

For Fluide Book
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River and lake ports in North America, and their cities

We know relatively little about river and lake ports in North America, and even less about their relationship to the cities that host them. That is not the same thing as saying that river and lake transportation is unimportant. The largest port by tons handled in the United States, the Port of South Louisiana, stretches for 54 miles along the lower reaches of the Mississippi River. Inland waterways carry a considerable volume of bulk cargo. In 2010, 29.4% of the 2.3 billion tons of cargo shipped into, within and out of the United States was carried on the internal waterways of the nation or the Great Lakes (USACE, 2010).

Every now and then, such as with the recent drought in the Mississippi basin, the importance of river and lake ports enters public consciousness and policy debates. Likewise, rising energy prices and concerns about the fiscal and environmental consequences of autocentric transportation systems have stimulated interest in the role of inland waterways in goods distribution (for example, see EPA, 1999). But for the most part, North American river and lake ports are ignored.

This short paper examines the relationship between river and lake ports and their host cities in North America. Little has been published on this topic in the scientific literature, and it is important to start with an appreciation of how much cargo actually moves on the inland waterways of North America, as well as the characteristics of some to the ports involved. The paper is largely descriptive; it seeks to show that river and lake ports are still heavily implicated in the north-south movement of bulk commodities, but that they have been largely bypassed by the predominant east-west movement of container traffic. The paper concludes with some discussion of the potential for reconnection between river ports and their host cities, including the many challenges.

Patterns of inland waterway use

While the major North American container ports are almost all located on the ocean, river ports feature prominently amongst the largest ports in terms of cargo handled. Table 1 shows that only two major container ports occupy what are clearly riverside locations, Savannah GA and Montreal, Canada. It is also important to note that with the exceptions of Houston and New Orleans, all container ports are located on the East or West coasts of the continent. This pattern may change if the widening of the Panama Canal results in considerable container cargo diversion from the West to Gulf coast, but this remains an uncertain prospect since the existing configuration reflects deeply entrenched historical patterns of trade, transportation and development. There are container-on-barge services on the Mississippi and Columbia Rivers, but despite considerable efforts by advocates governments and entrepreneurs (see SEOPA, 2008; WCI, 2013; MARAD, 2011), containers are relatively uncommon on the inland waterways of North America.

In contrast, 13 out of 20 of the largest ports by volume are on the Gulf coast, and several of these ports (S. Louisiana, New Orleans, Baton Rouge, Plaquemines) are close to the mouth of the Mississippi river. There are two top-20 ports inland; Huntington Tristate on the Ohio River, and St Louis at the confluence of the Ohio and the Mississippi. One port on the Great Lakes, Duluth-Superior, makes it onto the list of the top-20 ports by volume.

Table 1: Top United States (mainland only) and Canadian Ports by tonnage and containers (foreign and domestic), 2011

Top 20 ports by tonnage			Top 20 ports by TEUs (loaded and empty)		
Port	Location	Coast	Port	Location	Coast
South Louisiana, LA	River	Gulf	Los Angeles, CA	Ocean	West
Houston, TX	Ocean/Bay	Gulf	Long Beach, CA	Ocean	West
New York/New Jersey, NY-NJ	Ocean	East	New York/New Jersey, NY-NJ	Ocean	East
Long Beach, CA	Ocean	West	Savannah, GA	River	East
New Orleans, LA	River	Gulf	Port Metro Vancouver, Canada	Ocean/River	West
Beaumont, TX	River	Gulf	Oakland, CA	Ocean/Bay	West
Hampton Roads, VA	Ocean/Bay	East	Seattle, WA	Ocean/Sound	West
Corpus Christi, TX	Ocean/Bay	Gulf	Hampton Roads, VA	Ocean/Bay	East
Los Angeles, CA	Ocean	West	Houston, TX	Ocean/Bay	Gulf
Huntington Tristate, OH-KY-WV	River	Inland	Tacoma, WA	Ocean/Sound	West
Baton Rouge, LA	River	Gulf	Charleston, SC	Ocean/Bay	East
Texas City, TX	Ocean/Bay	Gulf	Montreal, Canada	River	East
Mobile, AL	Ocean	Gulf	Miami, FL	Ocean	East
Lake Charles, LA	Bay	Gulf	Jacksonville, FL	Ocean/River	East
Plaquemines, LA	River	Gulf	Port Everglades, FL	Ocean	East
Baltimore MD	Ocean/Bay	East	Baltimore, MD	Ocean/Bay	East
Pascagoula, MS	Ocean	Gulf	New Orleans, LA	River	Gulf
St Louis, MO-IL	River	Inland	Anchorage, AK	Ocean/Sound	West
Savannah, GA	River	East	Halifax, Canada	Ocean	East
Duluth-Superior, MN-WI	Lake	Inland	Prince Rupert, Canada	Ocean	West

Source: American Association of Port Authorities; US Army Corps of Engineers, Waterborne Commerce Statistics.
 Note: Author's classification of location reflects the predominant site characteristics of the port facility.

