There is currently some controversy as to whether Mount Everest or K2 is the tallest mountain on earth. Measurements made by satellites seem to indicate that the summit of K2 may actually be higher than Everest, which has been recognized throughout this century as the tallest peak on our planet. Regardless of the outcome of the debate, the name Mount Everest will always hold some special magic for both the generations of mountain climbers who have been challenged by the lure of its towering summit and the Nepalese and Tibetans who live in the shadow of the great mountain and refer to it as Chomolungma—"Mother Goddess of the World." K2 may inch out Everest in the record books, but Everest will always retain its reputation as the most imposing and awe-inspiring peak on the planet, the mother of all mountains.

Mount Everest rises out of the tropical forests and rolling foothills of the Indian subcontinent to a height of 29,028 feet, its rocky summit standing more than 5 miles above sea level. In geologic terms, it is a new mountain, formed during the past sixty-five million years by the collision of the African and Eurasian crustal plates. Composed of 906 million tons of rock, Everest is the largest structure on earth, dwarfing anything humans have built.

During the five shipping seasons from 1975–79, the Great Lakes shipping industry moved 986 million tons of cargo. If put into a single pile, perhaps somewhere along the south shore of Lake Erie, the resulting peak would have surpassed both Everest and K2. It took millions of years for Everest and the Himalayan chain to be formed, but in just over 150 years, the bulk industry on the lakes has moved...
enough iron are, grain, coal, limestone, and liquid bulk products to form a mountain chain that would rival the great mountain ranges of the world.

The amount of cargo the industry moves in even a single season defies our comprehension. Since World War II, total tonnages moved each year have ranged from a low of 125 million tons in 1982 to a high of 214 million tons in 1979. To carry 214 million tons at one time, you would need 8,560 ships, each with a carrying capacity of 25,000 tons. Placed end to end, the ships would form a convoy that would stretch for over 1,180 miles, the distance from Duluth, Minnesota, to the east end of Lake Ontario. If that is hard to comprehend, it might help you to know that it would take 2,675,000 80-ton rail cars or more than eight million 25-ton trucks to carry the same amount of cargo. End to end, the rail cars, without engines, would stretch for more than 60,000 miles. The trucks would make a bumper-to-bumper convoy more than 90,000 miles in length. That’s a convoy! The trucks could circle the earth at the equator almost four times.

In a single trip, a 1,000-foot ore freighter can carry more than 60,000 tons of iron ore, enough to make all of the steel needed to build sixteen thousand automobiles. A single Seaway-size, 730-foot bulker can load over 500,000 bushels of grain. It takes almost 20,000 acres to grow that much grain. Ground into flour, the cargo from that one ship would be sufficient for your local bakery to turn out fifty million loaves of bread. The modern tankers that operate on the Great Lakes can carry more than 70,000 barrels of fuel oil or gasoline, enough to supply the needs of more than three thousand motorists for a full year, even if they weren’t driving economy cars.

Of the total cargo moved each year, a little over 40 percent, 51 to 94 million tons, is iron ore—the “river of red” that has been the industry’s key commodity for a hundred years. Mines in the Lake Superior region produce about 78 percent of all the iron ore mined in the U.S. In Canada, the provinces of Quebec and Ontario that border the Great Lakes and St. Lawrence River account for close to 60 percent of all the country’s iron ore.

Humans have been using iron since about 3,000 B.C., when people in the Middle East began making tools and ornaments by working iron-laden meteors. Iron obtained from meteors and meteorites was rare, so the metal was expensive; only kings and ranking warriors could afford it. True iron working, involving the smelting of ore to remove impurities and increase the quality of the iron began in Asia Minor about 1100 B.C., ushering in the Iron Age. Iron ore was found there in great abundance, so iron was cheap. It had the added advantage of being stronger than other metals that were then in wide use, such as copper and bronze.

Iron is one of the key elements in the core of the earth and makes up about 5 percent of the crust of the planet. Scientists believe that deposits of iron began to form over a billion years ago when violent volcanoes spewed iron laden dust into the air in massive quantities, covering much of the earth. The iron was gradually dissolved from the dust by water, and it settled to the bottom of the expansive oceans that then covered much of the surface of the planet, forming vast subterranean deposits of ore. Later, many of the ore deposits were forced to the surface as a result of earthquakes and the shrinking of the earth’s crust. Then, during the Ice Age, the retreating glaciers deposited a layer of sand and gravel over the beds of iron ore, what the mining industry refers to as “overburden.”

The ores differ significantly in the amount of iron they contain. The most common commercial ores are classified as either magnetite, hematite, or taconite, based on their physical characteristics and iron content. All three are found in the Great Lakes region.

Magnetite is a black mineral that accounts for about 60 percent of the ore mined in the U.S. As suggested by its name, magnetite, or lodestone as it is often called, has magnetic properties. About 1200 A.D., Europeans discovered that elongated pieces of the stone would point to the north if suspended by a string, leading to the first compasses and totally altering navigation.

About 40 percent of the ore mined in the U.S. is hematite, which can be as much as 70 percent iron and normally occurs as a red-colored mineral, the color of rust. The mineral’s name is derived from the Greek word haimatites, meaning bloodlike.

The third commercial ore, taconite, contains iron in specks and streaks and has an overall iron content that is often as low as 25 percent. While taconite is not commercially viable until some of its impurities have been removed and its iron content has been concentrated, it is growing in importance.
as supplies of higher quality ore are being depleted. Much of the ore produced today in the Great Lakes region is taconite.

Iron is presently the most widely used of all commercial metals because it is cheap, it is found in large quantities throughout the world, and it is the basic mineral used for the production of steel. As Rudyard Kipling wrote in his poem *Cold Iron*:

“Gold is for the mistress—silver for the maid—
Copper for the craftsman cunning at his trade.”

“Good!” said the Baron, sitting in his hall,
“But Iron—Cold Iron—is master of them all.”

To make one ton of pig iron, the basic ingredient in steel or cast iron, it takes about 1 1/2 tons of ore, 3/4 ton of coke, and 1/4 ton of limestone. Coke—coal which has been burned in special ovens to remove gasses—is ignited in the bottom of a blast furnace. The charge of ore and limestone is then dumped into the furnace and heated to around 3,000° Farenheit, which causes the iron in the ore to melt. To achieve those temperatures, large quantities of air are injected into the furnaces, up to 100,000 cubic feet per minute. This is the blast of air from which the blast furnace takes its name.

