the Lake Champlain Basin Program (LCBP), a non-regulatory partnership among the States of New York and Vermont, the Province of Québec, the U.S. Environmental Protection Agency (USEPA), other federal and local government agencies, and many public and private local groups.

MISSION OF THE LAKE CHAMPLAIN BASIN PROGRAM

The LCBP coordinates and funds efforts to benefit the Lake Champlain Basin's water quality, fisheries, wetlands, wildlife, recreation, and cultural resources, in partnership with government agencies from New York, Vermont, and Québec, private organizations, local communities, and individuals.

The LCBP maintains inclusive partnerships that empower diverse communities to take action toward improving and protecting the natural resources and the cultural heritage of the Lake Champlain Basin.

The LCBP envisions rich natural resources and cultural heritage of the Lake Champlain Basin that are stewarded by a diverse, inclusive, informed, and engaged community working together for the common good of Lake Champlain for current and future generations.

Lake Champlain is an enormous resource requiring special care and stewardship – this comprehensive management plan, Opportunities for Action: An Evolving Plan for the Future of the Lake Champlain Basin (OFA), is a coordinated effort to inform, guide, and assist essential stewardship efforts for the watershed.

LAKE CHAMPLAIN BASIN PROGRAM ROLE AND STRUCTURE

As a partnership of provincial, state, and US federal agencies, the LCBP brings cross-boundary and multidisciplinary leadership experience to coordinating and implementing OFA. The LCBP works cooperatively with many partners to protect and enhance the environmental integrity and the social and economic benefits of the Lake Champlain Basin. The LCBP is administered jointly by several agencies: U.S. Environmental Protection Agency (Regions 1 and 2), New York State Department of Environmental Conservation, Vermont Agency of Natural Resources, Québec Ministry of Environment and the Fight against Climate Change, and NEIWGCC.

Lake Champlain Steering Committee membership from New York, Québec, and Vermont reflects each jurisdiction's commitment to the 2015 *Memorandum of Understanding on Environmental Cooperation on the Management of Lake Champlain among The State of New York, The State of Vermont and the Government of Québec* (Appendix V). It is this MOU that also describes the role, goals, and eligible membership of the Lake Champlain Steering Committee (Appendix IV) and will be updated in 2022. US Federal Agency participation in the Lake Champlain Steering Committee, codified in OFA, reflects the federal commitments established in the *Special Designation Act of 1990* and the *Daniel Patrick Moynihan Lake Champlain Basin Program Act of 2002*, which have enabled substantial US federal funds to be appropriated to support the work of the LCBP. These funds are made available to the LCBP to support operations and tasks that are consistent with the federal authorizations. See **Appendix I** for more information about the LCBP Operating Structure, Committees (including Committee representation), and Staffing.

FUNDING FOR THE LAKE CHAMPLAIN BASIN PROGRAM

The Lake Champlain Basin Program historically has been appropriated funding by the U.S. government through the Environmental Protection Agency. More recently, the LCBP also has been supported with appropriations from the Great Lakes Fishery Commission and the National Park Service. LCBP also occasionally receives awards from other government entities, such as the International Joint Commission to conduct specific projects. During the past two decades, the LCBP has sponsored a great variety of programs supported by these different sources of funding, including research, monitoring, and grants to regional organizations to promote water quality

programs and install projects to improve water quality. As of Federal Fiscal Year 2021, nearly \$105 million had been appropriated to support the general priorities identified in OFA. The LCBP has provided more than \$20 million to support over 1,600 grants awarded to more than 600 local recipients to reduce pollution in the Lake, educate and involve the public, and gather and share information about Lake issues. The LCBP also has funded education, planning, demonstration, control, research, and monitoring projects to restore and protect water quality and the diverse natural and cultural resources of the Lake Champlain Basin. In FFY18, funding dedicated to the implementation of the 2016 phosphorus TMDLs for Lake Champlain was established; as of FFY21, nearly \$23 million in EPA – LCBP Section 120 funds have supported this specific initiative, in addition to the \$105 million noted above.

Infrastructure Investment and Jobs Act of 2021 (Bipartisan Infrastructure Law)

The Bipartisan Infrastructure Law of 2021 is intended to be a once-in-a-generation investment in the infrastructure and communities of the United States. This bill created an opportunity to expand access to clean drinking water; to tackle the climate crisis and advance environmental justice, while investing in communities – both urban and rural – that have too often been left behind. The bill also emphasizes the importance of directing funds toward traditionally underserved communities. \$40 million was identified in this bill to support the Lake Champlain Basin Program, to prioritize projects that address ecosystem and wetland restoration, stormwater treatment and control, nature-based infrastructure, community resilience, resilient shorelines, and environmental education. The LCBP will receive up to \$8 million per year to address these priorities for Fiscal Years 2022 – 2027, coincidental with the timeframe of this new OFA management plan.

ENVIRONMENTAL PROTECTION AGENCY

The Lake Champlain Special Designation Act (Section 120 of the Clean Water Act) was reauthorized in 2002, with the *Daniel Patrick Moynihan Lake Champlain Basin Program Act*, authorizing expenditures of up to \$11 million per year to accomplish this goal [https://www.lcbp.org/wp-content/uploads/2012/08/H.R.1070_LCBPAuthorization_2002.pdf]. Annual appropriations via the EPA have averaged over \$10 million since 2017, which support numerous LCBP programs and Lake Champlain Steering Committee priorities each fiscal year, with particular focus on supporting efforts to reduce phosphorus pollution to the lake and to reduce the occurrence of harmful algal blooms.

GREAT LAKES FISHERY COMMISSION

In addition to the funding appropriated to LCBP through Section 120 of the Clean Water Act, LCBP also receives support from the Great Lakes Fishery Commission (GLFC). The GLFC was established by the 1954 Convention on Great Lakes Fisheries to encourage cross-border collaborative management efforts to restore the fisheries of the Great Lakes, particularly for management of sea lamprey. The recognition of sea lamprey as a nuisance species in Lake Champlain opened an avenue for funding through the GLFC to support fisheries and water quality restoration work in Lake Champlain. The GLFC, the LCBP, and the U.S. Fish & Wildlife Service (USFWS) entered into a Memorandum of Understanding (MOU) on Native Species and

Habitat Restoration and Water Quality Improvements in 2010. Up to \$9 million has been recently appropriated via the GLFC toward Lake Champlain work annually, a reflection of Senator Leahy's commitment to improving the Lake Champlain ecosystem. Of this annual appropriation, approximately \$0.6 - \$2 million has been available annually to LCBP to support watershed restoration work in Lake Champlain, with the balance directed toward sea lamprey management, fisheries research, and other habitat restoration work conducted by the US Fish and Wildlife Service and researchers at the University of Vermont.

NATIONAL PARK SERVICE: CHAMPLAIN VALLEY NATIONAL HERITAGE PARTNERSHIP

The Champlain Valley National Heritage Partnership (CVNHP) was established in 2006 as a part of the National Heritage Area (NHA) programs to recognize the importance of the historical, cultural, and recreational resources of the region and to assist efforts to preserve, protect, and interpret those resources. The Lake Champlain Basin Program (LCBP) is the managing entity of the CVNHP. The LCBP coordinates its work with its official liaison to the National Park Service (NPS), the Marsh-Billings-Rockefeller National Historical Park (MBRNHP) located in Woodstock, Vermont. The purpose of the NHA also is to enhance the quality of the tourism economy and to encourage working partnerships among state, provincial, and local governments and non-profit organizations in New York, Québec, and Vermont. As a NHA with an approved management plan, the CVNHP is authorized to receive up to \$1 million annually and has recently been appropriated up to \$400,000 from the National Park Service (NPS). These funds are allocated annually from the U.S. Department of Interior budget, which is determined by the U.S. Congress.

ADDRESSING THE ISSUES: OPPORTUNITIES FOR ACTION

Opportunities for Action is a plan developed for managing the Lake Champlain watershed. To that end, it is designed as a tool for the Lake Champlain Steering Committee. Section 120 of the Clean Water act mandates that the Lake Champlain management plan is required to be updated at least every five years, and the priorities contained within the plan characterize the eligibility of projects and programs to be supported with resources directed to Lake Champlain through Section 120 each federal fiscal cycle. This resource is to be used as a strategic planning guide, to inform management decisions over the next several years. New in 2022, the Lake Champlain Steering Committee also will develop a guide to map out annual budget priorities using the Objectives and Strategies identified in the plan, through an OFA Implementation Plan. This Implementation Plan will be developed following approval of *Opportunities for Action*.

The broader community of governments, organizations, watershed groups, academic institutions, and other lake-user groups can use OFA to follow the priorities of the Lake Champlain Steering Committee, to use as a guide for targeting their own programs, and to identify priorities within their own specific management plans that align with those of the Lake Champlain Steering Committee. The Lake Champlain Steering Committee is a board comprised of a broad spectrum of representatives of government agencies and the chairpersons of advisory groups representing citizen lake users, scientists, and educators. The Lake Champlain Steering Committee approves the guiding priorities identified in this Plan and authorizes the use of appropriated funds to achieve these priorities. For more information about the Lake Champlain

Steering Committee, please refer to the “Lake Champlain Basin Program Role and Structure” section of the Plan.

All stakeholders within the Lake Champlain watershed wish to have a clean lake. Interpretations of “clean” may vary, but people generally want a lake that is suitable for recreation, provides a clean source of drinking water that is safe and reliable, and contains fish that are safe to eat. The stakeholders of the Lake Champlain watershed are not unique in this regard, and neither are the management issues that need to be addressed. Harmful algal blooms are a global issue, as are toxin levels within sportfish, conservation of threatened and vulnerable species, and the impacts of climate change. Invasive species can drastically alter lake ecosystems, often to the detriment of recreation and the economy, and occasionally public health. Changes in climate patterns affect the lake ecosystem, reducing ice cover and lengthening the biologically productive season of the lake. This increases the prevalence of cyanobacteria blooms, improves conditions for some species, and reduces the quality of the ecosystem for others. The broader themes of this plan address some of these “aspirational goals” by reducing the frequency and toxicity of harmful algal blooms, reducing the impact of invasive species and eliminating pathways for new invasions, and restoring native species, such as lake trout and Atlantic salmon.

Opportunities for Action 2022 identifies a suite of task areas to address these concerns, largely built from the task areas identified in the 2017 plan, but also reflecting a stakeholder prioritization effort held in June 2021 in which stakeholders engaged in LCBP committees worked together to identify high priority task areas for the 2022 plan. The 2022 plan outlines priority goals, objectives, and strategies for the LCBP. Sound science is critical to these efforts, and it forms the basis of the work described in this plan. Long-term monitoring of the Lake Champlain ecosystem’s health is the foundation of this scientific approach and is critical for conducting research and measuring the successes or weaknesses of the plan.

The jurisdictions governing the Lake Champlain Basin—the governments of Québec, New York, Vermont, and U.S. federal agencies—have specific statutory requirements to establish and to achieve water quality standards. They also can raise revenue and enforce laws that accomplish these responsibilities. For example, the achievement of numeric phosphorus load reductions (TMDLs) to achieve in-lake concentration standards are established as jurisdictional obligations in Vermont and New York. LCBP’s congressional authorizations provide a mechanism for LCBP to serve an important role in supporting the goals of the States to meet the numeric standards identified in the phosphorus TMDLs for Lake Champlain and to facilitate collaboration among the many agencies responsible for meeting common goals. Several inter-jurisdictional agreements advancing the stewardship of the Lake Champlain watershed have been facilitated by the LCBP, resulting in a robust culture of cross-boundary collaboration.

As the latest revision of this restoration plan has developed, particular care has been taken to acknowledge and support, but not to duplicate, the actions detailed in other existing management plans, such as the *Phosphorus TMDLs for Vermont Segments of Lake Champlain (2016)*, the *VT Lake Champlain Phosphorus TMDL Phase I Implementation Plan (2016)*, the *Lake*

Champlain Basin Rapid Response Action Plan for Aquatic Invasive Species (2009), and other important stand-alone planning documents.

Sound science and targeted management efforts alone will not achieve these broad aspirational goals. The resources available to achieve these goals are limited. A clean lake and healthy watershed will require more than what the LCBP and its partners can bring to the table. Broad changes in the way society relates to the Lake—as communities, as businesses, and as individuals working and living within the Lake Champlain watershed—will be required. Fundamental shifts in the way we think each day about the water that runs off our rooftops, driveways, lawns, fields and our forests, where that runoff goes, and what it carries with it will be critical if we are to achieve these aspirational goals in the long-term. If we each take actions to reduce our contribution to runoff and nutrient pollution, we can work collectively toward a healthy and resilient lake ecosystem. We need to consider how our educational system teaches students about their individual and collective impacts on the Lake, with emphasis on water conservation, quality, and management through individual actions. As a culture, we must think carefully about how we prioritize and fund programs that benefit the Lake, and how these programs can be sustained.

