Inland Waterways and Export Opportunities

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Executive Summary

Near continuous evolution of the global ocean-going fleet to ever larger vessels - an evolution of particular relevance to the Western Hemisphere with the scheduled opening of an expanded Panama Canal in 2014 – provided the impetus for Congress to direct the U.S. Army Corps of Engineers (USACE), Institute for Water Resources (IWR), to examine the preparedness of U.S. ports and waterways for 21st Century world trade. The results of this examination were presented in *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels*, dated June 2012. The USACE Planning Center of Expertise for Inland Navigation (PCXIN) was given the opportunity to report on how promised ocean freight rate reductions from an expanded Canal might affect inland waterways and U.S. export opportunities. The report that follows, *Inland Waterways and Export Opportunities,* was prepared in support of the IWR report, specifically by examining the ability of the inland waterway system to support and enhance export opportunities.

World trade has expanded at a rapid rate since the 1970s. World population growth and rising prosperity increased demand for goods, and relaxed trade policies lowered many barriers to trade between countries. Larger vessels, improvements in loading and unloading technologies (most dramatically advanced by container handling), and more reliable and efficient surface transportation within ports, and between ports and markets, greatly facilitated the global movement of goods. The gradual shift of consumer good manufacture for export west toward India has created new Suez Canal trade routes. This deep water canal and the nearly complete 50' deep Panama Canal have added impetus to the trend toward larger ocean-going vessels and the transportation cost savings they promise. This report examines the ability of inland waterways to support and enhance the export opportunities this new, global vessel fleet configuration may create.

The biggest role in the export market for the inland waterway system has been in the global trade for grains and coal. U.S. producers of these commodities face stiff global competition that will challenge their ability to maintain their current position, much less improve it. Investments in competing world ports are tapping production regions that were previously expensive to reach or nearly inaccessible. Coal mines in Mongolia, deep water ports in Brazil, rail lines from eastern coalfields in Columbia to the Pacific Ocean, and other planned developments add more competition to a list of already strong competitors with similar productive capacity and relative proximity to growing Asian markets.

U.S. government agencies' export forecasts indicate near term growth in grain and coal exports that level off over the next 20 years. These forecasts suggest that the U.S. will remain the single largest

participant in the global grain trade, while U.S. coal producers will continue to hold a marginal position in the global market. Grain producer forecasts see most of their exports being shipped from the Center Gulf region around New Orleans, Louisiana, with about one half of the increase in grain exports transiting the Panama Canal (see Table ES-1).

Table ES- 1. U.S. Corn, Wheat and Soybean Export Forecasts
(millions of metric tons)

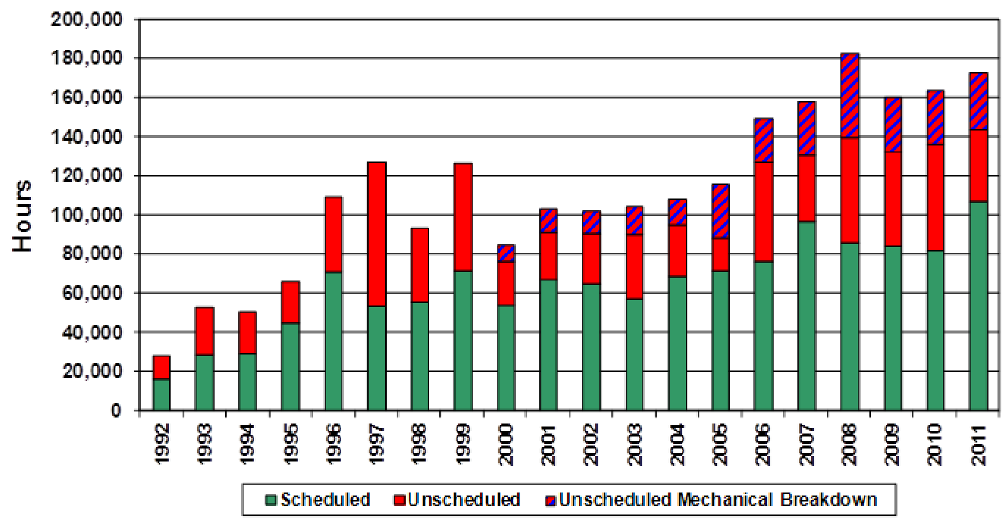
Year	US	Center Gulf		PNW		US thru Panama
		Mtons	% total US	Mtons	% total US	
2010	120.6	48.7	40%	32.7	27%	37.2
2011	105.8	50.6	48%	33.1	31%	38.3
2012	112.5	52.5	47%	33.4	30%	39.4
2013	123.5	54.4	44%	33.8	27%	40.6
2014	128.8	56.3	44%	34.2	27%	41.7
2015	131 9	58.2	44%	34.5	26%	42.8
2016	134 0	60.1	45%	34.9	26%	43.9
2017	136.1	62.0	46%	35.3	26%	45.0
2018	138 2	63.9	46%	35.6	26%	46.2
2019	140 2	65.9	47%	36.0	26%	47.3
2020	142.3	67.8	48%	36.4	26%	48.4

Note: US forecasts from USDA 2011; Pacific Northwest (PNW), Center Gulf, and US through Panama from Informa Economics report for US Soybean Board, U.S. Soybean Export Council, and the Soy Transportation Coalition.

This Center Gulf region, served by the Mississippi River and its navigable tributaries, appears to be the most likely immediate beneficiary of an expanded Panama Canal. The Lower Mississippi is currently maintained to a depth of 45'. A 50' deep Panama Canal will allow current Panamax vessels transiting the Canal to be loaded to their full draft of 42' to 45', a significant improvement over the current 35'. Mobile, Alabama and Lower Columbia River ports in Oregon and Washington are the other two U.S. coastal ports/port regions served by the inland waterway system that appear likely to see growth in export activity. Mobile is maintained to 45' feet, so coal loaded in Panamax vessels transiting the Canal could, like New Orleans, be more fully loaded. The Lower Columbia is currently maintained at 43' feet, making it unable to accommodate the largest dry bulk ships. The greatest advantage the Pacific Northwest (PNW) ports have is their proximity to Asia relative to Gulf and Atlantic ports. Planned investments on the Lower Columbia River and Puget Sound are indicative of the region's geographical advantage and exporters' confidence in future growth in northeast Asia demand for bulk commodities. Western railroads' healthy investment in lines linking the PNW with coal fields in the western plains and grain producing areas of the Midwest underscore this confidence. Great Lakes ports cannot directly benefit from larger vessels sizes as the Welland Canal and St. Lawrence Seaway locks (which can pass vessels 740' in length, 78' in width and drafting 26'9") are too small to accommodate even the current Panamax-sized vessels; however, opportunities still exist.

Shippers recognize that the inland waterways are a low cost method of transportation, though they remain uneasy about the reliability of this system, noting observed trends in availability (see Figure ES-1). To the extent that system outages disrupt waterborne service, shippers and carriers will experience additional, sometimes unexpected, costs. If the inland waterway system is to continue and even expand its role as a low cost, environmentally-preferred transportation link to coastal ports and the ocean going vessels that call at these ports, a reliable system must be offered. An unreliable transportation system is intolerable to shippers competing in the global market. The anticipated opening of the expanded Panama Canal and the projected advantage it will confer on grain and coal exports to Asia from the Gulf Coast is an advantage jeopardized by the real and perceived unreliability of the waterway route connecting U.S. grain and coal producers to the Center Gulf region.

Figure ES- 1 Lock Unavailabilty, 1992 - 2011



The Great Lakes, Mississippi River System, Columbia-Snake System, Gulf Intracoastal Waterway, and other inland waterways offer the opportunity to alleviate some of the burden placed on highway and rail. The U.S. Department of Transportation's Maritime Administration highlights the potential role inland and coastal waterways can play by designating Marine Highway Corridors. While most of these corridors offer considerable available capacity (the Upper Mississippi being a notable exception), the reliability of the infrastructure on these corridors is a concern. Increasing lock outages for scheduled and unscheduled maintenance of an aging system reduces the efficiency and reliability of these waterways. On the Upper Mississippi, if projected demands induced by larger ocean-going vessels are realized, the relatively small locks on the Upper Mississippi will impose delays on tows transiting this system, especially during the peak season for grain shipments, adding another layer of unreliability to the system.

Can the inland waterways, especially the Upper Mississippi (UMR) and Illinois Waterway (IWW) handle the potential demands? High Scenario projected traffic demands prepared for the U.S. Army Corps of Engineers' *Upper Mississippi-Illinois Waterway, Re-evaluation of the Recommended Plan: UMR-IWW System Navigation Study – Interim Report* most closely reflect industry grain forecasts for 2020. High Scenario traffic projections for the UMR in 2020 represent between 69% and 90% of annual throughput capacity on the lower reaches of the river from LD16 to LD27. At these levels of traffic, delays would likely cause significant amounts of traffic to shift to other modes of transportation or perhaps to other markets. Low Scenario traffic projections for 2020 represent less than 50% of annual throughput capacity; even at these levels, some traffic could shift to other modes.

Locks on the IWW are single 600' x 110' chambers, with the exception of O'Brien Lock with its 1,000' long chamber (this lock is near Chicago, Illinois and does not play prominently in the export shipment of grains or coal). Average delays on the IWW are over an hour to almost 1.5 hours per tow. These annual averages hide the more severe delays and stressing of lock capacity during grain harvest season. Annual throughput capacity is between 32 and 54 million short tons. High Scenario projections for the year 2020 range between 33 and 50 million short tons. In the event traffic demands reach these levels, delays would likely cause significant amounts of traffic to divert to other modes. Even under the Low Scenario traffic projections, lock utilization is fairly high – between 48% and 54% of capacity.

The second most important inland waterway for grain and coal exports is the Ohio River. Lock capacities on this waterway range from 46 million short tons to over 300 million short tons. Delay only becomes a problem when main chamber lock outages occur. Several main chamber closure events over the last 20 years resulted in serious disruptions in the form of lengthy delays, diversions to other transportation modes, and closure of some industrial facilities that could not receive or ship product.

The world depends upon U.S. grains and coal in situations of stress caused by interruptions or shortfalls in supplies from other countries. In turn, U.S. producers rely upon income from the economically rewarding export market. The prospect of a more efficient Panama Canal route and, to a lesser extent, a more efficient western land bridge route to the West Coast is regarded by farm interests as offering improved access to Asia that will increase their incomes by lowering transportation costs. Agricultural interests contend that their position as price takers means that any savings in transportation cost is an increase in their share of the revenues from delivery of their product. Coal interests perceive the resurgent export market as providing a much needed boost during a period of adjustment to domestic environmental regulations on the burning of coal by electric utilities and rapid development of shale gas reserves. Both have eroded the cost advantage coal has long enjoyed over competing fuels in the domestic electric utility market. Transportation costs affect coal producers in similar fashion to agricultural interests, so the performance and cost of an all water route to Asia through the Panama Canal and the western rail land bridge are of keen interest to both grain and coal producers.

The challenge will always be wise stewardship – maintenance and enhancements that anticipate future needs and uses. Foresighted planning, policy, and investment are all required. The railroad industry responded to Staggers Act deregulation in the 1980s by trimming capacity and becoming more efficient and more profitable. This return to profitability allowed railroads to invest heavily in main line expansion and terminal capacity; however, concerns persist over the railroads' ability to match demands. Private-public partnerships (like the Heartland Corridor Project) have already occurred and more partnerships of this nature may be required in the future.

A healthy trucking industry is vital to the freight transportation network, often accounting for the first and last leg of each freight shipment. These legs became longer as railroads abandoned rural country elevators and coal load outs in favor of fewer and larger terminals capable of handling unit and shuttle trains. This has resulted in more miles travelled by trucks on rural roads, faster deterioration of roads and bridges, and more maintenance expense for public highway agencies. Repair work on the Nation's highways and bridges was given a boost from American Reinvestment and Recovery Act funds, but experts suggest many more billions of dollars are required to bring the system up to safe and efficient standards.

Inland waterways in the U.S. are designed to carry massive quantities of freight and on nearly all segments of the system offer large reserves of untapped capacity. Two great river systems, the Mississippi and the Columbia-Snake, and the Great Lakes provide the pathways for a navigable system that covers vast expanses of interior North America, greatly aiding in the economic development of and conferring benefits to U.S. consumers of electricity, agricultural products, construction materials, petroleum products, and steel – nearly everyone. This inland waterway system complements a web of highways and rail lines to form a national multimodal freight transportation system - an engineering and logistical marvel built, redesigned, improved and expanded throughout the Nation's history. As a national freight network it efficiently serves the largest and the smallest communities in the U.S. from coast to coast and allows goods produced far from ocean ports to reach and compete in global markets. Like any other piece of infrastructure, the freight network goes largely unnoticed until it becomes unreliable or is no longer there. The flexibility of the U.S. freight network has allowed each mode to cover for the other during service interruptions. Repeated reports like the U.S. Department of Transportation's Freight Analysis Framework and the Engineering News Records' low grades for the condition of U.S. infrastructure, coupled with events like the rail car shortages of 2007 have raised the freight community's concern that this capability is nearly depleted just at a time when new opportunities are opening in the global market place..

Inland Waterways and Export Opportunities

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Inland Waterways and Export Opportunities

1. Purpose

Near continuous evolution of the global ocean-going fleet to ever larger vessels - an evolution of particular relevance to the Western Hemisphere with the scheduled opening of an expanded Panama Canal in 2014 – provided the impetus for Congress to direct the U.S. Army Corps of Engineers (USACE), Institute for Water Resources (IWR), to examine the preparedness of U.S. ports and waterways for 21st Century world trade. The results of this examination were presented in *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels*, dated June 2012. The USACE Planning Center of Expertise for Inland Navigation (PCXIN) was given the opportunity to report on how promised ocean freight rate reductions from an expanded Canal might affect inland waterways and U.S. export opportunities. The report that follows, *Inland Waterways and Export Opportunities,* was prepared in support of the IWR report, specifically by examining the ability of the inland waterway system to support and enhance export opportunities. This report relies upon readily available sources and recent evaluations of major inland systems conducted by the U.S. Army Corps of Engineers.

2. Global Fleet

The world container vessel fleet is dominated by a relatively small number of vessel owners and operators. Shipping containers moved by these vessels are generally owned by the carrier. The carriers typically make scheduled port calls referred to as liner service on either Round-the-World or Pendulum (back and forth across an ocean) routes. The average size of container vessels has been growing for the past 20 years, and additions to the vessel container fleet are heavily weighted to the post-Panamax and Suez-max sizes that cannot be accommodated by the Panama Canal. Ocean freight rates are published as tariffs, though on U.S. shipping lanes most transportation rates are confidential contract rates called service contracts. These annual contract rates are negotiated between the shipper and carrier in an environment where carriers are exempted from anti-trust regulations in jointly setting rate guidelines under the oversight of the Federal Maritime Commission (FMC). Consequently, container freight rates tend to be fairly stable, though spot rates can and are negotiated, and the supply or allocation of vessels by carriers to trade routes and ports is based upon demand and free of fierce competition.

The dry bulk fleet of ocean vessels, shown in Table 2-1, is generally operated on a charter basis for single voyages or longer-term arrangements. Port calls are not generally scheduled, though the carriers work general trade routes aligned with the type of vessel. The largest vessels are Very Large Ore Carriers (VLOC) and the Capesize vessels, which are dedicated to the iron ore trade from Australia and Brazil to China and to the coal trades, respectively. The greatest number of dry bulk vessels is in sizes that the current Canal can accommodate, with the 2007 and early 2008 surge in bulk demands driving expansion of the fleet in all classes. Rates are set in a competitive environment that allows for considerable flexibility in responding to demands and causes dry bulk ocean freight rates to be more volatile relative to container rates.

Table 2-1 World Dry Bulk Fleet, Current and New Vessel Orders

Type of Vessel	Size (dwt)	Current Fleet		On Order		% Change of Fleet Capacity
		No. of Vessels	Capacity (mdwt)	No. of Vessels	Capacity (mdwt)	
Handysize	10,000-40,000	2,636	72.0	793	25.9	35.4%
Handymax	40,000-60,000	1,801	89.2	884	50.4	55.9%
Panamax	60,000-80,000	1,408	101.1	273	20.3	20.2%
Post-Panamax	80,000-110,000	311	27.7	461	40.5	153.0%
Capesize	110,000-200,000	793	131.0	625	107.0	83.0%
VLOC	200,000+	172	41.4	151	43.8	109.8%
Total		7,121	462.4	3,187.0	287.9	62.7%

Source: Drewry Shipping Consultants as reported in *Study of Rural Transportation Issues*, U.S. Department of Agriculture and U.S. Department of Transportation, April 2010.

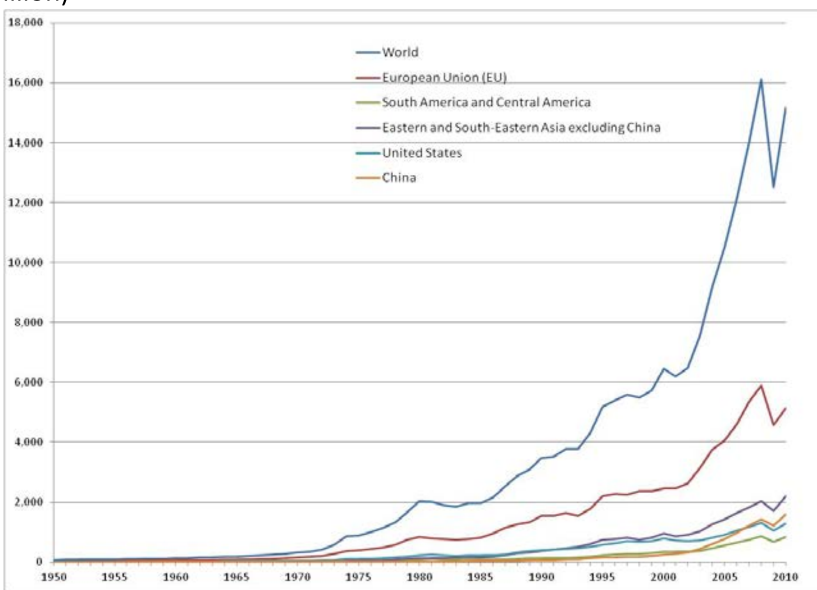
The expansion of the Panama Canal offers an example of the effect that larger vessels and lower ocean rates can have on shipper opportunities. Informa Economics, Inc. estimates that the larger, more efficient ships reduce the cost of the movement of grains to northeast Asia via an all-water Panama Canal route by $0.31 to $0.35 per bushel of grain. On this Panama Canal route, ocean transit efficiencies primarily result from the ability to load Panamax vessels to their maximum capacity, taking full advantage of elevator capacity and available depths on the lower Mississippi River. Transit times through the Canal will also be reduced – an additional benefit for bulk commodities that could not justify paying fees for reserving slots in the current canal. In fact, any infrastructure improvement that allows ports to take advantage of the larger global fleet enhances the competitive position of that port relative to other ports, and vessel efficiencies can be expected to have the same impact on other dry bulk commodity rates. This is significant to producers of coal, the other dry bulk commodity exported in volume by the U.S.

3. World Trade

3.1. General

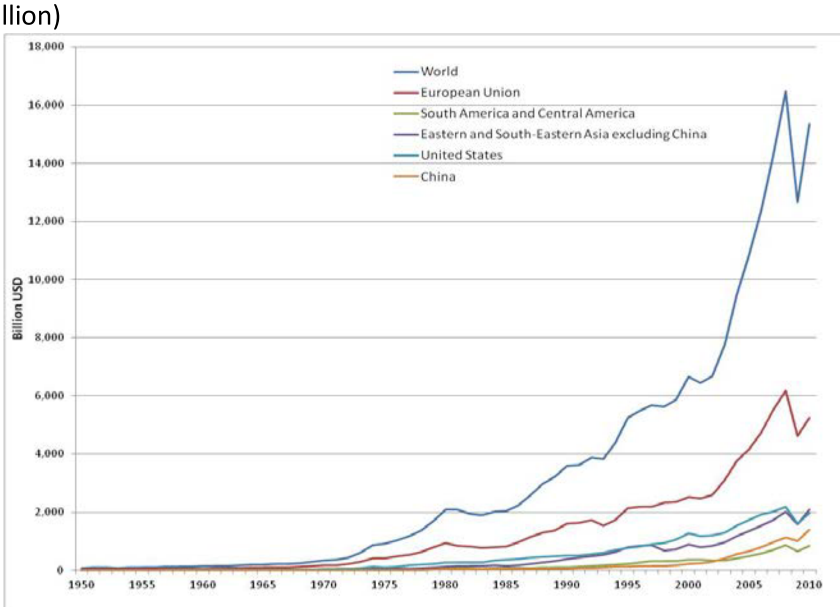
Since the 1947 signing of the first General Agreement on Tariffs and Trade (GATT), a multilateral agreement regulating trade among 153 countries, world trade has seen exceptional growth. As shown in Figure 3-1, merchandise exports have grown from nearly $62 billion in 1950 to $15,174 billion in 2010. As expected, imports kept pace with exports and the value of imports of merchandise in 2010 was 245-times the level of 1950 as shown in Figure 3-2.

Figure 3-1 Annual Value of Merchandise Exports from 1950 to 2010 ($billion)



Source: United Nations Conference on Trade and Development. 2011. UNCTDStat. Available at http://unctadstat.unctad.org/ Accessed March 2012.

Figure 3-2 Annual Value of Merchandise Imports from 1950 to 2010 ($billion)



Source: United Nations Conference on Trade and Development. 2011. UNCTDStat. Available at http://unctadstat.unctad.org/ Accessed March 2012.

3.2. Maritime Transport

World trade and maritime transportation demonstrate a positive correlative relationship. As the level of world trade has increased over the last 50 years, so has the amount of seaborne trade. Since 1980 the expansion in seaborne trade has been driven by the container trade and major dry bulks as shown in Figure 3-3 and Table 3-1. The United Nations Conference on Trade and Development's *Review of Maritime Transport 2011* (UNCTAD 2011) indicated that world seaborne trade continues to be dominated by raw materials, with tanker trade accounting for about one third of the total tonnage and other dry cargo including containerized accounting for about 40%. The remainder (about 28 %) is made of the five major dry bulks, namely iron ore, coal, grain, bauxite and alumina, and phosphate.

