



# INLAND SUPERHIGHWAY

For half a century, the St. Lawrence Seaway has served as a critical artery for ships carrying the coal, grain and iron ore that fuelled Canada's economy. But a sea change may be brewing.

BY D'ARCY JENISH WITH PHOTOGRAPHY BY MARTIN BEAULIEU

**WITH THREE BLASTS OF ITS HORN** — two long and one short, a traditional maritime greeting — the CSL *Spruceglen* sails into the St. Lambert Lock, on the eastern shore of the St. Lawrence River, opposite downtown Montréal. It's just after noon on March 31, 2009, and right on schedule, the freighter glides to a stop. Deckhands feed thick, braided steel lines to a pair of lockmen, who secure the ship. The lock operator opens a set of intake valves, each large enough to accommodate a compact car, and millions of litres of water rush into the chamber. As the ship rises — it will be lifted about five metres in less than 10 minutes — the port side of its hull forms an imposing black wall that cuts off our view of Parc Mont-Royal and the Montréal skyline. The *Spruceglen* is 222.5 metres long and 23 metres wide, and it fits into the 24.4-metre-wide lock like a hand in a glove.

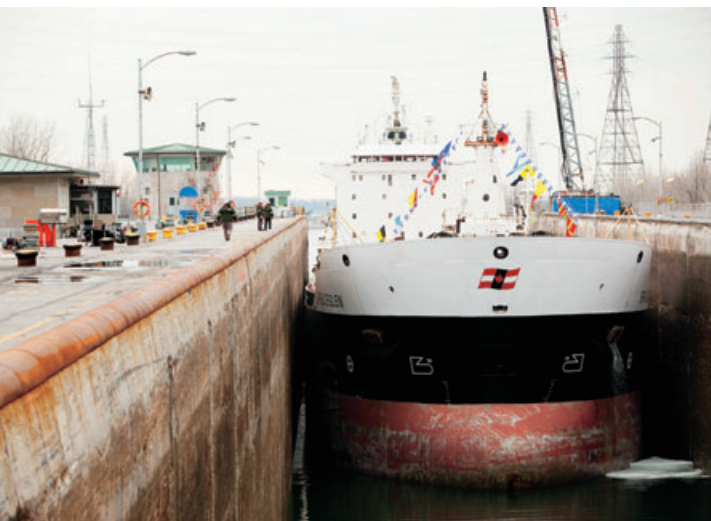
Deckhands lower a gangplank, and two smartly dressed officers disembark. Captain Mark Dillon and Chief Engineer Christian Pelletier are wearing navy blue suits with crisp white shirts and neatly knotted, matching blue ties. The St. Lambert Lock is the gateway to the Great Lakes St. Lawrence Seaway — a system of canals, shipping channels and locks that allows ships to sail 3,700 kilometres inland from the Atlantic Ocean to the head of Lake Superior — and the *Spruceglen* is the first vessel to enter the waterway in its 50th-anniversary season.

Dillon and Pelletier join about 200 shipping executives, politicians, seaway employees and journalists assembled on the lock wall for a birthday ceremony, complete with a shower of blue and white confetti. Fifty years is a major milestone, yet the speeches are brief and businesslike. Richard Corfe, president and CEO of the St. Lawrence Seaway Management Corporation (SLSMC), gives a brisk talk,

The CSL *Spruceglen* (TOP) breaks a blue ribbon and gets a shower of confetti at the St. Lambert Lock during a ceremony to mark the start of the seaway's 50th anniversary season. It was the first westbound ship to enter the seaway this year. Headed for Ohio with a 15,000-tonne load of titanium slag, the *Spruceglen* glides past Kahnawake (RIGHT) and enters the Beauharnois Locks (LEFT) at the western end of Lac Saint-Louis. A chemical tanker called the *Clipper Tasmania* (PREVIOUS PAGES) sails under Montréal's Champlain Bridge.



Fifty years is a major milestone, yet the speeches are brief and businesslike. After stopping for less than an hour at the St. Lambert Lock, the *Spruceglen* resumes its journey.