For this reason, plan implementation must involve the public and build local support through nongovernmental organizations and municipalities. Implementation must also be paired with efforts to educate the public, elected officials, and interest groups about the science behind Lake issues to ensure these groups are informed during policy development and funding decision processes.

Many cooperating agencies, organizations, and individuals have contributed their time and expertise to producing a comprehensive pollution prevention, control, and restoration plan that efficiently guides the allocation of LCBP resources. The Lake Champlain Steering Committee strives to allocate funds annually to support high priority tasks of Basin-wide importance:

- long-term monitoring of water resources,
- local plan implementation and educational program grants,
- direct pollution prevention projects,
- targeted environmental research,
- interpretation & presentation of objective science to inform resource managers, the public, and policy-makers,
- numerous educational programs including substantial LCBP website resources and operation of the LCBP Resource Room at the ECHO Leahy Center for Lake Champlain,
- operational assistance to watershed organizations, and
- heritage and recreational programs consistent with the goals of the Champlain Valley National Heritage Partnership Management Plan

ABORDER LES ENJEUX: PERSPECTIVES D'ACTION

[Addressing the Issues section to be translated in April]

ACCOMPLISHMENTS SINCE 2017

The LCBP and the CVNHP have awarded over \$13 million to more than 500 grants and contracts since the plan was last updated in 2017. Many of these grants were augmented by non-federal matching funds or other federally-funded programs (Appendix II).

CLEAN WATER

The LCBP awarded 138 projects, summing to over \$7.7 million, to address priorities in the Clean Water goal between 2017-2021. These projects conducted research, monitoring, assessments and designed and installed water quality improvement projects across the basin. Notably, over 200 conservation practices were implemented across 150 farms in the Basin and 50 acres of wetlands were restored or conserved. Over 130 acres of shoreland and riparian habitat were planted or managed, including management of terrestrial invasive species that would inhibit growth of planted trees. Over \$1 million was dedicated to research to inform management decisions about stormwater, to understand innovative phosphorus reduction and treatment approaches, and to map impervious surface area. Another \$1.6 million supported monitoring programs, including cyanobacteria monitoring, tributary flow monitoring, and meteorological monitoring programs. Over \$1.5 million supported stormwater master planning, installation of more than 50 stormwater BMPs to keep over 75,000 pounds annually of sediment out of Lake Champlain and its tributary system. Over \$500,000 supported three dam removals, and culvert assessments and replacements, reconnecting 30 miles of stream networks for fish passage.

In addition to managing the 138 projects noted above, LCBP staff completed a report on the Nutrient Loading and Impacts in Lake Champlain, Missisquoi Bay, and the Richelieu River as part of the International Joint Commission's Missisquoi Bay Water Quality project in partnership with Organisme de bassin versant de la baie Missisquoi (OBVBM). Staff also supported the International Joint Commission's Lake Champlain-Richelieu River Study Board analysis of flooding causes, impacts, risks, and solutions. The final report for this study will be published in 2022. LCBP staff coordinated the planning and hosting of the Lake Champlain Research Conference, which brought together more than 200 stakeholders for interdisciplinary sessions on lake science and management. Agronomists in New York and Vermont assisted farmers in implementing best management practices to reduce erosion and export of nutrients from farmland. Staff conducted analyses and produced a Lake Champlain tributary loading report which examines trends in pollutant delivery from the Lake's major tributaries since 1990.

An additional \$22.4 million was appropriated between FFY2018-2021 for the implementation of the Vermont 2016 TMDL for phosphorus reduction in Lake Champlain. These funds have largely been directed to the State of Vermont to support grant programs for implementation of agricultural BMPs, acquisition and conservation of critical wetlands, and addressing stormwater

problems in public schools across the Vermont portion of the Lake Champlain Basin. Targeted programs also will reduce nutrient loading to the Lake from municipal stormwater assessments, reducing nutrient loading into Lake Carmi, reducing runoff from non-municipal roads, and supporting forestry accepted management practices.

HEALTHY ECOSYSTEMS

LCBP staff managed over 60 projects summing to over \$800,000 were awarded to address aquatic invasive concerns across the Lake Champlain basin. These projects provided trainings to watershed groups, and inspected more than 65,675 watercraft at boat launches on waterbodies across the Basin, removing more than 2,100 AIS, and over 630 watercraft were fully decontaminated. Twenty new decontamination stations for boats and angling gear were installed at public access points on lakes and rivers. Projects mapped new and existing AIS infestations, removed thousands of invasive plants from Lake Champlain and inland waterways, supported biological and mechanical management of invasive plants, and assessed nearly 50 lakes and ponds for AIS,

Separately, nearly \$1 million supported more than 40 LCBP boat launch stewards, who inspected nearly 140,000 watercraft from 49 US states and Canadian provinces at public access points on Lake Champlain. These inspections identified and removed 3,183 AIS from watercraft and trailers, preventing them from being introduced into Lake Champlain or from being trailered to other waterbodies in the region. These funds also supported the purchase and maintenance of two high pressure, hot water decontamination stations that are operated at high traffic public launches on the lake.

LCBP staff spent significant time working with the USACE on a study to determine options for an AIS barrier on the Champlain canal. A Phase 1 study was initiated in 2017, with \$200,000 in local sponsor funds provided to the USACE. The report for that study will be completed in 2022. Staff also helped to coordinate meetings between stakeholders and the USACE to identify projects eligible for support through the USACE WRDA Section 542 authorization for watershed improvement projects. Staff led multi-state, bi-national, multi-agency efforts to discuss approaches to preventing new invasions of aquatic species, including hydrilla and round goby. Staff also participated in and coordinated VT and NY Dam Task forces, respectively, to bring together stakeholders to identify and prioritize removal of dams that no longer serve a useful purpose and to improve aquatic organism passage.

THRIVING COMMUNITIES

Over \$500,000 in projects were awarded to groups across the Champlain Valley National Heritage Partnership area to support interpretation of the culture and history of the region. CVNHP supported 24 projects focused on the three interpretive themes: Making of Nations, Corridor of Commerce, and Conservation & Community. An additional 7 Special Program projects were larger-scale awards that supported these interpretive themes. Nineteen heritage projects helped students learn about local history, 16 collections projects helped museums protect, conserve, inventory, and display artifacts and interpretive exhibits. The CVNHP also supported workforce development in this sector through 6 internship grants, in which students

or new professionals to the culture and recreation field worked in museums and earned hands-on learning experiences for their resumes.

The LCBP and CVNHP staff also developed, designed, produced and installed 66 new and refurbished 6 interpretive wayside exhibits across the CVNHP area. Staff produced a guide to the Revolutionary War in the Champlain valley, celebrated and interpreted the International Year of the Salmon, commemorated the centennial of the 19th Amendment, which gave women the right to vote. Staff build and maintain partnerships across the region, coordinating and engaging in meetings and conversations to move new ideas forward in the CVNHP.

The LCBP continued to support watershed groups with missions centered on achieving water quality improvements in the Lake Champlain watershed with 55 projects, summing to more than \$185,000. When the COVID-19 pandemic arrived in March 2020, there was significant fiscal uncertainty among the watershed groups of the Lake Champlain Basin. Recognizing the invaluable work that these groups do for Lake Champlain, the Lake Champlain Steering Committee re-prioritized some available funds to support 14 one-time COVID Emergency support grants to help watershed groups transition to virtual platforms and programming during the early days of the work-from-home period.

INFORMED AND INVOLVED PUBLIC

LCBP supported more than 95 projects totaling nearly \$1,000,000 that focused on public education and outreach. These projects worked to build school outreach programs, summer youth programs, and community development. The COVID pandemic of 2020-2021 reduced in-person engagements, but LCBP and partners quickly pivoted programs to virtual platforms to continue working with interested members of the public. Nearly 25 educational events were supported with grant awards, reaching 225 students interested in learning more about Lake Champlain issues, and summer youth programs connected with over 175 additional people. New projects supported 20 workshops and community events, and 5 new exhibits were produced. Over 40 short videos were created, addressing a broad spectrum of water quality and watershed management topics.

LCBP staff in the Resource Room at ECHO, Leahy Center for Lake Champlain engaged with 115,000 visitors during this time period. The COVID pandemic also significantly reduced visitation to this facility during 2020-2021, and LCBP's ability to deliver in-person programming. The LCBP website was redesigned in 2020, providing updated and new content to visitors. The new website receives more than 160,000 hits annually, and more people visit 6 additional websites maintained by LCBP. LCBP social media accounts average more than 4,000 unique user views per month. The Lake Champlain Atlas was updated in 2018, and is now a resource accessed by teachers, researchers, and resource managers for maps and quick-reference information about the basin. LCBP staff delivered over 325 programs to schools, community groups, and on field trips, sharing information about watersheds and wetlands. The LCBP published the *State of the Lake* report in 2018 and 2021, summarizing data around key indicators of the health of the Lake Champlain Basin.

KEY FUNCTIONS OF OPPORTUNITIES FOR ACTION

COORDINATE PROGRAMS AND IMPLEMENTATION ACTIVITIES

Coordination of the work conducted in multiple political jurisdictions by numerous federal and state resource agencies, regional and local governments, private-sector stakeholders, nonprofit organizations, residents, and visitors is critical to effective management of the Lake Champlain Basin. By coordinating management efforts, the dispersal of resources and facilitating dialogue and the exchange of data and information, the LCBP helps to ensure efficient management that reduces redundancy among partners.

SUPPORT LOCAL LEVEL IMPLEMENTATION AND INVOLVE THE PUBLIC

On-the-ground work conducted at the local level by watershed groups, lake associations, conservation districts, and educational institutions is the cornerstone of a successful restoration effort. Local residents who are most directly affected by an issue are often motivated to address the issue. Many communities have existing resources and organizations to help implement programs, but may lack technical expertise, adequate funding, or access to additional human and financial resources. Building local capacity for plan implementation requires strengthening technical assistance to community groups and may require additional financial support for local programs.

A public that understands the Basin's water quality and resource management issues can make informed choices about the long-term protection and restoration of the Lake. For this reason, public information and outreach efforts have been a core function of the LCBP's work since its establishment. Informing the public about how to change personal and collective behaviors and providing opportunities to change those behaviors are critical steps in reducing our impact on Lake Champlain. Furthermore, involving the public in planning and implementation increases both the sphere of responsibility for action and support for recommended policy actions.

MEASURE AND MONITOR SUCCESS RELATIVE TO BENCHMARKS

Monitoring progress toward established goals is a critical component of watershed management. Tracking of this kind hinges on the availability of reliable data that informs key ecosystem indicators of watershed health. Evaluation of trends related to these indicators leads to the adjustment of management actions and funding priorities. In this way, monitoring ensures accountability to the public. The *State of the Lake* report, which summarizes the status and trends of these indicators every three years, is LCBP's primary outlet for communicating this process to the public.

In addition, the LCBP works in close collaboration with Federal, State and Provincial partners to track the success of specific management initiatives. LCBP has published an annual report of LCBP-funded accomplishments for our State and Federal partners to use in tracking performance measures within their unique accounting systems since Federal Fiscal Year 2016. For nutrient management-related projects, LCBP also provides specific project information to the States of Vermont and New York for use in their phosphorus accounting systems for TMDL progress

tracking. This approach reduces the risk of “double counting” management interventions, while also ensuring that management interventions funded solely by the LCBP are included within the respective State and Federal accounting systems.

Each of the four goals of the 2022 plan identifies anticipated metrics that will measure success in implementation of the Plan at the Goal-level and at the Strategy level. These targets reflect anticipated numbers of management interventions, funding for research programs, audiences for outreach campaigns, and recreation programs. This information will be provided in our Annual Report to our State and Federal partners to use in their performance tracking systems.

PROMOTE AND ADVISE PARTNER COMMUNICATIONS

Protection and restoration of the Basin relies on continued input and support from numerous individuals and groups. Decisions concerning the management of the resources in the Lake Champlain Basin must be made through a consensus-based, collaborative process that encourages the expression and understanding of diverse viewpoints. This process helps integrate economic and environmental considerations into management actions and ensures that a focus on implementation at the local level is maintained. Through its committees and the partner workgroup in which it participates, the LCBP helps to ensure that the numerous stakeholders working on Basin issues communicate regularly.

LCBP Committees

LCBP staff will continue to coordinate and facilitate regular meetings of the Lake Champlain Steering Committee, the Executive Committee, and its three advisory committees: Technical, Education & Outreach, and Heritage Area Partnership. These committees are charged with developing annual budget priorities, informing project workplans and providing recommendations on draft project reports. Subcommittees, including the Aquatic Nuisance Species Subcommittee and Toxic Substances Workgroup of the Technical Advisory Committee, meet ad hoc to focus on specific issues and share information.