When the iron in the blast furnace has melted, it settles to the bottom, because it is heavier than the other materials in the furnace. Impurities that were in the iron, along with the limestone that has served as a flux to aid in the melting and separation of impurities, float to the top of the furnace. At regular intervals, the iron is tapped off by burning out a plug near the bottom of the furnace. The white hot stream of iron flows through a trough to ladle cars, also known as bottle cars or hot metal cars, which hold 40 to 160 tons of molten iron. As much as 400 tons of iron can be removed from the furnace at a time. The limestone and impurities that form a slag floating on top of the molten iron are tapped off through a hole located above the level of the iron in the furnace. The slag, too, is carried away in ladle cars.

In the past, the iron removed from the blast furnaces would have been taken to a pig-casting machine where it was cast into pigs, or bars of iron. Today, however, most of the molten iron goes directly into the production of steel. Steel is an alloy of iron and small amounts of carbon and other minerals. It is stronger than iron and can be shaped into many useful products. The steelmaking process is basically one of removing excess carbon and other impurities from the iron and adding other desired materials, such as manganese, dolomite, chromium, or vanadium, in small quantities. The materials added
Molten iron from the blast furnace is charged into one of two basic oxygen furnaces as Bethlehem Steel's plant in Bethlehem, Pennsylvania. After the charge has been completed, the vessel will return to its upright position for the oxygen “blow” during which the blast furnace iron, combined with scrap steel and additives, will be refined into steel. (Bethlehem Steel Corporation)
to the iron in the steel-making process determine the type of steel alloy that is produced. Stainless steel, for example, is a corrosion-resistant steel that has had chromium added to it.

Most steel made in the U.S. today is produced by the basic oxygen process developed in Europe shortly after World War II. A basic oxygen furnace, called a BOF, can produce up to 300 tons of steel in less than an hour, compared to the five to eight hours needed in the older, open hearth process. The BOF furnaces are cauldrons that look much like gigantic thermos bottles. The furnaces are open at the top, like a thermos, so that raw materials can be added, and they are mounted on pivots so they can be tipped to pour out their contents.

About 30 percent of a BOF’s charge consists of scrap metal. Molten iron from blast furnaces is poured in on top of the scrap to melt it, and pure oxygen is injected into the BOF at supersonic speeds to burn away carbon and other impurities and convert the metal into steel. Limestone is then added to act as a flux and gather impurities into a layer of slag that floats on top of the molten steel in the furnace.

The slag can be drawn off the top of the BOF and discarded. Then alloying materials can be added to the steel in the furnace before the BOF is tipped to pour its contents into molds or feed a continuous casting process that forms the steel into billets or slabs. The resulting ingots, billots, or slabs can then be shaped into finished steel products, such as sheets, bars, wires, pipes, or beams.

In the older open hearth process, still in wide use in the industry, the furnaces are about as large as a two-story building. The furnace is filled through a door on the top level, while the molten steel is tapped through a door on the other side, where the floor is one story lower. In one melt, an open hearth furnace can produce 100 to 300 tons of steel in five to eight hours.

To charge the furnaces, a special machine with a long arm dumps boxes of limestone and scrap steel into the furnace. The materials are heated until they are melted, then molten pig iron is added to mix with the molten scrap iron. Mill workers constantly test samples of the molten metal to determine when it has reached the desired purity; then small quantities of other minerals can be added to produce the desired alloy.

The open hearth furnaces are tapped by shooting out the tap-hole plug in the lower level of the furnace with a device much like a bazooka rocket. The molten steel and slag run off into a ladle, with the slag rising to the top. The slag overflows into an adjacent smaller ladle, known as a slag thimble. The ladle with the molten steel can then be lifted by a crane and poured into ingot molds mounted on railroad cars. Each resulting ingot weighs about 115 tons.

The third steel-making process, involving the electric furnace, accounts for about 10 percent of all steel produced, primarily the more exacting grades of alloys and carbon steel. The electric furnaces are saucer-shaped and, like the BOFs, they can be tipped to pour off slag and molten steel. The charge used in electric furnaces is primarily scrap steel, with little or no pig iron being used. Massive electrodes in the top of the furnace are lowered until they are almost in contact with the charge, then the electricity is turned on. The electricity arcs from the electrodes to the charge in the furnace, causing temperatures to rise to about 3,500° Fahrenheit. The furnace can then be tipped to rake off the layer of slag and pour the steel into a ladle.

About 75 percent of all the iron ore that moves through the Great Lakes and St. Lawrence system each year is shipped from iron ranges south and west of Lake Superior through ports in Minnesota, Wisconsin, and Michigan. Currently, the largest ore ports on Lake Superior are Two Harbors and Duluth in Minnesota and Superior, Wisconsin.

Duluth and Superior are often referred to as the twin ports, because they share a common harbor that straddles the Minnesota-Wisconsin border at the west end of Lake Superior. Until 1871, the only entrance to the sprawling, 24-mile long harbor was through a break in the sandbar on the Superior side. Wanting to create a direct access to its side of the harbor, Duluth began excavating a channel through the sandbar in 1871. Officials from Superior attempted to block the excavation by obtaining a federal court injunction. Before the injunction could be issued, however, thousands of angry Duluth residents armed with shovels worked day and night for two days to finish the channel and link their side of the harbor with Lake Superior.

French explorers first visited the Duluth-Superior area in about 1634, led by Chippewa Indians who
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lived there. The first permanent settler may have been George Stuntz, the surveyor and amateur geologist who discovered iron ore on the Vermilion range north of Duluth around 1852. The importance of the two ports increased significantly during the 1890s when ore first began moving off the Mesabi Range. Shipyards were eventually established in both cities, including Captain Alexander McDougall's famous American Steel Barge Company in Superior. Most of McDougall's unique whaleback barges and steamers were built there between 1888 and 1896. The only surviving whaleback, the *Str. Meteor*, is now a maritime museum at Superior, just a few miles down the shore from the shipyard where it was launched. Today, between 12 and 30 million tons of taconite pellets move across the ore docks in Duluth and Superior each year, accounting for about 40 percent of the total shipments from U.S. ports on the Great Lakes.