Although the Great Lakes St. Lawrence Seaway system (LEFT) extends all the way west to the head of Lake Superior, when most Canadians talk about the seaway they're referring to the series of locks, canals and channels (BELOW) between Montréal and Lake Ontario along the St. Lawrence River.

devoted equally to the successes of the past half century and the significant challenges ahead. By 1 p.m., Dillon is back on the bridge, and the *Spruceglen* — with me aboard — resumes its journey toward the port of Ashtabula, Ohio, east of Cleveland. Its seven huge cargo holds are carrying 15,000 tonnes of titanium slag, which can be used as an additive in products as diverse as paint and sunscreen.

Looking at the lock from the deck of the *Spruceglen*, I'm struck by the difference between today's ceremony and the St. Lawrence Seaway's grand opening on June 26, 1959. A beaming, navy blue yacht, the HMY *Britannia*, was moored at Saint-Lambert that day. Queen Elizabeth II shared the stage with Prime Minister John Diefenbaker and President Dwight D. Eisenhower. About 20,000 members of the public attended, and among the 5,000 invited guests were dozens of Canadian parliamentarians, American senators, mayors of Great Lakes communities and shipping executives

from around the world. Eisenhower described the seaway as "a magnificent symbol ... of the achievements possible to democratic nations peacefully working together for the common good," while the Queen called it "one of the outstanding engineering accomplishments of modern times."

That was no exaggeration. An army of men and women 22,000 strong built the St. Lawrence section, between Saint-Lambert and the Ontario riverside town of Iroquois, 175 kilometres to the west (see sidebar on page 47). They started in October 1954 and, at a cost of \$470 million, were finished four years later. The seaway's canals, channels and locks — five in Canadian waters and two in the United States — replaced an inefficient, late-19th-century waterway on the St. Lawrence. It was designed to match the capacity of the revamped Welland Canal linking Lake Ontario and Lake Erie, which opened in 1932 and could handle 222.5-metre-long vessels in its eight locks.

MAPS: STEVEN FICK/CANADIAN GEOGRAPHIC



Friends gather to catch — or in this case, to watch — the "big one" from a riverside perch in the Montréal south-shore community of La Prairie.

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Both freshwater and ocean-going fleets use the seaway, but in recent years, vessels that sail only on the Great Lakes and the St. Lawrence have accounted for 70 to 80 percent of its traffic. Nevertheless, by making it possible for large ships to sail uninterrupted from the Atlantic to Lake Superior and back, the seaway has played a vital role in Canada’s growth and prosperity over the past half century.

The waterway has proved indispensable in moving grain from the Canadian Prairies and the American Midwest to terminals on the lower St. Lawrence for eventual delivery to export markets around the world. Ships that hauled grain east would often refill their holds with iron ore from the mines of Quebec and Labrador and sail up the St. Lawrence to the steel mills of Hamilton, Nanticoke and Sault Ste. Marie and American manufacturing centres such as Cleveland, Detroit and Chicago. All told, more than

2.5 billion tonnes of cargo — mostly bulk commodities like grain, iron ore, coal, aggregates and road salt — have moved on the system in its first 50 years.

Much of that cargo was carried before seismic upheavals in the international grain trade and the North American manufacturing sector, however. The inland-shipping industry is striving to overcome the ripple effects of these economic shifts, but there’s no guarantee of smooth sailing ahead.

**THE MOST ACUTE CHALLENGE** facing the seaway is the global recession, which has dramatically reduced the volume of goods moving on the system. Only 68 of the 103 vessels in the Canadian and American fleets were operating as of late April, according to [www.boatnerd.com](http://www.boatnerd.com), a website that closely tracks the Great Lakes shipping industry. The rest were tied up in harbours.



Captain Mark Dillon (LEFT) mans the bridge of the *Spruceglen*. Lock workers follow the ship on monitors from the control station (BELOW) as it navigates the lock at Iroquois, Ont., 175 kilometres west of Montréal. Fourth engineer Jose-Luis Ferrer (OPPOSITE, at left) and assistant mechanic Jerson Garcia at their station in the engine room of the *Spruceglen*.



