U.S. WATERWAYS

A BARGE SECTOR INDUSTRIAL ORGANIZATION ANALYSIS

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U.S. WATERWAYS — BARGE SECTOR INDUSTRIAL ORGANIZATION

The information age has created new opportunities for businesses, both in the increasing market globalization and advancing technologies. The ability of industries to react to markets and to develop and adopt technologies is critical in an increasingly competitive environment. The goal of this research is to profile the barge industry as a critical element of the waterways industry. The structure, conduct, and performance will be considered as fundamental components in this assessment. Knowledge regarding barge industry structure and behavior is fundamental in discussing multimodal planning and investment strategies that integrate this capacity into the national freight logistics system.

While extensive research has been conducted on the inland waterway system, the analysis has largely focused on the demand side of the market and on the estimation of the benefits and costs of Army Corp of Engineers (ACE) waterway projects. Generally, these analyses assume largely constant returns to scale and competitive pricing on the waterways. The goal of this project is to develop a basic understanding of the organization of the waterway carrier industry in terms of the *structure, conduct and performance* paradigm of industrial organization.

This paper develops a profile of the U.S. barge industry. The analysis is largely dependent on secondary data summaries, supplemented with expert testimony. A largely qualitative discussion is presented due to data limitations. First, a description of data sources is provided followed by an analysis of freight trends. A brief description of the U.S. waterways system is developed in the next section. The structure, including carriers, products, and market interactions is included in section five. Industry conduct, including price discovery and utilization, is addressed based on limited secondary data and discussions with industry experts in section six. This is followed by performance indicators for the industry which lend insight into viability and productivity. The final section includes a summary and suggestions for future research in this area.

BACKGROUND

The inland waterway system and associated industries is a critical component of the national intermodal freight system which is crucial to sustaining and growing the U.S. economy. It accounts for over 300 billion ton-miles of freight annually, plays an important role in the global competitiveness of U.S. agricultural commodities, provides an integral link in energy production resulting in lower energy costs, and improves domestic competition within the economy by lowering overall freight transportation costs. Further, the waterway carrier industry and associated economic sectors are a significant source of employment and gross domestic product. This important element in freight movement reflects one of the longest major transportation policy initiatives in U.S. history.

In fact, water navigation was a leading factor in the formation of the colonial U.S. economic geography (Innis, 1956; Mills, 1967). Canals offered the first alternative to the slow, tedious

movement of commodities between regions by horse and wagon. Cities such as Chicago and St. Louis were borne as trade hubs where inland routes merged to ship and receive via water. Although today's inland commerce movement is less dependent on water access, waterways still remain an important resource in the U.S. economy. Waterway capacity continues to be a cost effective modal alternative for bulk product shipment of commodities such as coal and grain.

Government participation in the waterway system began in 1918 when the United States Railroad Administration initiated barge operations on various segments of the system. This action was taken to increase capacity of the nation's transport system (Howe et al., 1969). In these early years, the capacity benefits and cost differences were evident. The success and increasing sophistication of these pricing techniques is supported by research on water compelled rates (MacDonald, 1989; O'Rouke, 2002). The price of canal transport was estimated to be 40 to 70 percent lower than wagon transport during the early decades of the 19th Century (Taylor, 1951).

The structure and conduct of an industry is largely defined by competitive forces in a capitalistic market. The barge industry, as the trucking industry, is characterized by a largely nationalized infrastructure system to operate on and low barriers to entry.[1] Additionally, they all produce an undifferentiated service, for the most part, and the technological requirements are well known and understood. These parameters contribute to a high degree of intra-industry competition. Firms are rather agile, entering and exiting the market with relative ease, given open access to the waterways system.

Government price and service controls in the rail and trucking industry have somewhat insulated the barge industry from inter-industry competition until recent decades. When the rail industry was largely deregulated in the 1980s, the barge industry was introduced to a new environment. The pricing freedom allowed railroads to differentiate markets based on competitive factors. This allowed them to shift relatively more of the system's fixed costs to captive shippers, and offer more favorable price and service terms to other shippers (GAO, 1999; Wilson, 1992; Bitzan, et al., 2003). It also allowed railroads to structure prices to induce investments and shipping practices that would increase efficiency of rail operations, such as larger trains and higher capacity cars. Due to a lack of pricing transparency in the barge industry, it is not possible to assess the barge industry in a similar fashion. Therefore, limited market price information will be supplemented with anecdotal information regarding barge industry pricing practices in the proceeding discussion.

DATA SOURCES

Two primary data sources for this analysis are the annual Army Corps of Engineers Navigation Data Center (NDC) files describing vessel operators and vessel characteristics. Information is

[1]Some would argue that there are capital barriers to entry into the barge industry, however, in today's capital markets this is no longer true; e.g., witness the new entrants into the airline industry on a continuing basis.

available for 1995 through 2002. The NDC Waterborne Commerce Statistics includes annual publications regarding commodity and traffic levels on the inland waterway system. As with the vessel information, the most recent data is for 2002. The NDC data is supplemented by the U.S. Department of Transportation *National Transportation Atlas Database* which contains basic information about waterway terminals and the Commodity Flow Survey report on modal traffic levels. The U.S. Census, private industry investment analysis, and the Federal Securities and Exchange Commission business filings are also data sources in this research. Specific information regarding these sources is provided throughout the document.

U.S. FREIGHT MARKET AND MODAL TRENDS

U.S. freight ton-miles grew dramatically from 1965 to 2001, more than doubling from 1,854,034 million ton-miles to 3,757, 546 million ton-miles (Figure 1).[2] This growth is expected to continue, placing increasing demand on the transportation network (U.S. Department of Transportation, 2004a and 2004b). Policy makers and businesses, cognizant of this growth and expected continued growth, are seeking insight in managing U.S. resources to most effectively serve the increasing demand for freight transportation capacity. Managing the movement of freight on a national scale is critical to the long-term growth of the U.S. economy, participation in the global economy, and improving the trade deficit.

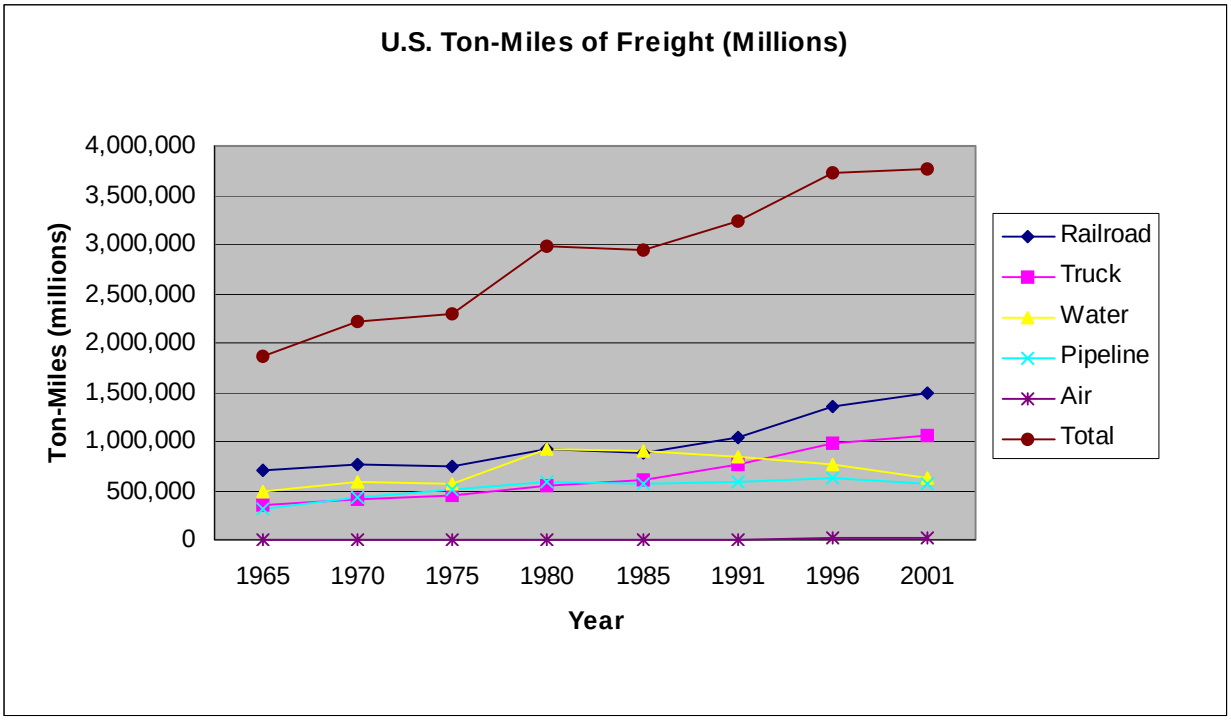

Figure 1. U.S. Freight Shipments by Mode, 1965 to 2001.

[2]Source: US Transportation Statistics 2004, Bureau of Transportation Statistics, January 2005, Table 1-46.

Waterborne freight plays an important role in providing significant capacity and service for U.S. shippers who rely on efficient and effective freight transportation to remain competitive. It accounted for 921,836 million ton-miles in 1980, nearly 31% of the total, the same as rail for the same year (Figure 2).[3] However, total freight moved by water has decreased every year since 1980, accounting for only 16.5% of total U.S. freight movement in 2001. This is in contrast to truck and rail which have both increased their share of the total freight market during this time period. Further, the absolute number of ton-miles hauled has decreased since 1980 to 621,686 million. What's more, this trend occurred during a period of growth in total freight movements in the United States in which total freight increased from 2,988,522 million ton-miles to 3,788,042 million in 2001, a 26% increase from 1980 to 2001. However, rather than drawing broad conclusions from aggregate statistics a more detailed analysis of waterborne movements may be useful in explaining part of this phenomena.

