

CHAPTER THREE

LIVING NATURAL RESOURCES

THIS CHAPTER INCLUDES:

Managing Fish and Wildlife
Protecting and Restoring Wetlands, Streams, and Riparian Habitats
Managing Nonnative Aquatic Nuisance Plants and Animals

The living natural resources of the Lake Champlain Basin are part of a complex ecosystem. Fish and wildlife, including non-native aquatic nuisance species, such as sea lamprey, occupy a mosaic of interconnected aquatic and terrestrial habitats. These habitats include the Lake's broad open waters, tributaries, wetlands, forests, agricultural lands, and other areas. The Basin's living natural resources can be divided into six major groups: fish, invertebrates, amphibians and reptiles, birds, mammals, and plants. Humans are also part of the ecosystem, and in many places, human activities and development have adversely impacted local ecosystems.

Les ressources naturelles vivantes

Les ressources naturelles vivantes du bassin du lac Champlain font partie d'un écosystème complexe. La faune, incluant les espèces aquatiques nuisibles comme la lamproie marine, occupe une mosaïque d'habitats aquatiques et terrestres étroitement liés. Ces habitats comprennent les eaux du lac, les affluents, les milieux humides, les forêts, les terres agricoles et les autres zones. Les ressources naturelles vivantes du bassin sont divisées en six grands groupes: les poissons, les invertébrés, les amphibiens et les reptiles, les oiseaux, les mammifères et les plantes. Les êtres humains font également partie de l'écosystème et, en de nombreux endroits, les activités humaines ont eu des effets négatifs sur les écosystèmes locaux.

MANAGING FISH AND WILDLIFE

GOAL

Restore and maintain a healthy and diverse community of fish and wildlife for the people of the Lake Champlain Basin.

Fish and wildlife provide tremendous social, economic, and environmental benefits to the Lake Champlain Basin. The structure and function of the food web affect water quality, bioaccumulation of toxins, and habitat suitability for fish and wildlife. Abundant fish and wildlife attract recreational hunters, bird watchers, and anglers, resulting in significant economic benefit to local communities. In 1997, people spent more than \$204 million on activities related to fishing on Lake Champlain (Gilbert, 2000). Bird and other wildlife viewing activities contribute to the Basin's economy, too, generating more than \$50 million a year in Vermont (Vermont Agency of Natural Resources, 1996). The complex array of plants and animals also provides other important benefits to humans, such as pollution filtration through wetlands and other vegetated areas, scenic beauty, and recreational opportunities. Natural species diversity is a highly valued part of the region's natural heritage and a critical component of the ecosystem that we, as humans, share.

ISSUES

Adaptive Resource Management

Adaptive resource management is an important process of adjusting management policies and actions in light of new information about the ecosystem, both social and scientific, and progress towards management goals. For example, there is a public concern that walleye populations have declined significantly and steadily in Lake Champlain over the past 40 years. Restrictive harvest regulations and other management actions, including a fry and fingerling stocking, have been initiated to curtail this perceived decline. While recent surveys indicate that the fishery has begun to show improvements in some areas of the lake, in Missisquoi Bay the walleye fishery has continued to decline. Additional information, such as assessing effectiveness of stocking and identifying life stages where high mortality is occurring, needs to be gathered to determine the future management actions for restoring the walleye fishery lakewide.

Enhancing Application of an Ecosystem Approach to Fish and Wildlife Management

Lake Champlain supports an abundance of fish and wildlife species, and current management efforts have achieved a measure of success. The Plan calls for management activities to be expanded and integrated to incorporate additional components of the Lake Champlain ecosystem. Recreational use and enjoyment of fish and wildlife resources will continue to be important features that need to be maintained.

A number of ongoing and proposed management actions for Lake Champlain may have significant effects on other natural communities. For example, stocking by the Fish and Wildlife Management Cooperative increases the numbers of predators, such as lake trout and walleye, feeding on forage fish in the Lake. Also, Basin-wide efforts to reduce phosphorus inputs into the Lake, will alter the phytoplankton food base available to zooplankton and smaller fish. It is important to predict and monitor how the Lake Champlain aquatic community responds to these changes (see Figure 5).