Figure 3-3 International Seaborne Trade
(millions of metric tons loaded)

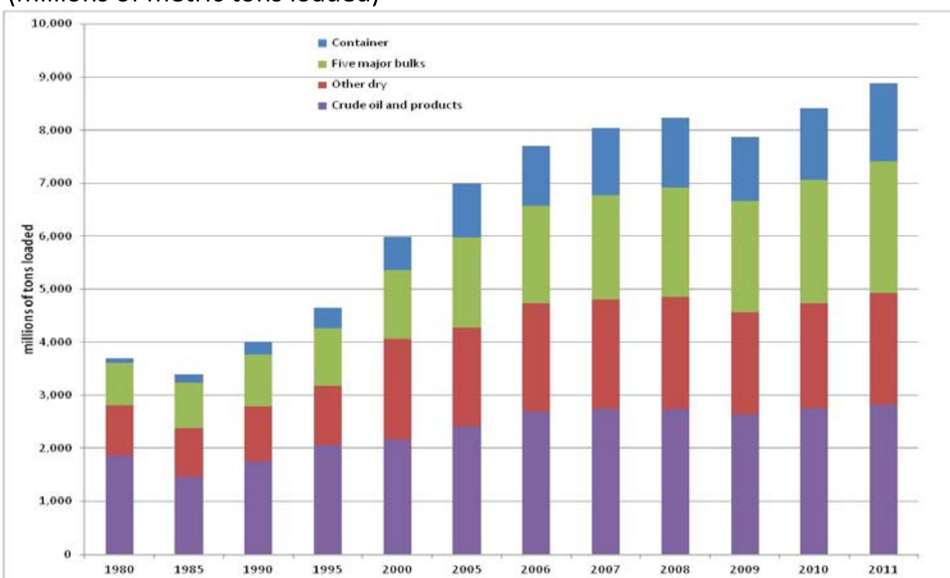


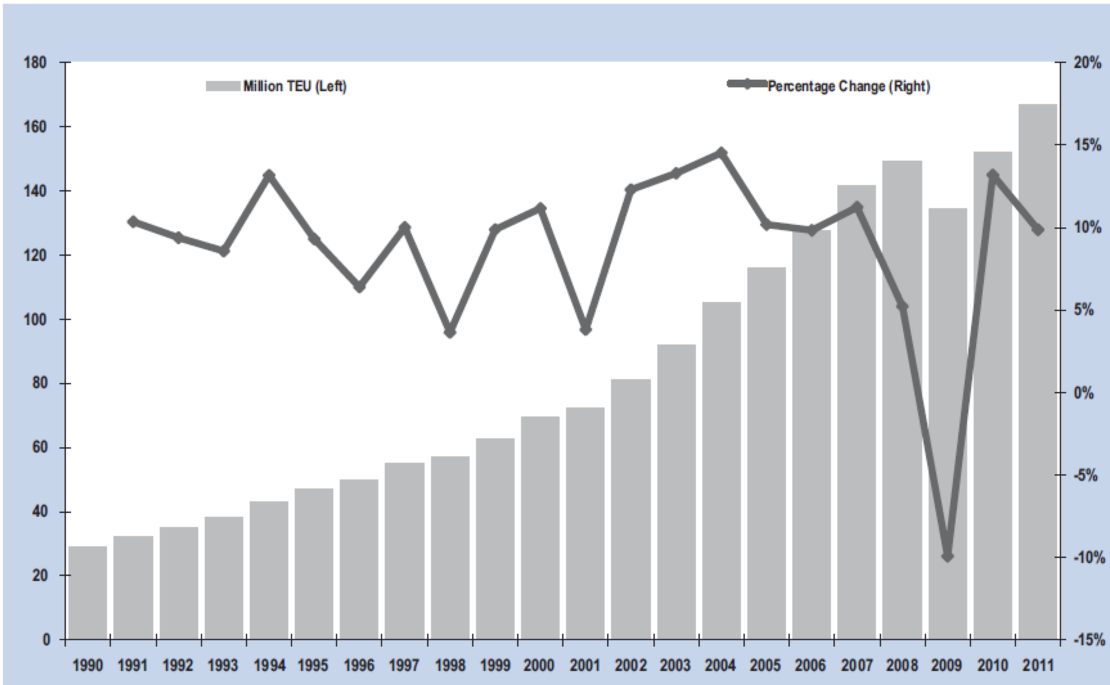
Table 3-1 International Seaborne trade
(millions of metric tons loaded)

	1980	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
Container	102	160	246	389	628	1,020	1,134	1,264	1,319	1,201	1,347	1,477
Other Dry	935	918	1,039	1,131	1,905	1,852	2,032	2,066	2,109	1,921	1,976	2,105
Five Major Bulks	796	857	968	1,082	1,288	1,701	1,836	1,957	2,059	2,094	2,333	2,477
Crude Oil Products	1,871	1,459	1,755	2,049	2,163	2,422	2,698	2,747	2,742	2,642	2,752	2,820
Total	3,704	3,394	4,008	4,651	5,984	6,995	7,700	8,034	8,229	7,858	8,408	8,879

Source (Figure and Table): United Nations Conference on Trade and Development. 2011. *Review of Maritime Transport 2011*. Available at http://www.unctad.org/en/Pages/Publications/Review-of-Maritime-Transport-(Series).aspx?Do=1,5,,/ Accessed March 2012.

As mentioned above, trade in containers has been a driving force in the expansion of seaborne trade. As shown in Figure 3-4 container traffic grew at an average rate of 8.2% between 1990 and 2010. The level of container traffic reached 140 million 20-foot equivalent units in 2010 or over 1.3 billion metric tons.

Figure 3-4 Global Container Trade, 1990 – 2011
(TEUs and annual percentage change)



Source: Drewry Shipping Consultants, *Container Market Review and Forecast* 2008/09; and Clarkson Research Services, *Container Intelligence Monthly,* May 2011.

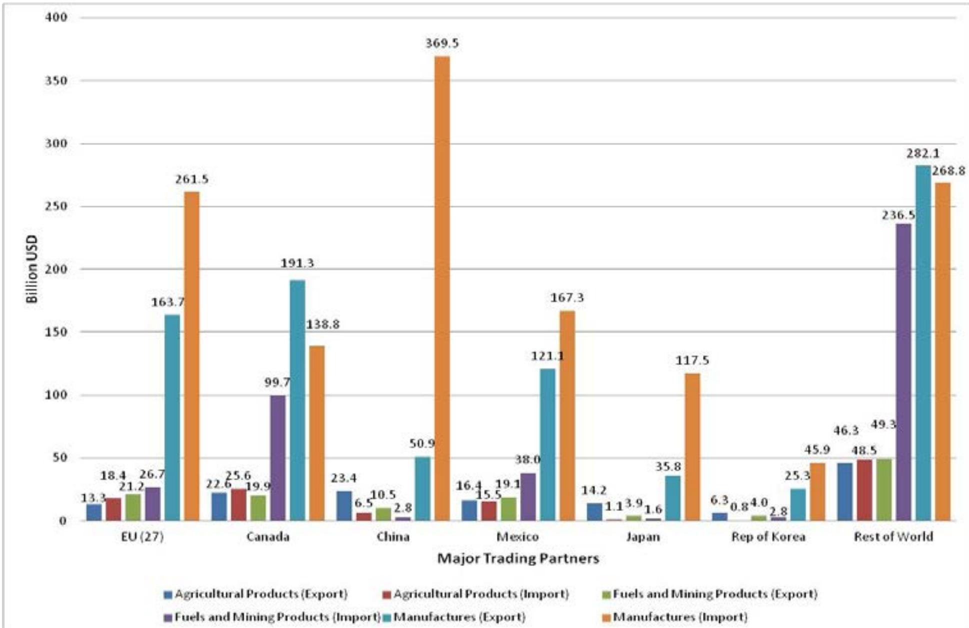
Note: The data for 2011 were obtained by applying growth rates forecasted by Clarkson Research Services in *Container Intelligence Monthly,* May 2011.

4. U.S. Trade

4.1. General

According to the World Trade Organization's *International Trade Statistics 2011* (WTO 2011), the United States imported merchandise valued at $1,968 billion and exported merchandise valued at $1,277 billion in 2010 (Figures 3-1 and 3-2 above**)**. Since 1950, the U.S. has accounted for an average of 14% of world imports and 13% of world exports. The main trading partners and commodities have changed over time, but in 2010 the main trading partners by value where the European Union (EU), Canada, and China. As shown in Figure 4-1, the main commodities being traded are imports of manufacturing from China and imports of manufacturing from the EU. The imports of manufacturing from China consist of machinery and transport equipment as well as office telecom equipment, while the imports of manufacturing from the EU include chemicals, machinery and transport equipment.

Figure 4-1 Merchandise Trade for United States by Product and Major Trading Partner, 2010



Source: World Trade Organization. 2011. *International Trade Statistics 2011*. "Table A19: Merchandise trade by product, region and major trading partner, 2009-2010 - United States" Available at http://www.wto.org/english/res_e/statis_e/its2011_e/its11_toc_e.htm Accessed March 2012.

4.2. Maritime Transports

The latest U.S. Department of Transportation, Maritime Administration data shows that in 2009 U.S. waterborne trade (foreign and domestic) amounted to 2.0 billion metric tons, down from 2.3 billion metric tons prior to the recession. As shown in Table 4-1**,** foreign trade accounted for 1,202 million metric tons.

Table 4-1: U.S. Waterborne Trades, 2004-2009
(Million metric tons)

							% Change
Type of Trade	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2004-2009**
Foreign	1,305.6	1,351.0	1,380.6	1,375.9	1,376.5	1,202.0	-7.9
Imports	954.6	995.7	1,000.5	949.9	892.1	750.0	-21.4
Exports	351.1	355.4	380.2	426.0	484.4	452.1	28.8
Domestic	949.9	933.4	928.6	926.7	867.6	777.5	-18.1
Coastwise	200.1	193.8	183.2	186.7	169.0	152.2	-23.9
Inland	568.1	566.1	569.3	564.2	533.9	474.0	-16.6
Lakes	93.9	87.3	87.9	86.7	82.0	57.3	-39
Other	87.8	86.2	88.2	89.1	82.7	94.0	7.1
Total	2,255.50	2,284.4	2,309.2	2,302.6	2,244.1	1,979.5	-12.2

Source: U.S. Department of Transportation, Maritime Administration. 2011. *U. S. Water Transportation Statistical Snapshot 2011*. "Table U.S. Waterborne Trades 2004 - 2009". February. Available at http://www.marad.dot.gov/documents/US_Water_Transportation_Statistical_snapshot.pdf Accessed March 2012.

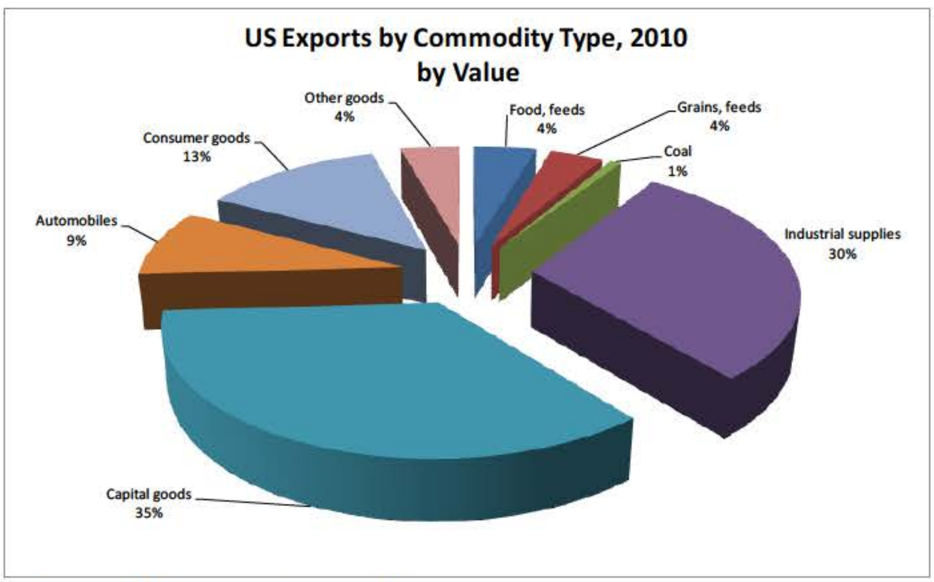
Though the tonnage is less than in 2004, foreign trade made up 61% of the total trade in 2009, which is an increase from 58% of the total trade in 2004. A decline in domestic trades along with an increase in exports led to the change in composition of waterborne tonnage.

5. U.S. Exports

5.1. General

In 2010, U.S. exports were valued at $1.3 billion. Capital goods (industrial equipment, semiconductors, medical equipment, aircraft and the like) accounted for 35% of U.S. exports (see Figure 5-1). Industrial supplies and materials (raw products and minerals like petroleum products, chemicals, ores, and coal, which is 1% of exports by dollar value) accounted for 30%, followed by consumer goods (13%), automobiles (9%), and food and feeds (food being 5% and grains and feeds 4%).

Figure 5-1 U.S. Exports by Commodity Type, by Value, 2010



Source: US Census, Bureau of Economic Analysis

Though relatively small in dollar terms, coal and grains are the largest U.S. exports of dry bulk commodities by volume. The primary production areas for grains, oilseeds, and coal are located in the interior of the United States. As a result, export movements of these bulk commodities rely on a multi-modal transportation system. Coal and grains are often hauled by truck to rail or river terminals for loading into railcars or barges for shipment to coastal ports and transfer to oceangoing vessels.

5.2. U.S. Trade Initiatives

The United States actively seeks to increase exports through trade missions, export credits and financing, removal of trade barriers, enforcement of trade rules and promotion of international policies that lead to balanced world growth. It also seeks free trade agreements in the interests of lowering barriers to trade. These include: the North American Free Trade Agreement (NAFTA) with Canada and Mexico, and agreements with Columbia, Panama and South Korea.

5.2.1. Trans-Pacific Partnership

On November 12, 2011, the Leaders of the nine Trans-Pacific Partnership countries – Australia, Brunei, Chile, Malaysia, New Zealand, Peru, Singapore, Vietnam, and the United States – announced the achievement of the broad outlines of an ambitious, 21st-century Trans-Pacific Partnership (TPP). The agreement will enhance trade and investment among the TPP partner countries, promote innovation, economic growth and development, and support the creation and retention of jobs. President Obama, along with the other eight TPP leaders, agreed to seek finalization of the agreement in 2012. The 11th round of TPP negotiations was held March 1-19, 2012, in Melbourne, Australia. Efforts are underway to bring Japan and possibly other Asia-Pacific nations into the TPP framework.

President Obama announced in November 2009 that the United States would participate in the TPP negotiations to conclude a far-reaching Asia-Pacific trade agreement. The U.S. Trade Representative Office (USTR) says such an agreement would boost U.S. economic growth and support the creation and retention of high-quality domestic jobs. It would increase U.S. exports to a region that includes some of the world's most robust economies representing more than 40% of global trade. The USTR says the Administration is working with Congress and stakeholders to ensure the TPP addresses issues and concerns of U.S. businesses and workers.

The agreement will include:

- Core issues traditionally included in trade agreements, including industrial goods, agriculture, and textiles as well as rules on intellectual property, technical barriers to trade, labor, and environment;

- Cross-cutting issues not previously addressed in trade agreements, such as increasing compatibility of the regulatory systems among TPP countries so U.S. companies can operate more seamlessly in TPP markets, and helping innovative, small- and medium-sized enterprises participate more actively in international trade and subsequently creating more jobs; and

- New emerging issues including trade and investment in innovative products and services, such as digital technologies, and ensuring state-owned enterprises compete fairly with private companies and do not distort competition in ways that put U.S. companies and workers at a disadvantage.

The huge and growing markets of the Asia-Pacific region are already key destinations for U.S. manufactured goods, agricultural products, and services suppliers. As a group, TPP countries are the fourth largest goods and services export market of the United States. Exports of U.S. goods to the broader Asia-Pacific totaled $775 billion in 2010, a 25.5% increase over 2009 and equal to 61% of total U.S. goods exports to the world. U.S. exports of agricultural products to the region totaled $83 billion in 2010 and accounted for 72% of total U.S. agricultural exports to the world.

Along with recently approved trade agreements with South Korea, Panama and Colombia, the TPP is expected to help achieve the Administration's goal of doubling U.S. exports, supporting millions of jobs. The President has said the TPP has the potential to be a model not only for the Asia-Pacific but for future trade agreements. It addresses a wide range of issues not covered by previous trade agreements, including increased compatibility of market regulations , as well as the protection of workers' rights and the environment.

5.2.2. Summary of U.S. – Republic of Korea Free Trade Agreement

The United States and the Republic of Korea (South Korea) signed a bilateral free trade agreement on June 30, 2007. A renegotiated version was signed in December 2010 and approved by Congress in October 2011. The National Assembly of South Korea approved the agreement in November 2011. The USTR says the comprehensive trade agreement will eliminate tariffs and other barriers to trade in goods and services, promote economic growth, and strengthen economic ties between the United States and Korea. The treaty's provisions eliminate 95% of each nation's tariffs on goods within five years, and also create new protections for multinational financial services and other firms. It is the first U.S. free trade agreement with a major Asian economy and has the largest economic impact since NAFTA in 1993.

Korea is a $1 trillion economy and is the United States' 7th largest trading partner. In 2008, the U.S. exported $34.8 billion in goods to Korea. In 2007, U.S. foreign direct investment in Korea totaled roughly $27.2 billion and was concentrated largely in the manufacturing, banking, and wholesale trade sectors. Korea currently enjoys broad access to the U.S. market and the United States is Korea's third largest market. Highlights of the agreement include:

- New market access for U.S. consumer and industrial products: Nearly 95% of bilateral trade in consumer and industrial products becomes duty-free within three years of entry into force of the agreement, including many key U.S. exports such as industrial and consumer electronic machinery and parts, auto parts, power generation equipment, the majority of chemicals, medical and scientific equipment, motorcycles, and certain wood products. Most remaining tariffs will be eliminated within 10 years;

- Increased access for U.S. auto makers; and

- Expanded markets for U.S. farmers and ranchers: Almost two-thirds ($1.6 billion) of current U.S. farm exports to Korea will become duty-free immediately, including wheat, corn, soybeans, and cotton, plus a broad range of high value agricultural products. Other U.S. farm products will benefit from expanded market opportunities with two to five year tariff phase-outs or tariff rate quotas. Market access was also expanded for beef and pork products and selected fresh fruits.

Other provisions of the Free Trade Agreement with Korea also cover:

- Textiles and apparel cooperation and benefits;
- New protections for U.S. investors;
- Open services markets;
- Improved financial services access;
- Expanded broadcast market for U.S. audio-visual products;
- An open and competitive telecommunications market;
- Access for pharmaceuticals, medical devices and innovative medicines;
- Digital-age protections for U.S. trademarks, copyrighted works and patents;
- Protection and promotion of worker rights;
- Commitments and cooperation to protect the environment;

- Expanded access to government procurement contracts;
- Increased transparency;
- Strengthened protection against technical barriers to trade; and
- Harmonized customs procedures and rules of origin.

5.2.3. USTR Agriculture Overview

The USTR noted that work continues on implementation of the FTA with Korea as well as recently approved FTAs with Colombia and Panama.

- USTR's Office of Agricultural Affairs has overall responsibility for negotiations and policy coordination regarding agriculture. Staff works with the Chief Agriculture Negotiator and other USTR officials as appropriate.
- Specific responsibilities include FTAs and World Trade Organization (WTO) Development Agenda (DOHA) negotiations on agriculture, operation of the WTO Committees on Agriculture and on Sanitary and Phytosanitary (SPS) measures, agricultural regulatory issues (e.g., biotechnology, cloning, BSE, nanotechnology, other bilateral SPS issues, and customs issues affecting agriculture), monitoring and enforcement of existing WTO and FTA commitments for agriculture (including SPS issues), and WTO accession negotiations on agriculture market access, domestic supports and export competition, and SPS matters.
- The office monitors U.S. implementation of Farm Bill programs to ensure consistency with international obligations in the WTO, and also is responsible for policy coordination of U.S. activities in agriculture committees of the Organization for Economic Co-operation and Development (OECD).

5.2.4. National Export Initiative

In his 2010 State of the Union address, President Obama announced a National Export Initiative (NEI) with a goal to *"…double our exports over the next five years, an increase that will support two million new jobs in America."* The initiative brings together an Export Promotion Cabinet (EPC) consisting of heads of departments and agencies from across the federal government, including the USTR, the Commerce Department, the Agriculture Department, the Small Business Administration, the Export-Import Bank, Administration officials and others to oversee implementation of the initiative. Subsequently, membership of the already-existing President's Export Council was expanded to include government, business, labor and agriculture representatives, so it could serve a larger advisory role for the NEI.

The key provisions of the National Export Initiative include the following:

(a) Exports by Small and Medium-Sized Enterprises (SMEs). Members of the EPC shall develop programs, in consultation with the Trade Promotion Coordinating Committee (TPCC), designed to enhance export assistance to SMEs, including programs that improve information and other technical assistance to first-time exporters and assist current exporters in identifying new export opportunities in international markets.
(b) Federal Export Assistance. Members of the EPC, in consultation with the TPCC, shall promote Federal

resources currently available to assist exports by U.S. companies.
(c) Trade Missions. The Secretary of Commerce, in consultation with the TPCC and, to the extent possible, with State and local government officials and the private sector, shall ensure that U.S. Government-led trade missions effectively promote exports by U.S. companies.
(d) Commercial Advocacy. Members of the EPC, in consultation with other departments and agencies and in coordination with the Advocacy Center at the Department of Commerce, shall take steps to ensure that the Federal Government's commercial advocacy effectively promotes exports by U.S. companies.
(e) Increasing Export Credit. The President of the Export-Import Bank, in consultation with other members of the EPC, shall take steps to increase the availability of credit to SMEs.
(f) Macroeconomic Rebalancing. The Secretary of the Treasury, in consultation with other members of the EPC, shall promote balanced and strong growth in the global economy through the G20 Financial Ministers' process or other appropriate mechanisms.
(g) Reducing Barriers to Trade. The United States Trade Representative, in consultation with other EPC members, shall take steps to improve market access overseas for our manufacturers, farmers, and service providers by actively opening new markets, reducing significant trade barriers, and robustly enforcing our trade agreements.
(h) Export Promotion of Services. Members of the EPC shall develop a framework for promoting services trade, including the necessary policy and export promotion tools.

NEI: Progress in Key Areas Actions to move forward on the NEI goals of doubling exports include measures such as:

- **Improved advocacy efforts on behalf of U.S. exporters:** The Department of Commerce has coordinated more and expanded trade missions, involving representatives from key exporting businesses, with visits to dozens of countries.
- **Increased access to export financing:** The Export–Import Bank of the United States more than doubled its loans to U.S. exporters.
- **Reinforced efforts to remove barriers to trade:** Bi-lateral agreements with China and Russia have reopened some markets to U.S. agricultural products, while newly passed FTAs with Korea, Colombia and Panama will open greatly expanded export opportunities in these nations. Further opportunities are being actively pursued through the TPP with nations in the Asia-Pacific region.
- **Enforced trade rules:** Pursuing actions through the WTO to challenge trade barriers and open or reopen international trade marketing opportunities.
- **Increased international promotion of policies leading to strong, sustainable, and balanced economic growth**.

5.2.5. U.S. Department of Agriculture Export Programs

Export Credit Guarantee Programs

The U.S. Department of Agriculture administers export credit guarantee programs for commercial financing of U.S. agricultural exports. These USDA Commodity Credit Corporation (CCC) programs encourage exports to buyers in countries where credit is necessary to maintain or increase U.S. sales, but where financing may not be available without CCC guarantees.

Agricultural Advisory Committees for Trade

The Agricultural Policy Advisory Committee (APAC) and seven Agricultural Technical Advisory Committees (ATACs) for Trade are a formal way to ensure ongoing discussions between the federal government and the private sector about agricultural trade issues. The committees provide advice and make recommendations to the Secretary of Agriculture and the U.S. Trade Representative about a wide range of agricultural trade issues.

The advisory committees are:

- Agricultural Policy Advisory Committee
- ATAC for Trade in Animals and Animal Products
- ATAC for Trade in Fruits and Vegetables
- ATAC for Trade in Grains, Feed, Oilseeds, and Planting Seeds
- ATAC for Trade in Processed Foods
- ATAC for Trade in Sweeteners and Sweetener Products
- ATAC for Trade in Tobacco, Cotton, and Peanuts
- ATAC for Trade in Grains, Feed, Oilseeds, and Planting Seeds

Federal State Marketing Improvement Program (FSMIP)

FSMIP provides matching funds to State Departments of Agriculture, State agricultural experiment stations, and other appropriate state agencies to assist in exploring new market opportunities for U.S. food and agricultural products, and to encourage research and innovation aimed at improving the efficiency and performance of the marketing system.

5.3. U.S Export Trade Outlook

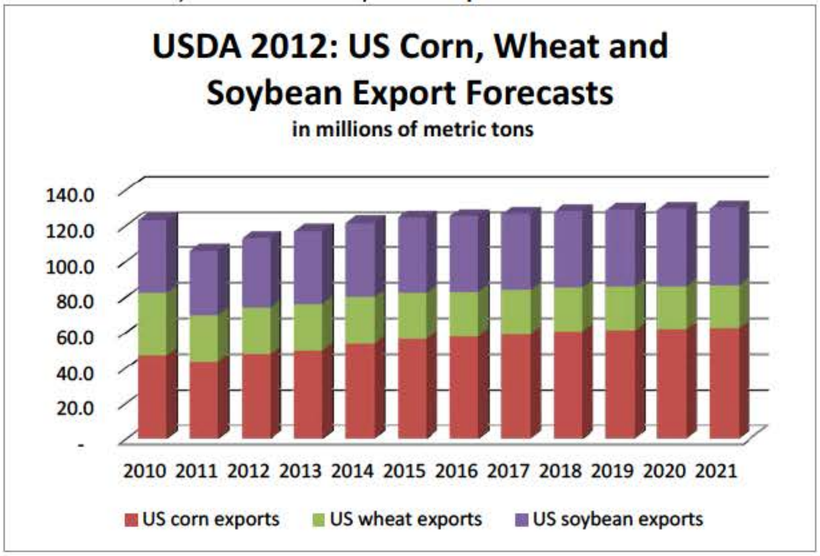
5.3.1. General Overview of Bulk

Opportunities for enhanced bulk exports as a result of the move to larger, more efficient ocean going vessels is anticipated to have the most significant effect on grain and coal exports – the largest volume dry bulk commodities moving on the inland waterways to domestic and export markets. The outlook for these two commodities is discussed below.