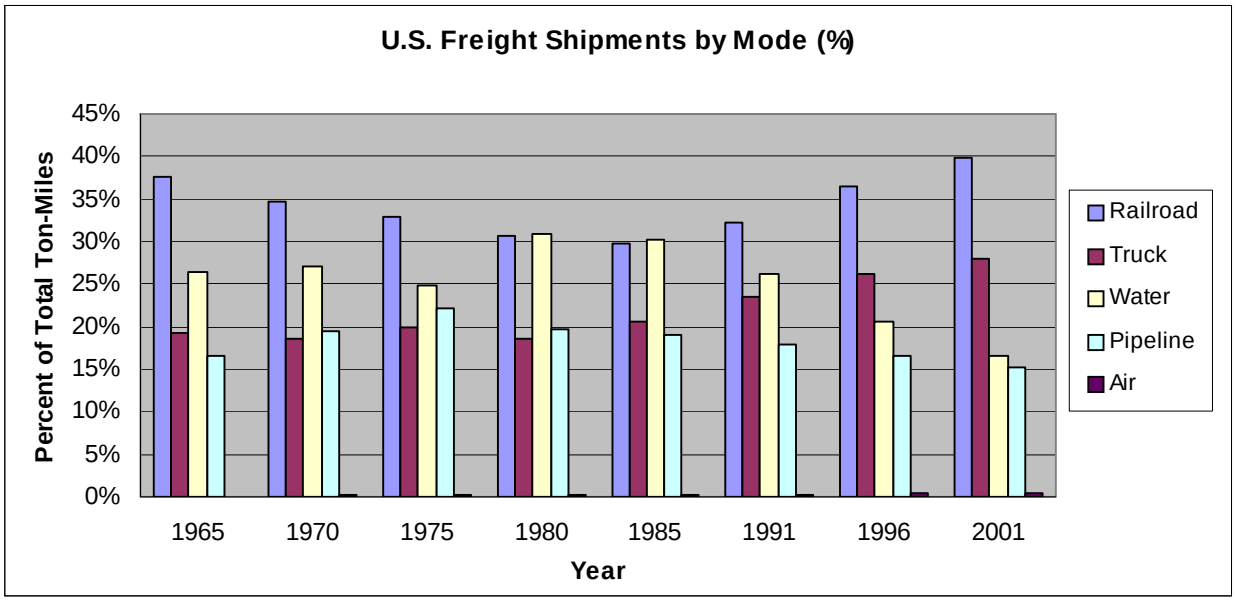

Figure 2. Modal Trends of U.S. Freight shipments as a Percent of Total, 1965 - 2001.

Waterborne freight service is confined to the navigable U.S. inland and inter-coastal waterways consisting of a limited network of about 12,000 miles, lakewise shipping, and intraport shipping. This compares to over 100,000 miles of track in the rail industry and about 5.4 million miles of roads in the truck industry. Although the waterways industry has a relatively limited spatial network among these modes, as shown earlier, it still handles a significant portion of the nation's freight movements. However, the decline in percent of market share and absolute volume of ton-miles raises intriguing questions about the future of the industry.

Among the four waterway systems, inland, inter-coastal, lake, and inter-port, a decline in inter-coastal shipping accounts for the majority of the loss, 356,590 million ton-miles (Figure 3). This amounts to a 56 % decline since 1980. Additionally, Lakewise shipping also experienced a

[3]Ibid.

significant decline since 1970, 79,416 million ton-miles to 50,584 million.[4] However, since it accounts for a much smaller part of the total ton-miles it does not appear to be as significant. None-the-less, there are probably implications that are beyond the scope of this study. Inland waterway traffic appears to have stabilized at about 300,000 million ton-miles since 1991. This would appear to be good news for the inland waterway sector of the industry until it is compared with the change in rail traffic. During this same time period rails increased their traffic from 1,038,875 million ton-miles to 1,495,472 million, a 44 % increase. Given that rail and barge are very good substitutes and compete in the same market niche, low value bulk commodities that are not very time sensitive, this should create some concern about the direction of the industry.

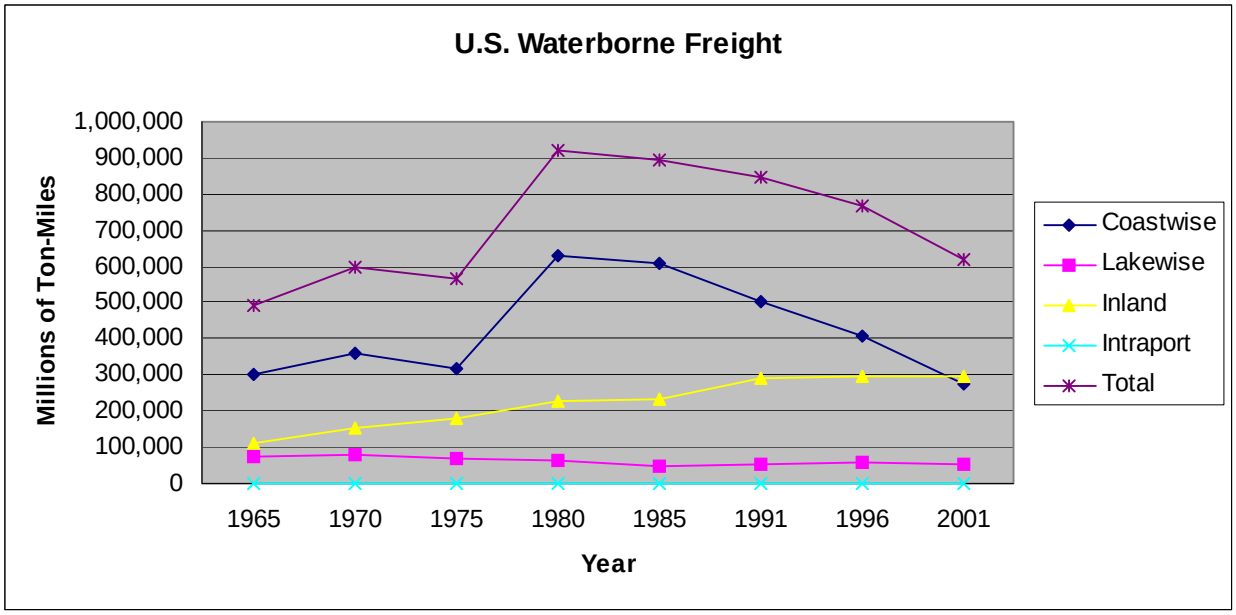

Figure 3. U.S. Waterborne Freight by Type of Waterway, 1965 - 2001.

The underlying reasons for this decline may be a result of several business trends. The U.S. economy has continually evolved from an agricultural and natural resource based economy, to a durable goods economy, and now to a global and knowledge-based economy. First, although the U.S. economy still includes durable goods, consumer goods, and agricultural product components, the growth in demand for bulk industrial transportation capacity has not increased at the same rate as the growth in demand for smaller consumer market shipments that are more conducive to truck and containers. A second point for consideration is the evolution of supply chain management as a modern business tool. This drive for efficiency has resulted in increasingly time sensitive supply chains based on practices such as JIT inventories and lean manufacturing. Another factor that has played a role is rail industry deregulation. Pricing and operating flexibility for railroads have allowed them to compete for traditional barge traffic. Regardless of the reason, or confluence of reasons, the continuing modal share decline in absolute terms and as a percentage of the total market is alarming considering the expectations for continued traffic growth in a congested U.S. market network.

[4]Op.cit., Table 1-46.

INDUSTRY ORGANIZATION

Waterborne commerce of the United States is classified into two broad categories, domestic and foreign. Foreign waterborne commerce is composed of inbound merchandise and commodities that originate in other countries for U.S. domestic consumption and outbound export movements, all by marine vessel. Domestic waterborne commerce includes all movements on the inland waterway system, intercoastal barge movements, lakewise movements and intra-port movements. Although total waterborne commerce has generally continued to increase over the last 40 years, domestic waterborne commerce has stabilized and begun to decline, as was pointed out earlier (Figure 4.). This report is focused on the domestic movements and the barge industry that serves that part of waterborne commerce. It is interesting to note that the rise in foreign waterborne commerce roughly coincides with the globalization of trade that developed in the latter part of the 20th Century.

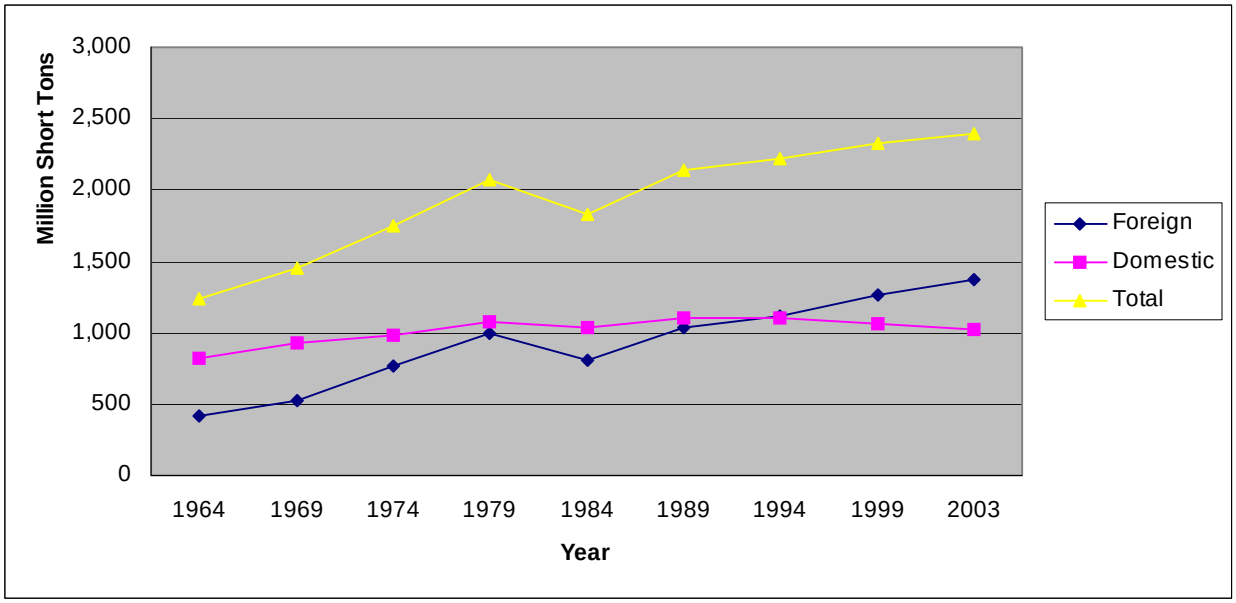

Figure 4. Total Waterborne Commerce of the United States, 1964 - 2003.