Federal Partners Workgroup

The Lake Champlain Federal Partners Workgroup consists of many of the U.S. Federal agencies working toward goals in the Lake Champlain watershed and is currently coordinated by LCBP staff. These partners include the core group of Federal agencies that are signatories of *Opportunities for Action*, as well as several other agencies. Federal agencies formally participating in the Workgroup through a Memorandum of Understanding include the USEPA, National Park Service (NPS), Natural Resources Conservation Service (NRCS), United States Army Corps of Engineers (USACE), United States Fish and Wildlife Service (USFWS), United States Forest Service (USFS), and the United States Geological Survey. Other agencies, including Lake Champlain Sea Grant (a program within the National Oceanic and Atmospheric Administration), participate in this group informally. These agencies allocate resources, either in the form of staff time or funding for programmatic areas including research, monitoring, training, infrastructure improvements or management interventions. A renewal of the Federal Partners

Workgroup MOU may add new federal agencies to the agreement, including the U.S. Department of Transportation (USDOT), USDA-Rural Development, USDA-Farm Services Agency (FSA), Federal Emergency Management Agency (FEMA), Department of Housing and Urban Development (HUD), the U.S. Coast Guard, the National Weather Service (NWS) and others. In 2016, LCBP began coordinating communication and facilitating meetings for the group. These meetings bring together staff from many of the Federal agencies working toward management of the Lake Champlain watershed. These meetings provide an opportunity for agency representatives to report on recent projects, discuss upcoming initiatives and funding opportunities, and to develop new collaborative programs targeting priority management goals within the Lake Champlain Basin.

Ad hoc Meetings and Workgroups

LCBP staff frequently provide meeting facilitation for partners. Most recently, the International Joint Commission (IJC) requested meeting facilitation services to coordinate discussions of potential flood management strategies for Lake Champlain, in response to the spring 2011 flooding event that affected many residents on the Lake Champlain shoreline as well as those downstream of Lake Champlain along the Richelieu River in Québec.

At the request of partners, LCBP frequently organizes workgroups or discussions focusing on specific issues. LCBP resources often are used to arrange site facilities for the event, coordinate the meeting, facilitate the conversations during the event, and provide meeting follow-up information for participants. LCBP anticipates similar requests to facilitate cross-border (bi-state, state-provincial and bi-national) conversations, particularly in Missisquoi Bay. The Program also is engaged in coordinating conversations regarding aquatic invasive species vectors through canalways connecting the Hudson River to Lake Champlain in New York and allowing for navigation of the Richelieu River to and from Lake Champlain in Québec.

PARTNERS IN ACTION

Countless partners—including federal, state, and provincial agencies, watershed and conservation groups, heritage and recreation organizations, and local citizens—work to prevent pollution and protect, restore, enhance, and enjoy the water quality of the Lake Champlain Basin. Many of these partners are guided primarily by their own plans and priorities, such as the Phosphorus TMDL Implementation Plan for Lake Champlain or the Aquatic Invasive Species Rapid Response Plan. The intent of *OFA* is to provide guidance to Steering Committee and Advisory Committee members in identifying the annual budget priorities and tasks for LCBP, including its function of collaborating with and coordinating the efforts of these partners. While *OFA* focuses on the actions of agency partners and other stakeholder organizations, it also aims to improve the knowledge of lake issues among the public and the private sectors, and to encourage positive changes in stewardship behaviors.

LOCAL RESIDENTS AND VISITORS

The cumulative effect of many individual actions makes a substantial difference in the complex issues facing the Lake Champlain Basin. In this way, all members of the public are key partners in implementation of *OFA*. More than 600,000 people live, work, and play in the Lake Champlain Basin, which they share with more than six million annual visitors. The need for increased public involvement underlies all the actions in the plan. Individual changes in household and workplace practices, such as maintaining septic systems properly and reducing the use of toxic chemicals in cleaning and lawn care, are needed. Citizens can volunteer for local boards, monitor their community activities, and participate in citizen groups that work for a cleaner Lake. Visitors bring significant tourism income and an appreciation of the region's natural assets, which in turn encourages sustainable practices by local businesses. *OFA* emphasizes education and outreach programs to encourage public involvement to augment the efforts of agencies to achieve management goals for Lake Champlain.

STATE AND PROVINCIAL AGENCIES

State and Provincial agencies in New York, Québec, and Vermont have several key roles in protecting the Basin's resources. They administer several critically important resource management programs, including water-quality protection programs, wetlands protection programs, fish and wildlife management programs, and recreation and cultural resource programs, among others. The states and province also provide technical and financial assistance, such as training for wastewater treatment plant operators and funding for local nonpoint source pollution control projects, to ensure that the appropriate people have the expertise to implement their programs.

US FEDERAL AGENCIES

Many of the activities necessary to improve the watershed must occur at the local and state levels. However, environmental restoration efforts in the Lake Champlain Basin often benefit from the work of federal agencies that implement key projects on the ground. Agency support of the plan is coordinated through a unique network of partnerships. Several federal agencies have signed a *Memorandum of Understanding* to facilitate their cooperation and coordination through the LCBP. Representatives of these agencies are active in many LCBP activities.

- The **U.S. Environmental Protection Agency** provides financial and technical support to the states and to LCBP for implementing several federal environmental programs and is responsible for implementation and enforcement of the Clean Water Act, including approval of Total Maximum Daily Loads for Lake Champlain segments, the Safe Drinking Water Act, and other key environmental laws. The agency ensures that all Americans are protected from significant risks to human health and the environment.
- The **U.S. Department of Agriculture** provides financial and technical assistance for best management practices that control nonpoint source pollution, particularly from agricultural runoff.

- The **U.S. Department of the Interior** supports the management plan through the work of three agencies.
 - The **U.S. Fish and Wildlife Service** cooperates with the states in the management of fish and wildlife resources, plans and carries out site-specific habitat restoration projects, operates a National Wildlife Refuge and two National Fish Hatcheries that support work in the Basin, works with partners on landscape scale conservation planning, and helps ensure that the actions of other federal agencies are consistent with the needs for fish and wildlife conservation.
 - The **National Park Service** serves as a partner through the National Heritage Areas Program to provide support, financial assistance, and advice on managing the important cultural heritage and recreational resources within the Champlain Valley National Heritage Partnership.
 - The **U.S. Geological Survey** provides financial and technical support through stream gauge monitoring and watershed research concerning nutrients and contaminants of concern.

- The **U.S. Army Corps of Engineers (USACE)** is authorized by Section 542 of the Water Resources Development Act of 2000 (revised 2007) to provide assistance with planning, designing, and implementing projects that contribute to protection and enhancement of the Lake Champlain water quality, water supply, ecosystem, and other water-related issues while preserving and enhancing the economic and social character of the communities within the watershed. The USACE works in partnership with the LCBP to implement the Section 542 program within the Lake Champlain Basin. Additional WRDA authorizations may also be accessed to allow USACE to execute projects in the Champlain basin.

- The **U.S. Department of Commerce**, through the National Oceanographic and Atmospheric Administration's National Sea Grant College Program, provides financial and technical support for research, management of fisheries and other aquatic resources, and related watershed programs operated by Lake Champlain Sea Grant. In 2018, Lake Champlain Sea Grant was advanced to Institute status. The Institute designation gives the program increased national recognition and an enhanced ability to support research throughout the region.

NEIWPCC

NEIWPCC¹ is a regional commission that helps the states of the Northeast preserve and advance water quality. Established in 1947 by the U.S. Congress, NEIWPCC engages and convenes water quality professionals and other interested parties from New England and New York to collaborate on water, wastewater, and environmental science challenges across shared regions, ecosystems, and areas of expertise. NEIWPCC's executive committee and commissioners

¹ Following a rebrand in 2020, the New England Interstate Water Pollution Control Commission is known exclusively as NEIWPCC.

(gubernatorial appointees from each of its member states² set the goals and priorities implemented by the Executive Director and the staff. NEIWPCC is a federal grant recipient and receives Section 120 funds from the EPA, as well as other federal agencies, to assist and support the LCBP in implementing OFA. As the host entity of the LCBP, NEIWPCC also provides programmatic advice; hires and supervises staff; manages subawards and contracts; provides administrative, financial, and human resources support; provides direction to the LCBP and the work of its staff; and participates in the Lake Champlain Steering Committee as a non-voting member.

In 1992, the Lake Champlain Management Conference sought NEIWPCC to administer the newly formed LCBP by managing the bulk of its personnel and financial resources according to programmatic goals laid out by the Management Conference (and subsequently the Lake Champlain Steering Committee), a responsibility which NEIWPCC accepted. The role of NEIWPCC in administering finances for the LCBP was further codified in the Great Lakes and Lake Champlain Act of 2002 (Clean Water Act §120), in which NEIWPCC was named alongside the States of Vermont and New York as an entity authorized to receive funding from the U.S. EPA to administer the LCBP. LCBP operations handled by NEIWPCC conform to its Quality Management Plan, approved by the USEPA.

LOCAL GOVERNMENTS

Most of the solutions to problems affecting the Basin, such as nonpoint source pollution from urban and agricultural land uses, failing septic systems, planning for future development, and recreation conflicts, are best implemented at the local level. The plan identifies several actions, mainly in the Thriving Communities Goal, through which the LCBP can assist local governments to address these matters. Key partners likely to implement such actions are Selectboards, local boards and commissions. Because local governments have primary authority over planning—and increasingly, financial responsibility—for the impact of their transportation infrastructure, it is essential that they incorporate a watershed planning focus into their work.

REGIONAL GOVERNMENT ORGANIZATIONS

Watersheds cross town boundaries, and one town acting alone may not be sufficient to address a particular issue. Regional organizations, such as the county planning offices in New York, Municipalité Régionale de Comté (Regional Municipalities) in Quebec, and the Regional Planning Commissions in Vermont, work with several jurisdictions to coordinate efforts that address issues of mutual concern. They will continue to be key partners in focusing implementation efforts through a watershed approach to planning and ensuring that the recommendations of the plan are carried out equitably.

LEGISLATIVE BODIES

Legislative bodies in the Basin are responsible for enacting laws and appropriating funds for many programs important to the Lake. Consistent policies in New York, Québec, and Vermont help to ensure effective and equitable management. The LCBP seeks opportunities to facilitate

² Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont

coordination among the lawmaking bodies of the three jurisdictions. Successful implementation requires that legislators respond decisively and creatively to protect and enhance the resources of the Basin in the face of technical, political, and financial obstacles.

NONGOVERNMENTAL ORGANIZATIONS

Many actions in the plan list nonprofit and citizen-based organizations as potential key partners. Watershed associations and environmental groups have long helped to organize and support local action, including water-quality monitoring, research, conservation of cultural heritage resources, educational workshops, streambank stabilization, toxin reduction initiatives, aquatic species control, public forums, and the encouragement of low-impact recreational activities. Their continued communication with the LCBP about emerging issues and priorities is invaluable.

ACADEMIC INSTITUTIONS AND RESEARCH ORGANIZATIONS

Academic institutions, research organizations, and cooperative extension programs have served vital roles in studying Lake Champlain and its Basin. Institutions such as the University of Vermont, SUNY Plattsburgh, Paul Smith's College, St. Michael's College, Institut de Recherche et de Développement en Agroenvironnement (IRDA), McGill University, Université de Sherbrooke, Cornell University, Middlebury College, Castleton and Northern Vermont universities, and others have conducted a variety of research projects on the Lake and the Basin. They also have educated students, teachers, and other citizens about Lake Champlain issues. Many actions in the plan call for research concerning Lake-wide problems and emerging issues. Continued OFA implementation requires continued participation by academic institutions and research organizations and depends greatly on the soundness of data and information collected by them.

The Lake Champlain Research Consortium (LCRC), a multidisciplinary research and education program that includes many of these institutions, collaborates with the LCBP periodically to sponsor research symposia and conferences, and helps identify research needs and priorities related to the management issues in the plan.

COORDINATING ORGANIZATIONS

The need for state and international communication and cooperation regarding the management of the Lake Champlain Basin has been apparent since the 1940s. Numerous successful efforts have brought the two states and countries together to deal with common issues since that time.

The Lake Champlain Fish and Wildlife Management Cooperative was created through written agreement in 1973 by the USFWS, the NYSDEC, and the Vermont Department of Fish & Wildlife. The Cooperative Agreement, which was updated in 1995 and renewed in 2009, created a Policy Committee consisting of program directors from the three agencies and management and technical committees of agency staff to coordinate fish and wildlife programs of interstate significance in Lake Champlain. Organizations in Québec are not formal partners with the Cooperative but coordinate and communicate with the Cooperative.