East of Duluth and Superior along the north shore of Lake Superior are the Minnesota ports of Two Harbors, Silver Bay, and Taconite Harbor. While Two Harbors dates to about 1884, when George Stuntz's Duluth and Iron Range Railroad connected the twin bays of the port with the Vermilion Range, Silver Bay and Taconite Harbor are among the newest ports on the lakes. The three ports are among the largest and most modern in the system. All capable of accommodating thousand-footers, together they handle 10 to 30 million tons of taconite each year. Silver Bay was opened in 1955 as the outlet port for Reserve Mining's Davis Works at Babbitt, Minnesota, the first facility developed by Republic Steel and Armco Steel to concentrate low-grade iron ore into taconite pellets. A second taconite processing plant was subsequently built at Hoyt Lakes, Minnesota, by a consortium of steel companies, including U.S. Steel and Youngstown Steel.

The process for concentrating low-grade taconite ores into pellets with an iron content in excess of 60 percent was developed by faculty at the University of Minnesota. Referred to as "benefication," the low grade ores are pulverized until they are the consistency of dust, then the iron is drawn off by magnets. The concentrated iron powder is then moistened and rolled into balls the size of marbles that are fused solid in mammoth ovens. A second process, developed for use with non-magnetic ores, involves a flotation process that separates the heavier ore-bearing particles from impurities that would make the shipment of the low grade ore uneconomical. The concentrated iron ore is then rolled into balls and hardened in ovens. Today, virtually all of the ore moving off Lake Superior is shipped in the form of taconite pellets. They provide the steel mills with a uniform, high-quality product that is generally considered to be superior to raw ore.

Taconite Harbor, the newest of all ore ports on the Great Lakes, was opened in 1957 to handle pellets from a beneficiating plant at Aurora, about 100 miles west of Taconite Harbor. Operated by LTV Steel, the country's second largest steel producer, the facility uses a conveyor belt loading system, similar to those in use at Silver Bay and Two Harbors. The Taconite Harbor loading system is among the most efficient in the world, capable of loading the giant freighters at rates up to 10,000 tons per hour. By comparison, most of the older style chute docks cannot exceed more than 3,000 tons per hour.

Along the south shore of Lake Superior, at Marquette, Michigan, is the oldest of the Great Lakes iron ore ports. The first ore ever shipped on the lakes was loaded by hand at Marquette in 1855, largely by crewmembers aboard the ships that carried it. The sailors loathed the indignity of being pressed into service for the arduous work of loading iron ore, a task they viewed as demeaning to their status as mariners. While the first cargoes of ore were small, the wheelbarrows loaded with ore were heavy and it was backbreaking work. Most sailors would rather have been called on to weather a gale on Lake Superior than to load the dirty red ore.

In 1859, the first chute-type ore dock was built at Marquette by the Cleveland Iron Company, forerunner to the present Cleveland Cliffs Iron Company. The prototype for all subsequent ore docks, it was 22 feet wide and 25 feet tall and could load up to four ships simultaneously. A newer dock was constructed at Presque Isle Point on the outskirts of Marquette in 1896. While the pockets of the original dock could hold only 50 tons apiece, those in the new dock each held 160 tons. To keep pace with the growth in the size of the ore boats, the dock stood 54 feet high, twice the height of its predecessor.

The chute-type docks were built so that rail cars loaded with ore could be pushed to the top of the dock trestle. Gates in the bottom of the hopper-shaped cars were opened and the ore would spill into the
A worker replaces grinding plates inside one of the twelve crude ore grinders at the Tilden Mine on Michigan's Marquette Range. The cavernous 32-foot grinding mill breaks down chunks of raw ore so that the iron can be removed for use in the benefication process that produces taconite pellets. (Cleveland-Cliffs Iron Company)
The *Str. Benson Ford* loading taconite pellets at the belt-type ore dock at Escanaba, Michigan. The articulated boom of the loader can be moved about to distribute cargo evenly in the cargo hold. The operator rides in a cab near the end of the boom. (Author’s collection)

A freighter being loaded at the chute-type ore docks at Marquette, Michigan. The dock workers standing on each side of the ore chute open and close the trap doors that allow ore to flow from the storage bins above them into the hold of the ship. (Author’s collection)
pockets under the tracks. At the bottom of each pocket was a gate that could be opened to let the ore slide down the loading chute and into the hold of the ship moored alongside the dock. It was an ingenious system that allowed a large quantity of ore to be loaded very rapidly, with little manual labor. Needless to say, the system was an instant hit with the sailors who crewed the ore boats.

By 1899 there were twenty-two ore docks serving the Lake Superior District. In addition to the docks at Marquette, there were five docks at Two Harbors; two docks at Duluth; one dock at Superior; three docks at Ashland, Wisconsin; four docks at Escanaba, Michigan; one dock at Gladstone, Michigan; one dock at L'Anse, Michigan; and one dock at St. Ignace, Michigan. The twenty-two docks contained a total of 4,624 pockets, with an aggregate capacity of 633,804 tons. The docks ranged in length from 559 feet to 2,304 feet. Laid end-to-end, they would have stretched for more than 5 miles.

The present chute dock at Marquette was completed in 1912 at Presque Isle. Handling ore mined in Michigan’s Upper Peninsula, the dock now loads 2 to 8 million tons a year. The only other ore dock now operating in Michigan is at Escanaba, on Little Bay de Noc at the northern end of Lake Michigan. The first ore dock was built at Escanaba in 1863. Today, the conveyor belt loading system there handles 5 to 10 million tons of taconite each year. The loading system is rated at about 3,700 tons per hour.

Because ships loading at Escanaba do not have to transit the Soo Locks, the port has traditionally held the record for the largest cargoes of ore loaded on the lakes. The current record of 72,351 gross tons of taconite was loaded aboard Bethlehem Steel’s M/V Lewis Wilson Foy during the 1986 shipping season at Escanaba. The record cargo aboard the Foy was made possible partially as a result of record high water levels that existed on the Great Lakes.

On the Canadian side, shipments of iron ore originate from Thunder Bay on Lake Superior and Little Current on Lake Huron. Thunder Bay, known as the “Canadian lakehead,” is primarily a grain port, but it ships 1 to 2 million tons of ore each year. Little Current is the home of International Nickel, which ships only 15 to 16,000 tons of ore annually. The other Canadian ore moved through the Great Lakes and St. Lawrence system is ore shipped from mines in Eastern Canada to mills on Lake Ontario and at Sault Ste. Marie. More than 6 million tons of ore moves into the system each year from port facilities at Contrecoeur, Pointe Noire, Port-Cartier, and Sept Iles, all in Quebec.