The recession is compounding a long-term trend. Traffic volume dropped sharply during the economic slump of the early 1980s and never fully recovered. For the past decade, the waterway has operated at about 60 percent of its capacity, in part because more than half of Canadian grain exports now move through ports on the West Coast. Moreover, iron ore shipments, which peaked at about 20 million tonnes in 1977, now range from 12 million to 8.6 million tonnes annually due to restructuring and downsizing in the steel industry. A typical 280-day shipping season begins in late March and runs until weather conditions deteriorate after Christmas. In 2008, domestic and international vessels made 4,200 trips on the seaway and moved 40 million to 45 million tonnes of cargo. In the late 1970s, ships were carrying 66 million to 80 million tonnes annually.

“When I got hired in 1978, there was a ship in your lock all the time, and one above and one below waiting to get in,” says John Chalmers, the seaway’s senior operations coordinator, who started as a line handler on the locks of the Welland Canal. “You were walking up and down the wall for eight hours straight, tying or untying ships.”

The age of the Canadian merchant fleet is another concern. Most of the vessels in service today were built in domestic shipyards in the 1960s and 1970s, specifically for use on the seaway. They should be replaced, but shipbuilding has virtually disappeared in this country, and the federal government imposes a 25 percent duty on vessels manufactured offshore for Canadian companies — a sore point for

many in the industry, who consider the duty a punitive tax. “Fleet renewal must start now if we are to maintain a thriving shipping industry in Canada,” says Gerald Carter, president and CEO of Montréal-based Canada Steamship Lines (CSL), which operates the *Spruceglen*.

The seaway is also under increased environmental scrutiny. Groups such as Buffalo-based Great Lakes United, a coalition of Canadian and American organizations, have been critical of the seaway and the shipping industry in recent years. This was triggered, in part, by the spread of the notorious zebra mussel, a fingernail-sized mollusc native to the Caspian Sea. Scientists believe that an ocean-going freighter flushed ballast water containing zebra mussels into Lake St. Clair in the late 1980s. Since then, this prolific invader has infiltrated the Great Lakes, as well as numerous rivers and smaller lakes, and has had a devastating effect on ecosystems and infrastructure. Zebra mussels can achieve a density of several hundred thousands per square metre and clog up water-intake pipes used by municipalities, steel manufacturers, power companies and golf courses. New regulations are being implemented, and shipping companies are adopting control measures, but the issue remains far from resolved (see sidebar on page 46).





Environmental groups have additional complaints about commercial navigation. They claim that the waves created by passing ships contribute to shoreline erosion and disturb wildlife habitat, especially in the narrow channels of the St. Lawrence, where fuel spills and other contaminants threaten drinking-water sources for millions of people. While Canada and the United States have long imposed strict clean-fuel standards on automobiles, trucks, trains and construction vehicles, environmentalists argue, they have ignored ships.

Most freighters burn bunker fuel, and they consume a lot of it — up to one tonne per hour when they're sailing at full speed with cargo holds loaded. A low-grade, high-sulphur derivative of refined petroleum, bunker fuel can contain up to 45,000 parts per million (ppm) of sulphur; the limit is 80 ppm in the gasoline consumed by automobiles and as low as 15 ppm in the diesel that locomotives, trucks and other heavy vehicles burn. The Canadian and American governments are developing regulations to force shipping companies to reduce the sulphur content in their emissions by 96 percent, but they have until 2015 to meet the requirement.

"Sulphur air pollution in North America is a big enough issue for the two countries to act in a coordinated fashion," says Jennifer Nalbone, the navigation and invasive-species campaign director with Great Lakes United. "As the seaway turns 50, it's time for a reality check. Now is the perfect time to critically ask, 'What changes does the maritime commu-