INTERNATIONAL TREATY ORGANIZATIONS

The Boundary Waters Treaty of 1909 created the International Joint Commission (IJC) to resolve and to avoid potential disputes regarding the use of boundary waters along the U.S. and Canadian border. IJC membership is comprised of six commissioners appointed by the President of the United States and the Prime Minister of Canada. The IJC convened a Champlain-Richelieu Board during the 1970s to examine regulation of water levels in Lake Champlain and more recently supported research and planning endeavors focused in the Missisquoi River Basin. In 2016, the IJC embarked on a new planning effort to address flooding issues in the Lake Champlain-Richelieu River corridor. This project is anticipated to be complete by late 2022, with several recommendations to be issued to the governments of Canada and the United States.

BUSINESS AND INDUSTRY

The activities of private businesses and chambers of commerce are a critical component of protecting the resources that support the economic vitality of the Basin. Voluntary efforts to recycle and prevent pollution are examples of how the private sector has been active in implementing elements of the plan. Educational partnerships with television and other news media have tremendously increased public awareness of the importance of individual citizen participation and community involvement in good Lake stewardship practices. Chambers of commerce have been effective at drawing together business interests to assist in the planning process and will continue to contribute knowledge through the course of plan implementation.

SECURE AND DIRECT FUNDING

The cost of implementing the plan is high, though not as high as the potential costs of failing to act ([LCBP Technical Report 81](#): An Assessment of the Economic Value of Clean Water in Lake Champlain. University of Vermont, Gund Institute for Ecological Economics, 2015). The ability to implement watershed programs relies on the availability of and access to funding sources. Each fiscal year, the LCBP receives assistance awards from the USEPA, National Park Service, and the Great Lakes Fishery Commission through NEIWPC. These funds are the basis of the LCBP annual budget, by which essential functions are supported, including annual staffing levels, core programmatic tasks (e.g. monitoring programs), and new “capital” projects, such as targeted research projects, management interventions, heritage and recreation grants, or outreach campaigns. The LCBP budget is aligned with the four goals of *OFA*. Additional funding opportunities may be considered where appropriate. Efforts will be made to ensure LCBP does not secure funds from additional funding sources that may have been directed to other watershed groups working on similar goals in the Basin.

CONDUCT SOUND RESEARCH

The plan identifies several areas in which research is needed. Research has been an important component of preparing and updating the plan and will continue to provide critical information as implementation evolves. Improved knowledge of the physical, chemical, biological, and social characteristics of the Lake and Basin will help resource managers make effective policy and management decisions in the future.

REGULARLY UPDATE PLAN RECOMMENDATIONS

Because environmental conditions in the Basin change over time and new technologies are routinely discovered, priorities for action in the plan may change. Priorities identified in the 2022 Plan were generated through a virtual Summit held in June 2021, which included participants from the Steering Committee and all LCBP advisory committees. A facilitated discussion led to identification of a suite of priorities to be identified in the plan. Moving forward, some management programs may become more important, others less so. The plan will be reviewed and updated periodically (ideally every five years) to reflect these changing conditions. Moreover, the Steering Committee may periodically identify new actions requiring implementation based on reports of emerging issues from advisory committees.

OVERVIEW OF GOALS

The Lake Champlain Basin Program has identified four goals that represent the key resource issues facing Lake Champlain and its watershed. Each goal is addressed by **objectives, strategies, and task areas**. The plan also identifies anticipated **metrics** for each strategy to measure progress in implementation of the plan. Objectives are the target areas for action that will help to reach the overarching goal of the chapter. Strategies outline the approaches that will be taken to achieve the objective using the general actions or tools identified in the task areas. Specific tasks in each task area will be identified as part of the budget process each year. The Lake Champlain Steering Committee will maintain an implementation schedule, to be developed independent of this Plan, which will be reviewed annually at the start of each budget cycle. The implementation schedule will identify a suite of strategies or priorities related to select topical areas for support in each budget cycle. This approach gives the Lake Champlain Basin Program committees an opportunity to review the task areas for each goal to determine progress made.

A QUICK GUIDE FOR USING THIS MANAGEMENT PLAN:



MANAGEMENT THEMES:

Several common themes that define the LCBP’s approach to reaching the ecosystem targets are present in all four goals outlined in this management plan. These themes reflect a whole-watershed management approach that addresses current and future resilience to environmental, economic, and political change.

HOLISTIC WATERSHED APPROACH

More than 95 percent of the water in Lake Champlain passes through the 8,234 square miles (21,326 km²) of the Basin as surface and subsurface runoff before reaching the Lake. As a result, land-use activities and pollution sources throughout the Basin have a tremendous impact on the Lake and its ecosystems. Restoration or protection efforts based on watershed boundaries rather than political boundaries better address polluted or threatened areas. In addition to applying the watershed approach on a Basin-wide level, *OFA* encourages the watershed approach at a local level. This allows citizens to improve water quality based on their knowledge of their local area, and for neighboring communities to develop innovative ways to solve pollution problems within their local watersheds. Empowering local communities and their organizations to collaborate gives any effort a better chance of real, sustained success. The plan continues to use a watershed approach that links the Lake with activities in its watershed.

The Lake Champlain Steering Committee recognizes that all segments of the Lake Champlain watershed are important, and that each segment has its own unique management issues. Some

of these segments are further from their management targets than others, particularly with respect to nutrient management issues. Several State and Federal partners have targeted specific watersheds to focus resources for nutrient pollution reduction in their respective management planning efforts. These watersheds include Missisquoi Bay, St. Albans Bay, and the South Lake (Crown Point area southward). The LCBP will work with State and Federal partners to allocate a portion of LCBP funds for nutrient reduction in these high priority watersheds each year. These additional funds may be used for direct management interventions on the landscape, for planning initiatives, research, or short-term targeted monitoring programs designed to identify critical locations for future work.

RESILIENCE TO CLIMATE CHANGE

The climate in the Basin is changing and we must be prepared for an environment that may look very different in the future than the one we see today. Scientists predict a warmer, wetter watershed, which will have far-reaching impacts on tourism, water quality, frequency and toxicity of harmful algal blooms, invasive species spread, and many other management priorities. Recent research at the University of Vermont has shown that climate change is occurring at a faster rate in the region than originally predicted. Local, state, provincial and federal governments are starting to act. Planning for these changes at a watershed scale will create more resilient natural systems and human communities. Throughout each goal of the plan, principles that address local and regional-level climate change adaptation are embedded in the strategies for implementing action.

SCIENCE-DRIVEN COLLABORATIVE MANAGEMENT

Management of the Basin's resources is based on consistent, high-quality data and current scientific knowledge that is developed by a diverse array of federal, state, provincial, local, and not-for-profit partners. Just as policy development and implementation of management actions require a consensus-based approach to decision making, the collection and development of the data and knowledge upon which those actions are based requires cooperation and coordination.

INTEGRATION OF THE ENVIRONMENT AND THE ECONOMY

A healthy Lake Champlain is crucial to a strong regional economy, and a strong economy is good for the Lake. This plan strives to protect and restore the ecological and cultural resources of the Basin while maintaining vibrant local economies by identifying cost-effective solutions and ensuring efficient use of resources by coordinating funding efforts and management actions.

MEASURABLE PROGRESS

LCBP carefully tracks the outcomes of funded projects to measure progress. Nearly \$50 million in projects, monitoring efforts, programs and interpretive events were completed or initiated during the implementation of the 2017 management plan. This includes projects and programs initiated and managed by the States of New York and Vermont, and by the LCBP. These projects will improve water quality, expand research and monitoring programs and support public outreach. During that time, over 500 projects were supported with LCBP funds, ranging from

curriculum development and cultural heritage preservation to aquatic invasive species spread prevention and nutrient reduction programs.

EXPLANATION OF PROGRESS TRACKING METRICS:

Phosphorus load reductions are required by state, federal and provincial law. The LCBP was established with the charge of coordinating efforts among government agencies working toward these outcomes. Within the constraints of the LCBP's annual budget, the Lake Champlain Steering Committee has identified priorities for the LCBP for each goal. For each of these priorities, anticipated metrics will be tracked by LCBP and summarized in an annual report of activities. These metrics also will be communicated to the relevant jurisdictional partners for their internal tracking purposes. The collective success of the LCBP and its partners is documented in the tri-annual *State of the Lake and Ecosystem Indicators Report*, which tracks progress in addressing issues toward phosphorus reductions, human health and toxins, and biodiversity and aquatic invasive species.



GOAL I: CLEAN WATER

Water in the Lake Champlain Basin's lakes, ponds, rivers, and streams will sustain diverse ecosystems, support vibrant communities and working landscapes, and provide safe recreation opportunities.

Clean water is critical for the diverse habitats, working landscapes, and vibrant communities that sustain us. Pollution from human activities across the watershed impairs the water quality of the lake, reduces public access, and decreases economic opportunities. Lake Champlain is among the 25% of lakes in the United States that are impaired by excess nutrients ([USEPA 2011](#)), and among the 40% of lakes with health advisories for fish consumption due to elevated mercury concentrations ([USEPA 2011](#)).

SCIENTIFIC UNDERSTANDING

Sound science is fundamental for action to achieve clean water in the Lake Champlain Basin. Our understanding of lake conditions relies on ongoing monitoring and targeted, management-driven research. Data from monitoring networks like the Lake Champlain Long-Term Monitoring Program are critical for identifying areas in need of pollution interventions and making management decisions to allocate limited resources. New technologies and innovative research will be increasingly necessary to address threats to clean water.

CONTAMINANTS

Contaminants that originate from human activities and products, including pharmaceutical products, pathogens, road salt, and microplastics, pose distinct and complex threats to the waterways of the Basin. Their sources, environmental fate, and effect on biota and human health often are poorly understood. The variety and environmental persistence of these substances necessitate continued monitoring and scientific investigation to prioritize management actions.

NUTRIENT LOADING

Although nutrients are essential for all ecosystems, excessive levels of nutrients can impair water quality. Phosphorus in particular has been identified as a key nutrient that has a direct influence on cyanobacteria blooms in Lake Champlain. Phosphorus inputs to Lake Champlain must be reduced to meet the Clean Water goal. Phosphorus Total Maximum Daily Load (TMDL) regulations for Vermont and New York and reduction plans for the Québec portion of the watershed are guiding forces for LCBP's phosphorus reduction efforts to benefit Lake Champlain. Actions outlined in this plan will directly align with state and provincial partner plans to meet these important phosphorus reduction targets.

CLIMATE CHANGE

The effects of climate change have been widely documented in the Lake Champlain Basin. Rising air temperatures, warmer water temperatures, less frequent and persistent ice cover, more frequent and persistent rainstorms, and more precipitation falling as rain rather than snow all combine with other pressures that threaten Lake Champlain water quality. To respond to these pressures, it is necessary to better understand their effects, and then adapt to mitigate the negative impacts. A new climate change-focused objective aims to close knowledge gaps and direct resources that will provide benefits like shading streams to reduce water temperatures, reconnecting floodplains to reduce flood risk, and minimizing road-salt related salinization of Lake Champlain.

MEASURES OF SUCCESS

Quantifying measures of success is critical to understanding the benefits of LCBP’s work and communicating on progress toward the Clean Water goal for the restoration of Lake Champlain. Each strategy within the Clean Water goal has metrics that will tell the story of how Opportunities for Action is implemented, as identified in the tables below. Key strategy-level metrics will also be aggregated to provide a summary of implementation for the Clean Water goal.

Clean Water goal-level metrics:

- Number of applied research projects supported with results provided to managers and stakeholders
- Amount of funding allocated toward research
- Amount of funding allocated toward implementation
- Number of pollution-reducing best management practices installed
- Amount of phosphorus pollution reduced
- Number of clean water improvement designs or plans funded

Objective 1.A. Improve understanding of water quality conditions and trends; determine the effectiveness of past management and inform future management decisions

Strategy	Task Area	Metrics
Strategy I.A.1 - Fund and interpret monitoring and management-oriented research	I.A.1.a - Support programs and initiatives that increase accessibility of Lake Champlain Basin data to foster new management-oriented research and collaboration.	-Number of applied research projects supported with results provided to managers and stakeholders
	I.A.1.b - Support research to increase understanding of groundwater transport of nutrients and contaminants in the Lake Champlain Basin through monitoring and modeling efforts.	-Amount of funding allocated toward research -Creation of a Lake Champlain data hub

	I.A.1.c - Support research to understand root causes of in-lake, tributary loading, and other environmental trends to effectively focus restoration resources.	
	I.A.1.d - Maintain and expand the Lake Champlain Long-Term Monitoring program to include an in-situ monitoring network that effectively detects ecosystem conditions and changes and informs policy decisions and public interest.	
	I.A.1.e - Support and promote programs that expand sub-watershed monitoring to inform targeted watershed objectives.	
	I.A.1.f - Support research to improve understanding of cyanobacteria in Lake Champlain through expanding existing monitoring programs, increased cyanotoxin testing, and new technologies.	
	I.A.1.g - Support monitoring to screen lake water for toxic substances, including herbicides, pesticides, and personal care products.	
	I.A.1.h - Support research and monitoring programs to inform consumption advisories for Lake Champlain fishes.	
	Strategy I.A.2 - Fund and interpret research on management decisions and best management practices (BMPs)	I.A.2.a - Support research to develop innovative management approaches likely to improve water quality.
I.A.2.b - Support research to increase understanding of factors affecting BMP performance and efficiency, including the potential effects of climate change.		
I.A.2.c - Support research to assess progress of existing water quality management programs to inform new decisions, priorities, and management trajectories.		