System Profile

The system profile developed in this section provides fundamental information about the waterways system. The profile is a description of the organization of the navigable waterways system's network, traffic levels, and traffic composition. These data are important in discussing the operations and market functions of U.S. waterborne firms.

Geography

The geography of the U.S. inland and intercoastal waterways network is concentrated in the eastern half of the country as illustrated in Figure 5. The NDC publications regarding this network are geographically organized around three primary water series: the Great Lakes

System, the Mississippi River System, and the Gulf Intracoastal Waterway (GIWW), and two less significant systems, in terms of freight volume, the Atlantic Intracoastal Waterway and the Pacific Coast. The Lake and Coastwise traffic accounted for about 35 % of the over 1 billion short tons of domestic waterborne traffic in 2003. The Mississippi River System accounts for 65% of the domestic traffic short tons (U.S. Army Corps of Engineers, 2004).

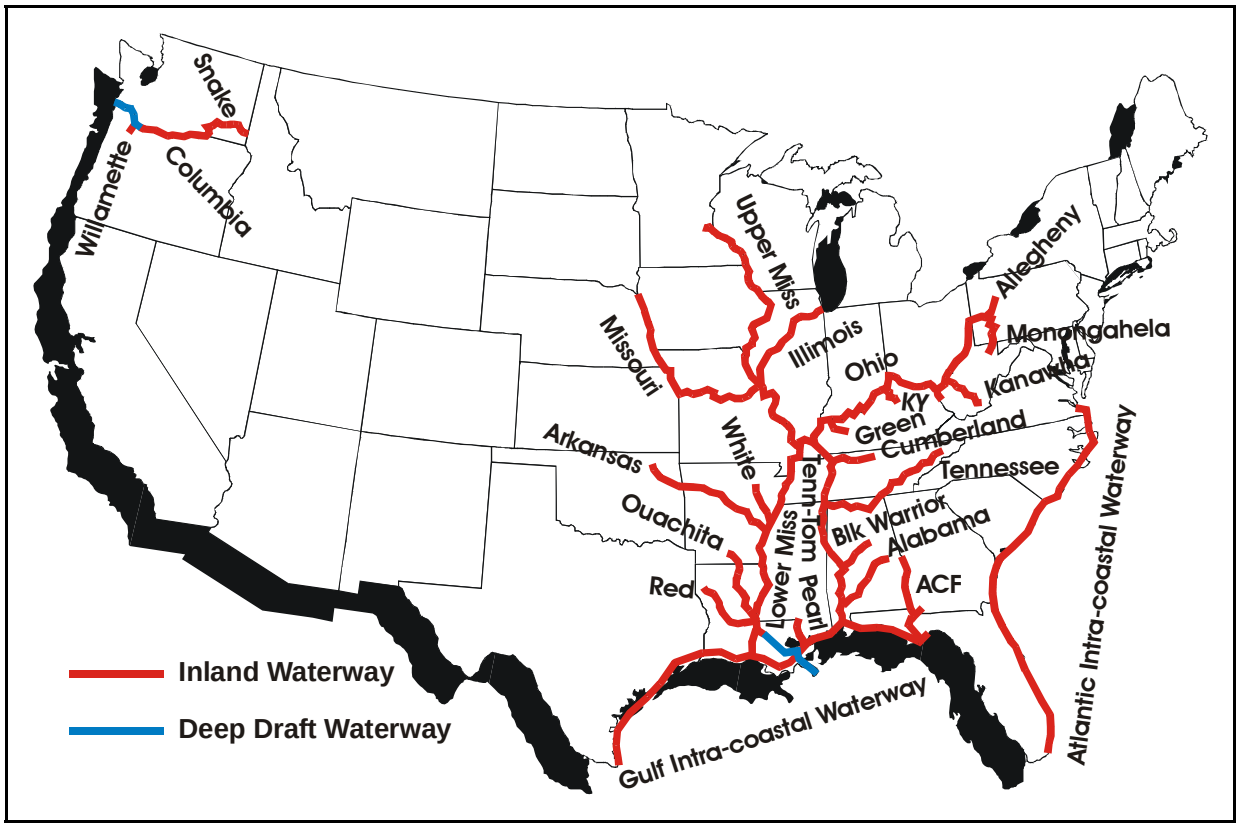

Figure 5. U.S. Inland Waterway Network

Disaggregate information is available for all waterways in the United States, as identified by the Corps. The waterways in this study consist of those that are generally referred to as the Mississippi System. This includes all those waterways that connect to the Mississippi excluding the Gulf Intercoastal system, the Atlantic Intercoastal system, and the Pacific Coast system.

The Mississippi and Pacific Coast systems account for 98 % of domestic inland waterway traffic based on 2003 traffic data (Table 1, USACE Waterborne Commerce Statistics). Among the waterways, the Mississippi River and the Ohio River account for 26% and 14% of the waterway mileage. The Tennessee River, Illinois Waterway, and Monogahela River account for 9, 5, and 4 percent of the total network miles for selected waterways. These five waterways account for 83% of the traffic and 57% of the network miles

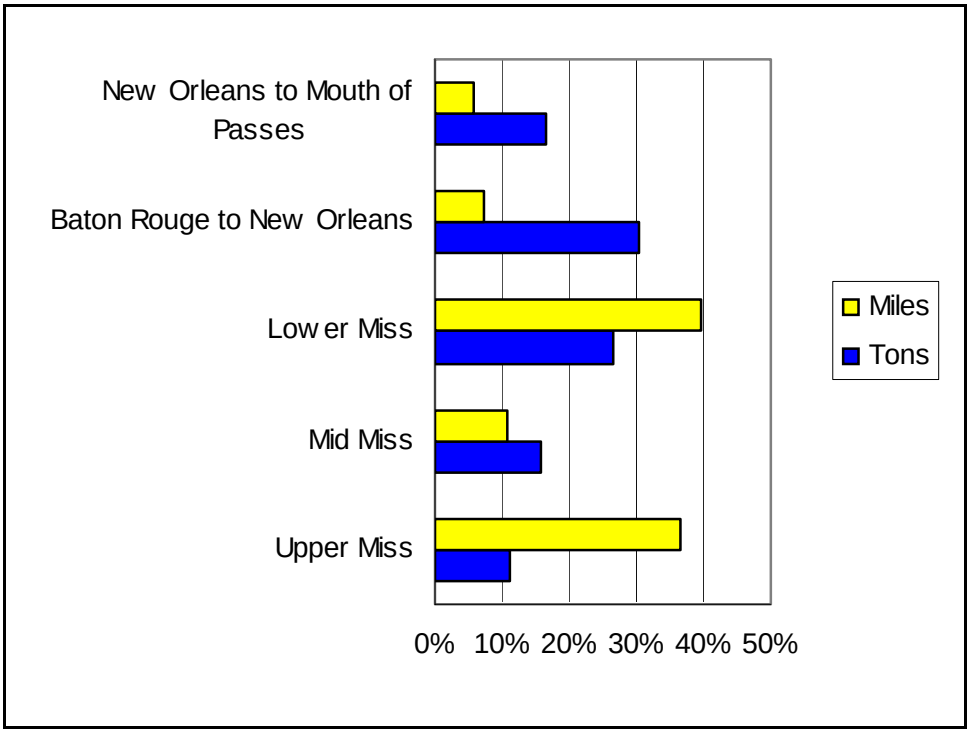

Figure 6. Traffic and Mileage Composition of the Mississippi River, 2003

Table 1. Domestic U.S. Waterborne Traffic 2003, Millions of Short Tons

Waterway	Miles	Tons	Share
Mississippi River Mpls to Mouth of Passes	1,814	308.2	38.7%
Ohio River	981	228.8	28.7%
Tennessee River	652	49.8	6.3%
Illinois Waterway	981	45.0	5.7%
Monongahela River	129	27.6	3.5%
Columbia-Snake River System	596	23.1	2.9%
Big Sandy River	27	22.6	2.8%
Cumberland River	381	20.6	2.6%
Kanawha River	91	19.4	2.4%
McClellan-Kerr Arkansas River System	462	13.0	1.6%
Atachafalaya River	121	9.8	1.2%
Missouri River	732	8.1	1.0%
Green and Barren Rivers	109	7.9	1.0%
Red River	212	4.2	0.5%
Allegheny River	72	3.3	0.4%
Ouachita and Black Rivers	332	2.2	0.3%

Source: USACE Waterborne Commerce Statistics

The mainstem of the Mississippi River itself is also considered as a composition of waterway segments. The segments are the Upper Mississippi (Minneapolis to the Mouth of the Missouri River), Mid Mississippi (Mouth of the Missouri River to the Mouth of the Ohio River), Lower Mississippi (Mouth of the Ohio River to Baton Rouge), Baton Rouge to New Orleans, and New Orleans to the Mouth of Passes. The Upper, Mid, and Lower Mississippi is served by barges.