Since the earliest days of the iron ore industry on the Great Lakes, most of the ore carried aboard the lake freighters has been destined for Ohio ports along the south shore of Lake Erie. Both Cleveland and Lorain developed early as steel-making centers as a result of their accessibility to ships bringing ore and limestone down from the northern lakes. Coal, the other vital raw material needed to make steel, was shipped in from the coalfields of Kentucky, West Virginia, Pennsylvania, and southern Ohio by rail. Andrew Carnegie reportedly felt that northern Ohio was the natural center for the world’s iron and steel industries because all of the necessary raw materials could be shipped there so economically.

The LTV Steel mills on Cleveland’s infamous Cuyahoga River and the U.S. Steel plant on Lorain’s Black River are still major consumers of ore mined on the northern lakes. Lorain is also the site of LTV’s pellet transshipment terminal. The terminal was opened in 1972 to serve thousand-footers carrying ore destined for the LTV mills in Cleveland, which cannot navigate the narrow and winding Cuyahoga. Pellets discharged at the terminal at the mouth of the Black River are loaded aboard smaller ore carriers, like the M/V American Republic, for movement to Cleveland and up the Cuyahoga. Other ore discharged at Lake Erie ports is destined for steel mills inland, primarily in southern Ohio and western Pennsylvania. Ore unloaded at ports like Toledo, Ashtabula, Huron, and Conneaut often moves by rail to steelmaking centers like Pittsburgh and Youngstown.

Accessibility to raw materials also led to the construction of steel mills along the southern shore of Lake Michigan at South Chicago, Illinois, and Burns Harbor and Gary, Indiana. Gary, in fact, was developed in 1905 by U.S. Steel, turning sand dunes and marshland into what was for years the largest steel manufacturing facility in the world. The city was named for Judge Elbert H. Gary, a lawyer and industrialist who helped form U.S. Steel in 1901. The port of Burns Harbor in Portage, Indiana, is home to Bethlehem Steel’s Burns Harbor mill. The port of South Chicago, on the Calumet River, serves an LTV Steel mill and facilities of Acme Steel.
Three steel mills are also located in “downriver” suburbs of Detroit. Trenton is home to McLough Steel, while Ecorse is the site of National Steel’s Great Lakes Steel Division. In Dearborn is Ford Motor Company’s Rouge Steel subsidiary, which supplies much of the steel used by the auto manufacturer. The Ford complex is connected to the Detroit River by the Rouge River, a narrow, twisting industrial channel that is crisscrossed by rail and highway bridges. Like Cleveland’s Cuyahoga and Chicago’s Calumet, it challenges the skill of the sailors who must regularly guide their giant ships up and down the treacherous channels.

Three major steel mills are located on the Canadian side of the lakes in the province of Ontario. On Lake Ontario are the Hamilton and Nanticoke mills of the Steel Company of Canada (Stelco) and Dofasco Steel. At Sault Ste. Marie, within view of the Soo Locks and just a few miles from the entrance to Lake Superior, is Algoma Steel, the only steel mill on the northern lakes.

Most of the iron ore moved on the Great Lakes and St. Lawrence is now carried aboard self-unloaders, eliminating the need for shoreside unloading equipment. Historically, most of the ports receiving shipments of ore had shoreside unloading systems. While small ports around the lakes could not justify the installation and maintenance of unloading equipment, the iron ore ports handled sufficient quantities of material to develop their own unloading systems. They could then be served by traditional Great Lakes straight-deckers, which have a slightly greater carrying capacity per load than comparably sized self-unloaders.

During the 1986 shipping season, however, no straight-deckers were assigned to the ore trade. A few that were primarily engaged in grain movements also carried some iron ore during the season, but for the first time in the industry’s long history, the regular iron ore trade was limited to self-unloaders. Self-unloading equipment can unload a ship faster than shoreside equipment and eliminates the need to maintain and operate expensive and aging dockside equipment at a time when the tonnages being handled by the industry are at a low level. It had also become difficult and expensive to maintain crews of dock workers to operate equipment that was not in regular use.

For a hundred years, however, the efficiency of the shoreside unloading systems used around the lakes contributed significantly to the overall efficiency of the Great Lakes bulk industry. It didn’t take long for the industry’s early pioneers to conclude that the efficiency of their vessels would be forever limited by the speed at which they could be loaded and unloaded. High volume chute docks were developed within a few years of the opening of the iron ore trade on the lakes, but efficient unloading proved to be a more difficult challenge.

The greatest breakthrough in unloading technology didn’t come until 1899, forty years after the first chute-type loading dock was opened at Marquette, when an eccentric genius named George H. Hulett built an unloader that looked something like a giant prehistoric grasshopper. The Hulett unloader consisted of a huge clamshell bucket mounted at the end of a heavy articulated arm. The unloading rig was operated by a worker who rode in a cab just above the bucket itself.

Powered first by steam and later by electricity, a Hulett could be guided into the hold of a ship, where it would take a 15-to-18 ton bite of cargo. Because the operator rode into the hold atop the bucket, he was able to do a much better job of cleaning out the cargo hold than systems where the operator was stationed on the dock and could not see into the hold. Those systems, like conventional cable cranes, relied on laborers in the cargo hold to move material to the bucket, making cleanup of the hold a slow process.

During their heyday, the Hulett unloaders were the most efficient in the world. In 1937, for example, port officials in Liverpool, England, bragged that they had set a European record when they unloaded 4,960 tons of iron ore from the Str. Tregarthen in twenty hours. By comparison, at about the same time Hulett unloading rigs at Conneaut, Ohio, scooped 13,586 tons of ore from the hold of the Str. William A. Irvin in just two hours and fifty-five minutes! Even today, cargo loading and unloading “efficiency” has a totally different meaning on the Great Lakes than it does elsewhere in the world. While a lot of international ports ballyhoo loading and unloading systems that can handle 3,000 tons or less an hour, ships on the lakes are commonly loaded and unloaded at rates of up to 10,000 tons per hour without any fanfare.

Over the years, the efficiency of the Great Lakes bulk industry has had a tremendous impact on the
steel industry within the region and the overall economic vitality of the U.S. A 1980 study by Michigan Technological University showed that lake shipping saved the steel mills around the lakes about $15 per ton over what it would cost to ship the ore by rail. Those savings amounted to $240-$475 million a year for the steel industry, representing 29 percent of the industry’s net income during the 1970–78 period. A large share of the savings documented were the result of the highly efficient loading and unloading systems that had been developed on the lakes, like the Huletts.