	I.A.2.d - Support research to develop strategies that reduce public beach closures.	
Strategy I.A.3 - Fund and interpret research to better understand nutrient dynamics and limit their impact	I.A.3.a - Support research to quantify the mass balance, forms, and transportation routes of phosphorus for the entire Lake Champlain Basin.	-Number of applied research projects supported with results provided to managers and stakeholders
	I.A.3.b - Support research to close knowledge gaps on internal nutrient loading in key areas of the lake, with management recommendations.	-Amount of funding allocated toward research
Strategy I.A.4 - Fund and interpret research on contaminants in the Lake Champlain Basin	I.A.4.a - Support research to reduce agrochemical application and runoff.	-Number of applied research projects supported with results provided to managers and stakeholders
	I.A.4.b - Support research to improve understanding of road de-icing salt impacts and effective management strategies.	-Amount of funding allocated toward research
	I.A.4.c - Support research to improve understanding of emerging contaminants and points of control.	

Objective 1.B. Reduce contaminants of concern and pathogens

Strategy	Task Area	Metrics
Strategy I.B.1 - Reduce contaminant pollution	I.B.1.a - Fund and promote programs that reduce public beach closures.	-Amount of funding allocated toward implementation
	I.B.1.b - Fund and promote programs that increase the efficiency of use of agrochemicals and limit their transport to waterways.	-Number of planning and design projects to reduce contaminant pollution
	I.B.1.c - Fund and promote programs that reduce de-icing salt application and limit their transport to waterways.	-Number of projects supported that directly reduce contaminant pollution
	I.B.1.d - Fund and promote programs that upgrade wastewater treatment infrastructure to effectively treat PFAS, microplastics, and other contaminants of concern.	

	I.B.1.e - Fund and promote programs that reduce the prevalence of contaminants of concern in Lake Champlain Basin waterways.	
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Objective 1.C. Reduce nutrient loading

Strategy	Task Area	Metrics
Strategy I.C.1 - Reduce nutrient inputs from streambanks	I.C.1.a - Fund and promote programs to improve stream equilibrium and connect rivers to their floodplains in critical areas of the Lake Champlain Basin.	<ul style="list-style-type: none"> -Amount of funding allocated toward implementation
	I.C.1.b - Fund and promote programs to protect or enhance river corridors for nutrient reduction and flood resilience.	<ul style="list-style-type: none"> -Number of pollution-reducing best management practices installed -Amount of phosphorus pollution reduced -Number of river restoration projects implemented -Area of floodplain restored -Length of stream/river restored
Strategy I.C.2 - Reduce nutrient inputs from agriculture	I.C.2.a - Fund and promote programs that install recommended BMPs, provide technical assistance, improve soil health, and optimize farm operations to reduce nutrient load and improve water quality.	<ul style="list-style-type: none"> -Amount of funding allocated toward implementation -Number of pollution-reducing best management practices installed
	I.C.2.b - Fund and promote programs that recover agricultural land in floodplains to restore floodplain function, reduce nutrient inputs, and increase flood resilience.	<ul style="list-style-type: none"> -Amount of phosphorus pollution reduced -Area of land recovered or floodplain restored
	I.C.2.c - Fund and promote programs that help farmers meet water quality regulations with	

	targeted cost-share support for small farms, especially in critical sub-watersheds.	<i>-Number of farms supported</i>
	I.C.2.d - Fund and promote programs that remove phosphorus from tile drains and agricultural ditches.	
	I.C.2.e - Fund and promote economical and sustainable agricultural practices that address water quality concerns.	
Strategy I.C.3 - Reduce nutrient inputs from developed lands	I.C.3.a - Fund and promote programs to reduce effective impervious surface area, especially in critical watersheds.	<i>-Amount of funding allocated toward implementation</i>
	I.C.3.b - Fund and promote green stormwater infrastructure design and installation, especially in combined stormwater-sewer service areas and in critical watersheds.	<i>-Number of pollution-reducing best management practices installed</i> <i>-Amount of phosphorus runoff reduced</i>
	I.C.3.c - Fund and promote programs and interventions aimed at reducing nutrient pollution from high-density shoreland areas around lakes and ponds	<i>-Number of preliminary (30%) infrastructure designs funded</i>
	I.C.3.d - Fund and promote programs for asset management and water quality upgrades for wastewater treatment facilities.	<i>-Number of full (100%) infrastructure designs funded</i> <i>-Area of impervious surface treated</i>
Strategy I.C.4 - Reduce nutrient inputs from forested lands	I.C.4.a - Support programs to restore and protect riparian forests and corridors.	<i>-Amount of funding allocated toward implementation</i> <i>-Number of pollution-reducing best management practices installed</i>
	I.C.4.b - Fund and promote programs that assist landowners with meeting water quality regulations on forested lands. Support water quality BMP training programs associated with forested lands.	

	<p>I.C.4.c - Fund programs to promote forestry BMPs while protecting habitats and improving climate change resilience.</p>	<p><i>-Amount of phosphorus runoff reduced</i></p> <p><i>-Area of forested treated with BMPs</i></p> <p><i>-Number of landowners reached</i></p>
<p>New strategy: Implement recommendations from the Missisquoi bay bi-national phosphorus reduction task force</p>	<p>Support recommended tasks to reduce phosphorus pollution and cyanobacteria bloom intensity and frequency in Missisquoi Bay</p>	<p><i>-Number of projects that address task force recommendations</i></p> <p><i>-Funding allocated toward task force recommendations</i></p>

NEW Objective 1.D. Support research to understand the impact of climate change on clean water and act to adapt to climate change impacts

Strategy	Task Area	
<p>Strategy I.D.1 - Fund and interpret climate-change-oriented research</p>	<p>I.D.1.a - Support research to assess the impacts of climate change on nutrient loading from watershed and internal sources.</p>	<p><i>-Number of applied research projects supported with results provided to managers and stakeholders</i></p>
	<p>I.D.1.b - Support research to improve understanding of the impacts of climate change on nutrient cycling dynamics in Lake Champlain.</p>	<p><i>-Amount of funding allocated toward research</i></p>
	<p>I.D.1.c - Support research to quantify the impacts of climate change on phytoplankton communities.</p>	
	<p>I.D.1.d - Support research to improve understanding of the impacts of climate change on cyanobacteria bloom dynamics.</p>	
	<p>I.D.1.e - Support research to assess the impacts of climate change-driven land use changes on water quality.</p>	

	<p>I.D.1.f - Support research to quantify the impacts of climate change on contaminant sources and transport.</p>	
	<p>I.D.1.g - Support research to improve understanding of the impacts of climate change on de-icing salt application and salinization.</p>	
	<p>I.D.1.h - Support research to assess the impact of climate change on water availability and water use.</p>	
<p>Strategy I.D.2 - Adapt to climate-change-caused water resource impacts</p>	<p>I.D.2.a - Fund and promote clean water implementation programs that have co-benefits for adapting to climate change.</p>	<p><i>-Amount of funding allocated</i></p> <p><i>-Number of climate change adaptation projects supported</i></p>
	<p>I.D.2.b - Fund and promote programs to protect and restore natural infrastructure systems that are most vulnerable to the impacts of climate change, including floodplains, wetlands, upland streams, and headwater areas.</p>	<p><i>-Area of floodplains restored</i></p> <p><i>-Area of wetlands restored</i></p>
	<p>I.D.2.c - Fund and promote programs to reduce the impacts of increasing water temperatures.</p>	
	<p>I.D.2.d - Fund and promote programs to reduce the impacts of climate change on water availability and use.</p>	



GOAL II: HEALTHY ECOSYSTEMS

Goal: Ecosystems will provide clean water for drinking and recreating, and intact habitat that is resilient to extreme events and free of aquatic invasive species where diverse fish and wildlife populations flourish.

Healthy ecosystems provide invaluable services such as native species habitat, nutrient filtration, flood resilience, and sediment retention. Diverse ecosystems in the Lake Champlain basin support a lake that provides clean water for drinking and recreating, and healthy fish and wildlife populations. This goal will strengthen the aquatic ecosystem of Lake Champlain with increased understanding of climate impacts, evaluating restoration programs, improving connectivity, supporting restoration efforts for species of concern, and reducing the risk of new invasions by non-native species.

CLIMATE CHANGE

The effects of climate change on ecosystem health have been widely documented in the Lake Champlain Basin. Supporting climate change research can inform how increasing air and water temperatures, lake levels, flood events, less frequent and persistent ice cover, and changing land use all combine with other pressures that threaten habitats and species in the basin. To respond to these pressures, it is necessary to better understand their effects and then adapt to minimize negative impacts. This new Climate Change objective will support and interpret research that identifies the impacts of changes in climate to the Lake's habitats and species, economic and ecological impacts of aquatic invasive species, refugia sites for species of conservation need, and impacts to lake trout. The objective also supports adaptation to climate change impacts by building and maintaining healthy soils in a range of habitats that support ecosystem functions.

ECOSYSTEM MANAGEMENT EVALUATION

Resource managers, businesses, organizations, and landowners in the basin are investing in restoration projects to protect priority habitats and species of concern. Monitoring and evaluation of restoration projects including wetland and retention pond project installations, riparian buffers and plantings, dam removal, in-stream management, and tracking species of greatest conservation need are critical to informing the most effective and efficient use of limited resources. It is also important to support research and identify gaps that are needed to align policy with healthy ecosystems goals.

CONSERVATION OF HABITAT

Natural communities face many threats and have experienced significant changes in biodiversity and abundance during the last few centuries. These threats include loss, degradation and fragmentation of wetland and riparian habitat, overexploitation of highly valued species, introduction of new species to the ecosystem, and climate change.

Conservation of riparian corridors, floodplains, lake shorelands, wetlands, and supporting headwater connectivity in the basin protects and restores these habitats so they can provide ecosystem functions and support a greater diversity of species. For example, dams and undersized or improperly placed road-stream crossings can reduce fish and other aquatic organism habitat by interrupting passage from one stream segment to another. Poorly planned land development also can lead to reduced habitat connectivity, increased erosion and sedimentation, stream bank instability, and increased nutrient and sediment loadings in rivers resulting in further degradation and loss of aquatic habitats. Habitat restoration is also an effective way to support rare, threatened, or endangered species.

AQUATIC AND RIPARIAN BIODIVERSITY

Maintaining high biodiversity is critical for a healthy ecosystem in the face of increasing threats from habitat loss and degradation, aquatic invasive species, and climate change. Support of Lake Champlain food web research informs management decisions by better understanding internal and external drivers such as the impact of new aquatic invasive species or warming water temperatures. Research is also important to help identify information gaps and restoration needs for protected species such as the lake trout and lake sturgeon. To enhance the Lake Champlain fishery, the Lake Champlain Fish and Wildlife Management Cooperative regularly monitors the state of populations of landlocked Atlantic salmon, lake trout, brown trout, American eel, sea lamprey, lake sturgeon, walleye, and northern pike, and conducts targeted research on limiting factors to guide future management. In response and to ensure sustainable native fish populations, state and federal agencies assess and stock native and sport fish species in Lake Champlain. Reducing aquatic and riparian fragmentation is another way to protect native species such as brook trout, Atlantic salmon, and mudpuppies by removing dams and culverts that limit access to cold water streams for spawning and regaining access to historic habitat.

AQUATIC INVASIVE SPECIES

Aquatic invasive species (AIS) are non-native plants, animals, and pathogens that harm the environment, economy, or human health. AIS that become established in the basin can pose serious threats to native fish, wildlife, and plant populations, impede recreational activities, significantly alter the ecosystem of the Lake, and damage the economy of the region.

Support of early detection monitoring and effective responses to new infestations are important to limit invasive species impacts to habitat, native species, and human use and enjoyment of Lake Champlain and other bodies of water in the basin. The Vessel Incidental Discharge Act of 2018 authorized the Great Lakes - Lake Champlain Invasive Species Program, which would support early detection monitoring and population of the Lake Champlain Aquatic Nuisance Species Information Database. This new database, connected with a similar database established

for the Great Lakes, would help improve invasive species risk assessments and efficiently create an AIS watchlist for the basin, updated with information from the Great Lakes database. Continued support of rapid response capabilities including the Lake Champlain AIS Rapid Response Task Force and its emergency fund has allowed for responses to contain and provide education and outreach for spiny and fishhook waterflea and round goby threats.