Managing Threatened and Endangered Species

Populations of some rare, threatened, and endangered plant and animal species and rare natural communities in the Lake Champlain Basin are declining as a result of habitat degradation, invasions of exotic species, collection, and other factors. Of the approximately 487 vertebrate species of fish and wildlife thought to be in the Basin, 30 species are officially listed by federal and state agencies as endangered and threatened. More information on the status of and threats to these species and natural communities, in addition to more public education, is necessary for their protection and restoration. A comprehensive inventory of these species and their habitats for the entire Lake Champlain Basin is critical, as is close coordination by various agencies on all aspects of protection and restoration.

Conserving, Enhancing, and Restoring Habitat

Although the Lake Champlain Basin provides a rich and varied habitat for aquatic and terrestrial species and natural communities, much habitat has been lost as a result of residential, agricultural, and commercial development, and because of the impacts of nonnative invasive species. Because of this, strategies to conserve, enhance, and restore habitat

OBJECTIVES

(not listed in priority order)

- 1) Manage fish and wildlife resources using a comprehensive ecosystem approach and adaptive management strategy.
- 2) Restore, enhance, and maintain natural communities and habitats necessary to support the fish and wildlife resources of the Lake Champlain Basin.
- 3) Restore, enhance, and maintain imperiled fish and wildlife populations (e.g., native mussels and lake sturgeon) when found to be biologically feasible and socially desirable.
- 4) Ensure efficient, coordinated fish and wildlife resource management among the institutions responsible for living resources conservation in the Lake Champlain Basin.
- 5) Manage nuisance native species to reduce human/wildlife conflicts and adverse affects on fish and wildlife resources, unique ecosystems, and preserve human use and enjoyment of the Basin.