Today, Huletts remain in operation at only two Great Lakes ports, Cleveland and Chicago, and they see only limited use. There are still Huletts at Toledo, Huron, and Conneaut, but they are all idle and may never be used again. Many other lower lake ore ports are equipped with some sort of crane-type unloading equipment, primarily bridge cranes. Like the Huletts, bridge cranes have been largely made obsolete by the industry’s reliance on self-unloaders. If the demand for ore forced the industry to put the few remaining straight-deckers back into operation, the shoreside unloading equipment could again see some use.

In terms of tonnages, the second most important commodity moved on the lakes today is coal, much of which is destined for use as fuel by steel mills along the lower lakes. Power plants and other industrial facilities in both the U.S. and Canada are also prime customers for coal moved through Great Lakes ports.

Before the late 1960s, when coal was still the primary fuel used in home heating, freighters moved 50 to 60 million tons each year. With the shift to natural gas for residential heating and low fuel oil prices, tonnages dropped to a low of just under 35 million tons in 1974. Then, when oil prices skyrocketed in the early 1970s during the Arab oil embargo, coal tonnages began to creep upward again, reaching almost 46 million tons during the 1979 shipping season. In 1980, primarily as a result of the downturn in steel production, tonnages again dropped to around 34 to 35 million tons per year.

The majority of the coal shipped on the Great Lakes and St. Lawrence is Appalachian bituminous coal or soft coal, which is shipped by rail from the mines to ports on Lake Erie and Lake Michigan. More than 60 percent of the total coal moving in the system is shipped from the Ohio ports of Conneaut, Ashtabula, Sandusky, and Toledo. Conneaut and Toledo are the largest of the Great Lakes coal ports, both moving approximately 10 million tons a year. In addition, substantial amounts of coal are moved out of South Chicago on Lake Michigan and from Superior, Wisconsin, and Thunder Bay, Ontario, on Lake Superior. Between 1.5 and 2 million tons of Appalachian coal move through South Chicago annually, while Superior has handled up to 7 million tons a year and Thunder Bay has reached 1.9 million tons. Coal moved through the Lake Superior ports is made up largely of low sulphur Western coal mined in Wyoming.

Most of the coal shipping docks on the Great Lakes, including most of the major facilities on Lake Erie, are owned and operated by railroads, including CSX, Norfolk Southern, Bessemer & Lake Erie, and Pittsburgh & Lake Erie. The railroads are extensively involved in marketing coal to consumers in the U.S., Canada, and overseas, often in conjunction with the shipping companies.

While iron ore shipments are received at only a limited number of ports around the lakes, coal goes to more than fifty facilities. Major coal consumers include utility companies that operate power plants that burn coal, steel plants not located on Lake Erie or Lake Michigan, paper manufacturing plants, auto plants, cement manufacturers, and coal retailers.

Much of the coal that is loaded aboard ships at Lake Erie ports, totalling 8 to 12 million tons a year, is destined for Canadian ports. One to 2 million tons a year go to the Algoma Steel plant in Sault Ste. Marie, Ontario, and 6 to 8 million tons are shipped to ports east of the Welland Canal, primarily to the major steel plants on Lake Ontario. Virtually all of the coal exported to Canada is carried aboard Canadian ships, a fact that has attracted the attention of many government and shipping officials in the United States.

In 1953, before construction of the St. Lawrence Seaway, U.S. vessels carried 30 percent of the cross-lakes cargoes. By 1986, the U.S. share had dropped to only 5 percent. A 1985 study by the U.S. Government Accounting Office (GAO), done at the request of the House of Representatives Merchant Marine Committee, blamed much of the disparity on government policies that put U.S. fleets at a competitive disadvantage. The government investigators cited
The *Str. Wyandotte* loading coal at Toledo. A conveyor system feeds coal to the ship loader, whereas the older loader visible in the right foreground lifts railroad cars full of coal and dumps them into the hold of a ship. (Institute for Great Lakes Research, Bowling Green State University)
Canadian tax incentives and financial assistance to their fleets, and their ability to build ships overseas cheaply, as contributing to the economic competitiveness of the Canadian fleets.5

Coal shipments out of the Lake Erie ports, as well as incoming iron ore shipments are coordinated by an organization known as the Ore and Coal Exchange. Based in Cleveland, the Ore and Coal Exchange was established by the government during World War I to insure that delays were not experienced in the movement of raw materials critical to the U.S. war effort. At the end of the war, the operation was taken over by the railroads, and it operates today as the agent for thirteen railroads involved in ore and coal movements in and out of Lake Erie ports. Through the efforts of the personnel at the Ore and Coal Exchange, delays are dramatically reduced for vessel operators, the railroads, and the customers waiting to receive the coal or ore. Partially as a result of their coordination of cargo movements, Great Lakes shipping companies seldom experience the demurrage, time spent waiting to load or unload, that is an everyday part of doing business at many saltwater ports in the U.S.

Demurrage problems at U.S. East Coast coal ports in the early 1980s, due partially to a growing demand for coal on world markets, led to development of a unique coal transshipment technology, which has resulted in international shipments of coal from Lake Erie ports. The system was pioneered in 1980 by the Bessemer & Lake Erie Railroad (B&LE), which operates modern dock facilities at Conneaut, Ohio. When ocean vessels were delayed for thirty days or more waiting to load at East Coast ports, B&LE arranged to move coal by self-unloaders to the deep water at the mouth of the St. Lawrence River. There, the self-unloaders discharged their cargoes directly into the holds of the giant coal carriers, which are too large to enter the St. Lawrence and Great Lakes system. Almost a million tons of Lake Erie coal was shipped overseas during 1981 as a result of the midstream transfer technology. Included was the single largest cargo of coal ever shipped from North America. The record was set when six self-unloaders from Canada Steamship Lines (CSL) loaded 165,000 tons of metallurgical coal aboard a massive Japanese collier at anchor in the bay off Sept Iles in the St. Lawrence. The coal was loaded aboard the CSL vessels at Conneaut and Sandusky for the 900-mile trip to the mouth of the St. Lawrence. The ultimate destination for the coal was Nippon Steel in Japan.

CSL subsequently established a regular monthly top-off service at Sept Iles, servicing large foreign ships that could not be completely loaded at East Coast or St. Lawrence River ports because of draft restrictions. The vessels, which were often capable of carrying 150,000 tons, would load to the maximum draft available at the East Coast or St. Lawrence River port, then sail to the deep waters off the St. Lawrence to be topped-off to their full capacity by Great Lakes self-unloaders.