Lake Champlain aquatic invasive species management and response benefits from maintained involvement in regional and national programs such as the national Aquatic Nuisance Species Task Force and the Northeast Aquatic Nuisance Species Panel which connects the basin to the latest research, control technologies, and education and outreach programs.

AIS enter the Lake Champlain Basin through several pathways, most commonly through interconnected waterways such as the Champlain and Chambly Canals. These human-made canals connect Lake Champlain to the Hudson and Richelieu Rivers. Other priority pathways include overland transport of AIS through human activities such as boating and bait transport. Implementation of a barrier on the Champlain Canal and evaluation of invasive species transfer through the Chambly Canal would address the highest priority pathways, while support of boat launch steward programs and expansion of access to decontamination stations will reduce the spread of invasive species spread via watercraft and trailers. Additional resources are needed to address accidental water garden releases, aquarium dumping, spiritual release and illegal fish stocking.

Of the 51 known non-native aquatic species in Lake Champlain, about a dozen are classified as harmful AIS. Once AIS become established in Lake Champlain, they are difficult to effectively manage. Water chestnut management in Lake Champlain has been a success but requires consistent funding to reduce satellite populations and the main infestation in the south lake to prevent the invasive plant from choking up the waterway and impeding boat traffic, reducing recreational opportunities. Resource managers also expend significant resources managing the sea lamprey population to improve the health of the fishery in Lake Champlain. Increasing effort into education and outreach campaigns to ensure that they are multi-lingual and accessible to the entire Lake Champlain community will help reduce AIS introduction and spread.

MEASURES OF SUCCESS

Quantifying measures of success is critical to understanding the benefits of LCBP's work and communicating on progress toward the Healthy Ecosystems goal. Each strategy within the Healthy Ecosystems goal has metrics that measure progress toward implementation of this goal in *Opportunities for Action*. Key strategy-level metrics will be aggregated to provide a summary of implementation for the Healthy Ecosystems goal.

Healthy Ecosystems goal-level metrics:

- **Number of projects supported & amount of funding allocated toward applied climate change, ecosystem management policy, lake food web dynamic, species of greatest**

conservation need (SGCN) fish community, or aquatic invasive species research with results provided to managers and stakeholders

- Area assessed or covered by plans funded by LCBP
- Acres of land treated or improved for healthy soil function with soil best management practices
- Number of projects supported & amount of funding allocated toward the planning, design, and implementation of projects to improve, restore, and connect riparian corridors and floodplains, lake shorelands, wetlands, or habitat for rare, threatened, and endangered species.
- Population of the Lake Champlain Aquatic Nuisance Species Information System (LCANSIS) Database
- Number of watercraft decontamination stations active within the Basin
- Number of boater interactions at public launches completed by Boat Launch Stewards
- Number of Aquatic Invasive Species interceptions completed by Boat Launch Stewards
- Percent of boaters taking spread prevention measures as documented by Boat Launch Stewards
- Implementation of an effective Aquatic Invasive Species barrier on the Champlain Canal
- Lake area managed for aquatic invasive species

Objective II.A: Support research and understanding of predicted impacts of a changing climate in the Lake Champlain Basin

Strategy	Task Area	Response Metric
II.A.1 - Fund and interpret climate change research	II.A.1.a -Support research and understanding of predicted impacts of a changing climate on the basin including frequency of floods (lake levels), increased air and water temperatures, and changing land use on the lake's ecosystem	-Number of applied research projects supported with results provided to managers and stakeholders -Amount of funding allocated to support climate change research -Area assessed/covered by plan
	II.A.1.b - Support research and understanding of AIS impacts to the lake's ecosystem and economy under changing climate predictions	
	II.A.1.c - Support identification of refugia sites for aquatic species of concern (adapt in place or move in space)	

	II.A.1.d - Study the impacts of climate on the Lake trout population in the basin	
II.A.2 - Adapt to impacts caused by climate change	II.A.2.a - Support protection and restoration of healthy soils for ecosystem functions such as carbon sequestration, improved water quality and infiltration, and reduction of flooding impacts.	<i>-Acres of land treated or improved (with soil BMPs)</i>

Objective: II.B: Evaluate ecosystem management programs and policies (support research to assess success of current ecosystem management programs)

Strategy	Task Area	Response Metric
II.B.1 - Support research to align policy with ecosystem management goals in the basin	II.B.1.a - Assess state and local policies to identify those that align, contradict, or pose obstacles to healthy ecosystems goals	<i>-Number of applied research projects supported with results provided to managers and stakeholders</i>
	II.B.1.b - Conduct research to develop an improved understanding of the effects of funding cycles on the development of new management priorities (decision feedback loop).	<i>-Amount of funding allocated to support research that will inform ecosystem management policies</i>
II.B.2 - Fund research to evaluate ecosystem management programs	II.B.2.a - Fund and promote monitoring of restoration projects to determine long-term effects	<i>-Number of applied research projects supported with results provided to managers and stakeholders</i> <i>-Amount of funding allocated toward evaluation of ecosystem management programs</i>

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Objective II.C. Support Conservation of Habitat for Ecosystem Function

Strategy	Task Area	Response Metric
Strategy II.C.1 - Work with Lake Champlain management partners to prioritize, protect and restore important riparian, shoreland and wetland habitat areas	II.C.1.a - Fund and promote projects that Protect and Restore Riparian Corridors and Floodplains	<i>-Number of habitat improvement projects supported for shorelands, riparian corridors, wetlands, and headwaters</i>
	II.C.1.b - Fund and promote projects that Protect and Restore Lake Shorelands	<i>-Number of projects that address rare, threatened, and endangered species</i>
	II.C.1.c - Fund and promote projects that Protect and Restore Wetlands	<i>-Amount of funding allocated toward habitat improvement projects</i>
	II.C.1.d - Fund and promote projects that Protect and Restore Habitat for rare, threatened, and endangered species	<i>-Area or Length of lakeshore and riparian habitat restored</i> <i>-Lake and land area managed for invasive plants</i>
	II.C.1.e - Fund and promote headwater connectivity by protecting amphibian habitat/upland streams, terrestrial connectivity, and natural infrastructure	<i>-Area of protected core habitat established in conservation easements or other land conservation vehicles</i>

Objective II.D. Preserve and Enhance Aquatic and Riparian Biological Diversity

Strategy	Task Area	Response Metric
Strategy II.D.1 - Conduct research to improve our understanding of the functions and threats to the Lake Champlain ecosystem and develop and support	II.D.1.a - Fund and conduct research to better understand lake food web dynamics including for the improved understanding of lower to upper food web	<i>-Number of applied research projects supported with results provided to managers and stakeholders</i>

<p>programs that improve diversity of aquatic and riparian species in the Basin and work toward protection and restoration of native species.</p>	<p>interactions and impacts of changing external and internal drivers for management decisions.</p>	<p><i>-Amount of funding allocated to support ecosystem function and native species projects</i></p>
	<p>II.D.1.b - Support state and provincial efforts to describe information gaps and assess the restoration needs for statutorily protected species or Species of Greatest Conservation Need (SGCN), such as lake trout and lake sturgeon, to inform management restoration efforts.</p>	<p><i>-Number of assessments generated for Species of Greatest Conservation Need</i></p>
	<p>II.D.1.b - Promote and support fish community research, including juvenile lake trout, brook trout, and landlocked Atlantic salmon, and management of sea lamprey to enhance the fishery</p>	
<p>Strategy II.D.2 - Reduce species fragmentation by preserving and connecting critical aquatic and riparian habitats</p>	<p>II.D.2.a - Fund projects that prioritize and/or reduce fragmentation created by infrastructure, such as roads, dams, and culverts for native species such as brook trout, Atlantic salmon, mudpuppies, and salamanders</p>	<p><i>-Number of aquatic habitat improvement projects supported</i></p> <p><i>-Amount of funding allocated to support aquatic habitat improvement projects</i></p>

Objective II.E. Prevent the Spread of Aquatic Invasive Species

Strategy	Task Area	Response Metric
<p>Strategy II.E.1 - Work with Lake Champlain management partners to monitor and respond to new aquatic species invasions via early detection and rapid response (EDRR) and to educate different stakeholders about how their behavior can affect the spread of AIS</p>	<p>II.E.1.a - Conduct and coordinate AIS monitoring and implement the Great Lakes Lake Champlain Invasive Species Program (GLLCISP) which supports the early detection of the spread of existing AIS to new bodies of water in the basin or new arrivals of AIS to basin waters</p>	<p><i>-Number of projects/responses supported with results provided to managers and stakeholders</i></p> <p><i>-Amount of funding allocated toward implementation</i></p> <p><i>-Populate a Lake Champlain ANS Information System database with AIS species profiles for Lake Champlain</i></p> <p><i>-Progress toward reducing the risk of AIS invasions to Lake Champlain via the Champlain and Chambly canal systems</i></p>
	<p>II.E.1.b - Support and implement the Lake Champlain AIS Rapid Response Management Plan to respond to new AIS infestations and mobilize resources to prevent spread</p>	
	<p>II.E.1.c - Maintain involvement in regional and national AIS programs, such as GLLCISP, ANSTF and NEANS Panel.</p>	
<p>Strategy II.E.2 - Work with Lake Champlain management partners to reduce the risk of AIS transport along pathways such as the Champlain and Chambly canal systems, overland transport on boats and trailers, illegal stocking and bait</p>	<p>II.E.2.a - Intercept AIS transportation on watercraft and equipment by expanding the boat launch steward program and decontamination station coverage.</p>	<p><i>-Number of AIS decontamination stations operating at Lake Champlain public boat launches</i></p> <p><i>-Number of boater interactions</i></p> <p><i>-Number of AIS interceptions</i></p>
	<p>II.E.2.b - Fund and support implementation of an AIS barrier on the Champlain</p>	

	<p>and Chambly canals to prevent further invasions from species from the Hudson, St. Lawrence, and Great Lakes systems.</p>	
<p>Strategy II.E.3 - Support and Conduct AIS Management and Research in the basin</p>	<p>II.E.3.a - Eliminate, reduce, contain or prevent the expansion of AIS populations in the basin, including water chestnut and sea lamprey in Lake Champlain, using control techniques such hand pulling, benthic barrier matting, suction harvesting, and pesticides.</p>	<p><i>-Number of applied research projects supported with results provided to managers and stakeholders</i></p> <p><i>-Amount of funding allocated toward projects that address AIS concerns</i></p> <p><i>-Lake and land area managed for invasive species</i></p>
	<p>II.E.3.b - Research and remain connected to new and innovative research, spread prevention programs and control technologies capable of addressing real and potential AIS species impacts, including sea lamprey, to the Lake Champlain ecosystem and fishery, human health, and the regional economy</p>	
<p>Strategy II.E.4 - Work with Lake Champlain management partners to deliver and conduct multi-lingual AIS education and outreach behavior change campaigns targeted at the general public and water user groups AIS Public Outreach</p>	<p>II.E.4 a - Fund, support, and develop multi-lingual AIS spread prevention initiatives that address pathways (water gardening, aquarium and spiritual releases, bait, etc.) and promote the national Clean, Drain, and Dry Stop Aquatic Hitchhikers messaging program.</p>	<p><i>-Number of people engaged who demonstrate a minimum level of knowledge or attitude toward AIS spread prevention</i></p> <p><i>-Number of traditionally underserved community groups engaged with AIS messaging</i></p>



GOAL III: FOSTER THRIVING COMMUNITIES

Goal: Lake Champlain Basin communities have an appreciation and understanding of the Basin’s rich natural and cultural resources, and have the capacity to implement actions that will result in sound stewardship of these resources while maintaining strong local economies.

Any measure of a sustainable watershed must include communities that are thriving in a way that is compatible with the protection of our natural and cultural resources. A community only thrives when there is a balance of careful stewardship of those resources and smart economic development. Sound social and economic objectives are cornerstones of natural resource management and sustainable development. While economic development is beyond the purview of the LCBP and *OFA*, the organization can support and inform efforts by the business community and industry to implement lake-friendly and culturally responsible practices that contribute to a stronger economy and a healthier lake.

The LCBP has an array of tools to foster thriving communities. The Champlain Valley National Heritage Area Partnership is a National Park Service program that focuses on stewardship, education and interpretation of our region’s rich history and culture, collaboration among New York, Vermont and Quebec, and sustainable tourism from the mouth of the Richelieu River to the southern end of the Champlain Canal. The Champlain-Adirondack Biosphere Network encourages dialog among partners in the Basin and Adirondack Park. While these efforts are large in scale, the LCBP also promotes this networking and knowledge-sharing at the state, regional and local levels. The strategies below lay out an approach to ensuring that successful efforts are recognized and shared.