The Mississippi River system is the dominant inland waterway system in the United States, but the Columbia River and Great Lakes are also important (see Table 2). The Mississippi River rises in northern Minnesota; a series of human-made dams, locks, channels, dikes and dredging have made the river navigable from Minneapolis south to St. Louis, where the Mississippi is joined by the Missouri River. The Missouri itself is navigable as far north as Sioux City, though its tributaries extend to the Rocky Mountains and into Canada.

There are long-standing policy debates about whether the capacity of these locks and related structures should be expanded in order to promote river traffic. Wilson et al (2011) found that expanded lock capacity could lead to a shift of grain shipments from rail to barge, suggesting that capacity constraints and delay costs were indeed negatively impacting river traffic. Where rail meets the inland waterways, it can complement traffic on those waterways. At the same time several major continental railroads compete directly along the north-south axis, including Kansas City Southern, the Union Pacific, and Canadian National (which acquired in 1998 the Illinois Central Railroad with tracks between Chicago and New Orleans).

Some 200 miles below St Louis, at Cairo, the Ohio River merges with the Mississippi. The Ohio River is navigable over its entire 981 mile length, from Pittsburgh to Cairo. From here, the river flows for 1200 miles before reaching the ocean south of the city of New Orleans.

Table 2: Main inland and river waterway systems of the United States - Cargo 2010, millions of short tons (inbound and outbound, foreign and domestic)

	Mississippi River System			Great Lakes	Columbia River
	Mississippi Main Stem	Ohio River System	Mississippi all traffic		
Coal	54.1	142.4	177.2	31.0	0.0
Petroleum and Petroleum Products	140.4	14.4	151.6	3.7	5.5
Chemicals and Related Products	53.4	10.3	55.4	0.6	6.4
Crude Materials	59.7	54.0	98.6	83.8	10.5
Primary Manufactured Goods	22.6	8.8	26.1	6.7	2.3
Food and Farm Products	151.1	15.1	152.2	3.3	28.9
All Manufactured Equipment	1.6	-	1.7	0.3	0.9
Other	0.4	0.1	0.2	0.1	0.3
Total	483.2	245.2	663.2	129.5	54.7

Source: USACE, 2010

The Mississippi river system is connected to the other great inland waterway trade system of North America, the Great Lakes at Chicago, via a series of rivers and canal. The Great Lakes system forms the border between Canada and the United States, stretching from the east coast almost halfway across the continent. The inland lake routes connect to the ocean via the St Lawrence seaway and the Port of Montreal. Bulk commodities are predominant in Great Lakes transportation. The largest United States lake port in terms of cargo handled in 2011 was Duluth-Superior, MN-WI. Amongst Canadian lake ports, Hamilton (on Lake Ontario) was the 11th largest Canadian port by cargo handled in 2010; the lake ports of Nanticoke, Thunder Bay, Windsor and Sault-Ste-Marie were also within the top-20 Canadian ports. Most of the US-Canadian trade involves minerals, but fuel, agricultural products and manufactured products are also important (see Table 3). Domestic shipments involving Canadian lake ports are also dominated by minerals and agricultural products.

Table 3: Cargo Loaded and Unloaded at Canadian Lake Ports 2010, '000T

	Loaded		Unloaded	
	For domestic unloading	For international unloading	From domestic loading	From international loading
Agricultural products	5,624.4	1,846.6	1,161.4	370.0
Minerals	6,186.8	6,305.0	8,169.0	9,894.2
Coal	538.1	535.3	512.6	8,952
Fuel and Basic Chemicals	1,763.3	1,116.2	1,859.2	1,365.7
Primary and fabricated metal products	0	366.0	1.8	535.7
Manufactured and miscellaneous goods	1,362.2	2,111.9	1,042.1	226.2

Source: Statistics Canada, 2011.

The United States and Canada both have important domestic inland waterway systems that are dominated by bulk commodities. This transportation pattern reflects longstanding development patterns.

Geographical legacies

To understand the situation of urban river and lake ports in the United States and Canada, we need to consider the interaction between physical conditions, and a social and economic history of over 500 years of colonial and post-colonial settlement, industrial and post-industrial development.

Along the east coast of the United States, European colonists often located their ports on rivers, bays or estuaries, so they could enjoy the protection afforded while also being a short distance from the ocean. However, few of these rivers were deep, wide and gentle enough to allow inland travel, most notably the Hudson River with its mouth at New York City. The Delaware River (Philadelphia) and various inlets and rivers of the Chesapeake Bay also provided port locations that became cities such as Boston, Baltimore, Washington, Norfolk and Richmond. Further south, port cities also grew in protected harbour locations such as Charleston, Jacksonville and Miami. However, only Savannah can really be classified as river-fronting.

These ports could serve the coastal plains of the eastern United States, but the natural inland waterways of these ports were limited by geography. The Appalachians, a system of mountains runs from Canada in the north to Alabama in the south can be crossed by water in only one place due to human intervention; completed in 1825, the Erie Canal connects the Hudson River and New York, to the Great Lakes at Buffalo. There are many smaller, old industrial cities along this waterway such as Newburgh, Troy, Albany, Schenectady, and Syracuse. The fortunes of the east coast ports and their cities have diverged dramatically since containerisation: a few have become major container ports (see Table 1), while others, including almost all of those located on the inland waterways, have seen their waterfronts transformed into post-industrial spaces of consumption, entertainment and residence.