5.3.2. Grains and Soybeans

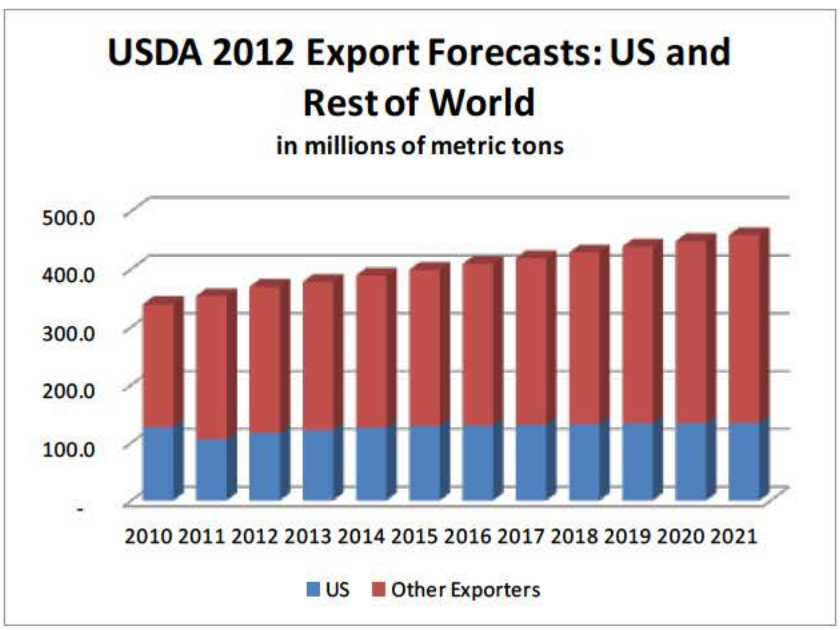
Grain exports from the U.S. are dominated by corn and wheat. Oilseed exports are dominated by soybeans. In subsequent discussions grains will refer to these three commodities. Figure 5-2 below shows U.S. Department of Agriculture 2012 projections for each from the U.S. (the 2010 value is actual). These projections are presented in *USDA Agricultural Projections to 2012,* published in February 2012 (USDA 2012).

Figure 5-2: USDA 2012: US Corn, Wheat and Soybean Export Forecasts



As shown below in Figure 5-3, while USDA forecasts slight growth for grain exports, it also projects faster growth for the U.S. competitors, particularly Argentina and Brazil.

Figure 5-3: USDA 2012 Export Forecasts: US and Rest of World

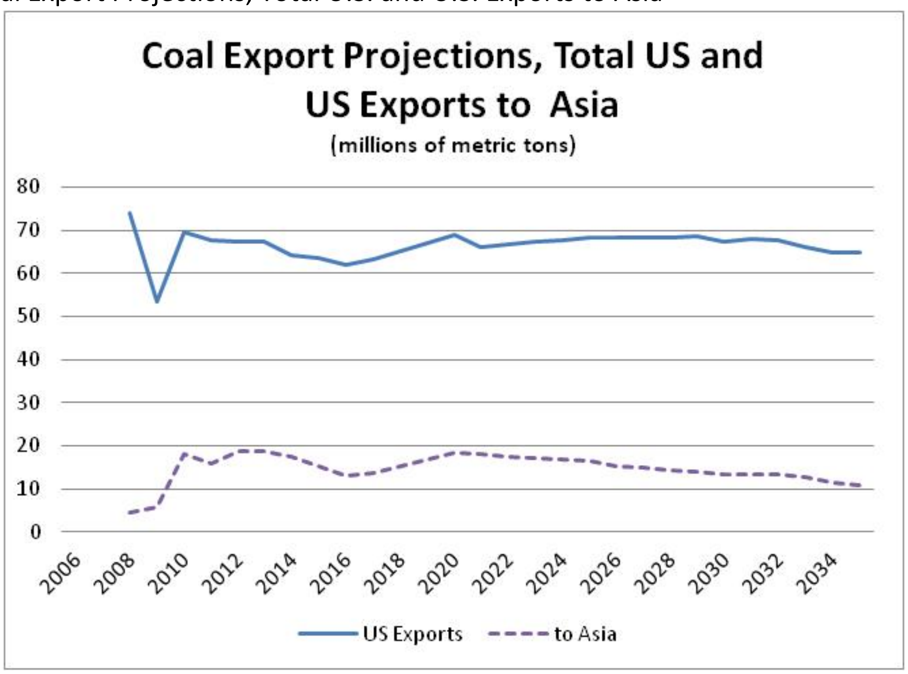


5.3.3. Coal

The Energy Information Administration's current world energy forecasts are presented in its *International Energy Outlook, 2011* (IEO2011). World coal consumption grows at 1.5% annually, increasing by 50%, from 139 quadrillion Btu in 2008 to 209 quadrillion Btu in 2035. Growth in developed economies is nearly flat, while developing world coal consumption grows at 2.1% annually. U.S. coal exports rise from about 1.5 quadrillion Btu in 2009 to 2.7 quadrillion Btu in 2035, buoyed by the overall increase in world coal demand, especially for U.S. metallurgical coal whose share of U.S. coal exports increases from 52% in 2008 to 71% by 2035. The latest projections presented in the Energy Information Administration's *Annual Energy Outlook, 2011* (AEO 2011) show total world coal trade growing from just under one billion metric tons to around 1.4 billion tons by 2035.

Long distances between coal production regions and coastal export facilities place U.S. coal exporters at a distinct disadvantage relative to other countries competing in the fast growing China coal market. The comparatively high transportation costs associated with shipping coal from the eastern and western coalfields in the United States to Asian markets historically has meant that U.S. coal exports could not compete economically in that region. Though relatively small, the Asian market for U.S. producers is expected to be strong (see Figure 5-4). According to preliminary data provided in AEO 2011, U.S. coking coal exports to Asia grew to levels unseen in the recent past, estimated at 13 million metric tons in the third quarter of 2010, compared with four million metric tons in the third quarter of 2009. The U.S. share of this trade is currently just under 10%, but projected to fall to around 5% by 2035.

Figure 5-4: Coal Export Projections, Total U.S. and U.S. Exports to Asia



Source: U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook, 2011.*

One obstacle to increasing U.S. coal exports is the lack of a large coal export terminal on the West Coast, which is closer to both Asian markets and the top U.S. steam coal-producing region in the Powder River Basin of Wyoming. Although two prospective western port projects on the lower Columbia River and one on the Puget Sound at Cherry Point, Washington, are being proposed, environmental concerns and the extensive permitting process could impede or delay these planned investments. Alternatively, Powder River coal producer Arch Coal has secured a deal that will allow it to export coal (about two million short tons in the first year) through Ridley Terminal in British Colombia through 2015.

IEO 2011 indicated that in the short term, low bulk rates and the expansion of the Panama Canal may improve U.S. competitiveness in coal export markets. This outlook also suggests that sustained high international demand and prices coupled with supply constraints in other coal-exporting countries could lead to larger U.S. export volumes. Counterbalancing this possible outcome are new supplies of coal (including additional supplies of coal from Mongolia, Africa, and Australia) and the resolution of transportation bottlenecks in other supply countries that could provide substantial increases in international coal supply and reduce international coal prices. As a result, the IEO 2011 expects the United States to remain a marginal supplier in world coal trade despite achieving higher export levels than in the early 2000s. Brazil remains the largest importer of U.S. coking coal, and Europe remains the largest destination for U.S. coal exports overall. Atlantic Coast ports are the primary outlet for these metallurgical grade coals railed to port from Appalachian coalfields.

6. Inland Waterways and their Role in US Export Trade

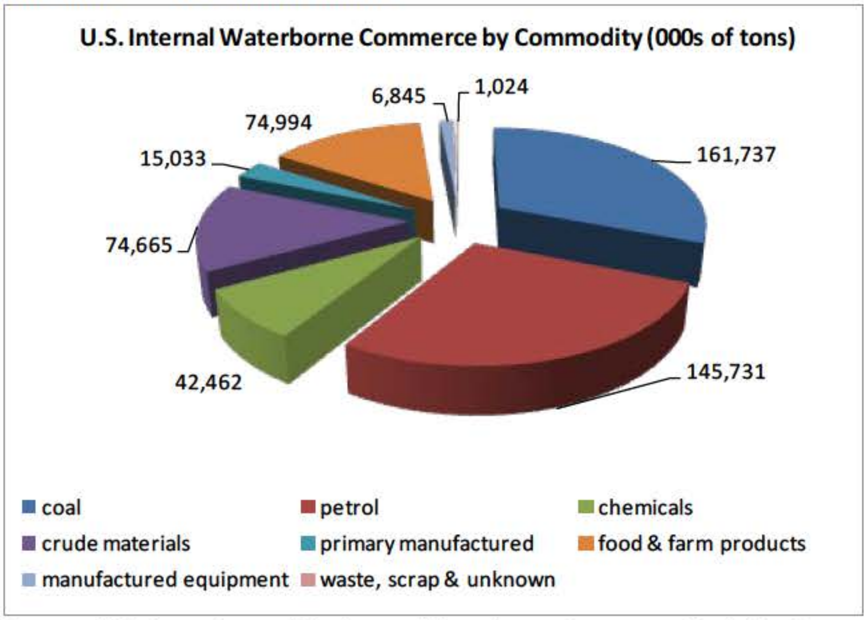
6.1. General

6.1.1. General Overview

The inland waterway system is comprised of rivers, waterways, canals, and the locks and dams that provide approximately 12,000 miles of commercially-navigable waters - more kilometers of navigable internal waterways than the rest of the world combined. The flotillas of towboats and barges that operate on this system carry approximately 15% by weight of the Nation's freight at the lowest unit cost of any other transportation modes. Barge transportation also offers an environmentally sound alternative to truck and rail transportation. If cargo transported on inland waterways each year were to be moved by another mode, it would take an additional 6.3 million rail cars or 25.2 million trucks to carry the load.

Shallow draft river systems handled 523 million short tons of cargo in 2009, while coastal systems handled an additional 168 million short tons. Including lake, intraport and intraterritorial movements, the system moved some 857 million short tons—actually a decrease in activity due to the severe recession during that year. The system typically handles more than a billion tons per year. The cargoes are mostly bulk commodities and raw materials such as coal (28% of the tonnage), petroleum (37%), grain and farm products (10%), chemicals (5%), and aggregates, steel, and fertilizer (see Figure 6-1). The waterway system is particularly important to the inland transportation of U.S. agricultural commodity exports. The Mississippi River System is the primary conduit for cargoes from the Nation's Midwest grain belt to Gulf ports.

Figure 6-1: Total Internal U.S. Waterborne Traffic



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center

6.1.2. Financing the System

The U.S. Army Corps of Engineers is responsible for all 12,000 miles of these waterways, with operation and maintenance funded from the Federal government's general fund. New construction and major rehabilitation work receives 50% of funding from the general fund and 50% from the Inland Waterway Trust Fund (IWTF). The IWTF is funded by a fuel tax program on roughly 11,000 of the 12,000 waterway miles. The tax rate on commercial users is $0.20/gallon, and revenues collected are deposited in the IWTF. The Secretary of the Army under Congress manages the trust. An eleven-member Inland Waterways Users Board was established under Section 302 of Public Law 99-662 [(1986 Water Resources Development Act (WRDA)] to advise the Secretary of the Army and Congress on fund management and prioritization for inland navigation projects.

6.1.3. Marine Highway Development

On August 11, 2010, the U.S. Department of Transportation (DOT) identified 18 marine corridors, eight projects, and six initiatives for further development as part of "America's Marine Highway Program" (see Figure 6-2 for a map of the corridors). The Marine Highway Program was fully implemented in April 2010 through publication of a Final Rule in the Federal Register. The 18 marine (all-water) corridors consist of 11 major waterway systems, four connecting systems, and three crossing systems that can serve as extensions of the existing and planned surface transportation system. These corridors include routes where water transportation presents an opportunity to carry commercial traffic that would otherwise move on congested landside corridors, to reduce highway-related air emissions, or to address other logistics challenges. Corridors consisting of major waterway systems are generally longer, multi-state routes, while the connecting systems represent shorter routes that serve as feeders to the larger corridor systems. The crossing systems are short routes that transit harbors or waterways and offer alternatives to much longer or less convenient land routes between points.

Figure 6-2: America's Marine Highway Corridors

While at this time railroads and trucks handle the vast majority of inland container movements, Marine Highway Corridors offer the prospect of helping alleviate highway congestion by moving freight (especially containers) off trucks and the highways and onto barges. The M-95 corridor between Norfolk, Baltimore and Philadelphia and the M-64 corridor in Virginia both have COB (container on barge) services that alleviate congestion on nearby interstate highways. In fact, the M-64 operations are subsidized by the Virginia Port Authority as part of a plan to minimize emissions and reduce highway traffic. Similar concerns motivate plans underway for COB service between Oakland, California and West Sacramento and Stockton, California on the M-580 corridor. COB services have long been available on the Columbia-Snake M-84 corridor and on stretches of the M-10 corridor in Louisiana and Texas. While plans are underway to make expanded use of the Marine Highway Corridors, COB service faces serious challenges from competitively priced rail and truck services. COB operators that currently exist occupy niche markets, typically offering a service that moves fully-loaded containers that would be overweight if hauled by trucks on highways.

6.2. U.S. Ports Served by Inland Waterways

6.2.1. General Overview

Many of the major coastal ports in the U.S. are located on or connected to inland waterways. Ports served by inland waterways exported 346 million tons in 2010.[1] The Gulf Intracoastal Waterway (GIWW) and the Lower Mississippi River (including Lake Charles off the Calcasieu River) served ports that accounted for 72% of inland waterborne exports in 2010 (see Table 6-1).

[1] These major ports are selected from among the top 150 ports by tonnage as identified by the USACE Waterborne Commerce Statistics Center.

Table 6-1: Waterborne Traffic by Type at Principal Ports Served by Inland Waterways, 2010 (in short tons)

Port Location	Total	Domestic	Foreign			% of Total Inland Port Exports
			Total	Imports	Exports	
Upper Mississippi	35,526,759	35,526,759	-	-	-	0.0%
Tennessee-Tombigbee-Black W	55,713,273	26,356,690	29,356,583	15,060,887	14,295,696	4.1%
Mobile, AL	55,713,273	26,356,690	29,356,583	15,060,887	14,295,696	4.1%
Ohio River System	125,707,528	125,707,528	-	-	-	0.0%
Missouri River	1,671,245	1,671,245	-	-	-	0.0%
Lower Mississippi River	497,601,694	275,687,022	221,914,672	99,306,561	122,608,111	35.4%
Lake Charles, LA	54,614,895	21,614,336	33,000,559	26,928,081	6,072,478	1.8%
Baton Rouge, LA	55,536,987	34,768,822	20,768,165	14,126,050	6,642,115	1.9%
Port of Plaquemines, LA	55,836,687	36,927,933	18,908,754	1,357,043	17,551,711	5.1%
New Orleans, LA	72,410,730	38,331,450	34,079,280	15,721,133	18,358,147	5.3%
Port of South Louisiana, LA	236,262,069	121,110,982	115,151,087	41,167,427	73,983,660	21.4%
Columbia-Snake	56,383,725	13,027,433	43,356,292	5,977,647	37,378,645	10.8%
Coos Bay, OR	1,586,404	150,059	1,436,345	27,050	1,409,295	0.4%
Longview , WA	6,822,715	1,279,808	5,542,907	880,085	4,662,822	1.3%
Vancouver, WA	8,390,485	2,019,272	6,371,213	916,330	5,454,883	1.6%
Kalama, WA	12,254,997	489,260	11,765,737	480,010	11,285,727	3.3%
Portland, OR	25,949,307	8,178,736	17,770,571	3,472,804	14,297,767	4.1%
McClellan-Kerr-Arkansas	2,046,926	2,046,926	-	-	-	0.0%
Great Lakes	207,487,957	169,810,144	37,677,813	14,844,862	22,832,951	6.6%
Ashtabula, OH	6,346,279	3,811,252	2,535,027	1,313,088	1,221,939	0.4%
Chicago, IL	18,534,237	15,381,973	3,152,264	2,079,695	1,072,569	0.3%
Duluth-Superior, MN and WI	36,598,247	26,936,111	9,662,136	331,330	9,330,806	2.7%
Presque Isle, MI	8,720,506	6,447,080	2,273,426	16,550	2,256,876	0.7%
Sandusky, OH	2,304,141	990,486	1,313,655	35,722	1,277,933	0.4%
Toledo, OH	10,720,187	3,927,139	6,793,048	3,803,648	2,989,400	0.9%
GIWW	571,013,994	172,503,829	398,510,165	270,188,568	128,321,597	37.0%
Houston, TX	227,133,231	67,572,638	159,560,593	88,507,605	71,052,988	20.5%
Beaumont, TX	76,958,592	25,176,606	51,781,986	44,309,994	7,471,992	2.2%
Corpus Cristi, TX	73,663,432	18,840,615	54,822,817	41,654,989	13,167,828	3.8%
Texas City, TX	56,590,856	16,515,074	40,075,782	32,553,419	7,522,363	2.2%
Pascagoula, MS	37,275,809	10,677,578	26,598,231	20,026,182	6,572,049	1.9%
Freeport, TX	26,675,842	4,347,395	22,328,447	20,083,819	2,244,628	0.6%
Galveston, TX	13,948,896	5,934,427	8,014,469	1,877,503	6,136,966	1.8%
Hudson River	146,008,232	61,205,328	84,802,904	64,356,977	20,445,927	5.9%
Albany, NY	6,810,017	5,721,480	1,088,537	472,969	615,568	0.2%
New York, NY and NJ	139,198,215	55,483,848	83,714,367	63,884,008	19,830,359	5.7%
San Joaquin River	1,813,859	32,978	1,780,881	1,258,305	522,576	0.2%
Stockton, CA	1,813,859	32,978	1,780,881	1,258,305	522,576	0.2%
Inland-served Port Totals	1,700,975,192	883,575,882	817,399,310	470,993,807	346,405,503	100%

Note: this does not represent a listing of all ports. Only major ports for a given waterway with export activity are shown.

Source: US Army Corps of Engineers, Waterborne Commerce Statistics.

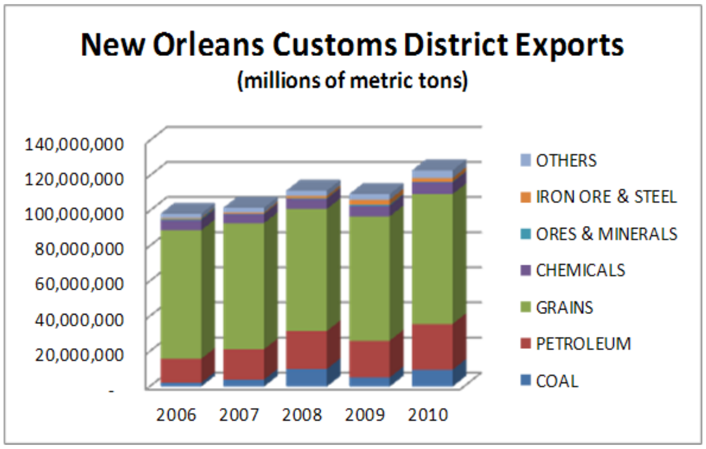
The Port of New York, NY and NJ and ports on or served by the Columbia-Snake, Great Lakes and Tennessee-Tombigbee-Black Warrior waterways account for most of the remaining share of exports from ports served by inland waterways. Ohio, Upper Mississippi, McClellan-Kerr-Arkansas (MKARNS), and Missouri river ports do not export directly, but reach the export market through ports on the Lower Mississippi River. Ports served by the GIWW – Houston, Corpus Cristi, Texas City, Beaumont and others – are dominated by the petroleum and petrochemical trades; the Port of New York by containers; and Great Lakes ports, Mobile, the Lower Columbia River, and the Lower Mississippi ports by dry bulk trades like coal, grains, and ores, along with a wide variety of other commodities. Inland waterways that serve a hinterland with desirable export commodities are of particular interest when considering the ability of such waterways to support enhanced export opportunities represented by a global fleet of larger ocean going vessels.. This directs focus to the Upper Mississippi, Illinois, Ohio (and its tributaries), and the Columbia-Snake rivers and the Great Lakes and the ports they serve.

6.2.2. Activity at Ports Served by Inland Waterways

6.2.2.1. *New Orleans/Lower Mississippi River*

The Lower Mississippi River is the most heavily travelled component of the Mississippi River System with approximately 25% of its traffic devoted to exports and almost 80% of this comprised of dry bulk commodities. The Port of New Orleans and Lower Mississippi are authorized to be dredged to 45'; however, there are times when dredging delays (funding related or otherwise) cause drafts to be restricted. Most recently (in June 2011), drafts were restricted to 43'. Grain is the predominate commodity exported from the Customs District of New Orleans, though sizeable exports of petroleum products, coal, and chemicals occur (see Figure 6-3).

Figure 6-3: New Orleans Customs District Exports



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics

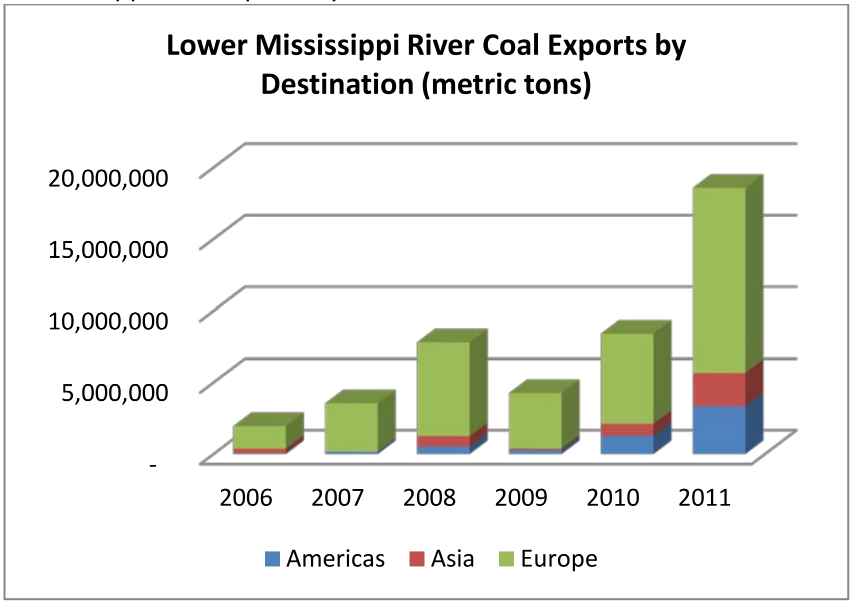
Table 6-2 shows the composition of dry bulk exports for the Lower Mississippi River in 2010. As expected, grain and oilseeds make up about 90% of the dry bulk exports with corn being the dominant commodity. Coal exports are the next largest commodity at 11% of total dry bulk exports.

Table 6-2: Lower Mississippi River Dry Bulk Exports, 2010

Lower Mississippi River Dry Bulk Exports, 2010	
Commodity	**Short Tons**
Corn	32,571,978
Soybeans	25,327,265
Coal	9,148,271
Processed Grains	8,019,464
Wheat	4,509,061
Rice	2,409,171
All Others	573,779
Total	81,985,210
Source: US Army Corps of Engineers, Waterborne Commerce Statistics	

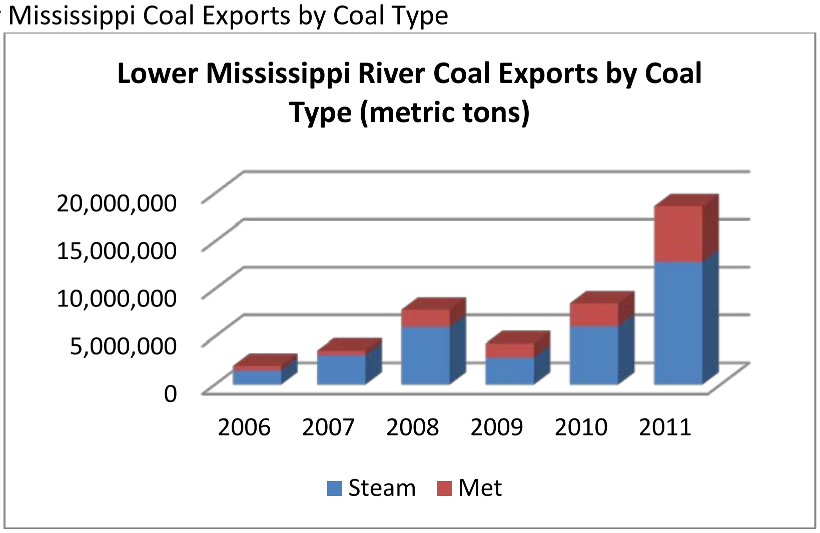
To provide a more detailed perspective, Figures 6-4 and 6-5 show a recent history of coal exports by destination and type from the Lower Mississippi River. As displayed, along with an overall trend of growth, most of the coal exports are destined to Europe. In addition, coal exports are primarily made up of steam coal, which is generally used by utilities to generate electrical power. Metallurgical coal is mainly used in steel mills to make steel products.