ENGAGING AND SUPPORTING PARTNERS

The LCBP has supported partners and encouraged collaboration for more than 30 years. The Program has provided watershed efforts with support and trainings through its Organizational Support to Watershed Groups grant programs. LCBP has provided forums for discussions on stewardship techniques among foresters, farmers, municipal and state officials, and landowners. School programs and outreach efforts strive to educate the public on how they can help address the issues facing Lake Champlain—and explain why the actions they take are in their best interest. The LCBP has illuminated the connection between a clean, sustainable environment and a vibrant, growing economy.

The LCBP State of the Lake report condenses the outcomes of our partners’ efforts every three years, and the LCBP annual report provides information on every project undertaken in the

previous fiscal year. These documents allow residents and policy makers to understand our collective progress toward achieving *OFA* goals. As social and environmental issues evolve, so does the plan. In addition to continuing address the actions described above, the LCBP will work to strengthen technical outreach and training, support plans for pending climate migration, take actions to increase engagement with underserved communities, and better illustrate how investing in infrastructure can benefit us economically.

WATER-WISE ECONOMIC DEVELOPMENT

An important first step in linking the value of a clean lake to the regional economy is a comprehensive assessment of the value of ecosystem services and the direct financial benefit to the business community, including revenues from recreation and tourism. Working with the business community, including farmers and loggers, to implement lake-friendly practices—from minor adjustments in everyday operations to large-scale innovation—can help enhance the ecological and economic services provided by clean water. The LCBP has traditionally presented Farm Awards to agricultural producers who implement practices to protect water quality. Extending the awards program concept to other areas, including implementation of effective green stormwater infrastructure, will highlight businesses that adopt more water-wise practices and exhibit leadership.

The LCBP has provided leadership in the recent revival of the Champlain-Adirondack Biosphere program, which was dormant for 30 years. The Biosphere provides more opportunities for encouraging our municipalities and citizens to be careful stewards of our natural and cultural resources. It also provides a platform to encourage an exchange of ideas and practices from other biospheres from across the globe. The formation of the Champlain-Adirondack Biosphere Network (CABN) created a “network of networks” that better ties communities and organizations working toward the same sustainable goals for the environment and society. The LCBP will support this effort through leadership, staffing and grants.

CULTURAL HERITAGE RESOURCES STEWARDSHIP

An appreciation of our natural and cultural heritage is critical in fostering an understanding of them; that appreciation and understanding leads to stewardship. The Champlain Valley National Heritage Partnership (CVNHP) works on many fronts to preserve, interpret and showcase this heritage, and as such the 2011 CVNHP Management Plan is integrated into *OFA* by reference. The CVNHP has made great strides in helping the public better understand the past and put those lessons to use today.

The CVNHP focuses on one of its interpretive themes each year: *Making of Nations*, *Corridor of Commerce*, and *Conservation & Community*. This annual approach encourages stakeholders to work together to collectively commemorate anniversaries, or mark special programs. In 2023, the CVNHP will focus on the bicentennial of the opening of the Champlain Canal as part of the *Corridor of Commerce* theme. Partners will mark this feat of engineering while providing information on the modern threats of invasive species using the waterway and colonizing Lake Champlain. In 2024, the CVNHP will focus on the *Conservation & Community* Interpretive Theme

by highlighting the Champlain-Adirondack Biosphere. The 250th anniversary of the American Revolution will be the vocal point of the *Making of Nations* theme from 2025-2027.

RECREATION

Whether hiking in the mountains, boating on Lake Champlain, or plunging into a favorite swimming hole, most people who recreate outdoors have a strong bond with our forests, lakes and streams. Recreation provides significant health benefits while building an appreciation of our natural resources. The LCBP has long been a proponent of creating access to the lake and its tributaries. The LCBP will continue to support sustainable recreation efforts, promote ethical use of our public lands and waters, and develop additional access to those recreation resources, while encouraging members of underserved communities to enjoy and learn about our renowned natural resources and recreation opportunities.

MEASURES OF SUCCESS

Assessing the outcomes or benefits of efforts to improve the health of communities in the context of societal changes is extraordinarily difficult. Metrics for progress for community-level characteristics like a strong sense of place, community pride, and environmental awareness are difficult to define and measure. The benefits of assisting partners with meeting coordination, public education efforts, and financial and technical support are indirect and often not immediate. Tangible on-the-ground environmental outcomes (phosphorus reductions, habitat improvement, etc.) of these initiatives are generally realized because of successful technical improvements. Long-term changes in water-quality knowledge and behavioral changes at the community level are best evaluated with program-specific evaluations and broad-scale surveys (see Goal IV: Informed and Involved Public). While the LCBP will continue to identify opportunities to evaluate the impact of our programs on societal and ecosystem scales, some basic measures have been introduced to better understand the impact of LCBP, CVNHP and CABN grants and programs.

Thriving Communities goal-level metrics:

- Annual number of meetings, technical trainings, and other outreach events supported through grants and technical support;
- Number of participants in those funded gatherings;
- Number of documented partnerships maintained per year (e.g. grant MOAs, committee membership, etc.);
- Number of grants awarded;
- Total amount of funding provided;
- Total amount of match generated by the funding provided;
- Number of volunteers participating in LCBP-sponsored projects;
- Total amount of volunteer hours contributed to LCBP or CVNHP projects;
- Value of those volunteer hours (rates provided by Independent Sector);

Objective III.A: Engage and Support Community & Management Partners

Facilitate work and communication within and among local communities that further watershed protection and restoration efforts.

Strategy	Task Area	Response Metric
<p>III.A.1— Support local watershed groups</p>	<p>**III.A.1.a – Grant Programs Provide funds for local watershed groups to implement projects</p>	<p><i>-Number of different watershed groups that successfully complete projects with LCBP funding</i></p>
	<p>**III.A.1.b – Technical Assistance Provide technical assistance through meetings, workshops, presentation, and training</p>	<p><i>-Number of Technical support programs offered</i></p> <p><i>-Number of people in the Basin who receive technical support</i></p>
	<p>III.A.1.c – Targeted watershed capacity building Work with partners in priority watersheds (Missisquoi, St. Albans Bay, South Lake A and B) to provide technical support and capacity building</p>	<p><i>-Total funding leveraged (including match, over-match, and non-match eligible leveraged funds)</i></p>
<p>III.A.2 – Facilitate and coordinate public messaging with management partners</p>	<p>III.A.2.a –Annual Report of LCBP Activities Publish report annually summarizing LCBP activities in the previous year.</p>	<p><i>-Number of meetings coordinated with partners (excluding LCBP standing Committee meetings)</i></p>
	<p>**III.A.2.b – Meeting Coordination Assist partners with coordination of public meetings to inform the public about new legislation, programs, and initiatives.</p>	
	<p>III.A.2.c - Public Feedback Strengthen the feedback loop between resource managers and community members. Ensure the managers are answering</p>	

	<p>questions relevant to communities.</p>	
<p>III.A.3 – Enhance flood resilience and climate change adaptation in community planning and development</p>	<p>III.A.3.a –Fund and Promote Outreach Support and advise municipalities' efforts to educate residents about sound river/floodplain management and promote recreation opportunities</p>	<p><i>-Number of climate resilience and adaptation outreach tools developed</i></p> <p><i>-Number of outreach activities and trainings directed to new Basin residents</i></p>
	<p>III.A.3.b – Plan for Climate Migration Examine how Basin communities are likely to receive new climate migration residents and how this will affect the Basin as a whole</p>	
<p>III.A.4—Serve as a conduit for information, build professional capacity among stakeholders, and foster strong working relationships among the partners of the LCBP and CVNHP, and Champlain-Adirondack Biosphere Network (CABN).</p>	<p>**III.A.4.a Professional Development Support professional development among CVNHP stakeholders, including hosting an annual heritage partnership conference.</p> <p>**III.A.4.b Promote Partnerships Encourage cooperation and enhance communication among partners within the CVNHP and CABN.</p>	<p><i>-Number of participants in the annual CVNHP Summit</i></p> <p><i>-Number of formal partnerships maintained (e.g. Steering Committee, CACs)</i></p> <p><i>-Number of technical training opportunities made available to municipalities, indigenous communities, and NGOs.</i></p> <p><i>-Number of volunteers engaged in projects or programs</i></p>
	<p>III.A.4.c Technical Outreach Training Fund and promote technical training programs for technical and outreach staff working with stakeholders in the Basin</p>	

	<p>III.A.4.d – Technical Issue Training Support seminars, workshops, and conferences to deliver technical information on topics such as BMPS, LID, stormwater management technologies, roads management, and adaptive management to municipal and state staff</p>	
	<p>III.A.4.e Eco-benefit Education Educate stakeholders on the benefits and outcomes of completed projects for water quality, to encourage local support for community-level investments in water quality projects that benefit the Lake</p>	
	<p>III.A.4.f Economic Analysis Conduct valuations of clean water and healthy watersheds to demonstrate the value of investing in watershed practices.</p>	
<p>III.A.5 - Support underserved communities and build diversity, equity, and inclusion principles into LCBP programming</p>	<p>III.A.5.a Diversity Planning Develop a long-term diversity, equity, inclusion plan to diversify LCBP, including staff, committees, and opportunities among grants and education programs</p>	<p><i>-Number of projects engaging underserved communities</i></p> <p><i>-Number of new applications from groups representing underserved communities</i></p>
	<p>III.a.5.b Encourage Diversity Ensure that LCBP and CVNHP programs and grant opportunities are representative of the Basin and its residents, and that traditionally underserved communities are</p>	

	represented within committees of the Program	
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Objective III.B: Support Water-Wise Economic Development

Support and inform business practices and economic development that promote clean water across multiple economic sectors.

Strategy	Task Area	Response Metric
III.B.1— Support business innovations that improve water quality	III.B.1.a – Business/Industry Education Outreach Work with key partners to develop industry-specific outreach III.B.1.b – Innovation Development Provide support to local businesses to develop and showcase new and innovative practices that support clean water	-Number of businesses partnered with LCBP
III.B.2 – Support working landscapes that help protect water quality	III.B.2.a – Outreach Assistance to Agriculture Support farmers and foresters efforts to share their water quality protection practices **III.B.2.b – Awards Program Continue and implement new programs that recognize effective practices to protect water quality with a focus on agriculture and community recognition	-Number of farmer-to-farmer education or technical programs supported
III.B.3 – Support implementation of green stormwater infrastructure (GSI)	III.B.3.a – Awards/Recognition Program Initiate a program that recognizes effective implementation of GSI	-Number of GSI projects supported with LCBP funds (corresponds with Clean Water goal)

<p>III.B.4—Coordinate efforts among partners to promote the CVNHP and the Champlain-Adirondack Biosphere Region as a world-class destination for heritage travelers.</p>	<p>III.B.4.a Promote CVNHP Themes Develop and maintain a consistent regional brand related to the interpretive themes of the CVNHP.</p> <p>III.B.4.b Web Promotion Use the CVNHP website to promote the region, including the Biosphere.</p> <p>III.B.4.c Bilingual Services Support the development of bilingual materials, interpretation, and services.</p> <p>III.B.4.d Welcoming Visitors Promote the CABN efforts to attract international travelers</p>	<p><i>-Number of grants supporting the CVNHP annual interpretive theme</i></p> <p><i>-Number of multilingual materials developed</i></p> <p><i>-Number of grants supporting sustainable tourism in the CAB region</i></p>
<p>III.B.5—Foster a sustainable relationship between people and the natural and cultural resources of the Biosphere and CVNHP.</p>	<p><i>III.B.5.a Energy Efficiency</i> Promote energy efficiency and resource conservation among CVNHP partners.</p> <p><i>III.B.5.b Promote Sustainability</i> Promote sustainable agriculture practices in the CVNHP and in the Biosphere.</p> <p>III.B.6. <i>CABN Coordination</i> Fund and promote work CABN coordination efforts</p>	<p><i>-Number of collections grants awarded through the CVNHP that address energy efficiency in museums and interpretive centers in the CVNHP</i></p> <p><i>-Number of CABN meetings and events coordinated</i></p> <p><i>-Number of grants awarded that address UN sustainable development goals</i></p>

Objective III.C: Support Awareness and Conservation of Cultural Heritage Resources

Increase understanding of the region’s cultural and historical resources. Greater understanding leads to greater appreciation, which leads to enhanced stewardship of these resources.