The longest segments are the Upper and Lower Mississippi (Figure 6). These segments account for 37 and 40 percent of the miles and 11 and 26 percent of the traffic, respectively. The Upper and Mid Mississippi includes a system of 29 locks and dams designed to maintain a 9-foot shipping channel between St. Louis, Missouri, and Minneapolis, Minnesota. Lower Mississippi has a deeper draft, up to 14 feet, and has no locks.

Tows including 15 barges typically traverse the Upper and Mid Mississippi. These 1,200 foot tows require a double-locking process in which the barges are moved through the 600-foot locking system in two sections. Tows of 45 barges and greater are used in navigating the Lower Mississippi to Baton Rouge. Deep draft navigation is available beyond Baton Rouge. The trip from Minneapolis to the Gulf requires about 45 days. The trip from St. Louis to the Gulf is completed in about two weeks.

The port network along these waterways is well developed. There are well over a hundred inland waterway ports that serve shippers represented by the dots illustrated in Figure 7. The port locations are based on U.S. Department of Transportation system information. The ownership and activity levels for individual ports is beyond the scope of this project but may be considered in future research.

Traffic

The Mississippi, Ohio, Tennessee, Illinois, and Monogahela Rivers account for over 80% of the domestic U.S. waterborne traffic (Table 1). The largest volume is attributed to the Mississippi River, as it alone accounts for 38.7% of the 2003 traffic. The Ohio River also has a substantial volume at 28.7%. It is the only other river to account for more than 10% of the overall traffic volume.

Comparing the 2003 traffic levels to those of 1994, the Tennessee River is the only waterway that experienced growth. Traffic levels on the Tennessee River increased 1.1% from 48.7 million to 49.8 million short tons. The largest percentage decline in traffic was for the Monongahela River, where traffic levels declined by over one-third compared to the 1994 levels. The largest volume decrease was on the Ohio River which experienced a 38.2 short ton decline in traffic (Figure 8).

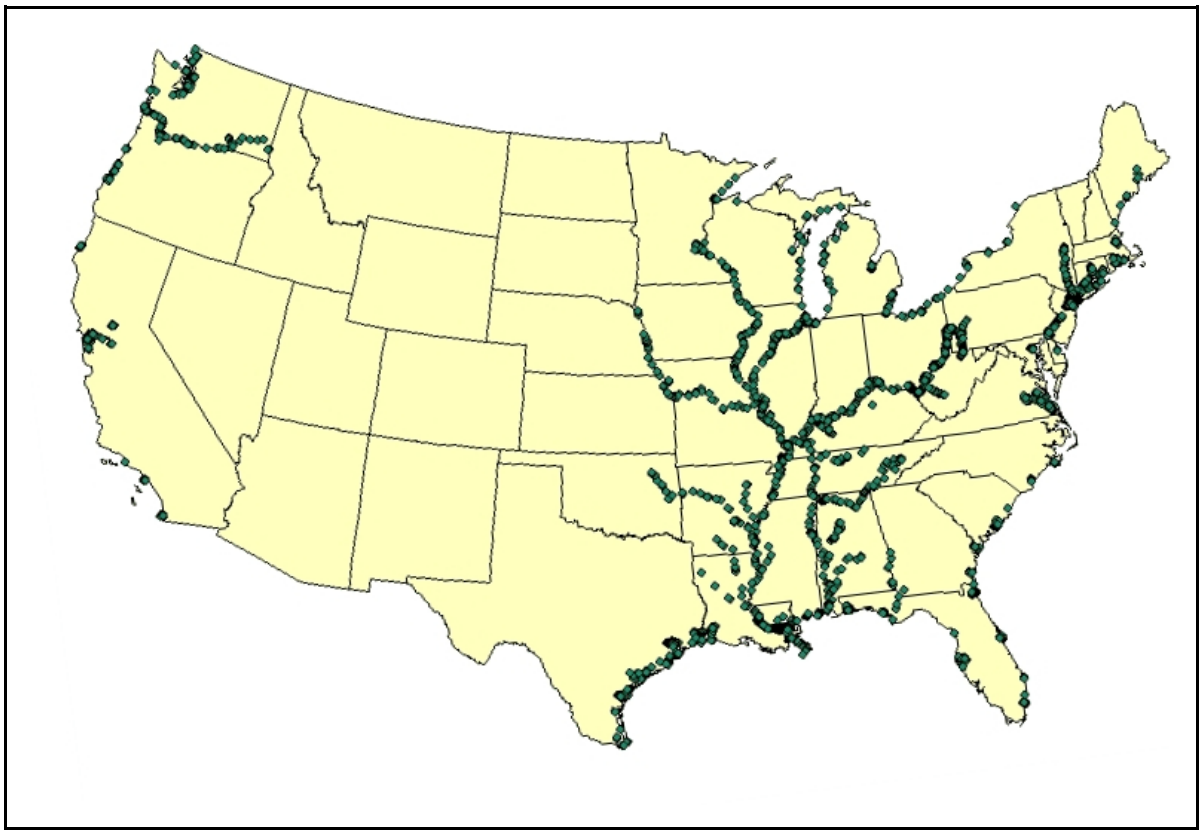

Figure 8. Inland and Intracoastal Waterway Port Locations.

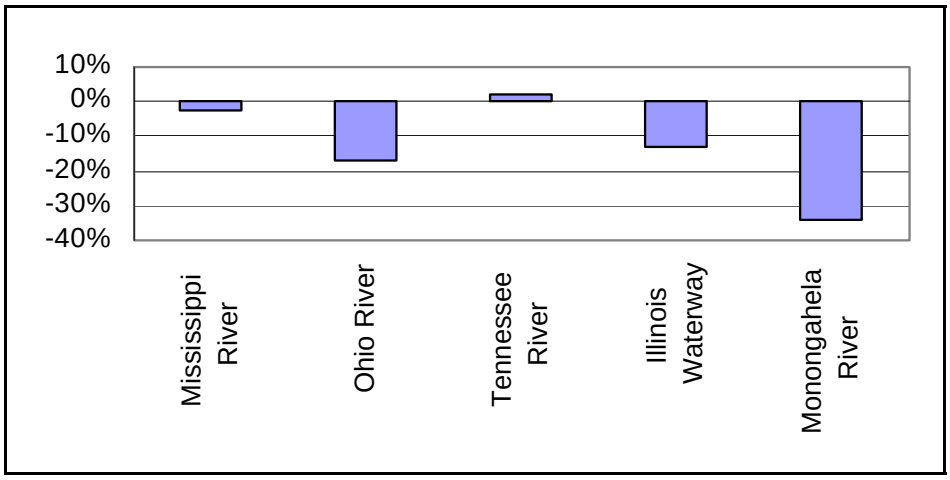

Figure 7. Traffic Change on the Five Top Volume Waterways between 1994 and 2003

Commodities

Traffic on U.S. inland and intercoastal traffic lanes is lead by the petroleum industry, as these goods account for 36% of 2003 waterborne volumes (Figure 9). Coal/coke and sand/gravel/stone aggregates form the next largest commodity groups, representing 21% and 13% of the 2003 waterborne volume. Food/farm and chemical products represent 9% and 7% of the total volume, respectively.

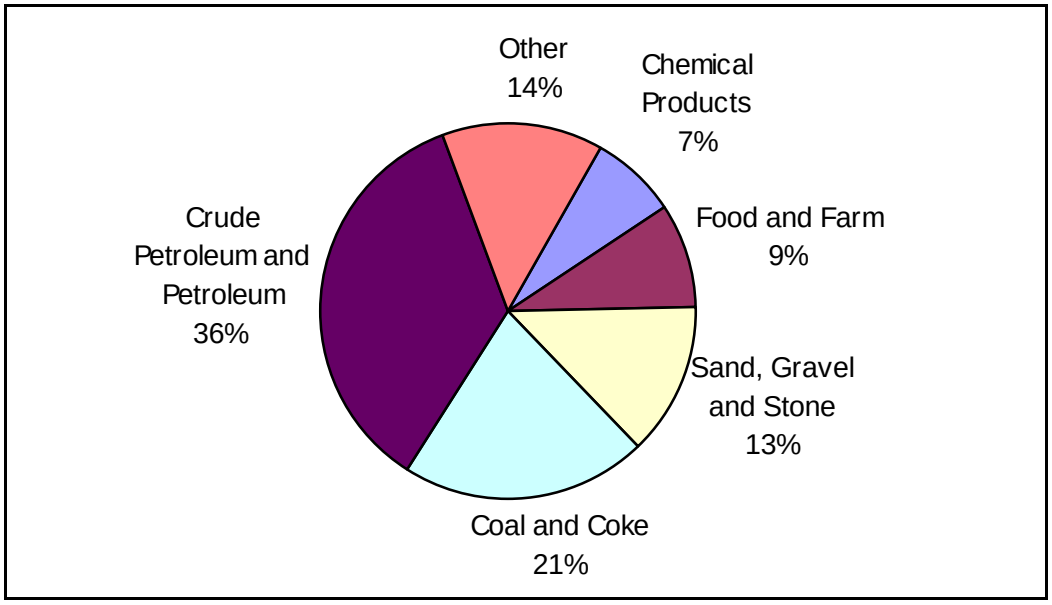

Figure 9. Total U.S. Waterways Traffic by Commodity, 2003

U.S. inland waterway traffic is dominated by bulky, natural resource-based energy inputs. Coal and coal coke products account for 28% of total tonnage. Combined crude petroleum and petroleum, which attribute 25% of the total waterway traffic. These two commodities account for over half the total waterway volume (Figure 10). Food/farm and chemical product mixes each attribute 14% of traffic volumes, and chemical products about eight percent of the commodities total. Iron ore, manufactured equipment, and manufactured goods accounting for five, four, and two percent, respectively, complete the list of goods attributing over one percent of overall traffic levels.