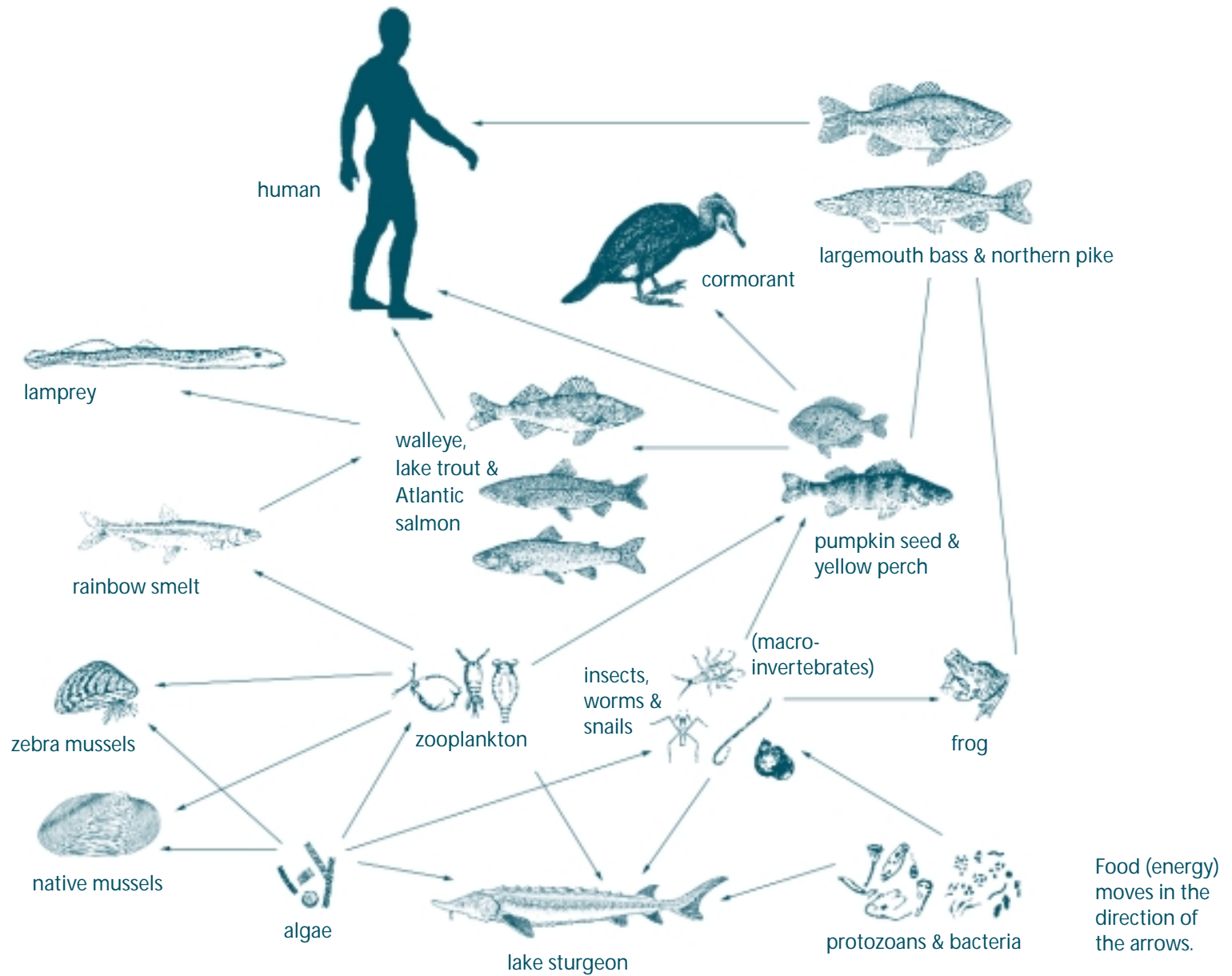


Figure 5. Lake Champlain aquatic food web.

should be implemented. Further study is needed to document land use practices that can cause adverse direct and indirect impacts to important habitats. The many agencies involved should share data and coordinate management efforts, especially with willing landowners who wish to conserve, enhance, or restore fish and wildlife habitat.

HIGH PRIORITY ACTIONS

(not listed in priority order)

1) Identify, Restore, Enhance, and Maintain Critical Habitats and Habitat Connections throughout the Lake Champlain Basin

This action favors nonregulatory measures with willing landowners and managers of public lands to prevent habitat loss, fragmentation, or degradation that may adversely affect threatened and endangered species, rare natural communities, and vulnerable habitat

corridors. For example, the removal of dams could restore the connection between lake and riverine spawning habitats for nonnuisance migratory fish. Another straightforward approach to habitat conservation is to acquire fee-title or long-term easements from willing landowners for important parcels of fish and wildlife habitat, and manage these lands primarily for the conservation of fish and wildlife resources they support. Elements of this action include:

a) Identify rare and environmentally sensitive habitats. Priority projects include:

- *Develop a list of high-priority terrestrial and aquatic communities in need of protection and conservation in the Lake Champlain Basin;*
- *Develop an aquatic natural community classification for Lake Champlain; and,*
- *Complete an aquatic natural community inventory for Lake Champlain.*

b) Work with agencies and other key stakeholders to identify criteria and an approach (e.g., priority watersheds) for targeting high-priority habitat areas for conservation. Criteria should include, but not be limited to identification of:

- *Present and former habitats of state and federally listed threatened and endangered species in the Lake Champlain Basin;*
- *Habitats critical to imperiled species whose decline may be halted or reversed through habitat restoration and conservation;*
- *Habitats vulnerable to destruction;*
- *Habitats supporting high biological diversity; and,*

- *Parcels that link critical habitats in the Lake Champlain Basin.*

c) Initiate an outreach program designed to assist and recruit landowners interested in habitat restoration and conservation. Priority projects include the development of a brochure outlining habitat conservation and restoration programs available through government agencies and conservation organizations.