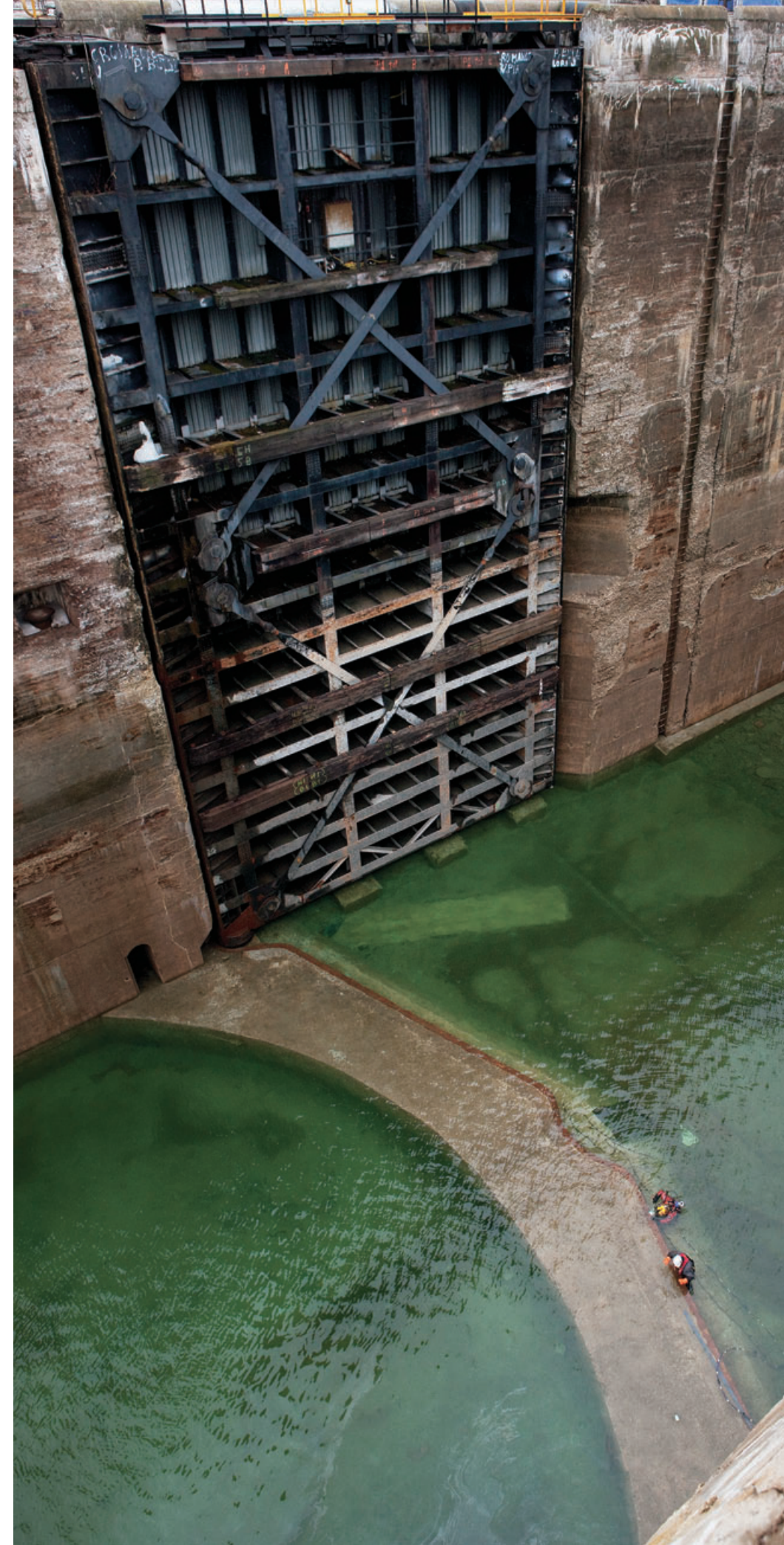
nity need to make to protect the Great Lakes and the economies that rely on them?'"

For their part, seaway officials and shipping company executives insist that their industry is getting a bad rap. Since 2003, they have marketed the waterway as "Highway H<sub>2</sub>O" and have attempted to increase traffic by promoting marine transportation as a safer, cheaper and greener alternative to trains and trucks, pointing out that one Great Lakes freighter loaded with 25,000 tonnes of cargo is equivalent to 225 rail cars or 870 trucks. Highway H<sub>2</sub>O's backers contend that to move one tonne of freight one kilometre, a train burns 2.2 times as much fuel as a ship and a truck goes through 9.7 times as much. They also say that for every accident involving a ship, trains have 13.7 accidents and trucks have 74.7.

Independent analysis supports many of these claims. Seven agencies, including Transport Canada and the United States Department of Transportation, collaborated on 2007's Great Lakes St. Lawrence Seaway Study. They concluded

**Another day, another ship:**  
the *Quebecois* enters the  
St. Lambert Lock for its  
voyage downstream toward  
the Atlantic Ocean.