The traffic mix on the internal waterway system is dominated by a mix of coal and coke products and petroleum shipments. These shipments account for 28% and 25% of all shipments on this portion of the waterway system. The food and farm product are more important to the internal waterway commodity mix. The farm products and the aggregates, which include sand, gravel, and stone, each account for 14% of the traffic on the internal waterways system.

The traffic mix varies across waterways, both in commodity mix and in the downstream-upstream commodity mix and traffic balance. Total traffic on the Mississippi River declined about two percent in 2003, compared to levels experienced 10 years earlier. The Mississippi

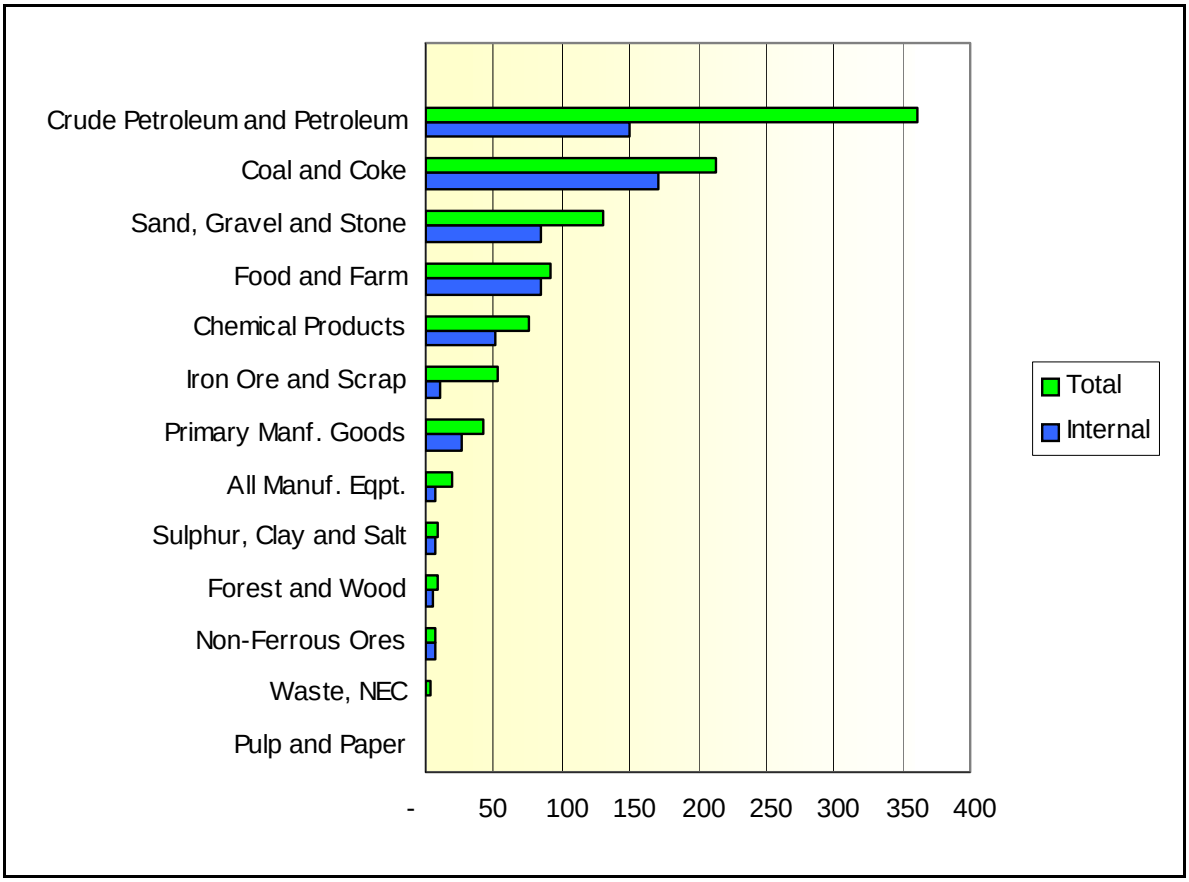

Figure 10. U.S. Internal Waterways Traffic, Short Tons in 2003

River traffic is dominated by the petroleum and food/farm products (Table 2). These commodities accounted for 52% of the traffic in 2003. The crude materials increase in importance, along with the petroleum and food/farm, with a reduction in the share coal traffic represents in the overall 2003 traffic mix compared to 1994.

The Ohio River is a primary corridor in the coal transport network. Traffic levels declined about three percent on this waterway in 2003, compared to 1995. Coal accounted for 57% and 52% of the traffic on the Ohio River in 1994 and 2003, respectively. Crude materials comprise the other notable commodity group, attributing 20% and 25% of the 1994 and 2003 traffic, respectively.

Among the other three large volume waterways, the Tennessee and Illinois Rivers have the more diverse commodity mix. The Tennessee River traffic includes coal and crude materials which account for 38% and 34% of the waterway's traffic. Food/farm products form the largest traffic segment on the Illinois River, accounting for about 40% of the total volume in 2003. Petroleum products, crude materials, and chemicals each attribute at least 10% of the Illinois River traffic. The Monogahela River, which is fifth in volume among the waterways, has the least diverse commodity mix as coal accounts for 88% of the volume in both 1994 and 2003. The commodity

mix is important in discussing the potential impact policy and change that may be induced by the derived demand of other industries forming this traffic mix among the waterways.

Table 2. Commodity Mix on Largest Volume Waterways

Waterway	All Short Tons	Coal	Petroleum and Petroleum Products	Chemi-cals	Crude Materials	Manufac-tured Goods	Food and Farm	Other
Mississippi River								
1994	314.6	17%	23%	13%	16%	6%	23%	0%
2003	307.4	13%	26%	12%	17%	6%	26%	0%
Ohio River								
1994	236.7	57%	8%	0%	20%	5%	7%	4%
2003	228.3	52%	7%	0%	25%	5%	6%	4%
Tennessee River								
1994	48.7	42%	0%	0%	32%	4%	10%	11%
2003	49.8	38%	0%	0%	34%	6%	10%	13%
Illinois Waterway								
1994	50.9	17%	12%	10%	14%	9%	37%	0%
2003	45.0	9%	14%	10%	17%	10%	40%	0%
Monongahela River								
1994	36.9	88%	4%	0%	7%	0%	0%	2%
2003	27.6	88%	1%	0%	8%	0%	0%	3%

Source: USACE Waterborne Commerce Statistics

Information on upstream and downstream flows during 2003 provides insight into relative efficiency in utilizing capacity, and the products creating the traffic balance, or imbalance, on the waterways (Table 3). The downstream movement volume on the Mississippi River is 67% larger than the upstream movement. The Tennessee River also has a substantial imbalance in traffic, with upstream traffic accounting for 78 % of total traffic, outweighing downstream traffic by 254%. The Ohio, Illinois, and Monongahela Rivers have relatively balanced volumes of up and down stream traffic.

Structure

Public and Private Market Participation

Public institutions are primarily involved in managing the waterways infrastructure and access. Private agents enter the market through investments in floating stock, resource management, and operational functions. This is similar to the trucking industry. The public owns and operates the waterways and the structures necessary to create pools and allow for locking through the system.

This is similar to the publicly owned and maintained highway and road system. Further, the use of the system is not limited to a particular carrier. Government does not franchise the right to operate on either system but allows firms to physically enter and exit the system based on the market signals.

Table 3. Up and Down Stream Traffic Flows for 2003, by Waterway

Waterway	All Short Tons	Coal	Petroleum and Petrolem Products	Chemi-cals	Crude Materials	Manufac-tured Goods	Food and Farm	Other	Share*
Mississippi River									
Down	192.1	10%	14%	4%	8%	0%	25%	3%	62%
Up	115.3	3%	12%	9%	9%	4%	0%	1%	38%
Ohio River									
Down	114.9	27%	0%	0%	13%	0%	5%	5%	50%
Up	113.4	25%	4%	0%	11%	0%	0%	9%	50%
Tennessee River									
Down	11.0	1%	0%	0%	14%	0%	2%	4%	22%
Up	38.9	37%	0%	0%	20%	4%	7%	10%	78%
Illinois Waterway									
Down	24.5	0%	7%	0%	0%	0%	39%	8%	54%
Up	20.5	8%	7%	8%	14%	0%	0%	8%	46%
Monongahela River									
Down	13.1	43%	0%	0%	3%	0%	0%	1%	47%
Up	14.5	45%	1%	0%	5%	0%	0%	2%	53%

Source: USACE Waterborne Commerce Statistics

Carriers that use these systems are similar to the trucking industry in several respects as well. Entry is fairly easy in many respects. Capital is not a barrier, nor is technology or the availability of the necessary knowledge and human capital. Additionally, the markets for carriage are easily accessible in both the trucking and barge industries. What's more, a few large firms account for a significant portion of th capacity in both cases which are continually threatened by a large number of small fringe competitors. Further, the services they both offer are largely indistinguishable and thus does not allow an individual firm garner significant market power. This results in a very competitive pricing environment in which margins are generally quite thin.