Instead, the development of the interior of the United States to the east of the Appalachians is associated more with the rise of the railroad (Cronon, 1991), and with the two great inland waterways of North America (the Mississippi/Ohio system and the Great Lakes). Many of the most important industrial cities of the United States are on these waterways, including Pittsburgh, Cleveland, Detroit, Chicago, Milwaukee and Minneapolis-St Paul, as are Windsor and Hamilton in Canada. Water transportation, amongst other factors, provided cheap access to the raw materials that were important to industrialists. It is precisely these cities that have experienced the painful process of industrial decline (Hill and Negrey, 1987), and abandoned industrial waterfronts are one legacy of deindustrialization here.

Ports on the west coast of North America typically also have limited inland waterway connections. The dominant port complex on the west coast, Los Angeles and Long Beach, is located directly on the ocean. The Ports of Seattle and Tacoma are in the protected waters of the Puget Sound. The newly regionalized Vancouver's port now encompasses cargo facilities on the Fraser River, but this river is only navigable over the last 160km (Hall 2012/3). The ports of the

San Francisco Bay, Oakland being the dominant container port having long ago beaten out San Francisco, connect to the navigable San Joaquin River and the Sacramento River/Canal which respectively reach the Stockton and Sacramento in the central valley of California. However, the only true river ports on the west coast of North America are on the Columbia River; the largest port, Portland, has struggled to maintain market share in the container trades, and the port itself is under constant pressure from alternative urban land uses.

The ports of the west coast of the United States and Canada have a long history of exporting raw materials from across the western half of the continent, and importing manufactured products. With containerization, the hinterland served by these ports expanded dramatically: by the 1970s, the land-bridge allowed the West Coast ports to displace first Gulf and then East Coast ports in serving consumers across the continent. However the west-to-east container wave was transported on trains and trucks; the predominantly north-south, bulk-oriented inland waterway system was entirely bypassed.

The prospects for port-city reconnection on rivers and lakes

Instead, North American river and lake ports are involved in bulk materials shipment; this trade is important, but it implies a particular relationship with the host cities. Bulk handling facilities typically involve specialized facilities that do not mesh easily with the urban economy in the ways that processing, industrial and even warehousing activities can. While lake ports are typically more spatially concentrated, loading docks for agricultural and mineral products outside metropolitan areas are typically spread along the riverfront in a land-extensive pattern. However, when such riverside bulk facilities they are located within dense urban space, the linear development pattern is especially vulnerable to displacement by alternative urban land uses (see Hall, 2012/3). Furthermore, river port governance reflects the linear, extensive physical pattern; most are governed by local special district authorities (Sherman, 2000) but individual terminal operators maintain a high degree of independence.

What then are the prospects for a sustainable reconnection between river/lake ports and their cities in North America?

It is possible that broader global and continental changes may create new opportunities for inland waterway transportation and a reconnection of river/lake ports and cities. During the recent recession, there was talk of reindustrialization in the United States; if this extends to heavy industrial and processing activity then it is possible that urban riverfront locations may reindustrialize. The widening of the Panama Canal may create opportunities for a south-to-north landbridge from the Gulf into continental markets, while expansion in some eastern Canadian ports may create opportunities for east-to-west movement of imports by water. However, all of these possibilities depend upon successful implementation of container-on-barge systems, which to date have not proven economic in almost all North American markets.

A more likely intermediate step is the use of shorter-haul container barging around large ports as a way of de-congesting metropolitan highway systems. This is the direction of most of the policy attention and public investment in the United States (see MARAD, 2011). This is not to say that inland waterways are not a source of air pollutants: Corbett and Fischbeck (2000) using data

from 1997 showed that inland-river and lake transportation contributed significant to transportation emissions in the United States. Even in large river cities such as St Louis, Nashville and New Orleans, waterborne transportation can contribute as much nitrogen-oxide pollution as road-based transportation.

Much of the policy argument for increased use of inland waterways for goods transportation is tied into arguments about climate change mitigation. The '2012 North American drought' revealed just how vulnerable the waterways might be to climate change. Although emergency measures were successful, river traffic south of St Louis on the Mississippi was especially affected. Shippers were reportedly reluctant to place sensitive cargo on barges for fear of the possibility that the loads may not arrive before threatened closures, while carriers have operated lighter (and hence more expensive) loads for fear of getting stuck on the river bed. The Lake Carriers Association (2012) reported that lake cargo vessels were taking on less cargo so that their draft depths could be reduced from 28ft to 26ft. There is also concern that climate change will lower lake water levels, but also a realization that reduced ice cover may lengthen the commercial shipping season (Quinn, 2002; Millerd, 2005).

It is a profound irony that the inland waterways, which may once again find a renewed role in freight transportation due to the imperative to reduce carbon emissions, should be so affected by the related climatic and weather changes.

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