While the cost of shipping coal overseas from Great Lakes ports would normally be more expensive than costs from East Coast ports, such as Norfolk, Baltimore, Philadelphia, or Hampton Roads, demurrage at the coastal ports tipped the scales in favor of the Great Lakes system when demurrage costs added as much as $10 per ton. Ship operators whose vessels had to wait a month or more to load at the coastal ports billed their customers up to $20,000 for each day they were delayed. By taking advantage of the opportunities for the midstream loading of coal that came from Lake Erie ports, at which there were no delays, coal customers were able to reduce their costs and speed up receipt of the coal they needed.

As delays were minimized at East Coast ports, as the result of both improvements in their facilities and some reduction in world demand for coal, tonnages transshipped declined. In the long term, however, Great Lakes operators are optimistic that midstream transfers can allow them to share in the international coal market, though their share of the market will vary from year to year depending on the capacity of the coastal ports to meet demands without costly delays.

The record coal shipment on the Great Lakes occurred in 1986 when Columbia Steamship’s 1,000-foot Columbia Star carried 70,706 net tons of western coal from Superior, Wisconsin, to St. Clair, Michigan. The largest shipment of coal from a lower lakes port took place on September 3, 1988, when American Steamship Company’s Indiana Harbor broke its own record by loading 59,058 net tons at Sandusky, Ohio, for delivery to Marquette, Michigan. Over 600 rail cars of coal were emptied into the hold of the Indiana Harbor.
Coal is the second most important bulk cargo shipped on the Great Lakes. Most of it moves from ports on Lake Erie to steel mills and power plants around the lakes. Here Algoma Central's Algosteel is shown loading coal at Toledo, Ohio for shipment to Algoma Steel's mill at Sault Ste. Marie, Ontario. Canadian shipping companies control most of the coal traffic between the U.S. and Canada. (Author's Collection)
The *Indiana Harbor*, one of two 1,000-foot coal colliers owned by ASC, also holds the record for the largest load of stone ever shipped on the lakes. During the 1984 season, it loaded 44,841 tons of limestone at Presque Isle Corporation's dock at the Port of Stoneport, located on the north shore of Lake Huron between Alpena and Rogers City. The record set by the *Indiana Harbor* surpassed the previous record by more than 9,500 tons and represented the first time that a thousand-footer had been used in the stone trade on the lakes. Because the dock at Stoneport is designed to handle ships only up to 826 feet in length, the *Indiana Harbor* first backed in to load its after holds, then turned around and went into the dock bow first so that it could finish loading.

The shiploader at Stoneport is typical of the modern conveyor belt systems used at most ports around the lakes for loading stone, iron ore, or coal. The loader at the sprawling limestone quarry is capable of loading ships at rates of up to 1,800 tons per hour, while similar equipment at other ports can achieve rates as high as 5,000 tons per hour for stone or 10,000 tons per hour for the heavier iron ore.

At Stoneport, limestone from the open pit mining operation is crushed and sorted according to size in a mill. Conveyor belts carry the sized stone to various storage piles adjacent to the loading dock. Each of the storage piles sits atop a concrete "tunnel" that houses a conveyor belt. Gates in the ceiling of the tunnel can be opened to allow stone of a particular size to drop onto the moving conveyor belt and be carried out to the shiploader.

The shiploader itself is a steel structure taller than the ships that call at the dock. It is mobile, operating on railroad tracks so that it can move back and forth along the dock to load each hatch of a ship. The conveyor belts carrying cargo from the storage piles connect with a belt on the loader's boom. The boom can be extended out so that it reaches to the centerline of the ship being loaded, just above the hatch openings, insuring that the limestone will be evenly distributed in the hold.

In terms of tonnages, stone has traditionally been the third most important bulk product moved on the lakes, although the slowdown in the steel industry caused shipments to drop below those of grain after the 1979 season. Only 15 million tons of stone was moved in 1982, compared to about 43 million tons in the record years of 1973 and 1974. Stone is the most diverse of all the commodities carried by the Great Lakes bulk industry. The overwhelming majority of the stone is limestone, with the balance made up of dolomite, a closely related mineral. The stone is used by the steel, construction, agricultural, cement, and chemical industries.

Limestone, chemically calcium carbonate, formed in the Great Lakes region when the area was covered by shallow seas. All water, fresh and salt, contains quantities of dissolved calcium carbonate, which eventually either settles out of the water or is extracted from the water by aquatic organisms that use it to make their shells and bones. When the organisms die, the shells and bones break down and form beds of calcium carbonate that harden into limestone or dolomite over a long period of time.

Major commercial limestone and dolomite quarries on the lakes include the Michigan Limestone Calcite Plant at Rogers City, Michigan; the USX Port Dolomite plant at Cedarville, Michigan; the Presque Isle Corporation quarry between Rogers City and Alpena, owned by a consortium of steel companies, including LTV; the Drummond Island quarry of Drummond Dolomite; and the Port Inland facility at Gulliver, along the Lake Michigan shoreline on Michigan's Upper Peninsula. The Port Inland facility was developed by Inland Steel, but it was sold in 1989 to St. Mary's Cement Company of Toronto.

The grey stone is crushed and sorted, with the larger rocks, pieces 4 to 5 inches in diameter, primarily used as flux in the making of steel. Smaller stone is commonly used as construction aggregate, with much of it going into the production of concrete for paving. The versatile mineral also has many applications in the chemical and agricultural industries, including use as lime by farmers to reduce the acidity of soils.

Limestone is shipped to hundreds of ports around the lakes and even to places where no port exists. When the massive concrete caissons that support the Mackinac Bridge were being constructed, they were filled with limestone from self-unloaders that tied up alongside them. When the Michigan Department of Transportation contracted for the repaving of the road that circles Mackinac Island in northern Lake Huron, a self-unloader was used to discharge the needed limestone directly onto the shore of the island. The first self-unloaders on the lakes, in fact, were primarily used in the limestone trade, a prac-
tice that caught on because of the demand for stone at ports around the lakes that did not have shore-side unloading equipment. Today, most of the ports to which limestone is delivered are totally dependent on self-unloaders for service.

While iron ore, coal, and stone have been the staples for the U.S. shipping companies on the Great Lakes, grain is the most important cargo for the Canadian fleets. Grain tonnages moved on the lakes have been showing a generally upward trend since the opening of the St. Lawrence Seaway in 1959. Before 1959, only about 9 to 15 million tons of grain were shipped annually on the lakes. Since the Seaway opened, however, volumes have ranged from 13 to 32 million tons, averaging more than 25 million tons a year for the past decade. In 1978, more than 32 million tons were shipped from Great Lakes ports, setting a record that still stands. Wheat accounts for more than 50 percent of the total grain shipped on the Great Lakes, followed by corn, which represents about 10 percent of the total. Other grains include oats, rye, barley, flax, soybeans, sunflower seed, and rapeseed.