**Workers immerse themselves in the water to inspect the door stop of one of the Beauharnois Locks. The seaway's locks are 233.5 metres long, 24.4 metres wide and 9.1 metres deep. Gravity-fed intake valves large enough for cars to fit through allow 90 million litres of water to rush into the locks in less than 10 minutes, and it takes about 45 minutes for a ship to pass through.**



that the freight moving on the seaway could not be transferred to roads and railways without causing massive congestion and a significant increase in emissions. “The transportation sector as a whole contributes 27 percent of total (North American) greenhouse gas (GHG) emissions,” the study says, “but less than three percent of all GHG emissions come from shipping.”

The study also provided some economic perspective. Marine transport on the Great Lakes produces \$3.4 billion in business revenue annually and more than \$4.3 billion in personal income. It also generates direct and indirect employment for as many as 150,000 people in Canada and the United States.

**NINE HOURS AFTER LEAVING SAINT-LAMBERT**, the *Spruceglen* is sailing across Lac Saint-François, a widening of the St. Lawrence 65 kilometres west of Montréal. The sky is



clear and full of stars, and to starboard, the light of a crescent moon reflects off the water. First mate Georges LaRoche is piloting the vessel in near-complete darkness. The lights on the deck five storeys below his post are off, except for three pale green beacons. The wheelhouse lights have also been extinguished so that LaRoche can make out the red flashing navigational aids that mark the shipping channel.



Cindy Simpson (TOP), the *Spruceglen*'s first cook, gathers snacks in the ship's storeroom. A crew of 23 staffed the ship as it sailed to Ohio; Simpson's job was to prepare meals and to keep the galley clean. While the *Spruceglen* transits the Beauharnois Locks, its crew members (LEFT) have no time to idle.

‘I’ve never worked so hard, but I’m surprised how much I like it. It’s like a big family when you’re on a ship, and the kitchen is the soul of it. I may do this until I’m 70.’

The *Spruceglen* has a crew of 23 aboard, all under the command of Captain Dillon, who relies on the first, second and third mates to help him sail the vessel. Chief Engineer Pelletier and his assistants — the first, second and third engineers — are responsible for the operation and maintenance of the ship's four-cylinder, 10,800-horsepower engine. They also run the three on-board generators, each capable of pumping out 525 kilowatts of electricity to power the lights, pumps, computers and other systems.

There are three other classes of employees on every vessel. Ordinary seamen perform routine maintenance, such as assisting with the loading and unloading of cargo and tying up while in port. Mechanical assistants work under the engineers and help maintain the engine and generators, while the cooks prepare meals and keep the galley clean and orderly. About one-quarter of the Canadians who work in Great Lakes shipping are Newfoundlanders, and many say they were born “with salt in their blood” but turned to inland sailing because that's where the jobs were.

No Newfoundlanders are aboard the *Spruceglen*, but there are three women, including third mate Ghislaine St. Aubin, who is in the darkened wheelhouse with LaRoche, plotting the ship's course on a chart by the light of a small, hand-held lamp. St. Aubin became a sailor more by accident than by design. She obtained a bachelor's degree in geography, then worked for several years as a whale-watching guide in Tadoussac, Que. She returned to school to study navigation at the Institut maritime du Québec, in Rimouski, and landed a job with CSL almost immediately after graduating.

“My mom and dad were surprised but impressed,” says St. Aubin. “I like the work, but it's kind of a love-hate thing. When you're on the water, you can't wait to get home. When you get home and you see a ship out on the river, you can't wait to get back.”

Colourful buoys line the shore as a Coast Guard ship sails past at Prescott, Ont.





A bird's-eye view of the St. Lambert Lock as the MSC *Sabrina*, a container ship, begins its passage. Seaway officials want to attract more container traffic to the waterway, which they feel will reduce highway and railway congestion.

A family connection brought Therese Asselin, the *Spruceglen's* second cook, onto the water. She was a secretary until three years ago, when her son, a second engineer with another Great Lakes shipping company, Algoma Central Corporation, suggested she apply her culinary skills in a ship's galley. "I've never worked so hard, but I'm surprised how much I like it," she says. "It's like a big family when you're on a ship, and the kitchen is the soul of it. I may do this until I'm 70."