Strategy	Task Area	Response Metric
<p>III.C.1— Build on existing knowledge, make new discoveries of the history, culture, and special resources of the CVNHP, and make this information accessible to all</p>	<p>**III.C.1.a Cultural Resource Support Support research and interpretation of our past and the cultural heritage resources of the CVNHP.</p> <p>III.C.1.b: Maintain Cultural Database Manage a comprehensive online heritage resource database.</p> <p>III.C.1.c: Promote Ethnography Document cultural components of the region, including Abenaki, Mohegan, Mohawk and Onita cultures, Franco-American culture, and new American communities to research, restore and maintain these cultural identities in the Basin and CVNHP region.</p>	<p><i>-Number of CVNHP grants awarded</i></p> <p><i>-Number of new interpretive displays and materials developed</i></p>
<p>III.C.2—Support the conservation of the historical, archeological, natural and cultural resources of the CVNHP</p>	<p>III.C.2.a: Build Bridges Between History and Ecology Utilize the heritage of the Basin to engage stakeholders and foster stewardship of the Basin's natural resources</p> <p>III.C.2.b: Promote Resource Protection Develop and implement CVNHP cultural and natural heritage resource protection programs as identified in the</p>	<p><i>-Number of grants awarded that conserve historical, archeological, natural and cultural resources</i></p>

	<p>CVNHP management plan.</p> <p>III.C.2.c: Support the Underwater Preserve System Support a lake-wide management strategy for underwater cultural heritage resources in the CVNHP.</p>	
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Objective III.D: Support Lake and Basin Recreation

Foster stewardship of the Basin’s land and waters, and support local economies, by connecting individuals and communities to the landscape.

Strategy	Task Area	Response Metric
<p>III.D.1—Provide sustainable and accessible recreational opportunities for everyone within the CVNHP, with a focus on access for underserved communities</p>	<p>**III.D.1.a: Sustainable Recreation Support initiatives that promote sustainable recreational activities that feature the natural, cultural, and historical resources in the CVNHP, including Lake Champlain Bikeways and the Western New England Greenways.</p>	<p><i>-Number of grants awarded that support sustainable recreation opportunities</i></p> <p><i>-Number of grants awarded that promote access for underserved communities</i></p>
	<p>III.D.1.b: Promote Better Access Increase and improve public access opportunities to the waterbodies of the basin and interconnected waterways of the CVNHP for diverse recreational activities.</p>	
	<p>**III.D.1.c: Encourage Sustainable Recreation Practices Support a public information program that emphasizes</p>	

	recreational ethics, public safety, sustainable use, and stewardship of cultural and natural resources	
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GOAL IV: INFORM AND INVOLVE THE PUBLIC

Goal: Basin residents and visitors will understand and appreciate Lake Champlain Basin resources, and will possess a sense of personal responsibility that results in behavioral changes and actions to reduce pollution and support healthy ecosystems and cultural resources.

The future of the Lake Champlain Basin rests in the hands of its citizens and leaders. For this reason, public information and outreach efforts have been a core function of the LCBP's work since its establishment. Education and interpretation of cultural and natural heritage have been a central component of the Champlain Valley National Heritage Partnership's work since its inception in 2006.

The LCBP, the CVNHP, and its partners must continue and expand efforts to engage diverse audiences, including underserved communities, in protecting and appreciating the resources of the entire Basin. Ultimately, a public that understands the Basin's water quality and resource management problems, with possible solutions, can make informed choices about their role in the protection and restoration of the Lake. Informing the public about how to change personal and collective behaviors and providing opportunities to change those behaviors is critical.

FORMAL LEARNING

Developing this understanding and appreciation at an early age is critical in fostering stewardship of natural and cultural resources. Formal learning in the classroom and field studies that are structured around a curriculum that integrates effective pedagogy and high-quality watershed content equips young citizens to make informed choices about their personal actions exploring the watershed. It also creates a multiplier effect as they share information and values with their parents, families, and other community members.

The LCBP and partners work directly with students through classroom programs and providing first-hand stewardship opportunities, and by training and providing resources to K-12 educators. The Champlain Basin Education Initiative (CBEI), a consortium of environmental and place-based education groups, continues to be a leader in watershed education in the Lake Champlain Basin. Through the *Watershed for Every Classroom* (WEC) program and annual professional development workshops, CBEI offers rich learning opportunities to teachers so that they might be better equipped to offer them to their students. CBEI has incorporated cultural heritage topics into WEC and its other programs, and will work to build this aspect of its offerings going forward.

INFORMAL LEARNING

In addition to formal education efforts, the LCBP will continue to inspire and build awareness among all age groups of watershed issues through informal and less structured outreach. Central to this objective is the need to interpret scientific findings, technical information and management efforts. The first step to connecting people to the resource and encouraging behavior change is making the science of lake issues understandable to all citizens.

A variety of techniques and forms of media—including face-to-face interpretation and development of exhibits and outreach materials in both print and electronic formats—help to achieve this objective. Mass media outlets such as television and radio can expand the reach of these messaging efforts to the 600,000 basin residents. The effectiveness of these efforts is enhanced through collaboration with key partners who have similar communications goals and audiences, and who possess skill sets that complement LCBP work.

BEHAVIOR CHANGE AND ACTION

The most successful education and outreach efforts inspire and facilitate citizen action. By making information about lake-friendly products and practices available, and by supporting the efforts of local watershed organizations and other partners to involve the public in direct action, the LCBP can help promote positive stewardship behaviors. New technologies allow citizens to share information and values more quickly and easily than ever before. Employing these tools in social marketing efforts can help engender a shift in collective values around resource stewardship.

Much of the work toward these objectives is accomplished most effectively by local watershed and river groups as well as other nonprofits and communities. As such, support for these organizations is critical to fully implementing this plan. Local implementation grants fund a variety of outreach projects and remain a high priority in the annual budget process.

MEASURES OF SUCCESS

Informed and Involved Public Goal-level Metrics

- Number of education programs offered;
- Number of teachers involved in programs and grants;
- Number of students reached through those programs and grants;
- Number of visitors at the LCBP Resource Room at ECHO;
- Number of individuals reached through interpretive and education and outreach programs and presentations;
- Number of visitors to LCBP web sites;
- Number of volunteers participating in LCBP grant-funded education and outreach projects

The ultimate outcome of education and outreach efforts is behavior change, but the on-the-ground impacts of specific projects that inform and involve the public can be difficult to

determine. Once a program is delivered, the ability to follow up with participants or audiences is limited, particularly over the long term. Some partners have begun to track participants’ behavior change several months after programs, providing a model for short- and mid-term evaluation efforts in the future.

While program-specific evaluations capture participants’ perceptions, immediate actions and intentions for future behavior, lasting behavior change takes some time to occur. Surveys administered at three- to five-year intervals will help evaluate broad-scale, long-term behavior change and the effectiveness of the strategies and task areas below. Under contract with the LCBP, Lake Champlain Sea Grant has conducted a survey that will serve as a baseline for tracking the public’s knowledge of watershed issues and engagement in stewardship activities. The survey was crafted to reflect on the work of the LCBP and its partners, and it will help guide future outreach efforts of these partners.

Objective IV.A: Enhance formal learning at all educational levels

Support programs that educate stakeholders in formal, organized settings. Provide resources and opportunities for students to increase understanding of and appreciation for natural and cultural resources, related threats, and priority actions needed to address them.

Strategy	Task Area	Response Metric
IV.A.1— Implement Programs for K-12 students	**IV.A.1.a – Fund, Promote, and Deliver School Programs Deliver classroom instruction that increases knowledge of watershed science, recreation and cultural heritage among K-12 students	-Number of students receiving watershed-focused instruction -Number of watershed science, recreation, and cultural programs delivered to K-12 schools
	IV.A.1.b – Fund, Promote and Deliver Field Programs Conduct field-based instruction and activities that provide hands-on knowledge of watershed science, recreation and cultural heritage among K-12 students	-Number of community projects implemented
IV.A.2 – Maintain and expand Digital/Online Tools and Resources	IV.A.2.a – Web Outreach Maintain and enhance web resources, update design and content of existing web sites to support digital classroom learning experiences.	-Number of Social media posts -Number of views on LCBP-hosted websites
	IV.A.2.b – Social Media Amplify social media presence for education efforts	

<p>IV.A.3 – Support professional development for teachers and educator networks.</p>	<p>**IV.A.3.a – Professional Development Trainings Deliver, fund and promote instruction in watershed content and pedagogy for K-12 teachers via CBEI and other workshops</p>	<p>-Number of teaching certificate hours awarded</p> <p>-Number of curricula developed</p>
	<p>IV.A.3.b – Curriculum Development Deliver, fund, and promote resources and curriculum materials developed as part of CBEI workshops and WEC and partner programs</p>	
<p>IV.A.4 – Engage youth in watershed management and stewardship opportunities</p>	<p>IV.A.4.a – Community Service Projects with K-12 students Fund and Promote community service projects and mentorship programs focused on clean water and healthy ecosystems, with an emphasis on traditionally underserved communities</p>	<p>-Number of youths engaged outside of classroom learning</p> <p>-Number of youth programs implemented</p>
	<p>IV.A.4.b Youth advisory committee. Develop and coordinate a group representing youth perspectives across the Basin.</p>	
	<p>IV.A.4.c: Youth engagement and exchange opportunities Fund and promote cultural exchanges and international scholarship programs</p>	
	<p>IV.A.4.d – Summer Youth Programs Fund, promote and deliver summer camp programs focused on hands-on water quality education and conservation practices</p>	

Objective IV.B: Build awareness of the Lake Champlain Basin through informal learning across all communities

Develop among residents and visitors an understanding of and appreciation for natural and cultural resources, the related threats, and the priority actions needed to address them.

Strategy	Task Area	Response Metric
<p>IV.B.1— Communicate watershed science and stewardship information for the public and stakeholders</p>	<p>**IV.B.1.a – Report on Condition of the Lake State of the Lake and Ecosystem Indicators Report</p>	<p>-Number of workshops, webinars, stakeholder meetings</p>
	<p>IV.B.1.b – Interpretation Develop wayside and interpretive exhibits, brochures, fact sheets, and other print materials that explain natural and cultural resources, including watershed issues and concepts and CVNHP interpretive themes.</p>	<p>-Number of people engaged in face-to-face or virtual platform meetings or presentations</p> <p>-Number of new outreach publications (print, digital, video) developed</p>
	<p>**IV.B.1.c – Direct Engagement Deliver face-to-face, small group, and interactive interpretation with members of the public.</p>	<p>-Number of underserved or environmental justice communities engaged</p>
	<p>IV.B.1.d – Public Presentations Deliver presentations and demonstrations to inform decision makers, foster public understanding, and inspire action.</p>	
	<p>**IV.B.1.e – Web/Electronic Outreach Produce video and other dynamic media for LCBP websites and social media</p>	
	<p>IV.B.1.f – Basin Data Sharing Tools Develop, support and promote digital tools for sharing and interpreting Lake and Basin data, including dashboards, story maps, portals, etc.</p>	

	<p><i>IV.B.1.g – Print Publications</i> Design and develop print materials to inform public of issues and progress made by stakeholders to address issues</p>	
	<p><i>IV.B.1.i</i> Develop targeted outreach and engagement strategies for underserved communities.</p>	
	<p><i>IV.B.1.j Missisquoi Bay Phosphorus Reduction</i> Support education and outreach programming in collaboration with the Missisquoi Bay Bi-National Phosphorus Reduction Task Force</p>	
	<p><i>IV.B.1.k Climate Resilience and Adaptation</i> Deliver, fund and promote education programs to communicate messaging about climate resilience and adaptation</p>	
	<p><i>IV.B.1.l Interpretation through the Arts</i> Deliver, fund and promote programs that use art to educate and interpret watershed issues.</p>	

Objective IV.C: Facilitate changes in behavior and actions of individuals for their communities

Develop programs that enable people to adopt behavioral changes that reflect a personal commitment to protecting and improving resources in the Basin.

Strategy	Task Area	Response Metric
IV.C.1— Promote individual stewardship action	<i>IV.C.1.a – Volunteer Opportunities</i> Use web and social media channels to encourage action at home or with local organizations' volunteer programs	-Number of volunteers participating in LCBP or grant-funded programs or projects
	<i>IV.C.1.b – Outreach materials</i> Promote lake-friendly products and practices.	
IV.C.2 – Promote community stewardship action.	<i>IV.C.3.a – Social Marketing</i> Implement social marketing techniques to foster sharing of information and stewardship ethic.	-Number of communities engaged in watershed programs (e.g. Raise the Blade campaign)
	<i>**IV.C.3.b – Media Competition</i> Implement a photo/video contest with a content sharing mechanism.	-Number of participants in lake leadership programming
	<i>IV.C.3.d</i> Develop a Lake Leaders program to promote individuals who take steps to improve the health of the Lake	
IV.C.4 – Assess changes in the public’s knowledge and behavior	<i>IV.C.4.a – Public Survey</i> Conduct long-term surveys to track long-term changes in the public’s knowledge and behavior, and effectiveness of LCBP and partner outreach efforts	-Number of people demonstrating a minimum level of knowledge or attitude
	IV.C.4.b Increase community science to engage and develop stewardship for the basin	-Number of participants in volunteer monitoring programs