d) Coordinate acquisition or other long-term protection decisions with existing "open space" and federal, state, and local habitat protection programs.

e) Work with willing landowners to conserve and protect habitats for high-priority terrestrial and aquatic communities through acquisition, easements, or other long-term protection measures. Develop other strategies when these methods are not desirable or practical.

f) Restore degraded habitats for high-priority terrestrial and aquatic communities by working with willing landowners and managers of public lands to promote natural community restoration with native plants from local seed sources.

g) Design and construct fish passage facilities and stream flow management regimes at existing dams to provide access and connectivity between lake and riverine habitats for nonnuisance migratory fish.

h) Remove dams to provide access and connectivity between lake and riverine habitats for nonnuisance migratory fish, if found to be biologically feasible and socially acceptable.

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The spiny softshell turtle is listed as a threatened species in Vermont and Québec.

i) Encourage residential and commercial landscaping practices that benefit living resources and their habitats.

j) Explore opportunities to provide tax incentives to landowners in exchange for beneficial land management practices, including affording access for bird watching, hunting, fishing, and trapping by the general public.

Potential key LCBP partners: USDA-NRCS, USDA-FSA, USFWS, NYSDEC, VTANR, QC MENV, QC MAPAQ, QC SFP, LCFWMC, VTDAFM, TNC, Sea Grant, other academic and private sector cooperators

Cost estimate: \$500,000 per year and additional funds for large projects

Potential funding sources: Federal, state, and provincial appropriations

Timeframe: Ongoing

Benchmark: Identify habitat needs of listed species and recommend specific conservation measures; develop protection and recovery plans for select species and community types within the Basin

2) Develop Management Strategies for Native Species that Become Nuisances

Fish and wildlife populations in most natural situations occur in a healthy balance within their ecosystem. Certain conditions can alter this balance, causing native species to become nuisances, overabundant, or problematic. Double-crested cormorant populations in the Lake Champlain Basin, for example, are at historic highs. Pollution control has lowered concentrations of toxic contaminants in their food supply; food is ample throughout their winter and summer ranges; construction of reservoirs and impoundments have created favorable habitats; and federal and state laws protect

them. These factors have allowed cormorant populations to increase to levels that may be in conflict with other ecosystem management objectives and human activities. This action supports minimizing human/wildlife conflicts while ensuring the sustainability, natural diversity, and productivity of the ecosystem. Elements would include:

a) Work cooperatively with the public, non-government organizations, and government agencies to identify fish and wildlife conflicts.

b) Assess the impacts of native nuisance populations through rigorous scientific investigation.

c) Develop and implement techniques to control and mitigate nuisance fish and wildlife damage and conflicts.

d) Assess public satisfaction with management of nuisance native species and determine mechanisms for enhancing this satisfaction.

e) Develop and disseminate scientifically valid information about nuisance native species.

f) Implement appropriate rules and regulations to facilitate the resolution of problems associated with native fish and wildlife species that become nuisances.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, LCFWMC, QC MENV, QC MAPAQ, QC SFP, USDA Animal Damage Control

Cost estimate: Staff biologist/coordinator, \$50,000 per year, and continued in-kind services of participating agencies

Potential funding sources: USFWS (e.g., federal aid funds), state, and federal appropriations

Timeframe: Ongoing

Benchmark: Approve species management plans and plan implementation

3) Use Biological Indicators to Monitor Ecosystem Change

Monitoring biological indicators helps detect ecosystem change and enables adaptive resource management. It can also guide future management decisions leading to the goals and objectives in this plan. For example, data demonstrating declines or increases in indicator species or communities could provide information about the expected trends of associated species and provide early notice of the need for management action. Specific elements of this effort include:

a) Identify and link biological and ecological indicators to management goals and objectives identified in Opportunities for Action, including quantifiable benchmarks.

b) Develop a long-term monitoring program that incorporates a complete set of biological and ecological indicators for the Basin.



Rising double-crested cormorant populations, as pictured here on Young Island, may be in conflict with other fish and wildlife management objectives and human enjoyment of the Lake.