Captain Dillon, who has worked on barges, tankers and container ships and has sailed around the world five times, also followed family into the business. His grandfather was a sea captain. "He died of a heart attack in 1976 while he was piloting a vessel," says Dillon. "My grandmother was on board at the time."



A home with an up-close view of the St. Lawrence River in Verchères, Que. Shoreline erosion caused by waves from passing ships is one of many environmental concerns about shipping.

## The river giveth and taketh away

When Carol Potts left Cornwall, Ont., in the fall of 1955 to attend nursing school in Ottawa, construction on the St. Lawrence Seaway and several accompanying hydroelectric projects was just starting. She returned often over the next four years and was struck by the changes occurring in her once quiet riverside city. "When you went downtown, the sidewalks were thick with people," says Potts, president of the Cornwall Historical Society. "You could never find a parking spot. Everything was thriving because of all the people working on the seaway."

Decades of wrangling between political factions and competing economic interests preceded construction, but the impasse was trumped by the North American steel industry's need for an efficient marine transportation system to supply plants with iron ore from newly opened mines in Labrador and eastern Quebec. Moreover, Ontario and New York State both needed to tap the hydroelectric potential of the upper St. Lawrence to keep pace with rapid post-war growth in their economies.

The St. Lawrence Seaway Authority, a Crown corporation established to manage the project, began awarding contracts in late 1954 for a system of locks, canals and shipping channels between Montréal and Iroquois. At the same time, the Hydro-Electric Power Commission of Ontario — the forerunner of Ontario Hydro — and the New York Power Authority were hiring contractors to build two major dams, along with powerhouses and generating facilities, in the vicinity of Cornwall.

Workers used bulldozers, excavators and dynamite to construct the 22.5-kilometre South Shore Canal, which bypassed the Lachine Rapids, and they relied on dredges to carve shipping channels out of the bottom of the St. Lawrence. Billions of tonnes of rock were moved, some of it so hard that contractors wore out bulldozer blades, excavator teeth and drill bits in hours instead of the usual days.

Remarkably, the waterway and the electrical-generating projects were completed on time and on budget. But for some, the projects brought tears and heartache. The hydro dams created a lake that stretched nearly 50 kilometres upstream from Cornwall. It flooded more than 16,000 hectares of farmland, as well as six villages and three hamlets, and forced over 6,500 people to relocate, mostly to the newly established communities of Long Sault and Ingleside.

Those drowned communities have not been forgotten. Former residents formed The Lost Villages Historical Society and created The Lost Villages Museum ([www.lostvillages.ca](http://www.lostvillages.ca)), west of Cornwall, which consists of 11 buildings, some of them original structures that were moved to the site prior to the flooding.

"My family arrived in Long Sault on October 28, 1957," recalls historical society president Jane Craig, whose father owned the Lion Hotel in the village of Moulinette. "We had a beautiful new home, but it wasn't home. My dad cried that night." **D.J.**

## Must be something in the water

Scientists estimate that more than 185 non-native plant and animal species, such as zebra mussels, water fleas and seaside goldenrod, have found their way into the Great Lakes over the past two centuries. They have arrived several ways, including the pet trade, aquaculture and live-fish markets, but the most common means may be the ballast water carried by ocean-going ships.

Over the past two decades, government agencies around the world, as well as the London-based International Maritime Organization (IMO), have adopted regulations to control the transfer of invasive species, which can have a devastating impact on local ecosystems. The IMO has approved a measure that would require all newly built ocean-going vessels to be equipped with on-board ballast-treatment systems by 2012, with existing ships required to install them by 2016. There are several approaches, some still in development, and they include the use of ultraviolet light, deoxygenation and filtration.

Since the start of the 2008 navigation season, Canadian and American regulations have stipulated that before entering the St. Lawrence, ocean-going vessels with ballast on board must pump out that water and fill their tanks with salt water at least 320 kilometres offshore and in seas 600 metres deep, the idea being that salt water will kill any freshwater organisms. Ships with no ballast on board are required to flush their tanks with salt water to eliminate any organisms that might be lurking in residual water and sediments.