Figure 6-4: Lower Mississippi Coal Exports by Destination



Source: *River Transport News*

Figure 6-5: Lower Mississippi Coal Exports by Coal Type

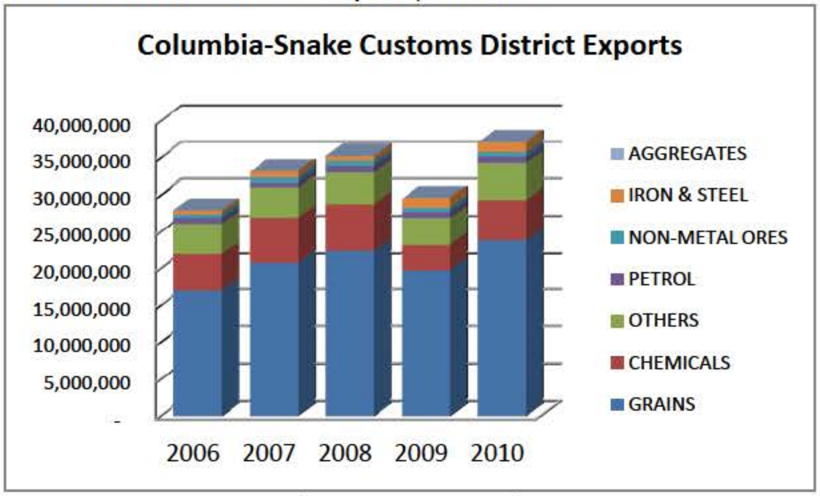


Source: *River Transport News*

6.2.2.2. *Portland*

The Columbia-Snake Customs District exported over 35 million metric tons in 2010. It is an important export link to Northeast Asia (China, South Korea, Japan, and Taiwan) for soybeans and other grains, and is dredged to a depth of 43'. As shown in Figure 6-6, grains dominate the export market on the Columbia-Snake.

Figure 6-6: Columbia-Snake Customs District Exports, short tons

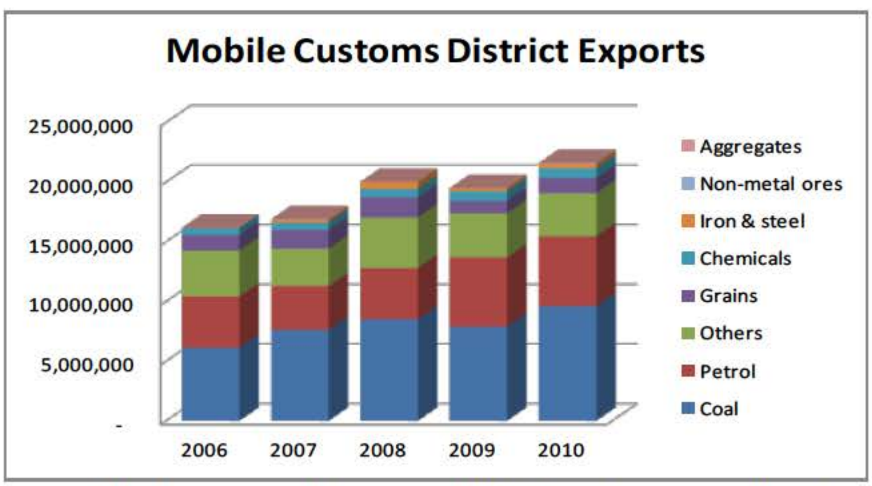


Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics

6.2.2.3. *Mobile*

The Mobile Customs District, as shown in Figure 6-7, exported over 20 million metric tons of commodities in 2010. The Port of Mobile is a major artery for these bulk goods and is dredged to 45'. Approximately 75% of these exports were coal and petroleum products, with a few other commodities comprising the rest. There is a slight growth trend in the timeframe 2006-2010, with the 2008-2009 financial crises appearing to have a relatively minimal impact.

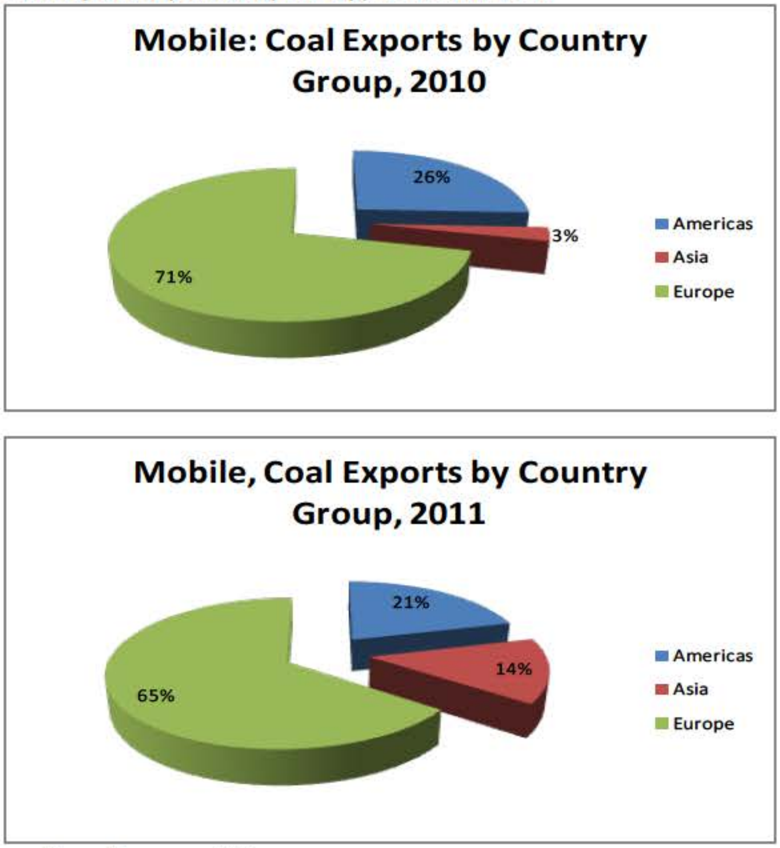
Figure 6-7: Mobile Customs District Exports, short tons



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics

As shown in Figure 6-8, coal exports to Asia have increased dramatically from 2010 to 2011. Further data will be required to determine if this is a new trend or a one year spike.

Figure 6-8: Mobile Coal Exports by Country Group, 2010 and 2011



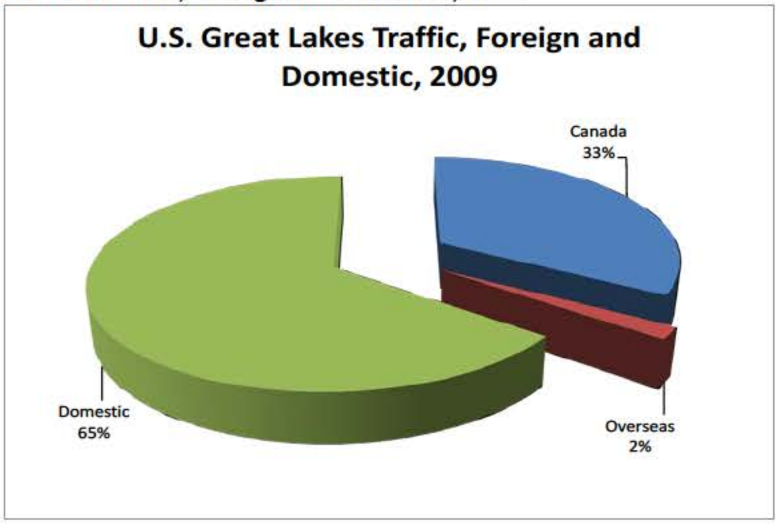
Source: *River Transport News*

6.2.2.4. *Great Lakes*

6.2.2.4.1. Overview of Ports

Roughly one-third of U.S. Great Lakes traffic occurs between U.S. and Canadian trading partners. Shipments and receipts are nearly equal between the two neighboring countries. U.S. trade with other foreign countries is relatively small and primarily grain. Total Great Lakes traffic is shown below in Figure 6-9.

Figure 6-9: U.S. Great Lakes Traffic, Foreign and Domestic, 2009

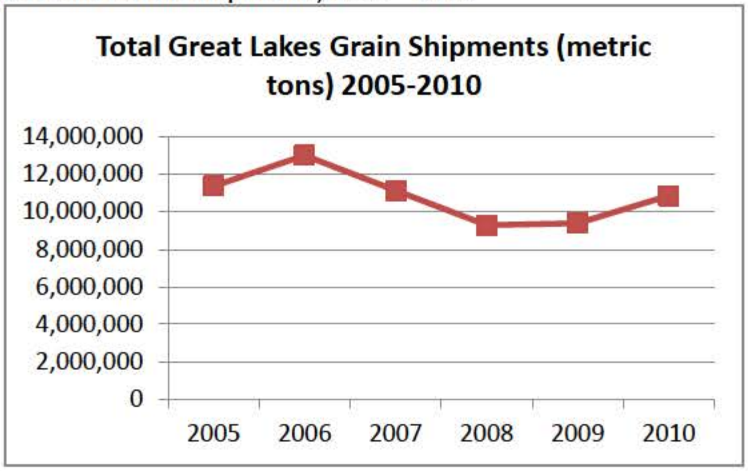


Grain movements on the Great Lakes are primarily for export (both U.S. and Canadian). The location of the major harbors involved in the Great Lakes grain trade is provided in Figure 6-10. The Great Lakes has six harbors that export grain; however, this function is concentrated at three harbors: Duluth/Superior on Lake Superior and Toledo Harbor on Lake Erie for the United States, and Thunder Bay Ontario for Canada.

Figure 6-10 Major U.S. Canadian Harbors Involved in the Great Lakes Grain Trade

As shown in Figure 6-11, total Great Lakes grain shipments (U.S. and Canada) have ranged from 9.3 million metric tons in 2008 to 13.0 million metric tons in 2006. Wheat is the main commodity exported and accounts for 58% of all shipments, followed by corn (11%), soybeans (10%), and canola (7%).

Figure 6-11: Total Great Lakes Grain Shipments, 2005 - 2010



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center

6.2.2.4.2. Port Operational Characteristics- Markets Served, Physical Description

The United States has 6 ports that are involved in the export of grains: Duluth/Superior, Milwaukee, Chicago, Burns Harbor, Toledo, and Huron. The main U.S. export port is Duluth/Superior which handles about 54% of Great Lakes U.S. exports. The next most active port is Toledo, Ohio, which handles around 32% of Great Lakes U.S. exports. Canada has five ports on the Great Lakes involved in grain exports: Thunder Bay, Sarnia, Goderich, Owen Sound, and Port Colbourne. Thunder Bay is the primary port for Canadian Great Lakes grain exports, typically handling 92% of all Canadian grain shipped out of the Great Lakes. The majority of Great Lakes grain shipments (73%) are destined for countries bordering the Mediterranean Sea (North Africa, southern Europe/ the Middle East). The remaining tonnages go to northern Europe (19%), Africa (3%), South and Central America (3%), and East Asia (1%).

Canadian grain export areas include Pacific, Atlantic and Seaway ports, and the Canadian prairies. These four Canadian grain export areas vie for grain shipments coming from Manitoba, Saskatchewan and Alberta. Canada's Pacific coast ports (Vancouver, Prince Rupert) have accounted for about 60% of Canada's total grain exports since 1990. These Pacific ports service East and South East Asia's grain importers. The St. Lawrence Seaway accounts for about 30% of Canadian grain exports and satisfies grain demand from European countries. Prairie shipments account for about 10% of total Canadian grain movements and consist basically of wheat exports to the U.S. by rail.

7. Outlook for Waterborne Grains and Coal for Export

7.1. Introduction

Grains, soybeans, and coal appear to have the greatest immediate potential for increased export due to world demands in general and the promise of lower transportation costs resulting from the continuing shift toward larger capacity ocean going vessels. This section examines available forecasts for grain and coal exports, focusing primarily on coastal ports served by inland waterways.

7.2. Grains

American soybean interests contracted with Informa Economics, Inc. (Informa) to look at the impact of the Panama Canal expansion on soybean exports. As part of their evaluation, Informa developed forecasts for grain and soybean exports by U.S. region of origin. Regions served by inland waterways are the Center Gulf (which roughly corresponds to the Lower Mississippi/New Orleans Custom District) and the Pacific Northwest (the PNW corresponds to the Portland/Columbia-Snake Customs District). These region-specific forecasts rely on the U.S. Department of Agriculture's 2011 (USDA 2011) world and national forecasts. As demonstrated in Table 7-1 below, these forecasts indicate strong and steady growth in U.S. exports. Informa projects about one half of the growth in Center Gulf exports will use the Panama Canal and that the Center Gulf will increase its share of total U.S. exports over the next 10 years.

Table 7-1: US Corn, Wheat and Soybeans Export Forecasts, US, Center Gulf, PNW and US Panama

US Corn, Wheat and Soybean Export Forecasts, US, Center Gulf, US Panama, and
(millions of metric tons)

Year	US	Center Gulf		PNW		US thru Panama
		Mtons	% total US	Mtons	% total US	
2010	120.6	48.7	40%	32.7	27%	37.2
2011	105.8	50.6	48%	33.1	31%	38.3
2012	112.5	52.5	47%	33.4	30%	39.4
2013	123.5	54.4	44%	33.8	27%	40.6
2014	128.8	56.3	44%	34.2	27%	41.7
2015	131.9	58.2	44%	34.5	26%	42.8
2016	134.0	60.1	45%	34.9	26%	43.9
2017	136.1	62.0	46%	35.3	26%	45.0
2018	138.2	63.9	46%	35.6	26%	46.2
2019	140.2	65.9	47%	36.0	26%	47.3
2020	142.3	67.8	48%	36.4	26%	48.4

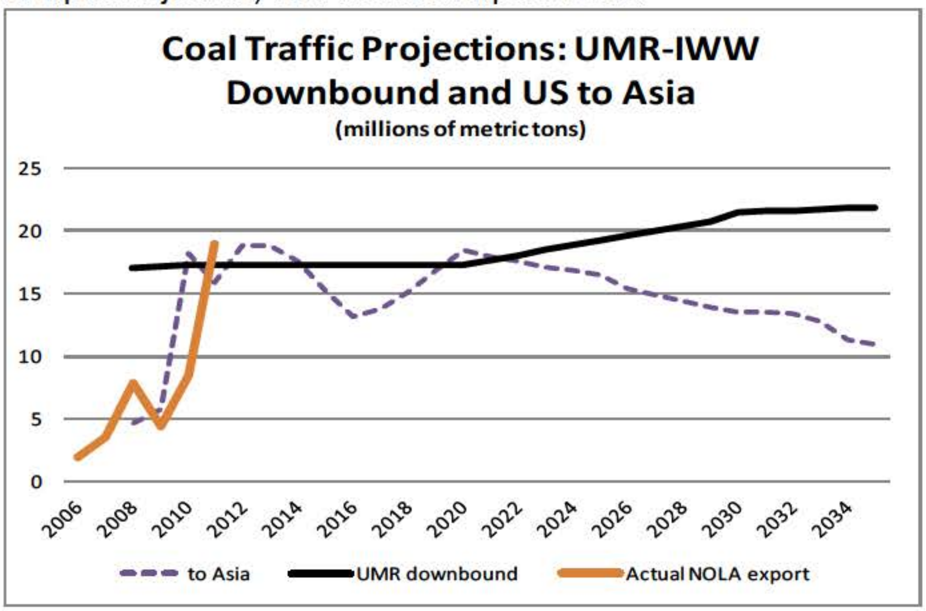
Note: US forecasts from USDA 2011; Pacific Northwest (PNW), Center Gulf, and US through Panama from Informa Economics report for US Soybean Board, U.S. Soybean Export Council, and the Soy Transportation Coalition. A forecast for 2020 was obtained from the Informa report - values between 2010 and 2020 are interpolations.

7.3. Coal

The U.S. Department of Energy prepares forecasts of coal production, imports by country and exports by country. The latest projections are presented in the Energy Information Administration's *Annual Energy Outlook, 2011* (AEO 2011). U.S. share of the one billion short ton global coal trade is currently just under 10%, but projected to fall to around 5% of the 1.4 billion short ton trade by 2035 (see the discussion in Section 5.3.3). Trade with Asia is of particular interest for this analysis as its growing import demands can be served by coastal ports linked to inland waterways, particularly the Mississippi River System. In Figure 7-1 below, AEO 2011 forecasts of Asian coal demand are juxtaposed with actual coal exports from the Lower Mississippi River and downbound coal forecasts prepared in the *Upper Mississippi-Illinois*

Waterway, Re-evaluation of the Recommended Plan: UMR-IWW System Navigation Study – Interim Report. This figure offers perspective only. Lower Mississippi coal exports serve markets in Europe and the Americas, as well as Asian markets, and Mobile and Atlantic coast ports serve Asian markets. The UMR-IWW forecasts do not distinguish between major market areas. What the figure does indicate is that UMR-IWW coal forecasts are in concert with actual exports and AEO 2011 Asian export forecasts at least through 2020.

Figure 7-1: Coal Export Projections, Total US and US Exports to Asia



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics, *UMR-IWW Navigation Study, Interim Report*, U.S. Army Corps of Engineers, March 2008 and *Annual Energy Outlook, 2011,* U.S. Department of Energy, Energy Information Administration.

7.4. Factors Influencing the Waterborne Outlook

7.4.1. Macroeconomic and Demographic Considerations

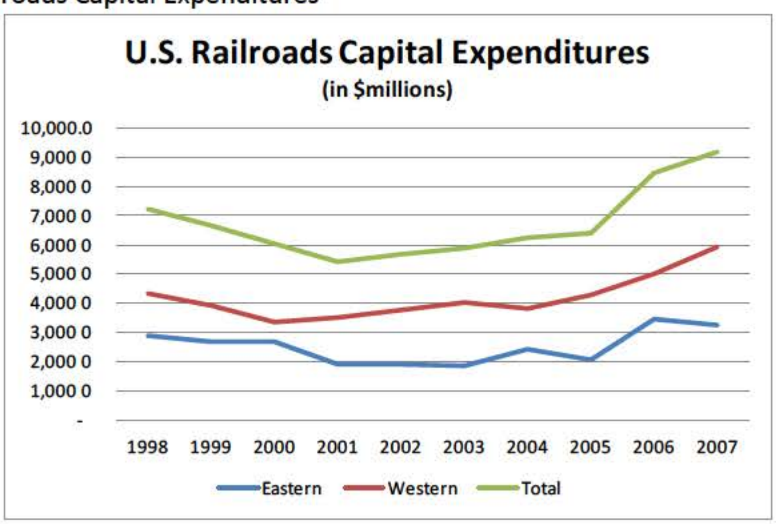
Population growth and rapidly rising incomes, particularly in Northeast Asia and to a lesser extent India, underpinned strong world growth through 2007 and into 2008. In India and China, expansion of heavy manufacturing industries - like steel and electric generating utilities, massive construction projects like Three Gorges Dam, and the near reconstruction of entire cities such as Beijing - led to surging demands for basic metals and ore and mineral products like copper, steel, iron ore and coal. Population and income growth also drove growing demands for grains and oilseeds, along with processed grains and foods. While this trend was eventually dampened by the recession in the developed world, a return to strong growth is expected from most sources.

7.4.2. Transportation Infrastructure

Global trade is facilitated by liberalized trade policies that act to remove barriers and protections for domestic producers. Seaborne trade linking the continental land masses is greatly facilitated by continuing advances in ocean going vessel efficiencies and the infrastructure that supports these vessels. This infrastructure includes port facilities, port channels, ocean-route canals, connecting channels, highway and rail connections to ports, and overland and waterway feeder systems and line routes. Any inefficiencies in this transportation system act as a damper on U.S. exporters' ability to realize the full potential of the export market and the vessels engaged in that trade.

The most significant infrastructure improvement is the expansion of the Panama Canal scheduled for completion in 2014. Though representing less dramatic engineering projects than expanding the Panama Canal, U.S railroads have steadily increased investments in both road and equipment, as shown in Figure 7.2. The $9 billion invested in 2007 was a 27% increase over what was invested in 1998. Western railroads, spurred by growth in Northeast Asia increased capital expenditures by nearly a third over this time frame, building capacity and improving performance of their land bridge between West Coast ports and production areas in the interior and consumer markets in the Midwest and East Coast. These investments allow West Coast ports to compete with Gulf Coast ports for both grain and coal export shipments out of the U.S. to Asia and improve the overall U.S. position globally in both the grain and coal export markets. Proposed coal terminal facilities on the Columbia River near Portland and at Cherry Point in Washington State (each with annual throughput capacity of roughly 30 million tons and representing an investment in excess of $500 million) are indicators of the private sector's view of the potential that exists in the Asian coal market. Without these terminal facilities, there are no terminals with the capability of handling coal in the volumes required by Panamax or post-Panamax vessels of any kind.

Figure 7-2: U.S. Railroads Capital Expenditures



Source: AAR, Analysis of Class I Railroads as reported in the *Study of Rural Transportation Issues,* USDA and USDOT.

The state of port infrastructure at both the point-of-shipment in the U.S. and at the point of destination can be limiting factors. For grains, PNW, Center Gulf (Lower Mississippi River), and Texas Gulf terminals are capable of accommodating the loading of large vessels of any size. Each is configured to handle grain in large volumes by rail and river at the PNW, largely by rail in the Texas Gulf, and mostly by river in the Center Gulf region. Ports in Northeast Asia receiving grains are currently maintained at depths compatible with current Panama Canal depths and the depths of nearly all U.S. ports, as shown in Table

7-2. Though capital investments are planned for some of these ports, at the current time they act as a limiting factor to the same extent as the depth of U.S. ports.

Table 7-2: Japanese, Chinese, and Taiwanese Grain Terminal Characteristics

Port	Grain Terminal(s)	Current Channel Berth Depth (feet)	Planned Depth (feet)
Japan			
Kashima	Kanto Grain Terminal	32-65	N/A
	Zen-Noh Silo Wharf		
	Showa Sangyo Wharf		
Shibushi	Zen-Noh Silo Wharf	39	N/A
	Shibushi Silo Wharf		
Nagoya	Inaei Pier	39-52	Plans to dredge, but no details available
	Rinoru Yushi Pier		
	Nisshin Sefun Pier		
	Chita Futo Pier		
	Zen-Noh Silo Pier		
	Toyo Grain Terminal Pier		
Chiba	Kyodo Silo	N/A	N/A
	Nihon Silo		
Kobe	Zen-Noh Silo Dolphin	46	N/A
	Tomen Silo Dolphin		
	Showa Sangyo Dolphin		
	Hanshin Silo Dolphin		
	Kohnan Futo Dolphin		
Kinuura	N/A	49-78	N/A
Hachinoe	Tohoku Grain Terminal	42	N/A
Kagoshima	Honkouku Kitafuto Wharf No. 1	29-39	N/A
	Shinkou Wharves No. 5,6,8		
	Taniyama Wharves No. 1,2,3,5		
Mizushima	Seto Futo Co.	32-46	46
Hakata	N/A	42-49	N/A
China			
Qingdao	N/A	42-46	N/A
Dalian	Dagang Berths No. 1,8,9,27,30	28-32	N/A
	Xianglujiao Berths No. 2,5,6		
	Dayaowan Berths No, 1,2		
Tianjin	Detailed information unavailable, but deep water port with plans for expansion		
Guangzhou	Huangpu New Terminal Berth No. 1	26-49	55
	Xinsha Berth No. 6		
Xiamen	Dongdu Berth No. 2	26-39	N/A
Ningbo	N/A	N/A	N/A
Rizhao	N/A	36-59	N/A
Nantong	Grain Bureau Berths (2)	31	N/A
Zhanjiang	N/A	N/A	N/A
Fanchenggang	Fangcheng Berth No. 11	31	N/A
Taiwan			
Kachshiung	Berths No. 71,72	N/A	46
Taichung	Berths No. 1,3	42	N/A
Keelung	N/A	50	N/A
Source: Port websites, Informa Economics, Lloyd's List Intelligence			

Deep draft ports handling ores and coal in Northeast Asia are designed to handle the largest ore and coal carriers. Only LA/Long Beach, Oakland, and Seattle/Tacoma on the West Coast and Baltimore and Norfolk on the East Coast have depths of 50' or more, limiting the potential use of fully loaded vessels drafting 50' to these four ports. In fact, the new Panama Canal locks are too small to handle the largest of the ore and coal carriers, making it a limiting factor on an Atlantic or Gulf Coast trade route to Asia.