ACCOMPLISHMENTS

RESTORING HABITAT

Partners of the US Fish and Wildlife Service (USFWS) have completed more than 100 habitat restoration projects in recent years. These projects involve installing fencing to keep livestock out of streams, stabilizing streambanks using natural materials and plantings, and creating in-stream habitat. Public-private partnerships have been key to habitat restoration. Partners include the Natural Resources Conservation Service, Vermont Agency of Natural Resources, New York Department of Environmental Conservation, The Nature Conservancy, Natural Resource Conservation Districts, local watershed groups, and private landowners.

MANAGING DOUBLE-CRESTED CORMORANTS

Double-crested cormorants are migratory birds that nest in many locations throughout North America, including Lake Champlain. The USFWS is preparing a national management plan to address impacts caused by population and range expansion of these birds. In the meantime, the USFWS has issued permits to Vermont to control Lake Champlain's cormorant population on state-owned Young Island. Lake Champlain Sea Grant is also supporting a study of the diet and feeding range of cormorants.

c) Present the indicators in an understandable manner, allowing them to be used to track and report progress toward management goals to both the management community and the public.

d) Use this information, along with public input, to guide future management decisions.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, LCFWMC, LCRC, NBS, USEPA, QC MENV, QC MAPAQ, QC SFP, universities

Cost estimate: \$150,000 per year for a, c, and d (for staff and operating expenses); \$300,000 to \$400,000 per year in subsequent years for b

Potential funding sources: State and federal appropriations

Timeframe: Ongoing

Benchmark: Selection of appropriate indicators, development of indicator presentation, implementation of long-term biological indicator monitoring

PRIORITY ACTIONS

(not listed in priority order)

4) Refine Current Management of Lake Champlain's Fish and Wildlife Resources to Enhance the Application of an Ecosystem Approach

Recreational hunting and fishing and the species they affect have been managed and regulated effectively by the states of Vermont and New York and the US Fish and Wildlife Service (USFWS) under the Lake Champlain Fish and Wildlife Management Cooperative (LCFWMC). To ensure the ongoing success of interjurisdictional fish and wildlife management programs that mutually benefit both game and nongame species, coordination among resource agencies needs to continue.

Elements of this action include:

a) Continue adaptive resource management in collaboration with the LCFWMC to ensure laws, policies, and management practices are responsive to changes in social values, environmental conditions, public interest, available data, and knowledge. This process should include the following elements:

- *Facilitate a dialogue among scientists, managers, and the public to identify problems, define sustainable goals and objectives, and develop appropriate management policies and actions;*
- *Implement management actions to achieve socially desirable conditions and long-term sustainable ecological functions (e.g., wall-eye access to critical spawning habitat);*
- *Develop and implement a monitoring program to support understanding resources, refining management goals and objectives, revising management actions, and setting additional monitoring priorities;*
- *Refine the management approach based on the information obtained.*

b) Investigate the feasibility for a fishing license agreement between the states of New York and Vermont that would not reduce revenues for either state.

c) Review FERC hydropower relicensing proposals to ensure that management objectives for upstream and downstream fish passage, fish and wildlife habitat, and habitat connectivity above and below hydropower dams are considered.

d) Review current fish and wildlife management plans and reports for consideration of the long-term sustainability of fish and wildlife resources.

e) Assess the broader ecological effects of fish stocking programs in the Basin.

f) Examine the relationships among management programs, salmonids, bass, walleye, pike, and other important recreational species.

g) Ensure that management approaches sustain healthy populations of both game and nongame species.

h) Incorporate appropriate additional key species—such as white perch, yellow perch, and cormorant—into the management of Lake Champlain fisheries.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, LCFWMC, USDA Animal Damage Control, QC MENV, QC MAPAQ, QC SFP

Cost estimate: Staff and coordinating, \$75,000 per year; continued in-kind services of participating agencies

Potential funding sources: USFWS (e.g., federal aid funds), state, and federal appropriations