But some of the eight American states bordering the Great Lakes have drafted or implemented what the industry views as a patchwork of confusing and contradictory regulations, says Bruce Bowie, president of the Ottawa-based Canadian Shipowners Association (CSA). Legislators in New York State, for instance, have approved a measure that would require on-board ballast-treatment systems for all vessels entering its waters by 2012. Bowie points out that many Canadian ships never sail beyond the Great Lakes or the lower St. Lawrence and therefore cannot carry foreign invasive species in their ballast water. Yet they would be required to comply in order to transit the seaway's two American locks.

But the New York regulations — which also call for ballast-treatment systems considerably stronger than the IMO standard — may never come into effect. Several plaintiffs on both sides of the border, including port authorities, shipping companies and the CSA, have launched a court challenge to have them overturned. **D.J.**

THE CANADIAN SHIPPING INDUSTRY employs about 5,000 people, and the seaway itself another 600, but the waterway supports a remarkably diverse range of businesses and trades, including, indirectly, port employees, Coast Guard personnel and railway workers. And family ties are evident everywhere.

When ships such as the *Spruceglen* transit the Welland Canal, they sail past facilities owned and operated by Snider Dock Services, a Port Colborne, Ont., company that is almost entirely reliant on seaway traffic. The family firm loads and unloads commodities, as well as manufactured goods, at the Lake Ontario and Lake Erie entrances to the Welland Canal. Its Lake Erie dock serves as a transfer point for about half of the road salt used in the Niagara Peninsula each winter.

The aging vessels of the Canadian seaway fleet require constant maintenance, which provides work for another Port Colborne company, Allied Marine & Industrial. Many of Allied's welders, machinists, millwrights and electricians ride the ships to service them during the season, although major repairs take place during the three-month winter layup, when Allied's workforce can triple to 150. "It's a constant battle," says plant manager Dave Marsland, "to keep the ships running."

Crew members live aboard seaway vessels for two months straight, and they rely on chandlers to supply them with food, towels, fresh bedding and other basics. C. E. Elliott & Sons Ltd. of Hamilton has been provisioning the Great Lakes shipping industry for 80 years. The firm services about 30 ships every year, with a staff of nine driving to ports throughout southern Ontario, providing clean linens every 10 to 14 days and groceries every two to three weeks. Current owner Sharon Elliott, the granddaughter of the company's founder, expects the company to remain family-owned for a fourth generation: her two sons and a nephew are on the payroll.

If Highway H<sub>2</sub>O's partners are right, there will be work for C. E. Elliott & Sons and most of the businesses serving the Great Lakes shipping industry for years to come. The coalition of 45 or so partners, which includes shipping companies, port authorities, the SLSMC and its American counterpart, believes that transporting bulk commodities and containers of manufactured consumer goods by water will ease road and rail congestion and reduce greenhouse-gas emissions.

More container traffic may be the seaway's best shot at an increased volume of cargo. Most container vessels are too

large to sail beyond Montréal and must unload there or in Halifax, with trains or trucks carrying their goods farther inland. The Highway H<sub>2</sub>O coalition wants smaller seaway ships to pick up those containers. “They will bring these goods to all the ports along Highway H<sub>2</sub>O, such as Montréal, Toronto, Hamilton, Cleveland, Detroit and Chicago,” says SLSMC president Richard Corfe, “because the roads and railways are already congested. And it’s only going to get worse.”

**AT 6:30 A.M. ON APRIL 1,** I am awakened abruptly by three sharp raps on the door of my cabin and a gruff voice announcing, “Half an hour to Iroquois.” It’s time to disembark, and it’s happening too soon. Fortunately, I was able to experience the entire system on my first seaway voyage. On a summer Saturday in 2007, while researching a book on the seaway, I boarded the MV *Algomarine* at Pier 99 in Montréal with my teenage son, Patrick, for the trip of a lifetime.

We plied the waters of the upper St. Lawrence and the Thousand Islands on a Sunday afternoon, when the river was buzzing with pleasure craft. We crossed Lake Ontario overnight and arrived at the Welland Canal just as the sun was illuminating the horizon. The *Algomarine* spent about 12 hours transiting the canal and another night crossing Lake Erie, affording us a daytime trip up the Detroit and St. Clair rivers, two very different waterways. On the Detroit,

we had a panoramic view of Detroit and Windsor and could hear the hum of traffic. On the St. Clair, we wound through vast marshes and wetlands and passed sparsely inhabited shores.