China continues to propose projects and make investments in ports (a deepwater bulk port in Brazil) and overland infrastructure (a rail connector proposed for linking Columbian coal fields on the Atlantic side of the country to a Pacific port) in South America that allow them to maximize their use of these vessels. These investments improve the competitive position of Brazil as an ore and soybean exporter and Columbia as a coal exporter relative to the U.S.

The prospect of a more efficient Panama Canal route and, to a lesser extent, a more efficient western land bridge route to the West Coast is regarded by farm interests as offering improved access to Asia and higher economic returns by lowering their transportation costs. Agricultural interests contend that their position as price takers means that any savings in transportation cost is an increase in their share of the revenues from delivery of their product. Coal interests regard the resurgent export market as having given their industry a much needed boost. Domestic environmental regulations on the burning of coal by electric utilities and industrial firms and the rapid development of shale gas reserves has eroded the cost advantage coal has long enjoyed over competing fuels. Transportation costs affect them in similar fashion to agricultural interests, so the performance and cost of the all water route to Asia through the Panama Canal and the western rail land bridge are of keen interest to them.[2] Of major concern and uncertainty are: 1) the toll structure that will be used at the Canal, 2) railroad service and pricing structures, and 3) the reliability of the inland navigation system. While the toll structure is a concern, the Panama Canal Authority (ACP) will have an interest in pricing the Canal route competitively.

Railroad service and pricing revolve around the railroads' efforts to improve speeds and efficiency. They have done this through investments in access lanes to the ports (like the Alameda Corridor), more equipment, track, unit and shuttle trains, and by abandoning feeder lines. This has shifted the cost burden onto the farmer and coal producer by requiring longer distance hauls to collection terminals for unit and shuttle trains, as well as placing a burden on state and local government to maintain rural highways. A similar phenomenon is occurring with the relatively new container trade for grains. Containers are often difficult to find and assembly points are few as the railroads concentrate their service in large population centers.

Most observers do not report congestion as a problem on highways, particularly in rural areas, but projections vary widely on the prospects for widespread road congestion in coming years. Deterioration of bridge structures is a major concern, as are general road conditions – leading to further questions regarding the dependability of highway routes and how that may affect transportation costs. Interestingly, the reliability of lock and dam structures is linked to both highway and rail performance in a demonstration of the interconnected nature of the transportation system. Lock outages at the Nation's aging system of locks and dams have experienced a sharp increase over the last 20 years as shown in Figure 7-3. Much of this is related to outages either for scheduled or unscheduled lock repairs.

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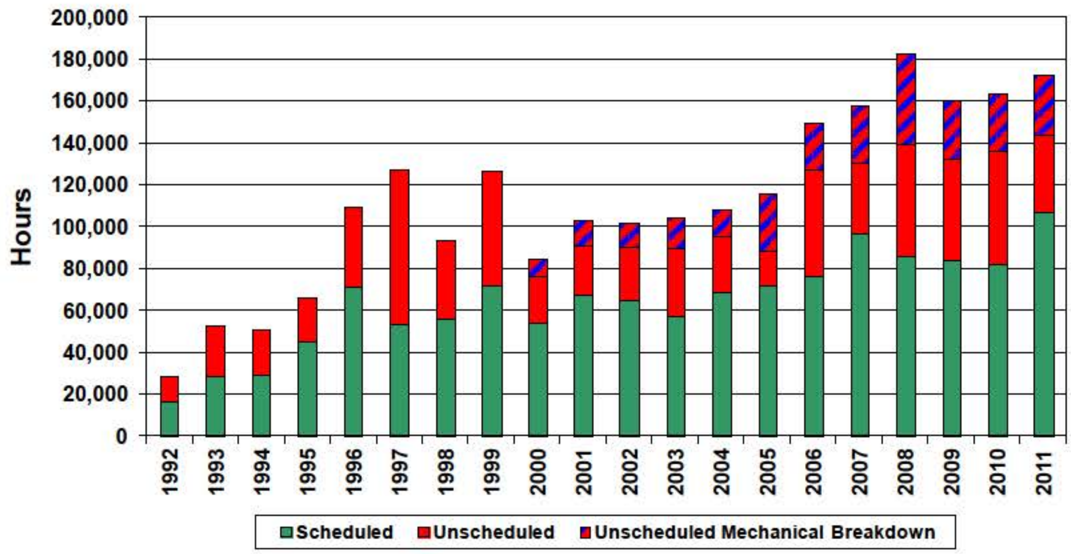
[2] Evidence the United Soybean Board, U.S. Soybean Export Council, and Soy Transportation Coalition sponsored *Panama Canal Expansion: Impact on U.S. Agriculture* prepared by Informa economics and articles by groups like the 10-state Mid American Freight Coalition, that address concerns over truck, rail, barge and port infrastructure with statements such as, "If barges cannot feed into Cape-sized vessels to transit the canal because of the outdated locks on the Mississippi River, it won't matter if the canal is expanded." (see http://midamericanfreight.org/2011/03/panama-canal-expansion)

Carriers face lost opportunities and increased costs due to these disruptions , while shippers face potential delays in their operations and increased transportation costs as they seek ways to work around lock facilities either closed to traffic or experiencing major congestion as traffic moves through smaller auxiliary chambers (when available). During closure events, shippers will seek overland alternatives, which can cause congestion on these routes (rail or truck).

Figure 7-3: Lock Unavailability – Scheduled and Unscheduled, 1992 - 2011



Source: U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

Aging infrastructure, a flat (declining in real terms) maintenance budget, and limited funds for new construction (the Inland Waterways Trust Fund has hovered around a zero balance for several years) are key factors behind the trend represented in the figure above. In 2009, a team of inland waterway users and Corps of Engineers representatives assembled to address these problems by prioritizing inland navigation projects for improvement, developing a revenue generating mechanism to replenish the Inland waterway Trust Fund, and making recommendations on improving the Corps of Engineers delivery process. The report produced by this team, *Inland Marine Transportation Systems (IMTS) Capital Projects Business Model,* provided a ranking of projects based upon their projected condition, the risk of an outage and the economic consequences of an outage. All but two of the top 10 locks in terms of need were either a major pathway for grains, for coal, or for both. To the extent that the perceived condition and performance of these locks influences shipper behavior, the inland waterway system represents a key factor in the outlook for coal and grain exports.

8. Inland Waterway System – Current and Future Performance

8.1. General

The inland waterway system as defined in this report includes the 12,000 miles of navigable shallow-draft waterways (both rivers and the intracoastal waterways) and the extensive Great Lakes Navigation

System. This system of inland rivers, coastal canals, and the Great Lakes serves much of the geographic area of the United States and most of its population. The Gulf Intracoastal Waterway (GIWW) serves the petroleum and petrochemical trades, while coastal rivers like the San Jaoquin, Hudson, and James have relatively small trades in containers and bulk commodities. The Great Lakes and rivers like the Tombigbee-Black Warrior, Columbia-Snake, and Mississippi River system primarily handle bulk commodities like coal, grains, and ores, along with a wide variety of other commodities and some containers. When viewed from the perspective of the ability of inland waterways to support enhanced export opportunities that a global fleet of larger ocean-going vessels represent, those inland waterways that serve a hinterland with desirable export commodities are of particular interest. This directs focus to the Upper Mississippi, Illinois, Ohio (and its tributaries), and the Columbia-Snake rivers and the Great Lakes. While other system will be addressed, discussions below focus primarily on the Great Lakes and three major rivers in this national system: the Upper Mississippi River-Illinois Waterway, the Ohio River System, and the Columbia-Snake System.

8.2. Upper Mississippi River-Illinois Waterway

8.2.1. Description – Traffic, Commodities, and Markets

The commercially-navigable portions of the Upper Mississippi River (UMR) extend from the confluence with the Ohio River, River Mile (RM) 0.0, to Upper St. Anthony Falls Lock in Minneapolis-St. Paul, Minnesota, RM 854.0. The Illinois Waterway (IWW) extends from its confluence with the Mississippi River at Grafton, Illinois, RM 0.0 to T. J. O'Brien Lock in Chicago, Illinois, RM 327.0. The UMR-IWW system contains 1,200 miles of 9-foot deep channels, 38 lock and dam sites, and thousands of channel training structures. The UMR basin encompasses large portions of the central and western Corn Belt and the eastern fringes of the Northern Great Plains. Five of the Nation's top agricultural production states – Iowa, Minnesota, Illinois, Missouri, and Wisconsin – have traditionally relied on the UMR-IWW navigation system as their principal conduit for export-bound agricultural products, mostly bulk corn and soybeans. The UMR-IWW system has been the traditional export outlet for much of the agricultural production of the upper Midwest.

An average of nearly 55.6 million short tons of grain, oilseeds, and other agricultural products—representing an average of 36% of total barge traffic—moved between Minneapolis and the mouth of the Missouri River on the UMR-IWW each year during 2000 through 2010. In addition, the UMR-IWW system provides an inbound conduit for fertilizers, fuel, and other farm inputs. For example, an average of over 5.7 million short tons of agricultural fertilizers moved up the UMR-IWW system annually in support of U.S. agricultural production during 2000 through 2010. Other commodities such as coal, chemicals, iron ore, and petroleum products are shipped in bulk on the UMR in significant numbers as shown in Figures 8.1 and 8.2.

8.2.2. Infrastructure

8.2.2.1. Location and Dimensions

There are 38 active navigation lock and dam sites on the UMR-IWW operated and maintained by USACE. These are listed in Tables 8-1 and 8-2. There are 29 active projects on the UMR; six of these projects feature two lock chambers. The southernmost projects, Locks and Dam 27 and Melvin Price Locks and Dam, have 1200' x 110' main chambers and 600' x 110' auxiliary chambers. Locks and Dam 15 has a 600' x 110' main chamber and a 360' x 110' auxiliary chamber. Locks and Dam 14 has a 600' x 110' main chamber and a 320' x 80' auxiliary that is over 80 years old and is used almost exclusively for locking recreational craft on a seasonal basis. The other dual-chamber project is Locks and Dam 1, which has two 400' x 56' chambers. Lock and Dam 2 has a 500' x 110' chamber. Lock and Dam 19 has a single 1200' x 110' chamber, and the remaining Mississippi River locks have single 600' x 110' lock chambers.

Table 8-1 Upper Mississippi River Lock and Dam Locations and Dimensions

		Main Chamber		Auxiliary Chamber	
Lock	River Mile	Year Open	Size	Year Open	Size
Upper St. Anthony Falls	853.9	1963	400 x 56	-	-
Lower St. Anthony Falls	853.3	1959	400 x 56	-	-
Locks and Dam 1	847.6	1930	400 x 56	1932	400 x 56
Locks and Dam 2	815.0	1930	500 x 110	1948	600 x 110
Locks and Dam 3	796.9	1938	600 x 110	-	-
Locks and Dam 4	752.8	1935	600 x 110	-	-
Locks and Dam 5	738.1	1935	600 x 110	-	-
Locks and Dam 5A	728.5	1936	600 x 110	-	-
Locks and Dam 6	714.0	1936	600 x 110	-	-
Locks and Dam 7	702.0	1937	600 x 110	-	-
Locks and Dam 8	679.0	1937	600 x 110	-	-
Locks and Dam 9	647.0	1938	600 x 110	-	-
Locks and Dam 10	615.0	1936	600 x 110	-	-
Locks and Dam 11	583.0	1937	600 x 110	-	-
Locks and Dam 12	556.0	1938	600 x 110	-	-
Locks and Dam 13	523.0	1938	600 x 110	-	-
Locks and Dam 14	493.0	1939	600 x 110	1922	320 x 80
Locks and Dam 15	482.9	1934	600 x 110	1934	360 x 110
Locks and Dam 16	457.2	1934	600 x 110	-	-
Locks and Dam 17	437.1	1939	600 x 110	-	-
Locks and Dam 18	410.5	1937	600 x 110	-	-
Locks and Dam 19	364.2	1957	1200 x 110	-	-
Locks and Dam 20	343.2	1936	600 x 110	-	-
Locks and Dam 21	324.9	1938	600 x 110	-	-
Locks and Dam 22	301.2	1938	600 x 110	-	-
Locks and Dam 24	273.4	1940	600 x 110	-	-
Locks and Dam 25	241.4	1939	600 x 110	-	-
Melvin Price	200.8	1990	1200 x 110	1994	600 x 110
Locks and Dam 27	185.5	1953	1200 x 110	1953	600 x 110

The IWW system has eight single-chamber lock and dam projects. The seven projects on the main part of the waterway have single 600' x 110' lock chambers and are over 60 years old. There is one lock on the Kaskaskia River, located just less than a mile from the junction with the UMR and has one 600' x 84' chamber. T. J. O'Brien Lock and Dam on the Calumet River has a 1000' x 110' chamber. Most barges moving to and from Lake Michigan use the O'Brien Lock.

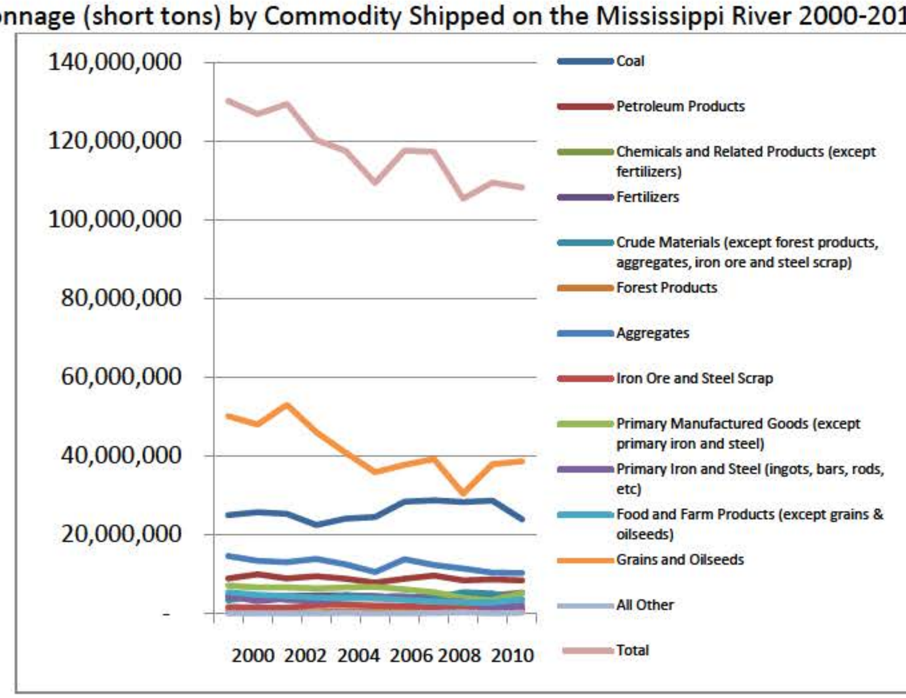
Table 8-2 Illinois River Lock and Dam Locations and Dimensions

		Main Chamber		Auxiliary Chamber	
Lock	River Mile	Year Open	Size	Year Open	Size
Thomas J. O'Brien	326.5	1960	1000 x 110	-	-
Lockport	291.1	1933	600 x 110	-	-
Brandon Road	286.0	1933	600 x 110	-	-
Dresden Island	271.5	1933	600 x 110	-	-
Marseilles	244.6	1933	600 x 110	-	-
Starved Rock	231.0	1933	600 x 110	-	-
Peoria	157.7	1938	600 x 110	-	-
Lagrange	80.2	1939	600 x 110	-	-

8.2.2.2. Traffic Trends

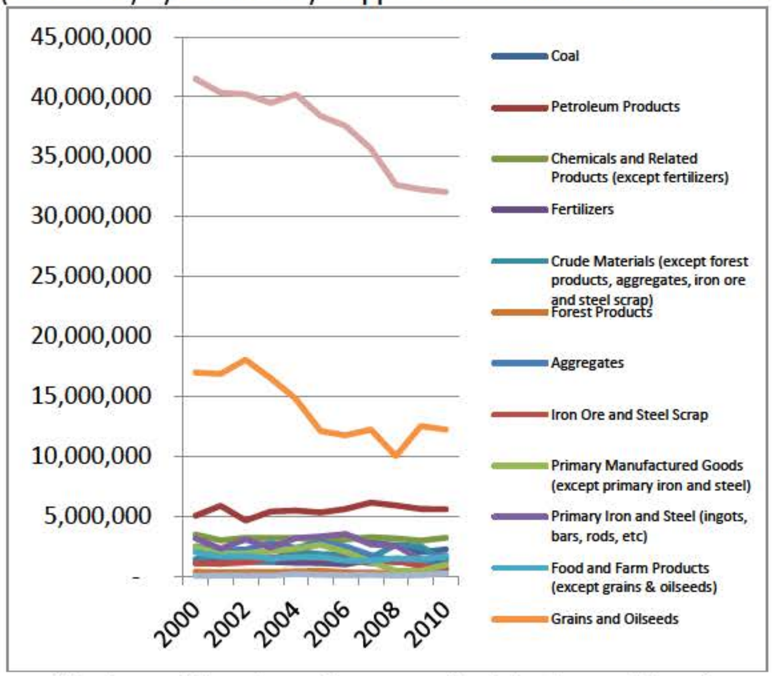
Grains, oilseeds, and coal continue to be the dominant commodity groups on the UMR-IWW, together making up about 58% of total traffic in 2010. Petroleum products were the third largest commodity group in 2010, accounting for 8% of traffic. The overall trend in Figures 8-1 and 8-2 appears to be moving downward; however, concerns about future rail and highway capacity may reverse this decline. Note that the downward trend over the past decade is driven by falling grain tonnages, while the rest of the commodities have remained relatively stable.

Figure 8-1 Tonnage (short tons) by Commodity Shipped on the Mississippi River 2000-2010



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center

Figure 8-2 Tonnage (short tons) by Commodity Shipped on the Illinois River 2000-2010



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, Waterborne Commerce Statistics

8.2.2.3. Delays, Capacity, and Future Demands[3]

Many of today's tows on the UMR-IWW consist of 12-15 barges, which require the tow to be split and passed through smaller locks in two operations. Processing times through these projects are directly related to the percentage of tows that require two cuts (referred to as a double lockage) in order to be processed through the lock chamber. The further downstream on both the UMR and the IWW, the greater the proportion of larger tows requiring double cuts. Similarly, the greater the proportion of double cuts, the greater the delays, and because traffic volumes tend to build moving downstream, heavier traffic can lead to delays. Lock capacities at the single lock projects with a dimension of 600'x110' accommodate double cut tows and have annual throughput in the neighborhood of 50 million short tons. Melvin Price LD and LD 27 have a 1200'x110' main chamber and 600'x110' auxiliary chamber. These two lock projects have slightly more than double the capacity of the single chamber, 600' lock projects. Table 8-3 shows capacity, processing, and delay for the 2002-2011 period and potential demand in the year 2020 at each lock. Average delays in this river stretch ranged from just under an hour to 2.5 hours per tow. These annual averages hide the more severe delays and stressing of lock capacity during grain harvest season.[4] High Scenario projected traffic demands, prepared for

[3] Lock capacities shown in this and subsequent sections are annual physical throughput capabilities with no regard to economics. Capacity can be measured in terms of either vessel or tonnage throughput. The capacity measurements show in this report reflect the current lock dimensions, number of lock chambers, operating conditions (to include operating rules and normal outages due to weather-related disruptions), and vessel fleet (vessel dimensions, cargo capacity, and number of vessels by type), all of which factor heavily in the tonnage throughput capabilities of a lock.

[4] Grain traffic peaks in early summer and the fall. For example, according to LPMS data, 22% of Melvin Price LD's annual grain traffic transited in July and August and another 25% in November and December.

the *Re-evaluation of the Recommended Plan: UMR-IWW System Navigation Study – Interim Report*, most closely reflect industry grain forecasts for 2020. High Scenario traffic projections for 2020 represent between 69% and 90% of annual throughput capacity on the lower reaches of the river from LD16 to LD27. At these levels of traffic, delays would likely cause significant amounts of traffic to shift to other modes of transportation or perhaps to other markets. Low Scenario traffic projections represent less than 50% of annual throughput capacity; even at these levels, some traffic could shift to other modes.

Table 8-3 Mississippi River Lock and Dam, Capacity and 2020 Traffic Forecast
(in millions of short tons)

Name	2020 High Traffic Demand (millions of tons)	Capacity (millions of tons)	2002-2011 Ave Minutes/ Tow	
			Processing	Delay
Upper St Anthony Falls L&D	2.8	23.8	25.68	1.04
Lower St Anthony Falls L&D	2.8	19.7	28.62	1.25
Mississippi L&D 1	2.8	20	34.78	1.38
Mississippi L&D 2	11.4	44.9	89.42	19.88
Mississippi L&D 3	11.4	46.4	83.58	19.86
Mississippi L&D 4	12.5	48.4	88.6	14.87
Mississippi L&D 5	13.7	50.4	84.31	14.65
Mississippi L&D 5A	13.7	54.3	80.88	14.32
Mississippi L&D 6	17.0	48.3	90.32	21.5
Mississippi L&D 7	17.0	49.7	88.36	27.31
Mississippi L&D 8	18.0	45.7	97.13	30.57
Mississippi L&D 9	22.2	48.9	92.83	28.86
Mississippi L&D 10	26.0	53.2	83.49	27.46
Mississippi L&D 11	27.1	43.3	82.76	36.08
Mississippi L&D 12	29.4	43.8	86.12	41.94
Mississippi L&D 13	30.0	46.9	85.81	52.52
Mississippi L&D 14	32.7	47.4	85.68	80.45
Mississippi L&D 15	32.9	47.4	80.6	80.05
Mississippi L&D 16	33.8	45.3	80.21	53.81
Mississippi L&D 17	35.7	48.9	102.06	87.76
Mississippi L&D 18	36.8	49.1	95.47	80.53
Mississippi L&D 19	37.2	66.7	70.82	52.07
Mississippi L&D 20	38.9	51.5	99.49	90.13
Mississippi L&D 21	40.4	53.4	101.74	74.28
Mississippi L&D 22	40.9	51.1	110.46	114.73
Mississippi L&D 24	42.5	47.1	102.29	125.37
Mississippi L&D 25	42.5	49.2	104.94	125.86
Melvin Price L&D	98.9	142.5	47.94	58.15
Mississippi L&D 27	108.6	127.6	45.35	78.21

Source: U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System and U.S. Army Corps of Engineers, *UMR-IWW, Interim Report*, March 2008

Locks on the IWW are single 600’x110’ chambers, with the exception of O’Brien Lock with its 1000’ long chamber, which does not play prominently in the shipment of grains or coal. Average delays on the IWW are all over an hour to almost 1.5 hours per tow. The annual average delays in Table 8-4 hide the more severe delays and stressing of lock capacity during grain harvest season. Annual throughput capacity is between 32 and 54 short million tons. High Scenario projections for the year 2020 range between 33 and 50 short million tons. In the event traffic demands reach these levels, delays would likely cause significant amounts of traffic to divert to other modes. Even under the Low Scenario traffic projections, lock utilization is fairly high – between 48% and 54% of capacity.