About 60 percent of the grain is shipped from Canadian ports, primarily aboard Canadian ships. By contrast, of the grain moving out of U.S. ports, only 10 to 15 percent is carried by U.S. ships. Around 35 percent of the U.S. grain is shipped on Canadian vessels, while 50 percent or more goes out of the lakes in foreign ships.

Virtually all of the grain carried by U.S. ships goes to elevators in Buffalo, New York, still the most important grain receiving port on the American lakes after more than a hundred years. U.S. and Canadian grain carried by Canadian bulk freighters is generally bound for mills or transshipment facilities in Eastern Canada. Grain shipped to storage facilities in Montreal, Quebec City, Port-Cartier, Baie-Comeau, and Sorel is often subsequently loaded onto foreign-flag vessels for overseas shipment. Much of
that grain moves overseas during the winter months when the system is icebound west of Montreal. About 60 percent of all the Canadian grain is sold on the international markets.

Most of the grain is grown on the great prairies that straddle the U.S. and Canadian border between the Great Lakes and the Rocky Mountains. It is shipped by rail from storage elevators on the prairies to terminal elevators at the ports, where it is cleaned and stored for eventual shipment by water. The largest grain port on the Great Lakes, and one of the largest in the world, is Thunder Bay, Ontario. There are fourteen grain terminals at Thunder Bay that can store more than 2 million tons of grain at a time and process and ship over 20 million tons a year. Over the last decade, grain shipments from Thunder Bay have averaged about 15 million tons a year, with a high of more than 17 million tons in 1983.

On the U.S. side, the twin ports of Duluth and Superior account for more than half of all grain shipments, moving 4 to 10 million tons a year. The other major U.S. grain ports include Toledo, Chicago, and Milwaukee, basically in that order.

With most of the grain that is shipped on the lakes destined for foreign markets, tonnages can vary significantly from season to season. Foreign sales of U.S. and Canadian grain are affected by the size of foreign harvests, prices on the international markets, and the strength or weakness of U.S. and Canadian currency. During the five-year period from 1979–1984, the best international customer for U.S. grain moved through the Great Lakes and St. Lawrence was Spain. It accounted for 17 percent of all shipments, or about 1.9 million tons a year. Holland was the second best customer during the period, the destination for almost 11 percent of the shipments from U.S. Great Lakes ports, about 1.2 million tons a year. Other major foreign customers for U.S. grain were Algeria, Belgium, England, Italy, Canada, Portugal, the Soviet Union, Japan, Mexico, and West Germany.

The Soviet Union is Canada’s top grain customer, buying 4 to 5 million tons a year. Most of the grain purchased from Canada by the Soviet Union has moved out the Seaway. In addition to the Soviets, the People’s Republic of China, Brazil, Japan, and the United Kingdom are major customers for Canadian grain.

Unlike the other dry bulk commodities carried by U.S. and Canadian fleets on the lakes, most grain is shipped on straight-deckers, rather than on self-unloaders. Because grain is a light product, with about 36 bushels to a ton, it is most efficiently transported by ships with high cubic capacity cargo holds. Even then, a ship’s cargo hold generally can be completely filled with grain and the ship will still not have reached its maximum loadline draft. More weight could be carried, but not more volume.

On a self-unloader, some cargo hold volume has to be sacrificed because there must be room beneath the cargo hold to accommodate the conveyor belt system. In addition, the interior walls of the cargo hold angle from the sides of the ship toward the bottom center of the vessel where the conveyor belt is located, so that cargo will slide down onto the belt. As a result, the cargo hold of a self-unloader is shaped like an inverted triangle, while the cargo hold on a straight-decker is cube-shaped, like a giant shoebox. For the carriage of grain, the boxy cargo holds of the straight-deckers are more efficient. Unloading is not a problem, because all of the grain terminals are equipped with special unloading systems for grain.

To observers, the bulk freighters on the lakes may look very much alike. However, some are better suited to certain cargoes than others. Maximum Seaway-size straight-deckers do the best job of carrying grain. Thousand-footers outshine the smaller ships in the iron ore trade, except in those instances when the ore has to be moved up a river like the Cuyahoga or Rouge. The smaller self-unloaders have carved out a niche in the river trades and in delivering coal and stone to small ports around the lakes. The most highly specialized ships on the Great Lakes are those designed to carry a single type of commodity, such as cement or petroleum products.

In an industry that has always been dominated by iron ore, grain, coal, and stone, the cement and tanker fleets have often been viewed as stepchildren by industry insiders. Until recently, the annual report of the Lake Carriers’ Association totally ignored cement shipments and devoted only one line to liquid bulk cargoes. Together, cement and petroleum shipments account for less than 5 percent of the total cargo moved on the lakes each year. During the boom years, such as 1978 and 1979, they represented less than 2 percent of the total carried by the U.S. and Canadian fleets.

Shipments of petroleum products, primarily gaso-
line and fuel oil, range from 6 to 15 million tons a year. On the U.S. side of the lakes there are two tanker fleets, Amoco's Coastwise Trading operates one vessel; Cleveland Tankers has three. Some liquid bulk is also moved by tug companies using barges. On the Canadian side, there are five fleets operating tankers. They include Sofati-Soconav, Enerchem, Shell, Gulf, and Texaco. Together, they operate about twenty tankers. Liquid bulk cargoes move mainly from refineries or shipping terminals on the lower lakes and Seaway to terminals on the upper lakes or in the Maritime Provinces of Canada, where the products are stored in large tanks for local distribution by truck.

Cement shipments on the lakes total 3 to 8 million tons a year. There are two U.S. cement fleets, serving manufacturing plants in Alpena and Charlevoix, Michigan. On the Canadian side, two cement companies operate their own tug-barge delivery equipment, while a third charters a cement ship operated by Canada Steamship Lines. Cement is delivered to terminals in the major cities around the lakes, where it is stored in silos similar to those used for grain. From the storage silos, the cement is delivered to retail or commercial markets. Cement for retail sale is generally bagged, while deliveries to commercial users, such as redi-mix concrete plants, is primarily in bulk quantities shipped in special trucks or rail cars.