Suppliers

The number of vessel operators increased from 1,821 in 1995 to 1,896 in 2002. The number of carriers increased in both the Mississippi River and Atlantic Coast series (Table 4). The Atlantic water series included 603 carriers, the Mississippi and GIWW included 894 carriers, and the

Great Lakes series 81 carriers with reported capacity in the 2002 shipping year. The number of carriers increased by 4% between 1995 and 2002.

Table 4. Vessel Operator Numbers with Reported Capacity by Series, 1995 and 2002

Series	Vessel Operators	
	1995	2002
Great Lakes	85	81
Mississippi River and GIWW	839	894
Atlantic, Gulf, and Pacific Coasts	557	603
No Capacity Reported	340	318
Total	1,821	1,896

Source: USACE, NDC, Vessel Data Series

These carriers operated a total of 66.8 million tons of vessel capacity in 1995. Total capacity increased by 3% between 1995 and 2002. The capacity increase is attributed solely to the Mississippi River and GIWW Waterways series (Figure 11). Vessel capacity on the Mississippi

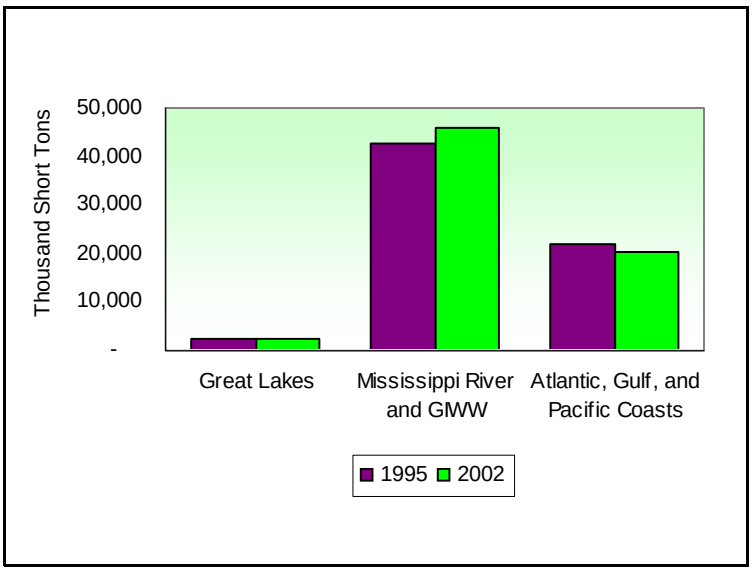

Figure 11. Total Vessel Capacity in 1995 and 2002, by Waterway Series

and GIWW accounted for about two-thirds of the total U.S. waterways in 2002. The Atlantic, Gulf, and Pacific Coast vessels comprised about 30 percent of the total vessel capacity, and the Great Lakes the remaining 3 percent.

Overall composition of the U.S. waterways floating stock in 1995 and 2002 is presented in Figure 12. The covered dry cargo barges are the largest vessel group, based on capacity, in both

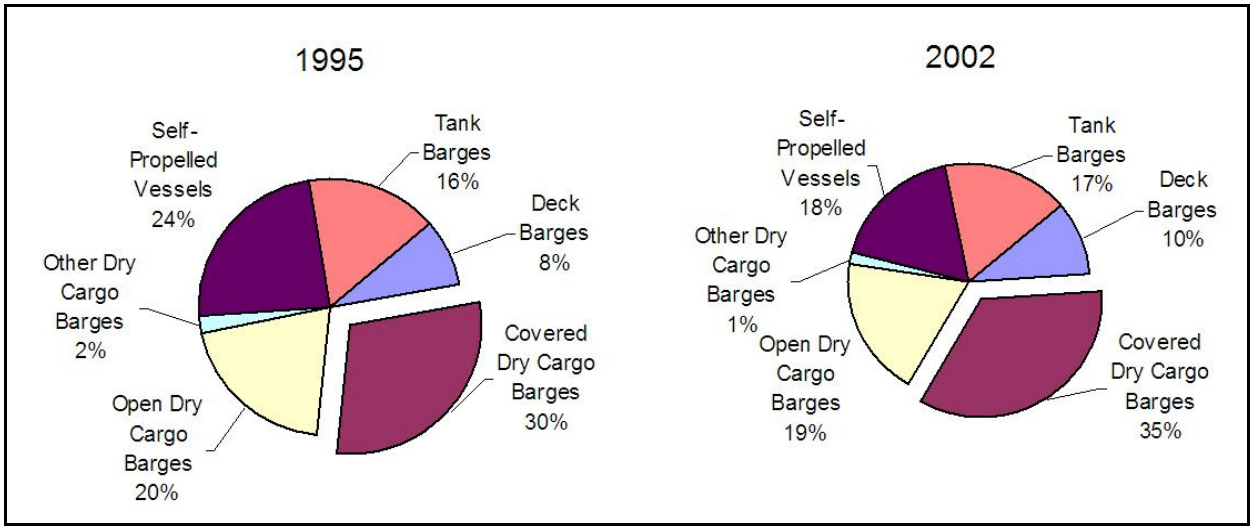

Figure 12. Total U.S. Waterways Floating Stock Capacity in 1995 and 2002, by Vessel Group

years. The covered dry cargo barge vessel capacity increased by 22% between 1995 and 2002. Tank and deck barge vessel capacity has also increased, with tank vessel capacity rising 9 percent and deck barge 23% in 2002 compared to 1995. The tank vessels represent 17% of the U.S. vessel capacity in 2002 and deck barges 10%. The Open Dry Cargo Barges, Other Dry Cargo Barges, and Self-Propelled vessel groups experienced capacity contraction levels of 3%, 34%, and 23%, respectively, in 2002 compared to 1995. These overall capacity trends offer insight regarding investment and expectations for future waterways traffic opportunities.

The time line of investment in new capacity among the vessel groups, for vessels still in service in 1995 or later, is illustrated in Figure 13. As vessel life is typically expected to be 30 years or more, this inventory should be largely representative of new capacity in the U.S. waterways

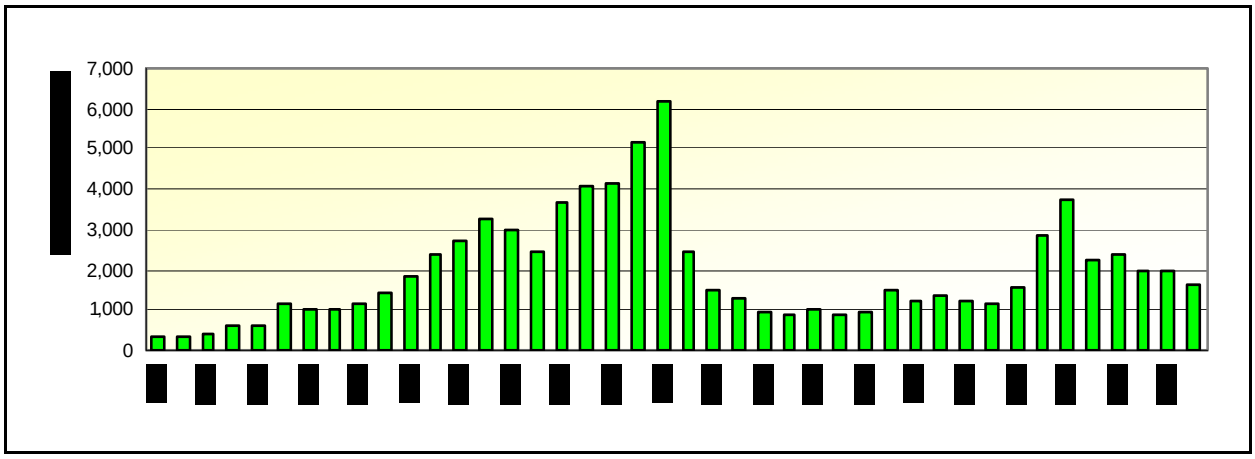

Figure 13. U.S. Waterways Floating Stock Investment, Annual New Capacity, 1961-2002.

fleet. Waterways investment steadily increased between 1961 and 1981. A sharp decline in investment is evident in the 1980s and through the first half of the following decade. Capacity gains during more recent years have increased, but remain well below peak levels.

Peaks in the largest vessel group, covered dry cargo barges, are evident in the early 1980s and late 1990s. Self-propelled vessel investment rose into the late 1970s. The open dry cargo barges peak in the early 1980s and again in the mid 1990s (Figure 14).