Table 8-4 Illinois River Lock and Dam, Capacity and 2020 Traffic Forecast
(in millions of short tons)

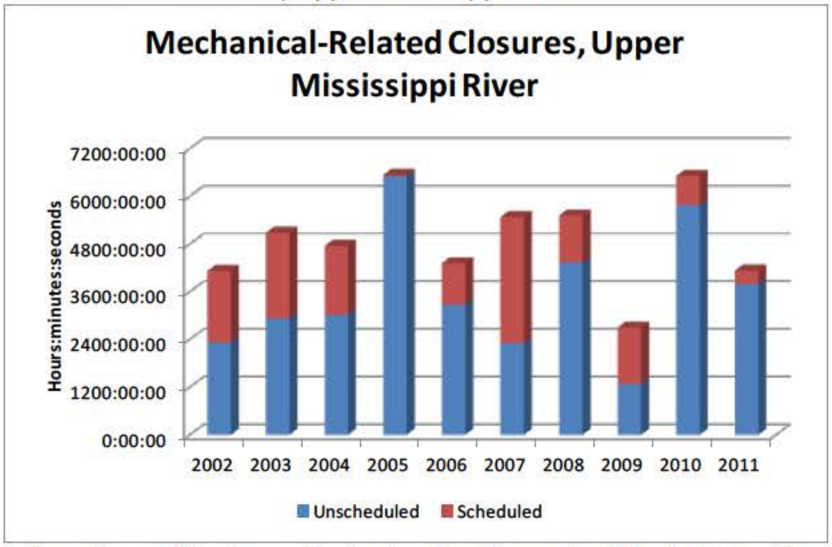
Name	2020 High Traffic Demand (millions of tons)	Capacity (millions of tons)	2002-2011 Ave Minutes/ Tow	
			Processing	Delay
Thomas J O'Brien L&D	16.0	49.6	41.05	4.66
Lockport L&D	31.3	33.4	89.96	69.45
Brandon Road L&D	32.2	32.8	86.05	73.52
Dresden Island L&D	35.9	45.1	83.46	57.04
Marseilles L&D	36.1	36.6	102.53	80.17
Starved Rock L&D	38.6	48.4	89.68	70.58
Peoria L&D	47.3	46.2	51.45	69.94
Lagrange L&D	53.6	49.9	60.06	88.46

Source: U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System and U.S. Army Corps of Engineers, *UMR-IWW, Interim Report*, March 2008

8.2.2.4. Maintenance Costs, Outages, Condition, and Future Outlays

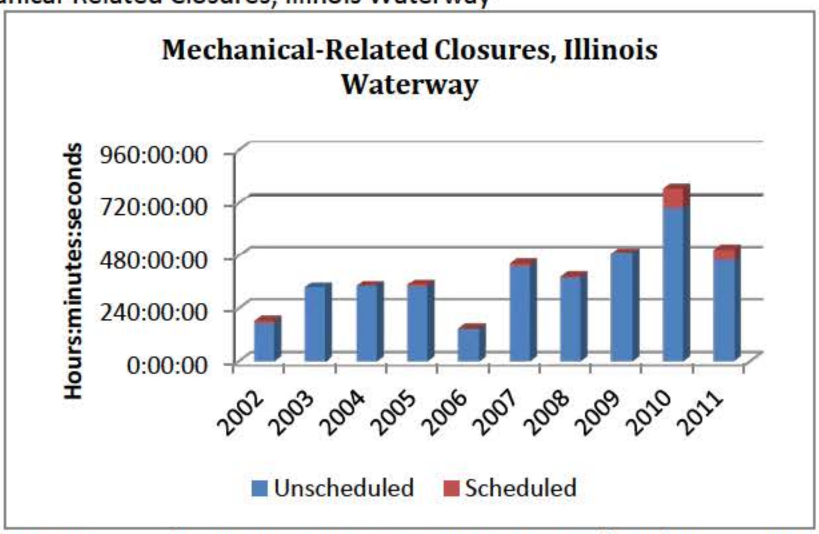
Only six locks and dams on the UMR-IWW have main chambers built after 1939 (see Tables 8-1 and 8-2 above). Aging of inland waterways infrastructure is not necessarily a concern as long as timely investments are made in maintenance and major rehabilitations, with some capacity and modernization improvements where needed. Depending on the nature of the lock malfunction, protracted repair time can have major consequences for the barge traffic that depends on the facility and for shippers and manufacturers depending on timely delivery of their cargo. Unscheduled outages are more costly than outages planned well in advance. As shown in Figures 8-3 and 8-4, unscheduled maintenance due to mechanical-related issues is resulting in a larger percentage overall closure time on both waterways.

Figure 8-3: Mechanical-Related Closures, Upper Mississippi River



Source: U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

Figure 8-4: Mechanical-Related Closures, Illinois Waterway



Source: U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

In constant dollar terms, operations and maintenance funding for the Corps' civil works infrastructure has been largely flat or declining for decades, while the needs for maintaining the aging infrastructure have increased. This is adversely affecting reliability of the system. Long-established programs for preventative maintenance of principal lock components have essentially given way to a fix-as-fail policy. This policy is a short term solution and does not account for potential impacts on inland navigation caused by long unforeseen closures. Annual maintenance, including dredging, on the UMR-IWW was about $101 million in FY2011 - $86 million on the UMR and $15 million on the IWW.

8.2.3. Assessment of Ability to Handle Future Traffic

The need for inland waterway modernization in the UMR-IWW system is considered in the following section. Modernization is necessary to accommodate potential increases in traffic volumes due to the ongoing trend in the shipping industry to deploy larger vessels in the global market. Agricultural products, particularly grain, are the primary commodities moving over the UMR-IWW system, and as such, grain represents an additional focus of this discussion.

In December 2004, the U.S. Army Corps of Engineers completed the *UMR-IWW System Navigation Feasibility Study*, which recommended a program of navigation efficiency improvement measures. Those improvements are displayed in Figure 8-5. In 2008, the *Re-evaluation of the Recommended Plan: UMR-IWW System Navigation Study – Interim Report*, a re-evaluation of the feasibility report recommended plan was completed. Among other updated inputs, the re-evaluation report incorporated revised traffic forecasts. As the purpose of the current investigation is to explore the potential impacts of the increased deployment of larger ships in global trade on inland waterway traffic levels, information developed for the 2008 re-evaluation report was used to help identify possible impacts on the UMR-IWW system.

Figure 8-5: Recommended Plan from UMR-IWW System Navigation Feasiblity Study

THE RECOMMENDED PLAN FROM UMR-IWW SYSTEM NAVIGATION FEASIBILITY STUDY

The Recommended Plan is a 50-year framework for modification and operational changes to the Upper Mississippi River and Illinois Waterway System to provide for navigation efficiency and environmental sustainability, and to add ecosystem restoration as an authorized project purpose. The integrated, dual-purpose plan will provide flexibility in managing operation and maintenance of the system for both navigation and the environment. The integrated, dual-purpose plan will be implemented through an adaptive approach that will include an incremental implementation strategy paired with periodic checkpoints requiring future reporting to the Administration and Congress. The Corps will administer the plan in full collaboration with the other Federal and State agencies involved in management of the UMRS.

The recommended navigation improvement framework includes small-scale structural and non-structural measures, new 1200-foot locks and lock extensions, and appropriate measures to avoid, minimize, and compensate for environmental impacts at a first cost of $2.59 billion at October 2004 price levels plus annual switch boat operation costs of $19.4 million. **The first increment** proposed for immediate implementation at a first cost of $2.03 billion includes:

- Small-scale measures ($218 million, including site specific mitigation)
  - Mooring Facilities at 7 lock and dam sites ($11 million)
  - Switchboats at Locks & Dams 20 through 25 in phased approach ($207 million for **first increment**)
- 7 new 1200-foot locks at Locks & Dams 20, 21, 22, 24, 25 on the UMR and LaGrange and Peoria on the IWW ($1.66 billion, including $200 million for site-specific and system mitigation) with decision points for adaptive implementation.
- In accordance with Section 102 of the Water Resources Development Act of 1986, one-half of the cost of navigation improvement construction shall be paid from the amounts appropriated from the general fund of the U.S. Treasury and one-half from amounts appropriated from the Inland Waterway Trust Fund.

Other features of the Recommended Plan (extensions of Locks 14, 15, 16, 17, and 18 and switch boats at locks 11, 12, and 13), will be revisited through an update of the feasibility study, which will be done a few years prior to completing the first increment.

The recommended ecosystem restoration framework consists of an estimated 1,009 individual projects with a combined first cost of about $5.72 billion at October 2004 price levels. **The first increment** proposed for immediate authorization includes:

- An estimated 225 projects with a combined first cost of $1.58 billion. The cost of projects proposed for implementation at full Federal expense is estimated at about $1.28 billion. The first cost of the cost shared floodplain restoration projects is estimated at about $299 million with a Federal cost of about $194 million and a non-Federal cost of about $105 million.
- Total operation, maintenance, replacement, repair, and rehabilitation (OMRR&R) costs for these projects, over a 50-year project life, are estimated at $82 million. OMRR&R costs will be the responsibility of the agency with management responsibility for the land on which the project is located or with operation and maintenance responsibility for the existing structure being modified.
- Ecosystem restoration will be accomplished through an adaptive management process.

The following general steps represent the evaluation framework that has been employed to identify UMR-IWW system impacts. Step 1: System capacity was roughly estimated by identifying the total accommodated traffic associated with the UMR-IWW modeled system. Step 2: The Informa grain forecast for 2020 was translated into a comparable grain volume for the UMR-IWW modeled system. Step 3: The Informa-based 2020 grain forecast for the UMR-IWW system was substituted for the re-evaluation report 2020 grain forecast. Step 4: Accommodated and unaccommodated traffic was estimated. Each of these steps is discussed in further detail below.

Step 1: Estimate system capacity. System accommodated traffic in a condition of congestion where not all potential traffic can be accommodated was used as a simple measure of system capacity. Capacity in this sense is not so much a physical constraint as it is an economic one. But indeed it is the economic sense that is most meaningful in attempting to determine the volume of traffic that may use the navigation system, as all traffic has a limit to its willingness to pay for any transportation mode. Using this measure, capacity in the year 2020 for the high traffic scenario in the without-project condition for the modeled system would be approximately 208 million short tons. Year 2020 was selected because this is the time horizon of other current traffic forecasts; high traffic was selected because it is associated with the condition of congestion where not all traffic is accommodated. It should be noted that in addition to the Mississippi River above the confluence of the Missouri River and the Illinois Waterway, the UMR-IWW modeled system also includes the Mississippi River from the mouth of the Missouri River to the mouth of the Ohio River. This is a non-lock and dam portion of the Mississippi River (except for high capacity Mississippi River Lock and Dam sites 26 and 27, each with a 1200’ and 600’ lock chamber) and as such is not “capacity” constrained by waterway structures.

Step 2: Translate Informa grain forecast. Since the completion of the 2008 re-evaluation report, various traffic forecasts for the inland waterways have been developed. One such forecast was performed by Informa Economics in September 2011. Informa Economics, a private sector research/consulting firm specializing in domestic and international agricultural markets, prepared a report for the United Soybean Board, U.S. Soybean Export Council, and Soy Transportation Coalition. The report is titled *Panama Canal Expansion: Impact on U.S. Agriculture*. In this report, Informa forecasts that grain exports through the Central Gulf region of the U.S. could increase by 39% from 2011 to 2020. The Informa percentage increase in Central Gulf grain exports was applied to the current volume of UMR-IWW system grain traffic. This produced an Informa-translated 2020 grain traffic estimate of 76 million short tons for the UMR-IWW system, approximately 21 million short tons higher than the re-evaluation report estimate. The Informa forecast is equivalent to the 2008 re-evaluation forecast in that both represent unconstrained traffic. Unconstrained in this context means unconstrained by increases in future water congestion associated with increased levels of waterway traffic. Therefore, unconstrained traffic levels can be viewed as levels of possible demand.

Step 3: Substitute Informa grain forecast. Substituting the re-evaluation report grain forecast for 2020 with the translated Informa forecast yields a total traffic estimate of 238 million short tons (76 million short tons of grain and 163 million short tons of non-grain). It should be noted that the non-grain system traffic has not developed as forecasted in the re-evaluation report. In fact, this traffic has actually declined from the base (2004) used to initiate the forecasts. This development is potentially significant given that conclusions regarding the system's ability to accommodate grain traffic must be made in the context of total system demands. Consequently, an alternative system traffic demand estimate was developed assuming the Informa forecast for grain and no growth in non-grain traffic from current levels. Total demand for this scenario is equal to 163 million short tons (76 million short tons of grain and 87 million short tons of non-grain).

Step 4: Estimate accommodated and unaccommodated traffic. The information developed in steps 1-3 above provides the basis for making general conclusions regarding accommodated and unaccommodated traffic. Assuming a system capacity of 208 million short tons and potential demand of 238 million short tons (Informa grain forecast and re-evaluation report non-grain forecasts), not all potential demand could be accommodated in 2020 with the current system infrastructure. However, with an alternative assumption of 163 million short tons for potential demand (Informa grain forecast and no growth in non-grain) all potential could be accommodated without waterway infrastructure efficiency improvements.

Beyond the sensitivity to non-grain traffic growth, several points regarding the accommodated/ unaccommodated traffic conclusions should be emphasized. First, the time horizon for these conclusions is 2020. With additional traffic growth beyond 2020 there would be an even greater magnitude of unaccommodated traffic (in the case of Informa grain and re-evaluation report non-grain), or an eventual state where at least some traffic would no longer be accommodated (in the case of Informa grain and no growth in non-grain). Second, the only constraint to traffic accommodation that has been considered is inland waterway infrastructure. In particular, landside infrastructure and deep-water port infrastructure have not been addressed in making inland waterway accommodated/ unaccommodated traffic conclusions. Third, the determination that traffic can be accommodated in the future does not mean that it will be accommodated at existing cost levels. Given the willingness to pay for water transportation, some increases in cost can be incurred before shippers make the decision to no longer use the waterway. Any increase in traffic over the lock and dam portion of the system will result in additional congestion and cost. Fourth, the implementation timeframe for the subset of authorized UMR-IWW improvements that is sufficient to address improved waterway efficiency and "capacity" from a system perspective is no earlier than the mid 2020s.

8.3. Ohio River

8.3.1. Description – Traffic, Commodities, and Markets

The navigation study area includes the entire main stem Ohio River, which extends 981 miles from the junction of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania, to near Cairo, Illinois where the Ohio flows into the Mississippi River. Year-round navigation is provided on the Ohio River by 20 locks and dams and periodic maintenance dredging. The entire Ohio River Navigation System comprises more than 2,600 miles of commercially navigable waterways. The basin comprises 204,000 square miles and encompasses all or portions of fourteen states, including Alabama, Georgia, Kentucky, Indiana, Illinois, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.

8.3.2. Infrastructure

8.3.2.1. Location and Dimensions

The 60+ year old upper three structures (Emsworth, Dashields, and Montgomery LDs) are located just downstream of Pittsburgh, PA. These three locks each have one 600'x110' main chamber and a 360'x56' auxiliary chamber. The conditions of these old structures, together with the inefficiently-small lock sizes,

Table 8-5 Ohio River Lock and Dam Locations and Dimensions

		Main Chamber		Auxiliary Chamber	
Lock	River Mile	Year Open	Size	Year Open	Size
Emsworth	6.2	1921	600 x 110	1921	360 x 56
Dashields	13.3	1929	600 x 110	1929	360 x 56
Montgomery	31.7	1936	600 x 110	1936	360 x 56
N. Cumberland	54.4	1956	1200 x 110	1959	600 x 110
Pike Island	84.2	1963	1200 x 110	1963	600 x 110
Hannibal	126.4	1972	1200 x 110	1972	600 x 110
Willow Island	162.4	1972	1200 x 110	1972	600 x 110
Belleville	203.9	1968	1200 x 110	1968	600 x 110
Racine	237.5	1967	1200 x 110	1967	600 x 110
R.C. Byrd	279.2	1993	1200 x 110	1993	600 x 110
Greenup	341.0	1959	1200 x 110	1959	600 x 110[b]
Meldahl	436.2	1962	1200 x 110	1962	600 x 110
Markland	531.5	1959	1200 x 110	1959	600 x 110
McAlpine	606.8	1961	1200 x 110	1921	1200 x 110[a]
Cannelton	720.7	1971	1200 x 110	1971	600 x 110
Newburgh	776.1	1975	1200 x 110	1975	600 x 110
J.T. Myers	846.0	1975	1200 x 110	1975	600 x 110[b]
Smithland	918.5	1979	1200 x 110	1979	1200 x 110
L&D No. 52	938.9	1969	1200 x 110	1928	600 x 110[c]
L&D No. 53	962.6	1980	1200 x 110	1929	600 x 110[c]

[a] The new 1200' x 110' chamber at McAlpine opened in 2009

[b] Auxiliary locks at J.T. Myers and Greenup L&Ds are authorized for extension to 1200'; however, construction has not been started.

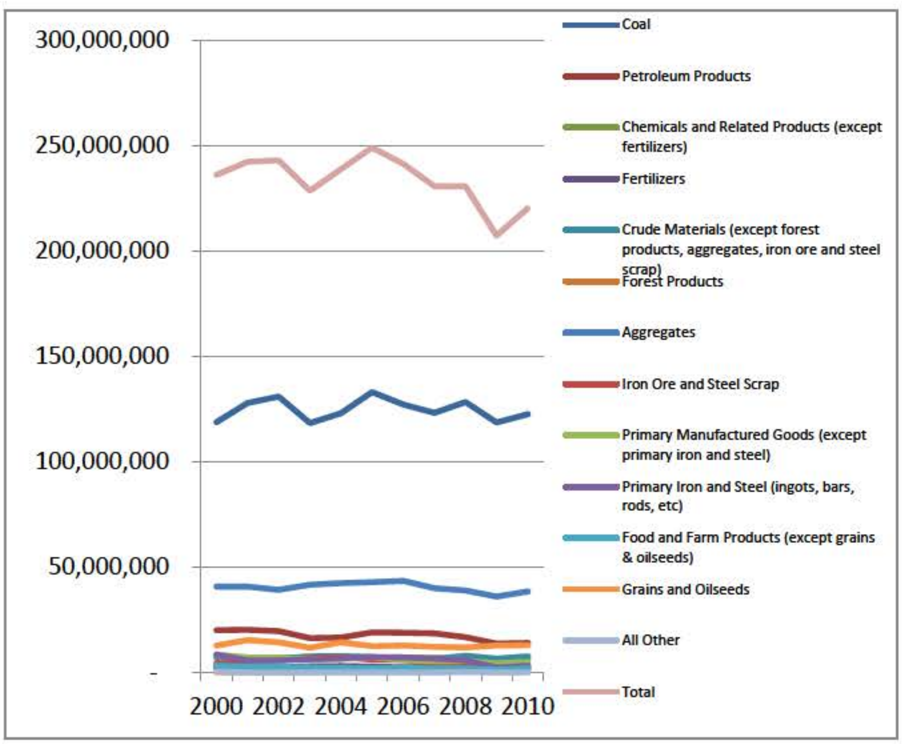
[c] Olmsted LD, now under construction at river mile 964.6, will replace both LDs 52 and 53. This new facility will have 2 identical chambers, both 1200' x 110' when completed.

are major concerns. Currently, 14 of the 40 lock chambers are over 50 years old, and 24 are between 30 and 50 years old. Thirteen modernized lock and dam structures were constructed between 1954 and 1979, plus Byrd LD which has new locks completed in 1993. This includes all the locks from New Cumberland LD downstream to J.T.Myers LD, a distance of 791.6 miles. Each of these newer locks has a 1200'x110' main lock chamber and a 600'x110' auxiliary chamber. Two locks have side-by-side 1200'x110' locks - Smithland LD (placed in operation in 1980) and McAlpine LD (placed in operation in 2009). When completed, Olmsted LD, which is replacing LD52 and LD53, will also have twin 1200' chambers. These locks and their locations, dimensions, and ages are shown above in Table 8-5.

8.3.2.2. Traffic Trends

During the time period 2000-2010, barges along the Ohio River main stem have carried a yearly average of 234 million short tons of commodities on all navigable rivers within the basin. These commodities are the product of coal mines, petroleum refineries, stone quarries, cement plants, and farms and the raw material for construction companies, steel mills, electric utilities, paper plants, aluminum manufacturers, and chemical companies. As shown in Figure 8.6, Ohio River main stem transportation consists largely of coal and other bulk or raw cargo. Coal itself made up 56% of all tonnage in 2010. Aggregates were the second largest commodity shipped in 2010, making up 17% of total tonnage. Most of the basin's coal moves to domestic markets, primarily to the electric utility industry.

Figure 8-6 Tonnage (short tons) by Commodity Shipped on the Ohio River 2000-2010



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, Waterborne Commerce Statistics

8.3.2.3. *Delays, Capacity, and Future Demands*

With the exception of the uppermost locks and Smithland LD below Evansville, Indiana, the Ohio River projects have a main chamber measuring 1200'x110' and an auxiliary chamber that is 600'x110'. All Ohio River lock projects have two chambers, which are reflected in higher capacity and lower delays than on the UMR-IWW. Capacities range from 46 million short tons to over 300 million short tons (see Table 8-6). Delay only becomes a problem when main chamber lock outages occur. Several main chamber closure events over the last 20 years resulted in serious disruptions in the form of lengthy delays, diversions to other transportation modes, and closure of some industrial facilities that could not receive or ship product.

Table 8-6 Ohio River Lock and Dam Capacities and 2020 Forecasts
(in millions of short tons)

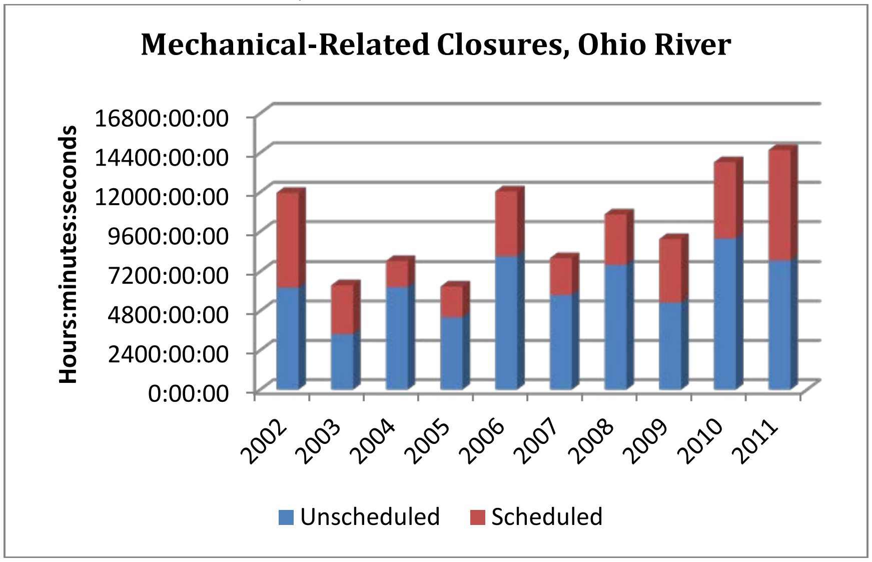
Name	2020 Traffic Demand (millions of tons)	Capacity (millions of tons)	2002-2011 Ave Minutes/ Tow	
			Processing	Delay
Emsworth L&D	24.6	45.8	68.41	46.85
Dashields L&D	25.2	51.7	65.19	30.35
Montgomery L&D	28.1	47.6	70.02	54.78
New Cumberland L&D	35.7	132.9	60.2	22.8
Pike Island L&D	39.4	151.2	55.48	21.26
Hannibal L&D	45.6	152.1	57.29	39.77
Willow Island L&D	43.8	155.1	58.15	38.86
Belleville L&D	47	167.2	58.52	37.64
Racine L&D	47.7	151.1	62.37	40.29
Robert C Byrd L&D	62.7	151	60.63	44.77
Greenup L&D	85.1	144.2	52.69	117.15
Meldahl L&D	68.2	151	59.16	72.93
Markland L&D	62.2	160.5	63.67	142.6
McAlpine L&D	66	225.5	59.81	65.19
Cannelton L&D	69.5	162.1	61.22	78.09
Newburgh L&D	86.2	169.8	51.32	43.76
John T Myers L&D	85.9	170.6	53.21	60.77
Smithland	93.5	264.4	56.19	36.02
Ohio River L&D 52	117.4	222.8	28.47	203.45
Ohio River L&D 53	104.2	367.6	10.04	24.38

Source: U.S. Army Corps of Engineers, *Ohio River Mainstem Systems Study (ORMSS), System Investment Plan/Programmatic Environmental Impact Statement,* May 2011

8.3.2.4. *Maintenance Costs and Outages*

The age of the locks' major component systems and the increasing frequency of unscheduled closures point towards greater traffic delays and growth in unexpected repair costs. These occurrences could have major impacts on the viability and reliability of the Ohio River moving into the future. Experience at Ohio River navigation projects has been that major lock and dam components become a reliability concern when those components are from 40-70 years old (reflecting the "50-year" design life typically ascribed to projects). The aging lock and dam infrastructure is a critical concern since one-third of the lock chambers (excluding LD 52 and LD53) are currently beyond their design life. As shown in Figure 8-7, there is a slight upward trend in unscheduled maintenance on the Ohio River main stem systems of locks and dams. While not as dramatic a rise as on the IWW, the hours of outage are on the same order of magnitude as the UMR – a continued concern heading into the future. The Federal budget request for FY 2012 for maintaining channel and infrastructure on the Ohio River totaled $45.6 million.