Timeframe: Ongoing

Benchmark: Ecosystem-based management decisions for key species in the Lake Champlain watershed

5) Integrate Aquatic Food Web Models into Fisheries Management Decisions

Food web or “bioenergetic” models allow managers to predict how changes in populations of one species or community of species affect other components of the ecosystem. Ideally these models support and enhance management decisions, such as adjusting salmonid stocking rates to meet both forage base and angler needs. The LCBP has funded two initial food web model studies, focusing on the top predators and the base of the food web. These and other models could be used to study the impacts of fish stocking, zebra mussels, and efforts to reduce nutrient levels among other factors. Food web models may be used to assist with the following specific activities:

a) Fill informational gaps between top-down and bottom-up bioenergetic models by modeling food web linkages between zooplankton and small fish.

b) Link the management of point and nonpoint sources of nutrients entering Lake Champlain with food web management activities.

c) Determine the effects of human activities on the food web.

d) Determine the effects of zebra mussels on both higher and lower trophic-level fish and wildlife species.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, QC MENV, QC FAPAQ, QC SFP, LCFWMC, LCRC, USGS, universities

Cost estimate: \$100,000 per year

Potential funding sources: State and federal appropriations

Timeframe: 3 to 5 years

Benchmark: Food web models completed and used in management programs

6) Improve Protection Strategies for Managing Threatened and Endangered Species and Rare Natural Communities

To ensure that threatened and endangered species and rare natural communities in the Lake Champlain Basin are protected adequately, coordinate the implementation of recovery strategies. This effort would be carried out by, and in coordination with, appropriate state and federal agencies and regulatory committees. Elements of this effort would include the following activities:

a) Compile a list of all species and natural communities occurring in the Lake Champlain Basin and their status (threatened, endangered, rare, native, nonnative, nuisance, etc.).

b) Compile a summary of federal, state, and provincial laws protecting threatened and endangered species.

c) Seek consensus on endangered and threatened species, listing criteria for Lake-related species.

d) Identify new cooperative efforts to ensure enforcement of applicable threatened and endangered species protection laws.

e) Identify new cooperative efforts to promote projects that identify, restore, enhance, and create habitats for selected threatened and endangered species.

f) Identify new cooperative efforts to resolve the status of potentially threatened or endangered species.

g) Establish a mechanism to identify threats and set priorities for species and natural community protection and restoration efforts.

h) Include threatened or endangered species as key species in the management of Lake Champlain fisheries.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, QC MAPAQ, QC SFP, LCFWMC, natural heritage programs, TNC, other academic and private sector cooperators

Cost estimate: \$150,000 per year and staff implementation

Potential funding sources: State and federal appropriations

Timeframe: Ongoing

Benchmark: Completion of Basin-wide species list; develop a task force under the LCFWMC on endangered species management.

7) Evaluate Whether the Broad Priorities Outlined in *Opportunities for Action* Are Consistent With Ecosystem Objectives for Managing Fish and Wildlife Resources

Fish and wildlife resources do not exist in biologically distinct units, but are interconnected through complex relationships and processes. Sound resource management must consider how various actions within *Opportunities for Action* could affect fish and wildlife populations and other resources in the ecosystem. Elements of this action include:

a) Examine the appropriateness of in-lake phosphorus concentration criteria for ecosystem health and sustainability of fish and wildlife populations.

b) Evaluate the ecological benefits and biological consequences of dam removal (e.g., zebra mussel and lamprey expansion into areas where they were previously excluded).

c) Examine whether nonnative invasive species control strategies are conducive to sustainable fish and wildlife populations and ecological functions.

Potential key LCBP partners: USFWS, NYSDEC, VTANR, LCFWMC, QC MAPAQ, QC SFP

Cost estimate: \$50,000 per year; in-kind services of participating agencies

Potential funding source: LCBP, state, and federal agencies

Time frame: Ongoing

Benchmark: Completed assessments



Mark Labarr

Osprey have recently made a comeback in the Lake Champlain Basin.