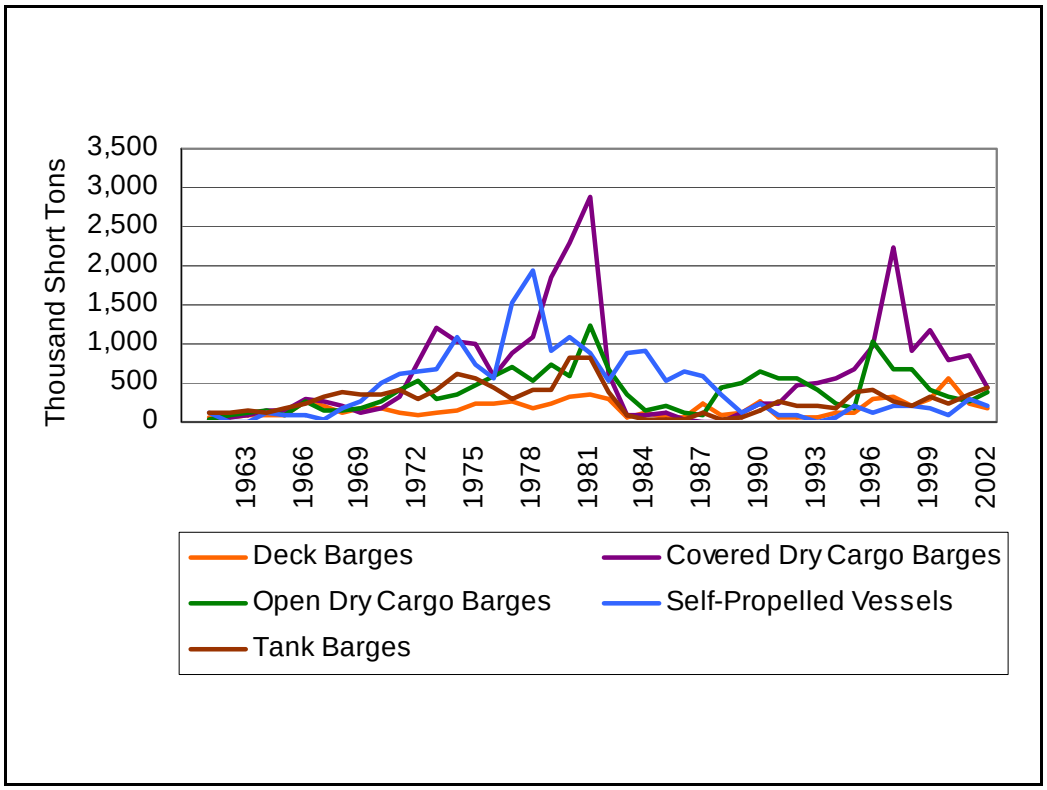

Figure 14. Floating Stock Investment by Vessel Group, 1963 to 2002

The increase in vessel capacity between 1995 and 2002 is attributed to solely to Mississippi River and GIWW. The vessel capacity adjustments between 1995 and 2002 varies across the waterways systems and vessel groups. The Mississippi River and GIWW vessel capacity is specifically effected by a large investment in covered dry cargo barge capacity (Table 5). The covered dry cargo barge capacity accounts for the largest share among vessel groups on the Mississippi and GIWW, representing 47 percent of the capacity in 2002. Open dry cargo barges are second among vessel groups operating on the Mississippi River and GIWW, with 11.8 million short-tons, accounting for about 26 percent of the series fleet capacity. Tank and deck barges account for 17% and 8% of the series fleet capacity.

Table 5. Series Vessel Number and Capacity, 1995 and 2002

Series Vessel Group	1995 Count	1995 Capacity	2002 Count	2002 Capacity	Change in Capacity
Great Lakes					
Deck Barges	160	174,669	98	90,586	-48%
Covered Dry Cargo Barges	7	118,635	57	253,548	114%
Open Dry Cargo Barges	51	73,296	40	69,424	-5%
Other Dry Cargo Barges	7	6,091	5	211	-97%
Self-Propelled Vessels	237	2,079,806	233	1,943,635	-7%
Tank Barges	38	77,162	8	23,182	-70%
Mississippi and GIWW					
Deck Barges	3,054	3,258,422	3,129	3,844,567	18%
Covered Dry Cargo Barges	11,433	18,487,891	13,224	22,048,334	19%
Open Dry Cargo Barges	8,647	12,696,429	7,791	11,787,260	-7%
Other Dry Cargo Barges	804	426,191	386	156,489	-63%
Self-Propelled Vessels	1,473	545,616	1,263	257,484	-53%
Tank Barges	3,182	7,138,425	3,416	7,854,351	10%
Atlantic, Gulf, and Pacific Coasts					
Covered Dry Cargo Barges	194	843,117	268	1,471,381	75%
Open Dry Cargo Barges	538	918,518	762	1,400,687	52%
Other Dry Cargo Barges	1,140	936,098	641	751,684	-20%
Self-Propelled Vessels	1,444	13,177,931	1,945	9,933,061	-25%
Tank Barges	664	3,752,332	644	4,048,330	8%

Source: USACE,NDC, Vessel Data Series

Capacity on the Atlantic, Gulf, and Pacific Coasts series is dominated by self-propelled vessels, as they account for 48% of the capacity in 2002 (Table 5). The 2002 capacity does, however, represent a 25% decline in capacity for the self-propelled vessel group compared to 1995. The largest increase among vessel groups is the 795,000 short-ton increase in deck vessels. The deck vessel capacity is third among the group volumes at 14% in 2002. Tank barge capacity, which increased by 296,000 short tons between 1995 and 2002, represents about one-fifth of the vessel capacity in this waterway series.

The Great Lakes experienced decline in each vessel series between 1995 and 2002, with the exception of covered dry cargo barges. The Great Lakes series is primarily comprised of self-propelled vessels, which accounts for 82% of total vessel short-tons on this series in 2002.

While the number of firms involved in the floating stock investment decisions has increased, the consolidation of floating stock into larger fleets is evident in an assessment of vessel capacity ownership. Increased concentration is identified in the market share information detailed in Table 6. In 1995, the top five firms accounted for 28% of total waterway freight floating stock

capacity. The top five firms accounted for 32 % seven years later. A merger between Ingram Barge Company and Midland Enterprises Inc. is a primary source of this increased concentration.

Table 6. Market Shares of Freight Floating Stock[1], Top Ten Firms in 1995 and 2002

Company	1995 (1,000 Short Tons)	Market[2] Share		Company	2002 (1,000 Short Tons)	Market[2] Share	
American Commercial Lines LLC	7,224	10%		American Commercial Line LLC	6,951	10%	
Midland Enterprises Inc.	3,731	5%		Ingram Barge Co.	6,821	10%	
American River Transportation	3,654	5%		American River Transportation	3,656	5%	
Ingram Barge Co.	3,146	5%		AEP Memco LLC	2,535	4%	
Memco Barge Line Inc.	1,749	3%	28%	Kirby Inland Marine LP	2,129	3%	32%
Alaska Tanker Company LLC	1,373	2%		Alaska Tanker Company LLC	1,373	2%	
McDonough Marine Service	1,337	2%		SeaRiver Maritime Inc.	1,294	2%	
Polar Tankers Inc.	1,243	2%		Crounse Corporation	1,208	2%	
Seariver Maritime Inc.	1,180	2%		Cargill Marine & Terminal Inc.	1,187	2%	
Cargill Marine & Terminal Inc.	1,173	2%	37%	Polar Tankers Inc.	1,049	2%	41%

[1]Freight Stock does not include tow boats or vessels with passengers designated as primary cargo.
[2]Market Share: the left column indicates individual company market share, the right column includes market share totals for the top five and ten companies.
Source: USACE, NDC.

Although the concentration has increased over recent years, a 2002 Herfindahl-Hirschman(HH) index of .03 suggests relatively low levels of industry concentration based on overall ownership of the waterway freight floating stock. The HH index is calculated as a summation of the squared values of individual barge company capacity share, including all waterways,

$$\text{HH} = \sum_{i=1}^{n} \left(S_i^2 \right)$$

where share of barge company *i* in total freight floating stock, *S*, measured in short tons. The index ranges from zero to one, with index values of zero implying perfect competition and an index value of one indicating a monopoly.

In an inter-industry comparison, the top five Class I rail industry firms accounted for 87% of Class I traffic in 1997 and 97% in 2002. The Herfindahl index for the Class I rail industry was 0.24 in 1997 and 0.27 in 2002. The Class I railroads account for approximately 70 percent of all U.S. rail ton-miles (Bitzan, et al., 2003).

The industry also includes barge fleeting facilities. These facilities provide a parking lot type service for carriers and shippers, allowing for some flexibility in the system through floating stock storage. In 2000, 22 barge fleeting firms operated on the Illinois Waterway and seven in the St. Louis Harbor (Commodity Futures Trading Commission, 2000).

Although some floating stock can be utilized on more than one river series, the vessels are typically best suited to a single series. Vessels are moved among the internal rivers with limitations in the loaded draft requirements. Information regarding the largest volume vessel operators in each waterway series listed in Table 7. The Herfindahl Index increased for each of the series between 1995 and 2002. The Mississippi River and GIWW increased from 0.04 to 0.06. The Great Lakes series continued to exhibit the most concentration among carriers, with a Herfindahl index of 0.11 in 1995 and 0.13 in 2002. The Atlantic and Coastal Series is characterized by the least concentration of vessel capacity at 0.01 in 1995 and 0.02 in 2002.

Mississippi River System and the Gulf Intracoastal Waterway Profile

This section provides additional detail regarding the profile of the Mississippi River System and the Gulf Intracoastal waterways, the primary inland and largest volume U.S. waterway series. As the information becomes more disaggregated, the characteristics of the system are revealed. The covered dry cargo barges and open dry cargo barges, which account for 54% of the U.S. vessel fleet, comprise 74% of the Mississippi and GIWW series fleet (Figure 15). Self-propelled vessels are less important as 1% of the Mississippi and GIWW fleet, compared to 18% for the entire U.S. vessel fleet.