Figure 8-7: Mechanical-Related Closures, Ohio River



U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

8.3.3. Assessment of Ability to Handle Future Traffic

An evaluation of the problems and needs of the Ohio River is presented in the *Ohio River Mainstem Systems Study, System Investment Plan/Programmatic Environmental Statement,* dated May 2011. Analyses conducted for this report projected the condition of key lock components (such as lock gates, culvert valves, electrical systems and so forth) for each lock chamber at each site not currently authorized for replacement. This Reliability Analysis took the form of time or lock cycle dependent probabilities of failure and resulting chamber outage probabilities that showed main chamber lock outages could cause serious traffic delays and diversion of tonnage to overland modes. Otherwise, the capacity of these locks was more than enough to handle projected levels of traffic. A schedule of major lock rehabilitations and major component replacements and replacement of the small, old locks on the Upper Ohio was recommended.

The most critical needs on this river either have been addressed with the replacement of small locks at R.C. Byrd in the early 1990s and construction of a new 1200' chamber at McAlpine, or are being addressed through the construction of Olmsted Locks and Dam to replace the old wicket dam projects at LDs 52 and 53 – the busiest locks in the nation.

Ohio River locks have the ability to handle projected coal and grain exports; however, the reliability of these projects has an effect on the transportation costs in the region and therefore the competitiveness of the U.S. as a coal and, to a lesser extent, grain exporting nation.

8.4. Columbia-Snake

8.4.1. Description – Traffic, Commodities, Markets

The Columbia-Snake navigation system is located in the northwest United States, flowing from the Washington – Idaho border to the Pacific Ocean. Moving upstream from the Pacific, the Columbia River forms roughly two-thirds of the northern boundary of Oregon and the southern boundary of Washington before turning north into Washington State. At the confluence of the Snake River with the Columbia River, the navigable channel follows the Snake River eastward through Washington to its confluence with the Clearwater River at the border of Washington and Idaho. Portland, Oregon is located 112 miles upstream from the mouth; this 112 mile stretch of the Columbia (including the Lower Willamette River) is a deep draft channel with a project depth of 40'. The shallow draft system upstream of Portland is 364.5 miles in length with a minimum depth of 14'. The shallow draft system is served by eight lock and dam structures: four on the Columbia River and four on the Snake River.

8.4.2. Infrastructure

8.4.2.1. Location and Dimensions

The lock chambers measure 675' in length and 86' in width, which differs from the standard of 600' in length and 110' in width found at most projects elsewhere in the United States. Physical dimensions of the lock chambers are listed below in Table 8.7.

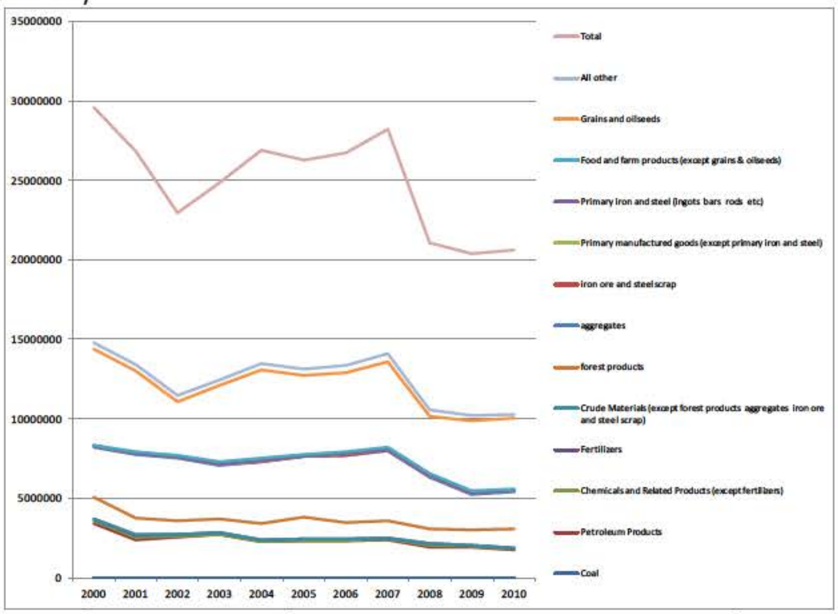
Table 8-7 Columbia-Snake Lock and Dam Locations and Dimensions

Project	River	River Mile	Miles from Mouth	Year Opened	Lock Dimensions
Bonneville	Columbia	145.3	145.3	1993	675' x 86'
The Dalles	Columbia	191.7	191.7	1957	675' x 86'
John Day	Columbia	216.5	216.5	1968	675' x 86'
McNary	Columbia	292.0	292.0	1953	675' x 86'
Ice Harbor	Snake	9.7	334.7	1962	675' x 86'
Lower Monumental	Snake	41.6	366.6	1969	675' x 86'
Little Goose	Snake	70.3	395.3	1970	675' x 86'
Lower Granite	Snake	107.5	432.5	1975	675' x 86'

8.4.2.2. Traffic Trends

The major commodity internal movement on the Columbia-Snake (barge traffic occurring within the waterway system) is the downbound shipments of grains and oilseeds for export. The second largest movement is upbound shipments of petroleum products moving to a pipeline terminal that serves Salt Lake City, Utah. Total internal traffic averaged 12.5 million short tons between 2000 and 2010, but has been on the decline (see Figure 8-8). Over the past 10 years, grains have accounted for an average 38% of total internal traffic, aggregates 28%, petroleum products 19%, and forest productions 9%. Of the tonnage that moves through the uppermost project, Lower Granite, 94% moves through the lowermost project, Bonneville, indicating that only 6% is unloaded at docks on the system between the projects. Lower Columbia terminals in Washington and Oregon handled an average of 35 million short tons of deep draft, foreign traffic between 2000 and 2010.

Figure 8-8 Domestic Tonnage by Commodity Shipped on the Columbia-Snake River 2000-2010
(in short tons)



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, Waterborne Commerce Statistics

8.4.2.3. Delays, Capacity, and Future Demands

Capacity estimated for John Day Lock and Dam is an accurate reflection of capacity at all of the Columbia Snake projects. The lower projects (McNary, The Dalles, and Bonneville) have a high degree of commonality of traffic with John Day, so 2020 traffic demand forecasts at John Day are representative of traffic expectations for those projects as well. Traffic at the other locks can be expected to be lower. Capacity is not expected to be a constraint on river traffic in the near future. Processing and delay time from 2002-2011 are shown below in Table 8-8. Delays at The Dalles and John Day Lock and Dam are skewed higher due to closures for repairs at these locks during the period of analysis.

Table 8-8 Columbia-Snake Rivers Lock Capacities and 2020 Forecasts
(in millions of short tons)

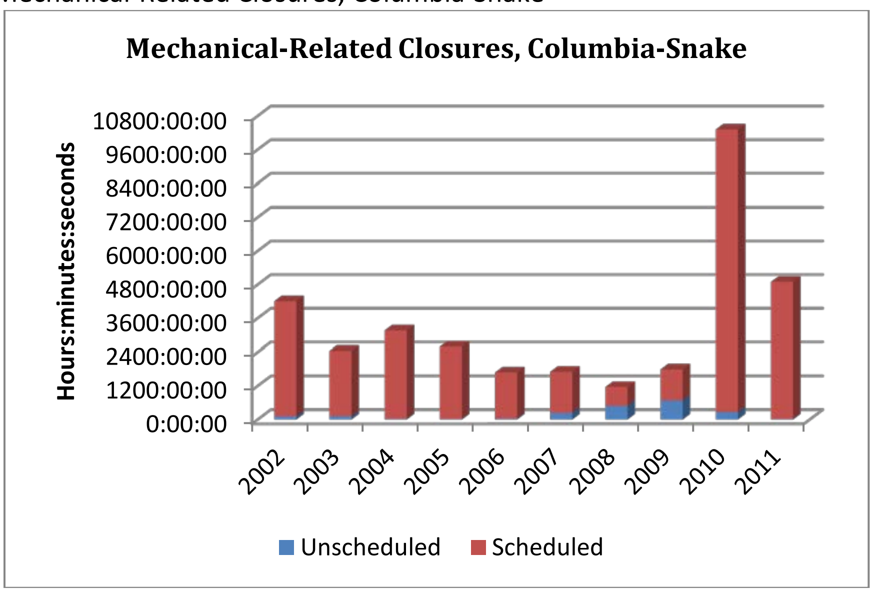
Name	2020 Traffic Demand (millions of tons)	Capacity (millions of tons)	2002-2011 Ave Minutes/ Tow	
			Processing	Delay
Bonneville L&D	n.a.	n.a.	41.25	10.75
The Dalles L&D	n.a.	n.a.	45.79	47.02
John Day L&D	8.1	57.7	51.45	53.06
McNary L&D	n.a.	n.a.	33.34	8.5
Ice Harbor L&D	n.a.	n.a.	36.38	7.76
Lower Monumental L&D	n.a.	n.a.	37.93	10.69
Little Goose L&D	n.a.	n.a.	35.41	7.23
Lower Granite L&D	n.a.	n.a.	31.51	34.72

Source: Traffic demand and capacity are taken from the *John Day Lock and Dam Major Maintenance Evaluation, Appendix E: Economic Analysis, Addendum 1, Inland Navigation Traffic and Benefits*, April 2011. Timing data is from the USACE Lock Performance Monitoring System.

8.4.2.4. Maintenance Costs, Outages, Condition, and Future Outlays

The locks and dams on the Columbia and Snake Rivers are relatively new compared to the UMR-IWW and Ohio River main stem, with the oldest lock completed in 1953. The Columbia-Snake River System is relatively less busy than the UMR-IWW and Ohio River. This along with the newer locks and dams means that there has been little unscheduled maintenance in the past decade; however, as seen in previous figures for the UMR-IWW and Ohio River, as age increases, the likelihood of unscheduled and disruptive closures also appears to increase (see Figure 8-9). This could be very problematic for the Columbia-Snake. An overwhelming percentage of its grain exports are soybeans, which are shipped at very specific times of the year. A major unscheduled closure during these times could have significant impacts on the grain trade to northeast Asia. The average operations and maintenance cost according to a sample of three of the locks was $2.8 million every year per lock, or $22.5 million. Locks at The Dalles, John Day, and Lower Monumental were closed for roughly 15 weeks in late 2010/early 2011 while $98 million in repairs to lock gates and other machinery were made.

Figure 8-9: Mechanical-Related Closures, Columbia-Snake



U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

8.4.3. Assessment of Ability to Handle Future Traffic

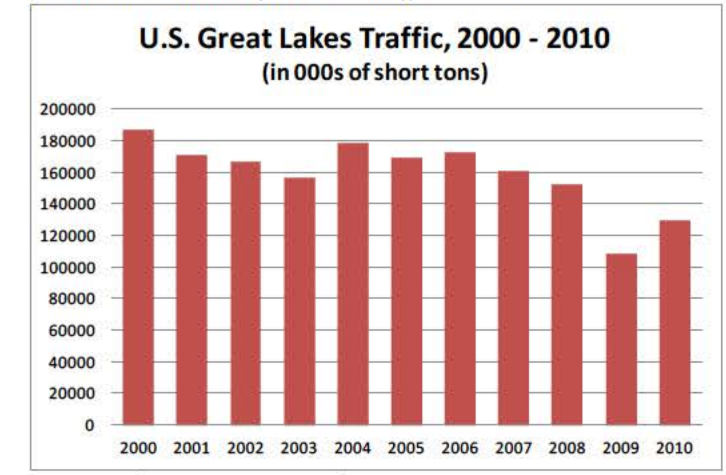
The Columbia-Snake system handles a small amount of traffic relative to the capability of the system to process traffic. Lock components that could lead to unexpected outages were addressed during the extended closure of the system in 2010/2011.

8.5. Great Lakes

8.5.1. Description – Ttraffic Trends, Commodities, and Markets

The discussion that follows covers U.S. Great Lakes traffic among U.S. ports, between U.S. and Canadian ports, and between U.S. and overseas ports. Shipments between Canada and other Canadian and overseas ports are not included in the data described. U.S. Great Lakes traffic has been gradually declining for over 20 years. This trend mirrors the performance of the U.S. steel industry, which is the foundation of much of the traffic in the region and the regional economy as well. Powder River Basin coal moving by rail to terminals on Lake Superior for loading onto lake vessels and waterborne carriage to electric power plants has added traffic in recent years. The steep traffic decline in 2009 was caused by the severe recession occurring in that year (see Figure 8-10).

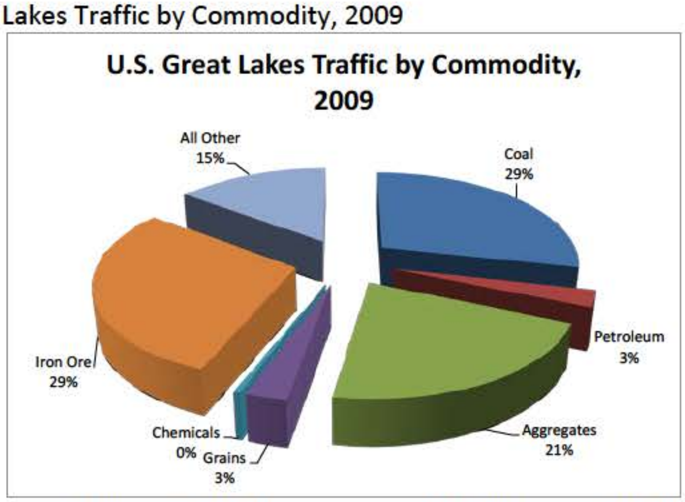
Figure 8-10: Total U.S. Great Lakes Traffic (metric tons), 2000 - 2009



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, Waterborne Commerce Statistics

Three commodities dominate U.S. traffic: iron ore, coal, and aggregates. The commodity breakdown is shown below in Figure 8-11. Iron ore off of Lake Superior originates in Minnesota and Michigan mines. Iron ore is also moved by barge and rail to Lake Erie ports for vessel shipment to the ultimate destination along with some Canadian ore coming up through the St. Lawrence Seaway and Welland Canal. Coal loaded at terminals in Lake Superior is railed from the Powder River Basin primarily to Lake Superior terminals for movement by Lake Vessel to U.S. and Canadian electric utility plants. Coal is also railed from Appalachian coal fields to Lake Erie terminals for movement by Lake Vessel to U.S. and Canadian steel mills and power plants. Aggregates include limestone flux material used in the steel making process. Most of this originates at quarries on Lake Huron.

Figure 8-11: U.S. Great Lakes Traffic by Commodity, 2009



Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics Center, Waterborne Commerce Statistics

8.5.2. Infrastructure

The U.S. locks at Sault Ste. Marie, Michigan (Soo Locks) on the St. Mary's River and the 15 locks of the Welland Canal and St. Lawrence Seaway, respectively, provide access between Lake Superior and Lake Huron, the upper Lakes and Lake Ontario, and the Great Lakes with the Gulf of St. Lawrence and the Atlantic Ocean. They are shown below in Table 8.9.[5] Soo Locks capacity is currently limited by the relatively small number of Class X lakers with carrying capacity of roughly 60,000 tons.

Table 8-9: Great Lakes, Welland Canal, and St.Lawrence Seaway Lock Capacities and 2020 Forecasts (in millions of short tons)

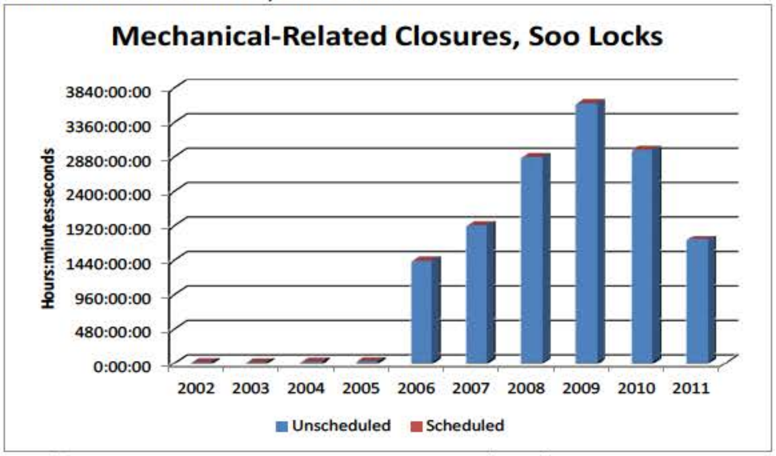
Name	2020 Traffic Demand (millions of tons)	Capacity (millions of tons)	2002-2011 Ave Minutes/Vessel	
			Processing	Delay
Soo Locks	91.8	NA	--	--
Poe	NA	NA	50.2	14.1
MacArthur	NA	NA	31.7	4.5
Welland Canal	38.2	NA	NA	NA
Lock 1	--	--	--	--
Lock 2	--	--	--	--
Lock 3	--	--	--	--
Lock 4	--	--	--	--
Lock 5	--	--	--	--
Lock 6	--	--	--	--
Lock 7	--	--	--	--
Lock 8	--	--	--	--
St. Lawrence Seaway	37.6	NA	NA	NA
St. Lambert	--	--	--	--
Cote Ste. Catherine	--	--	--	--
Beauharnois	--	--	--	--
Snell	--	--	--	--
Eisenhower	--	--	--	--
Iroquois	--	--	--	--

Source: Capacity – Great Lakes St. Lawrence Seaway Study Economics Appendix
Timing Data – USACE Lock Performance Monitoring Statistics

The locks at the Soo are aging. The Poe has been in operation for 43 years and the MacArthur Lock for 69 years. The Soo is closed to traffic during the winter, allowing maintenance to be performed during a period when repair work will not interfere with traffic. Data from the U.S. Army Corps of Engineers Lock Performance Monitoring System (LPMS) reflect the recent need for scheduled closures (see Figure 8-12). Maintenance of locks, channels and harbors was budgeted at $36.9 million for FY12.

[5] The Chicago and O'Brien locks in the Chicago area link the Illinois Waterway and Chicago Area Waterways with Lake Michigan, and the Black Rock Lock in Buffalo, New York links the New York State Barge Canal with the Niagara River and Lake Erie. Neither plays a role in the export trade.

Figure 8-12: Mechanical-Related Closures, Soo Locks



U.S. Army Corps of Engineers, Navigation Data Center, Lock Performance Monitoring System

8.5.3. Assessment of Ability to Handle Future Traffic

All Great Lakes originating traffic destined for the overseas grain market in Europe or Asia must first travel through the St. Lawrence Seaway/Welland Canal lock system. Assuming no improvement at these lock systems to accommodate post Panamax vessels in the future, the size of vessels that visit U.S. and Canadian ports for export grain shipments is limited by the maximum size vessel that can transit the Welland Canal/St. Lawrence Seaway system. The maximum vessel dimensions allowed through the St. Lawrence Seaway/Welland canal is a vessel with a 740' length, 78' beam and a 26'9" maximum draft. Although the Soo Locks can accommodate 1,000' vessels with a 105' beam, and a draft of around 28', these vessels' carrying capabilities cannot be taken advantage of since they do not fit though the Welland Canal/ St Lawrence Seaway system. Thus vessels used for Great Lakes export grain movements are not only limited by size, but also by draft. Also, vessels currently used to move export grain usually have a draft greater than 26'9" when the vessel is fully loaded with a grain shipment. Thus these vessels visit deep draft ports located at the mouth of the St. Lawrence River to load additional grain (topping off procedure) that will result in full cargo holds for the trip across the Atlantic or to Asia.

Given the above, The Panama Canal expansion will not result in post-Panamax size vessels visiting Great Lakes grain exporting ports. Consequently, no dockside port improvements to accommodate longer or deeper draft vessels are foreseen as needed as a result of the Panama Canal expansion plans. However, new post-Panamax sized vessels may affect the amount of grain shipped out of the Great Lakes. As the world demand for grain products grows in Asia (India, China) and Europe (Russia, Northern Europe, the Mediterranean, North Africa) due to population growth, the most cost effective method of moving grains will be sought. This will involve the use of new post-Panamax vessels at U.S. grain export ports on the West Coast and the Gulf of Mexico. The majority of grain exports take place through the Gulf of Mexico, specifically at New Orleans. The Panama Canal expansion should result in the use of new post-Panamax sized vessels to move grain. As grain export demand grows, more grain will flow down the Mississippi to fill these new post Panamax sized vessels. Grain would also flow to Pacific ports that can accommodate these new post-Panamax vessels. There may come a point when the Mississippi River's grain carrying capacity is reached, as well as unit train carrying capability to Pacific ports, and there is still export grain demand to be met. At this time, grain could start to flow out of the Great Lakes to satisfy this unmet grain demand. The Great Lakes grain export route can also be used if natural disasters preclude the usage of Gulf or Pacific ports.

The ability of Great Lakes grain export ports (U.S. and Canadian) to meet this new demand is relatively substantial with respect to current Great Lakes grain export levels. Current U.S. and Canadian Great Lakes grain shipments are in the 2.5 million and six million metric tons per year range. U.S. and Canadian grain exports at Duluth\Superior and Thunder Bay have been as high as nine million metric tons in 1980 and 17 million metric tons in 1983, respectively. The main challenges of again meeting these levels of exports would be the synchronization of the arrival of the grain products from the hinterland to the ports via rail and truck, the placement of the grain in port elevators for storage and sorting, and the scheduling of vessel arrivals and departures over the limited nine month navigation season on the Great Lakes. In order to move grain tonnages that would exceed historical maximum grain export levels, some port modifications would need to be made, specifically with grain storage capacity and ship loading speed capability.

The Welland Canal/ St. Lawrence Seaway system does not pose a capacity constraint problem if grain export tonnages were to increase. Current system tonnage of around 37 million metric tons per year is approximately 60% of the system's current carrying capacity. A joint U.S. Canadian report completed in 2007 (*Great Lakes St. Lawrence Seaway Study, Final Report*, Fall 2007) investigated the future maintenance needs of the system. The report provided a proactive maintenance schedule that would address U.S. and Canadian system capital improvement needs through 2050, based on an extensive condition evaluation of existing system components. This maintenance schedule will ensure the economic viability of the St Lawrence Seaway as a major waterway system that is reliable, safe and efficient.

The three main grain exporting ports on the Great Lakes - Duluth/Superior and Toledo in the U.S. and Thunder Bay in Canada - have very good road and truck connections to their grain supply hinterlands. Existing road and rail linkages and configurations should be able to handle historical maximum grain movements of 26 million metric tons.

In addition, the Port of Toledo is positioned to take advantage of any grain movements that may take place by containerization. Midwest Terminals, Toledo's bulk material facilities, recently added two new heavy lift cranes ($10.8m), a new hydraulic material handler ($4.0m), and a new dry bulk conveyor loading system ($.4m), and also made $6.4 million in rail improvements at their bulk terminal facility. The rail improvements included a new on-dock rail loop for 100 plus car trains, which will allow unit trains to be staged and built on site. Toledo has direct rail access to the newly upgraded ($59 million) Columbus, Ohio container rail terminal. This terminal has direct access to the new CSX intermodal container hub ($175 million) built just west of North Baltimore, Ohio. The 500 acre facility will be able to handle 28-30 unit trains per day and is expected to handle two million containers per year. Toledo's port improvements in rail connections, heavy lift equipment, and access to regional rail container facilities, as well as existing rail connections from all grain export elevators, will allow Toledo to take part in any future movements of grain by containerization.

The Port of Chicago is also well positioned to take part in future containerization movements of grain due to its location at a major rail hub. Facilities that would function as an intermodal interface would need to be built to either load grain into containers and then onto trains, or offload from vessel containers already filled with grain and reload them onto rail.