Regardless of how it is shipped, the key consideration is to protect the cement from exposure to water. Instead of large rectangular hatches like those used on ships in the ore or stone trades, cement boats load through small, circular hatches, generally no more than a foot or two in diameter. Use of the small hatches reduces the likelihood that water will get into the cargo hold, even if waves roll across the vessel's deck during a storm on the lakes.

The cement boats and barges are all self-unloaders, but do not have deck booms like ships designed to handle stone or ore. The cement is carried up and out of the cargo hold by either mechanical or pneumatic conveyors and elevators, but when it reaches deck level it is usually pumped into the shoreside storage silos. When aerated, cement will flow like a liquid, so it can be moved effectively by pumps like those that would be used for water or other liquid bulk commodities. The link from the ship to the silo is usually a large-diameter rubber hose, similar to those used to unload bulk products from tankers. In loading cement, a similar sealed connection is made between the loading spouts on the storage silos and the hatches on the deck of the cement boat or barge, protecting the cargo from exposure to moisture. The largest cement carrier on the lakes can carry 65,000 barrels of cement per trip, about 12,000 tons. That amount of cement will produce enough concrete to pave 10 miles of two-lane highway or manufacture close to seven million concrete blocks.

Other bulk cargoes moved on the lakes in small quantities include road salt, sand, coke, fertilizer, and gypsum. Canadian ships occasionally carry deck loads of automobiles from ports in southern Ontario to Thunder Bay.

Autos were once a major cargo for a number of U.S. and Canadian shipping companies on the lakes. There were more than half a dozen ships engaged primarily in hauling new cars from Detroit to Cleveland, Buffalo, Chicago, and other major ports, while many bulk freighters would take deck loads of automobiles every once in a while. The special auto haulers had decks installed in their cargo holds and racks on their main decks so they could carry hundreds of autos at a time. The last ship on the lakes solely engaged in carrying automobiles was the M/V Highway 16. The 328-foot vessel was operated by the Wisconsin and Michigan Steamship Company, carrying automobiles between Muskegon, Michigan, and Milwaukee. Placed in service in 1948, the ship was capable of hauling 190 cars in a single trip. By the early 1960s, most of the auto trade had been taken over by the railroads, although lakers continued to carry an occasional deck load of cars as backhaul cargo on their trips up the lakes. It is a sight that is seldom seen anymore, however.

Most American bulk freighters “deadhead” on their trips up the lakes, lacking return cargo. If any cargo is hauled on their upbound trips it is generally coal. On the other hand, the trade routes operated by the Canadian fleets commonly involve cargo movements in both directions. For the most part, the ships carry grain out the Seaway and iron ore on the return voyages into the lakes. Most of the ore is destined for mills in southern Ontario or the Algoma Steel plant at Sault Ste. Marie, so they generally run empty for at least a part of their return trip to the grain terminals at Thunder Bay or the ore docks at Duluth and Superior.
The Str. Medusa Challenger, operated by Medusa Cement, loads cement at the firm's Charlevoix, Michigan, manufacturing plant. Launched in 1906 as a straight-decked, the 552-foot ship was converted to a cement boat in 1967 and is the largest vessel on the lakes in that trade. Cement stored in the silos spills into the ship through the loading spouts that connect to small, round hatches on the deck of the ship. (Author's collection)
The *Str. S. T. Crapo* loading cement at LaFarge Corporation's Huron Cement plant at Alpena, Michigan. The loading spouts insure that the cement flowing from storage silos into the hold of the *Crapo* is protected from moisture.

(Author’s collection)
With the general decline in cargo movements on the lakes, a number of Canadian fleets have recently put some of their ships into international service, primarily during the winter period when the Great Lakes and St. Lawrence system are shut down because of ice. The ships that have been engaged overseas are called salty-lakers, vessels built to ocean standards. Self-unloaders owned by both Canada Steamship Lines and ULS International have been extensively involved in ore and coal movements in Europe. With their relatively shallow drafts and self-unloading capabilities, the ships have carried cargo to steel mills and power plants that cannot be served by deep draft ocean vessels.

ULS vessels have also been operating in the Gulf of Mexico, hauling grain from ports in Texas and Louisiana to Mexico, with backhaul cargoes of stone and fertilizer. The trade has proven so successful that ULS has reregistered several of its ships under the Mexican flag.

Misener Shipping has operated three straight-deckers in the European grain trade in recent years. Specially reinforced to operate in ice, the Misener ships even carried grain from terminals in Hamburg, Antwerp, and Rouen to Leningrad under charter to the Soviet government. With the stagnation of trade opportunities on the lakes, the Canadian fleets, particularly CSL and ULS are attempting to expand their international operations. The unique Great Lakes self-unloaders have attracted a great deal of attention from foreign shipping officials, and both companies feel they can benefit by marketing their many years of experience in operation of the versatile ships.

Few industry officials on the lakes expect any dramatic increases in cargo tonnages in the near future. With the downsizing of the domestic steel industry, iron ore and limestone tonnages are expected to remain far below their historical levels. As the economy strengthens, some increases are anticipated, but nobody expects to see the Great Lakes fleets move tonnages approaching the records set in the late 1970s.

In the long term, coal shipments appear to hold the greatest promise for U.S. fleets. If, or when, international oil prices increase, demand for coal will rise, and that should stimulate both interlake movements and opportunities for the transshipment of coal from Great Lakes ports to foreign markets.

With combined capacity of almost 80 million tons a year, the ports on the Great Lakes can handle almost twice as much coal as they presently do.

The Canadian fleets, too, could benefit from increased demand for coal, but grain is expected to remain the staple of that segment of the industry. The outlook for future grain movements on the lakes is uncertain, however. Yearly grain shipments can vary dramatically, depending on world demand and how competitive Canadian pricing is. In addition, Canadian West Coast ports, particularly Vancouver, have been wrestling grain shipments away from the Great Lakes ports for the past few years. Because of government subsidies to railroads hauling grain from the Prairie Provinces to Vancouver and Prince Rupert Island, the West Coast ports have enjoyed a competitive advantage over the Great Lakes and Seaway system.

What the future holds for the U.S. and Canadian fleets and ports on the lakes is unclear. The glory days of the industry appear to be past, both in terms of the size of the fleets and tonnages hauled, yet the bulk freighters continue to play an important role in moving vital industrial and agricultural products. The industry may be down, but it’s far from out.

Notes

7. For a complete discussion of the auto trade on the lakes, see Lawrence A. Brough, Autos on the Water (Columbus, OH: Chatham Communicators, 1987).