The cold, blue waters of colossal Lake Superior were as calm as a backyard swimming pool when we sailed west out of Whitefish Bay — rare conditions, we were told. Sixteen hours later, 108 hours after leaving Montréal, we arrived at Thunder Bay.

In these days of considerable economic uncertainty, the St. Lawrence Seaway and its partners in the shipping industry are facing serious challenges. Some of them are financial, others environmental. But after spending two years exploring the waterway and its history, I can see it continuing to serve as a vital artery for the movement of goods. And I am deeply impressed by the skill, teamwork and dedication of the people who sail ships such as the *Algomarine* and the *Spruceglen* on a marine highway that reaches deep into the heart of the continent.

*D’Arcy Jenish is the author of Epic Wanderer: David Thompson and the Mapping of the Canadian West. Photographer Martin Beaulieu lives in Montréal.*

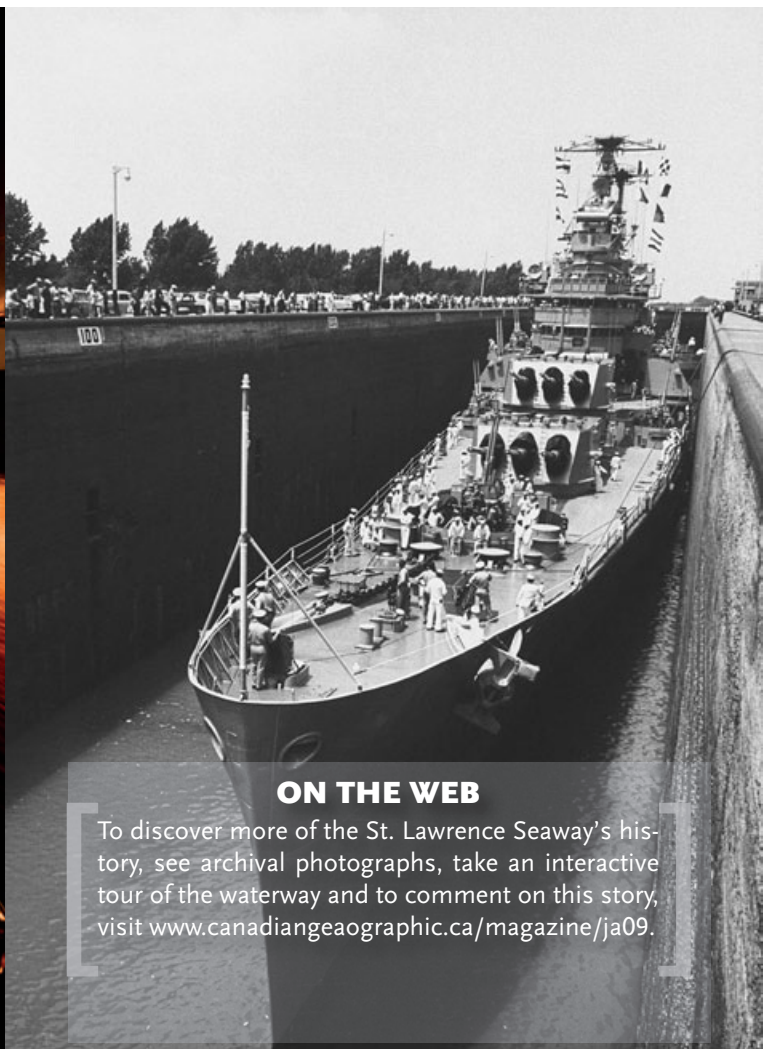


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BOTTOM RIGHT: AL FENN/TIME LIFE PICTURES/GETTY IMAGES



The *Spruceglen* approaches Cornwall, Ont. The U.S. Navy’s *Macon* (RIGHT) in 1959.



## ON THE WEB

To discover more of the St. Lawrence Seaway’s history, see archival photographs, take an interactive tour of the waterway and to comment on this story, visit [www.canadiangeographic.ca/magazine/ja09](http://www.canadiangeographic.ca/magazine/ja09).