8.6. Other Inland Systems

While the Upper Mississippi, Illinois, Ohio, and Columbia-Snake rivers and the Great Lakes dominate inland waterway traffic, other systems perform important functions and contribute to the health of the national economy. The most prominent of these is the Gulf Intracoastal Waterway (GIWW) with 108 million short tons of traffic in 2009. GIWW traffic is dominated by the movement of petroleum and chemical products (74%) as can be seen in Table 8-10 below. Coal and crude materials (like stone, sand and gravel) account for most of the traffic on the Tennessee, Monongahela, and Kanawha rivers. MKARNS traffic is tied to the farm economy and the movement of aggregate for construction activities, while Red River moves are dominated by petroleum and chemicals (53%) and crude materials. Not displayed in the table below are the Black Warrior and Tombigbee Rivers in Alabama, and the Tennessee-Tombigbee Waterway that links the Tennessee River with the Black Warrior and Tombigbee Rivers. These two waterways carry 15.8 million short tons and 5.8 million short tons of waterborne commerce, respectively. Coal accounts for most of the traffic (69%) on the Black Warrior and Tombigbee Rivers, while forest products and aggregates (47%) account for nearly half of Tennessee Tombigbee Waterway traffic.

Table 8-10: Other Important Waterways, 2009 Traffic by Commodity
(in short tons)

	GIWW		Tennessee		Monongahela		Kanawha		MKARNS		Red	
Commodity	Tons	% of Totl	Tons	% of Totl	Tons	% of Totl	Tons	% of Totl	Tons	% of Totl	Tons	% of Totl
Coal	5,251,703	5%	17,302,078	44%	18,396,898	88%	14,428,661	78%	272,530	3%	4,719	0%
Petroleum	61,441,563	57%	1,760,462	4%	215,717	1%	926,855	5%	724,261	7%	3,706,899	37%
Chemicals	17,918,623	17%	2,771,423	7%	278,519	1%	441,251	2%	1,726,344	16%	1,576,055	16%
Crude Materials	16,596,768	15%	12,196,810	31%	1,938,053	9%	2,641,240	14%	5,071,755	47%	3,993,530	40%
Primary Manufacture	3,542,610	3%	1,597,739	4%	102,459	0%	71,738	0%	730,240	7%	262,966	3%
Food and Farm	1,339,852	1%	3,578,310	9%	3,000	0%	-	0%	2,221,751	21%	350,820	4%
All Manufactured	1,286,209	1%	14,985	0%	1,600	0%	-	0%	15,928	0%	21,205	0%
Waste Material	729,371	1%	-	0%	-	0%	-	0%	-	0%	-	0%
Unknown	-	0%	-	0%	-	0%	-	0%	-	0%	-	0%
	108,106,699		39,221,807		20,936,246		18,509,745		10,762,809		9,916,194	

Source: U.S.Army Corps of Engineers, Waterborne Commerce Statistics

All receipts and shipments from these waterways are categorized as domestic, though trade with ports like New Orleans and Mobile do allow product moved on these rivers to enter the global market. The GIWW is notable for the 83 million short tons of traffic that passes through this system (see Table 8-11). Refineries and chemical plants at major port areas, often located in harbors just off the GIWW, use this waterway to ship and receive product to other waterways throughout the Mississippi River System and Gulf Coast. With the exception of some feed exports and receipt of imported materials products, Tennessee River shippers are engaged in the domestic economy. Large quarries ship stone, and electric utility plants on this waterway receive coal by water. The Monongahela and Kanawha rivers serve coal producers, and some of their product moves to Lower Mississippi ports for eventual export. MKARNS and Red River grain products also reach the export market by water. The Black Warrior and Tombigbee Rivers, and to a lesser extent the Tennessee Tombigbee Waterway, allow coal producers in Alabama and in the Ohio River Basin to reach Mobile's export terminal, which relies on barges for around 40% of the coal eventually exported from Mobile. Shippers that use each of these waterways may well experience improved opportunities for reaching the export market as a result of improved ocean going vessel efficiencies.

Table 8-11: Other Important Waterways, 2009 Traffic by Type

All Traffic Types (Domestic & Foreign)					
Waterway	**All Traffic Directions**	**Receipts**	**Shipments**	**Intrawaterway**	**Through**
Gulf Intracoastal Waterway	108,106,699	11,591,370	11,193,730	1,470,123	83,851,476
Tennessee	39,221,807	7,884,702	15,888,765	6,229,891	9,218,449
Monongahela	20,936,246	7,189,989	7,803,753	5,942,504	0
Kanawha	18,509,745	5,021,851	11,047,962	2,186,414	253,518
McClellan-Kerr-Arkansas Waterway	10,762,809	3,263,712	4,822,023	2,551,689	125,385
Red River (J. Bennett Johnston Waterway)	9,916,194	2,731,546	331,269	0	6,853,379
Domestic					
Waterway	**All Traffic Directions**	**Receipts**	**Shipments**	**Intrawaterway**	**Through**
Gulf Intracoastal Waterway	108,106,699	11,591,370	11,193,730	1,470,123	83,851,476
Tennessee	39,221,807	7,884,702	15,888,765	6,229,891	9,218,449
Monongahela	20,936,246	7,189,989	7,803,753	5,942,504	0
Kanawha	18,509,745	5,021,851	11,047,962	2,186,414	253,518
McClellan-Kerr-Arkansas Waterway	10,762,809	3,263,712	4,822,023	2,551,689	125,385
Red River (J. Bennett Johnston Waterway)	9,916,194	2,731,546	331,269	0	6,853,379
Foreign					
Waterway	**All Traffic Directions**	**Receipts**	**Shipments**	**Intrawaterway**	**Through**
Gulf Intracoastal Waterway	0	0	0	0	0
Tennessee	0	0	0	0	0
Monongahela	0	0	0	0	0
Kanawha	0	0	0	0	0
McClellan-Kerr-Arkansas Waterway	0	0	0	0	0
Red River (J. Bennett Johnston Waterway)	0	0	0	0	0
Source: U.S.Army Corps of Engineers, Waterborne Commerce Statistics					

9. Surface Transportation System – Current and Future Performance

9.1. Introduction

The maritime aspects of trade, whether domestic or foreign, inland vessel or ocean going ship, are part of a multi-modal system for the movement of bulk commodities from point of production to point of consumption. A complete examination of the inland system's capability to accommodate future flows of traffic also needs to consider the capability of other parts of this multi-modal system. Whether truck, rail, barge, Lake Vessel or ocean freighter, each mode is dependent upon the other if the system is to operate efficiently, and when this occurs, more markets are available to producers and the Nation enjoys the benefit of the efficiencies incurred. Much of the information presented in this section relies upon the *Study of Rural Transportation Issues,* a report prepared for the U.S. Department of Agriculture and the U.S. Department of Transportation and published in 2010.

9.2. Truck

The trucking industry carries nearly three quarters of all agricultural products and is the sole mode of freight service for more than 80% of all communities in the U.S. Trucks are critical to the efficient movement of goods, often making the first and/or last move in most supply chains, including those for coal and grains. This highly competitive industry has over 691,000 companies (over half of which own one truck), keeping truck rates relatively low. Operating costs are 95% of revenue, making trucking firms' rates sensitive to increases in operating costs, whether from fuel prices or operating requirements stemming from a patchwork of local, state, and federal regulations.

The capacity of this mode is dependent upon: 1) drivers, 2) trucks, and 3) roads. The availability of drivers can, in the short run, be constrained due to the need for training and licenses. National laws dictate driver requirements, such as daily hours in service as well as licensing and identification/security requirements. Trucks are currently available in great numbers; some 3,000 trucking companies went out of business during the recession. Carrying capacities are determined by payload dimensions and highway and bridge weight restrictions. The Federal government sets weight and size restrictions on the Interstate Highway System and fixes the maximum width, while placing limits to the restrictions that states can place on highways designated as part of the National Highway Network.

Road condition, which is a function of the weight restrictions mentioned above, and congestion are also limiting factors on the mode's capacity. The U.S. Department of Transportation, Federal Highway Administration's *2006 Status of the Nation's Highways, Bridges, and Transit: Conditions & Performance,* released in March, 2007 reported that over half of Federal-aid highways are in less-than-good condition and more than a quarter of the Nation's bridges are structurally impaired or obsolete. Abandonment of rail lines has exacerbated this situation as shippers turn to trucks to move product longer distances to rail and water terminals, placing additional burden on all levels of government responsible for highway maintenance. Recovery Act funds and restoration of billions of dollars to the Highway Trust Fund have made significant progress in addressing these issues; however, serious funding issues persist.

Most observers do not report congestion as a problem for grain and coal shippers with most miles travelled occurring in rural areas, but projections vary widely on the prospects for widespread road congestion in the coming years. Again, current highway funding issues heighten these concerns. Congestion issues may become problematic for grain and coal shippers when hauling long distances to terminals near urban areas, and could pose major impediments if concurrent with lock outages should shippers decide to take alternative routes through urban areas such as St. Louis, Missouri or Cincinnati, Ohio.[6]

[6] *Analysis of the Energy, Safety, and Traffic Effects of Proposed Upper Mississippi River-Illinois Waterway System Navigation Improvements,* prepared for New Orleans District, USACE, by Gulf Engineers and Consultants, Inc. Principal Investigator: Denver Tolliver May 21, 2004 investigated the impacts of diverting forecasts levels of traffic from these two waterways. Impacts were from both rail and truck.

9.3. Rail

The most significant improvement in transportation infrastructure at this time is the expansion of the Panama Canal, scheduled for completion in 2014. Though less dramatic than expanding the Panama Canal, U.S. railroads have steadily increased investments in both road and equipment improvement projects, which can be seen in Tables 9-1 and 9-2.[7] The $9 billion invested by the railroads in 2007 was a 27% increase over what was invested in 1998. Western railroads, spurred by growth in Northeast Asia increased capital expenditures by nearly a third over this time frame, building capacity and improving performance of their land bridge between West Coast ports and production areas in the interior and consumer markets in the Midwest and East Coast. These investments allow West Coast ports to compete with Gulf Coast ports for grain (and potentially coal) export shipments out of the U.S. to Asia and improve the overall U.S. position globally in both the grain and coal export markets. Proposed coal terminal facilities on the Columbia River near Portland, Oregon and Cherry Point, Washington (each with planned annual throughput capacity of roughly 30 million tons and representing an investment in excess of $500 million) are indicators of the private sector's view of the potential that exists in the Asian coal market. Without these terminal facilities, there are no terminals with the capability of handling coal in the volumes required by Panamax or Post Panamax vessels of any kind.

Table 9-1 Eastern Railroads, Capital Expenditures
($thousands)

Road					Equipment				
Year	Communications Systems	Signals	All Other	Total Road	Locomotives	Freight Cars	Other Equipment	Total Equipment	Total Road and Equipment
1996	36,676	129,905	1,082,403	1,248,984	543,943	440,342	94,495	1,078,780	2,327,764
1997	n/a								
1998	68,687	222,361	1,519,823	1,810,871	455,660	445,287	151,879	1,052,826	2,863,697
1999	59,426	174,255	1,233,435	1,467,116	582,297	449,305	197,454	1,229,056	2,696,172
2000	47,686	247,433	1,462,579	1,757,698	341,699	510,665	70,057	922,421	2,680,119
2001	27,358	128,370	1,234,765	1,390,493	315,916	155,413	60,664	531,993	1,922,486
2002	21,390	129,610	1,215,148	1,366,148	347,068	64,910	104,593	516,571	1,882,719
2003	29,609	107,941	1,278,074	1,415,624	281,954	82,364	70,043	434,361	1,849,985
2004	36,562	134,418	1,404,123	1,575,103	599,761	140,683	97,150	837,594	2,412,697
2005	19,164	121,536	1,344,112	1,484,812	415,602	114,426	69,375	599,403	2,084,215
2006	51,224	185,661	2,286,810	2,523,695	549,468	242,070	133,369	924,907	3,448,602
2007	45,699	170,899	2,047,594	2,264,192	600,578	252,158	112,558	965,294	3,229,486

Source: AAR, Analysis of Class I Railroads

[7] As of December 2008 the estimated total cost of the Panama Canal expansion according to the Panama Canal Authority is $5.25 billion.

Table 9-2 Western Railroads, Capital Expenditures ($thousands)

Road					Equipment				
Year	Communications Systems	Signals	All Other	Total Road	Locomotives	Freight Cars	Other Equipment	Total Equipment	Total Road and Equipment
1996	88,452	197,507	2,364,380	2,650,339	718,513	202,862	201,518	1,122,893	3,773,232
1997	n/a								
1998	97,141	314,992	2,652,086	3,064,219	984,998	155,313	127,667	1,267,978	4,332,197
1999	127,343	252,658	2,598,408	2,978,409	694,738	158,678	100,976	954,392	3,932,801
2000	129,706	225,344	2,436,425	2,791,475	353,568	112,699	119,003	585,270	3,376,745
2001	98,360	269,320	2,663,233	3,030,913	291,323	77,583	112,040	480,946	3,511,859
2002	123,604	292,154	2,863,460	3,279,218	349,648	56,076	98,726	504,450	3,783,668
2003	67,685	265,792	2,812,173	3,145,650	672,205	47,262	145,796	865,263	4,010,913
2004	119,511	319,078	2,927,384	3,365,973	188,184	38,665	236,842	463,691	3,829,664
2005	97,373	364,213	3,417,501	3,879,087	155,918	82,215	188,697	426,830	4,305,917
2006	87,833	411,104	3,959,252	4,458,189	239,025	82,907	223,478	545,410	5,003,599
2007	70,006	341,386	4,268,732	4,680,124	696,980	292,538	257,859	1,247,377	5,927,501

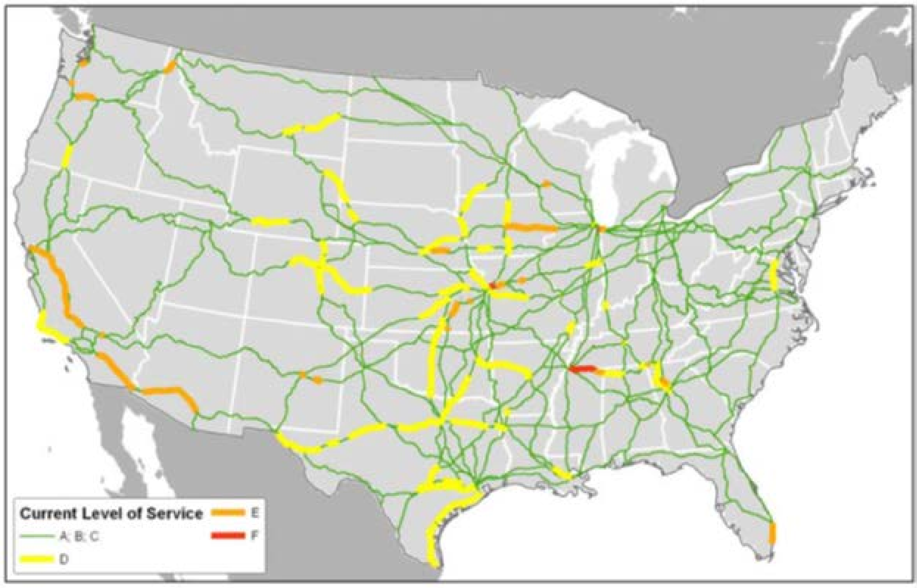
Source: AAR, Analysis of Class I Railroads

Railroad investments are made possible by the financial health of the major rail carriers. The Staggers Act of 1980 deregulated railroads and ushered in a return of profitability for the industry. Deregulation allowed the railroads to abandon low revenue lines, initiate mergers that removed redundancies, change terms of service, and initiate differential pricing for service. With the elimination of excess capacity and introduction of efficiencies like the shuttle train, railroads return on investment improved dramatically, allowing them to invest in high use, high return rail lines. Revenues rose while rates fell over the 20 years following Staggers. It was only in the early 2000s that rates began to rise as traffic grew at a pace faster than railroads could add capacity. Rates continued to increase until the recession that began in December 2007, alleviating pressure on the rail system for the time being.

Railroad service and pricing revolve around the railroads' efforts to improve speeds and efficiency, and to shift costs. They have done this by investing in access lanes to the ports (like the Alameda Corridor), in more equipment, more track, and more unit and shuttle trains, and by abandoning feeder lines. Some of the cost burdens have been shifted to the shipper. In the coal market entire trains are now owned by the shipper, while grain shippers often own the cars. Collection costs have been shifted to the coal producer and to the farmer, requiring truck haulage on rural roads to terminals that load out unit and shuttle trains. In addition to placing an additional cost burden on the producer, state and local governments need to cover the additional maintenance costs on rural highways. A similar phenomenon is occurring with the relatively new container trade for grains where farmers must travel to find empty containers and then transport them to often distant assembly points near large population centers.

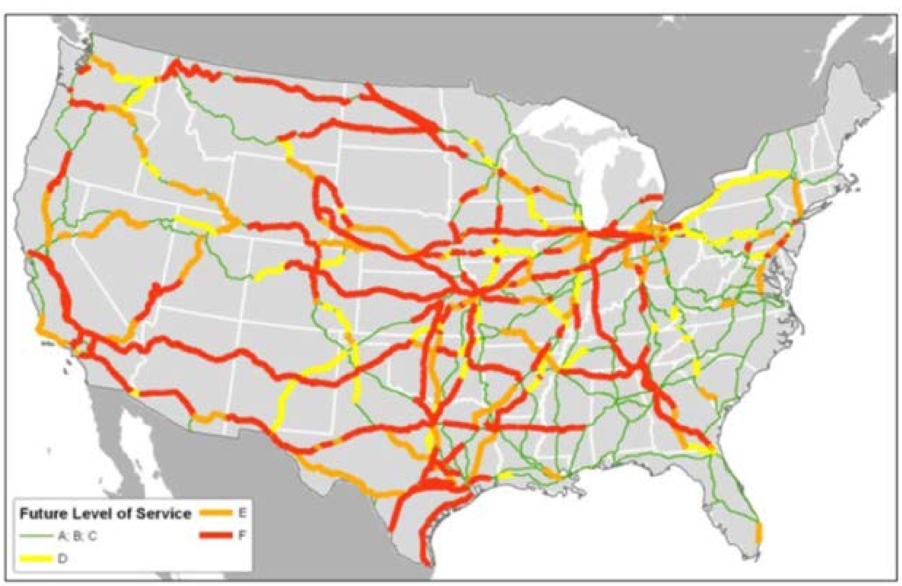
Efficiency gains allowed railroads to move 171% more traffic in 2007 than in 1980 despite having fewer miles of track. Despite efficiency gains, massive investments, and a current climate of adequate locomotives, cars and operators, capacity concerns remain. The map below (Figure 9-1) shows major rail lines and the capacity of each relative to the traffic each carried in 2007. Many lines in the grain producing area are near capacity, with a number of connecting lines at capacity and one line along the Tennessee-Mississippi border over capacity. With economic recovery and the return of higher traffic volumes, many of these near-capacity lines could become bottlenecks, particularly if the Panama Canal expansion and advent of larger ocean-going vessels encourage the movement of grains to the Gulf. Eastern railroads do not indicate widespread capacity issues with one important exception in Virginia.

Figure 9-1 Rail Performances in 2007



Source: Cambridge Systematics

Figure 9-2 Potential Rail Performances in 2035



Source: Cambridge Systematics

Some analysts project major bottlenecks throughout the system by 2035; others see rail demand easing. Nevertheless, it is apparent that periods of bottlenecks, especially for grain given the seasonal nature of its movement, are likely unavoidable and reason for concern if the U.S. is to remain a reliable supplier of grain to the world. Without rail capacity improvements, Cambridge Systematics, Inc. projected widespread rail congestion by 2035 (see Figure 9-2 above). This analysis shows that 45% of primary corridor mileage will be below capacity, 25% near or at capacity, and 30% above capacity. The analysis is dependent upon traffic forecasts and trade volumes that return to rates of growth experienced before the recession of 2008/2009. It is important to note that peak or seasonal flows are not considered.

10. Conclusion

Our inland waterway system complements a web of highways and rail lines to form a diverse freight transportation system that serves the largest and the smallest communities in the U.S. from coast to coast. This national freight network is an engineering and logistical marvel that allows goods produced far from ocean ports to consistently reach and compete in global markets. Such efficiency, however, was not achieved quickly or without cost. This extensive network requires perpetual evaluation, planning and investment; it can never be described as reaching a state of completion.

From its earliest days the U.S. has engaged in near continuous improvements in its transportation system, each generation leaving a more expansive, efficient, flexible and reliable system than any seen before. Like any other piece of infrastructure, the freight network goes largely unnoticed until it is not available. Chronic and prolonged disruptions to freight traffic are rarely observed, as each mode has had the ability to cover for the other during service outages - a key factor in the flexibility and availability of the U.S. freight network. Unfortunately, surface mode forecasts suggest that much of the flex may have left this system at a time all modes face diminished reliability. Shippers recognize that the inland waterways are a low cost method of transportation with available capacity on nearly all segments; however, the potential lack of reliability in this waterway system generates uncertain, additional costs in terms of both time and money.

There is near universal recognition that a reliable and dependable transportation network must be maintained to ensure the short and long term economic viability of producers and carriers, to the benefit of consumers on a national and global scale. With the likely expansion of world trade (particularly grains), available capacity, low transportation costs, and low environmental costs, inland waterways have the opportunity to increase their contribution to the economic health of the Nation.

The opportunity for inland waterways to enhance the Nation's export trade is most pronounced on the Upper Mississippi and Illinois rivers, where capacity appears to be sufficient as long as it is available. If the inland waterway system is to retain and even expand its role as a low cost, environmentally-preferred transportation link to coastal ports and the ocean going vessels that call at these ports, the community that has historically contributed to its efficacy – government and the private sector – will need to continue to cultivate a reliable system through ongoing evaluation, investment and oversight.[8]

A variety of recommendations for all three areas were explored in the joint industry and Corps report, *Inland Marine Transportation Systems (IMTS), Capital Projects Business Model.* The *U.S. Port and Inland Waterways Modernization: Preparing for Post-Panamax Vessels* report prepared by the Corps of Engineers Institute for Water Resources has catalogued several options for addressing funding shortfalls. Both recognize that for now the greatest challenge is securing timely funding to address the system's needs and fully realize its opportunities.

[8] Severe drought in much of the Mississippi River Basin in 2012-2013 has led to historic low-water conditions on the Mississippi, Missouri, Ohio and other major tributaries. On reaches of the Mississippi that have no lock and dam structures, numerous tow groundings have occurred. This drought event highlights another important element of reliability that was not addressed in this report. It also highlights the value of redundant and complementary transportation systems. In this case, railroads are able to assist in moving freight that would ordinarily move by water. In the case of severe winter conditions in the late 1970s that caused coal to freeze in railcars delivering coal for export through east coast ports, the waterways were able to assist by moving coal to export through lower Mississippi ports.

List of Acronyms

AAR- Association of American Railroads

ACP- Panama Canal Authority

AEO 2011- Annual Energy Outlook 2011

APAC- Agricultural Policy Advisory Committee

ATAC- Agricultural Technical Advisory Committee

BSE- Bovine Spongiform Encephalopathy

CCC- Commodity Credit Corporation

COB- Container on Barge

DOHA- Development Agenda

DOT- Department of Transportation

FMC- Federal Maritime Commission

FSMIP- Federal State Marketing Improvement Program

FTA- Free Trade Agreement

G20- Finance ministers and central bank governors from 19 large countries and the European Union

IEO2011- International Energy Outlook 2011

IMTS- Inland Marine Transportation System

IWW- Illinois Waterway

IWWTF- Inland Waterways Trust Funds

LD- Lock and Dam

NAFTA- North American Free Trade Agreement

NEI- National Export Initiative

OECD- Organization for Economic Co-operation and Development

PEC- President's Export Council

PNW- Pacific Northwest

RM- River Mile

SBA- Small Business Administration

SMEs- Small and Medium-Sized Enterprises

SPS- Sanitary and Phytosanitary Measures

TPCC- Trade Promotion Coordinating Committee

TPP- Trans-Pacific Partnership

USACE- United States Army Corps

UMR- Upper Mississippi River

UMR-IWW- Upper Mississippi River-Illinois Waterway

USDA- United States Department of Agriculture

US DOT- United States Department of Transportation

USTR- United States Trade Representative Office

VLOC- Very Large Ore Carriers

WRDA- Water Resources Development Act

WTO- World Trade Organization