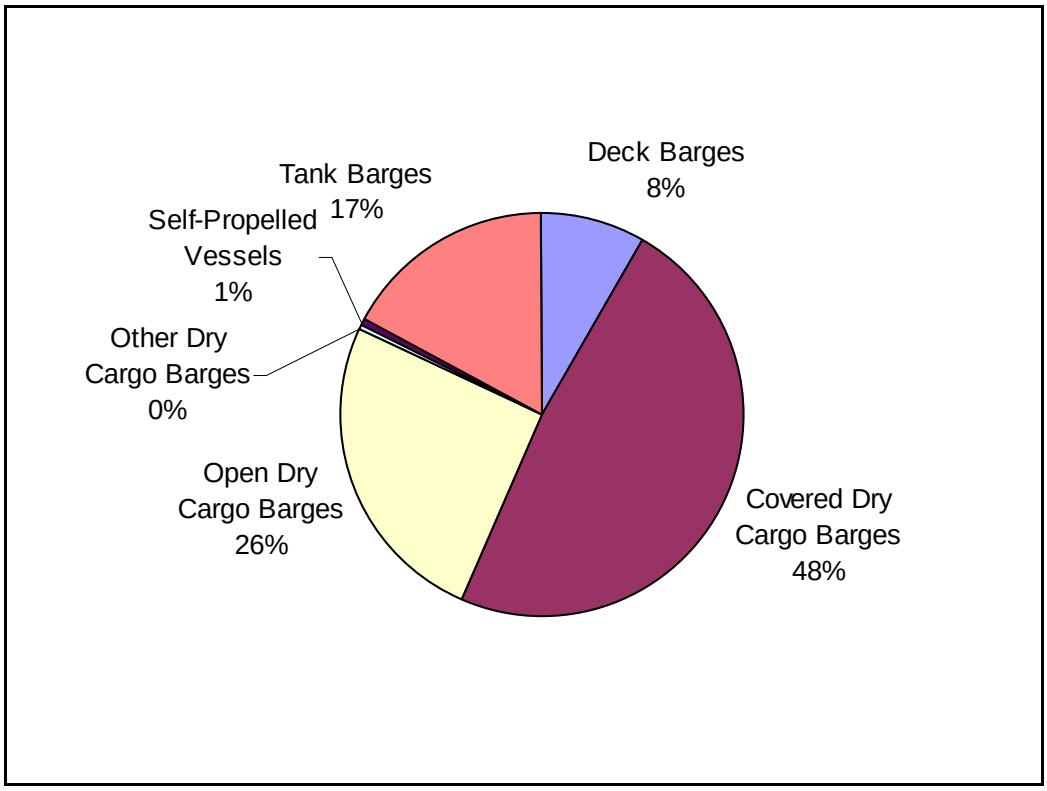

Figure 15. Mississippi and GIWW Series Fleet Composition, 2002

Table 7. Leading Vessel Operators, Capacity by Series in 1995 and 2002

Source: USACE Vessel Data Series

1997				2002			
Company	Vessels	Capacity, Short Tons	Market Share	Company	Vessels	Capacity, Short Tons	Market Share
Mississippi River System and Gulf Intracoastal Waterway Series							
American Commercial Lines LLC	4,474	7,224,340	15.6%	American Commercial Lines LLC	4,300	6,950,609	15.1%
Midland Enterprises Inc.	2,405	3,730,923	8.0%	Ingram Barge Co.	4,209	6,821,142	14.8%
American River Transportation	2,197	3,654,189	7.9%	American River Transportation	2,199	3,656,469	8.0%
Ingram Barge Co.	1,900	3,145,994	6.8%	Aep Memco LLC	1,592	2,534,694	5.5%
Memco Barge Line Inc.	1,104	1,748,656	3.8%	Kirby Inland Marine lp	860	2,129,120	4.6%
Mcdonough Marine Service	797	1,336,854	2.9%	Crounse Corporation	805	1,207,500	2.6%
Cargill Marine & Terminal Inc.	734	1,173,026	2.5%	Cargill Marine & Terminal Inc.	744	1,186,958	2.6%
Mid-south Towing Co.	663	1,109,859	2.4%	Teco Barge Line	616	1,024,921	2.2%
Crounse Corporation	722	1,083,000	2.3%				
American Electric Power River	617	958,415	2.1%				
Great Lakes Series							
American Steamship Co.	10	467,332	19.1%	American Steamship Co.	10	467,332	20.1%
Interlake Steamship Company	10	429,254	17.6%	Interlake Steamship Company	9	404,252	17.4%
Oglebay Norton Marine Services	12	370,506	15.2%	Oglebay Norton Marine Services	12	370,506	16.5%
USS Great Lakes Fleet Inc.	9	302,525	12.4%	Great Lakes Fleet Inc.	8	340,600	14.8%
Material Service Corp.	96	147,018	6.0%	Isg-Burns Harbor	2	136,850	6.4%
Bethlehem Steel Corp.	2	136,850	5.6%	Illinois Marine Towing Inc.	57	90,947	4.3%
Stinson Inc. American Steamship	1	70,896	2.9%	Indiana Harbor Steamship Co.	3	89,712	4.9%
Indiana Harbor Steamship Co.	2	62,212	2.5%	Stinson Inc. American Steamship	1	70,896	3.6%
Inland Lakes Management Inc.	5	51,494	2.1%	Inland Lakes Management Inc.	5	51,494	2.1%
Grand River Navigation Company	3	51,103	2.1%	Grand River Navigation Company	3	51,103	2.7%
Atlantic Coast Series							
Alaska Tanker Company LLC	10	1,372,827	6.5%	Alaska Tanker Company LLC	10	1,372,827	6.7%
Polar Tankers Inc.	8	1,243,090	5.9%	Seariver Maritime Inc.	27	1,294,311	6.3%
Seariver Maritime Inc.	16	1,179,929	5.6%	Polar Tankers Inc.	6	1,049,459	5.1%
U. S. Ship Management Inc.	18	824,370	3.9%	Mcdonough Marine Service	789	1,011,080	4.9%
Marine Transport Management Inc.	19	724,101	3.4%	Marine Transport Management	19	693,205	3.4%
American Ship Management	12	682,335	3.2%	U. S. Ship Management Inc.	17	652,600	3.2%

Table 7. Leading Vessel Operators, Capacity by Series in 1995 and 2002

Source: USACE Vessel Data Series

1997				2002			
Company	Vessels	Capacity, Short Tons	Market Share	Company	Vessels	Capacity, Short Tons	Market Share
Crowley Marine Services Inc.	58	531,953	2.5%	American Ship Management	10	605,358	2.9%
Gulfcoast Transit Company	17	506,438	2.4%	Teco Ocean Shipping Inc.	17	506,438	2.5%
Central Gulf Lines Inc.	830	499,247	2.4%	Crowley Marine Services Inc.	57	489,328	2.4%
Seabulk International Inc.	10	475,516	2.3%	Seabulk Tankers	10	475,516	2.3%
Maritrans Operating Partners	16	462,864	2.2%	Bouchard Transportation Co.	29	475,123	2.3%
Matson Navigation Company	18	462,219	2.2%	Maritrans Operating Company	15	467,542	2.3%
Bouchard Transportation Co.	28	454,323	2.2%	Liberty Maritime Corp.	7	463,356	2.3%
Liberty Maritime Corp.	7	420,365	2.0%	Matson Navigation Company	18	462,219	2.3%

Table includes companies with a minimum 2 percent of series capacity.

As aforementioned, vessel loaded draft clearance requirements are a key factor in the mobility of vessels among the rivers. The composition of the Mississippi and GIWW series is dominated by vessels with loaded draft of 9 feet or less (Table 8). These vessels are able to migrate from the Upper Mississippi to the lower river, and along rivers that comprise the Mississippi River System excluding the upper reaches of the Missouri.

Table 8. Mississippi River and GIWW Series Fleet Capacity by Vessel Loaded Draft, 1995 and 2002

		Capacity, in Short Tons		Change
Draft	Vessel Type	1995	2002	
9 Feet or Less				
	Deck Barges	1,923,236	1,807,132	-6%
	Covered Dry Cargo Barges	16,861,763	16,664,860	-1%
	Open Dry Cargo Barges	9,588,333	9,514,831	-1%
	Other Dry Cargo Barges	16,511	149,822	807%
	Self-Propelled Vessels	54,321	50,881	-6%
	Tank Barges	3,624,121	4,296,624	19%
	Sub-Total	32,068,285	32,484,150	
	Share of Total	69%	71%	
10 to 14 Feet				
	Deck Barges	1,880,900	1,713,750	-9%
	Covered Dry Cargo Barges	3,834,923	3,791,447	-1%
	Open Dry Cargo Barges	2,578,327	2,269,686	-12%
	Other Dry Cargo Barges	50,688	6,667	-87%
	Self-Propelled Vessels	142,937	133,520	-7%
	Tank Barges	3,882,803	3,467,212	-11%
	Sub-Total	12,370,578	11,382,282	
	Share of Total	27%	25%	
14 Feet or More				
	Deck Barges	410,580	323,685	-21%
	Covered Dry Cargo Barges	1,384,141	1,592,027	15%
	Open Dry Cargo Barges	-	2,743	
	Self-Propelled Vessels	64,986	73,083	12%
	Tank Barges	97,295	90,515	-7%
	Sub-Total	1,957,002	2,082,053	
	Share of Total	4%	5%	
	Total Capacity	46,395,865	45,948,485	

Source: USACE Vessel Data Series

The market concentration among carriers on the Mississippi River and GIWW Series is considered at the vessel group level in Table 9. The consolidation among larger carriers is evident in both the market share and the Herfindahl index.

Table 9. Market Concentration by Vessel Type for the Mississippi River and GIWW Series, 1995 and 2002

		Herfindahl Index	Capacity	Total Capacity	Top 10 as Share of Total
Covered Dry Cargo Barges					
	1995	0.1673	12,358,006	22,080,827	56%
	2002	0.2030	16,312,903	22,048,334	74%
Open Dry Cargo Barges					
	1995	0.1425	9,710,832	12,166,660	80%
	2002	0.2160	9,628,416	11,787,260	82%
Tank Barges					
	1995	0.1161	3,030,301	7,604,219	40%
	2002	0.2250	4,972,431	7,854,351	63%

Source: USACE, NDC, Vessel Data Series

Market share for operators of the 9 foot and less loaded draft covered dry cargo barge fleet, the largest vessel group, is listed in Table 10. Although the total number of operators has increased, the concentration trend in this important vessel group is evident. Market share for the top ten

Table 10. Market Share of Mississippi River and GIWW Series Covered Dry Cargo Barge Fleet Capacity for Top Ten Firms, 9 Foot Draft or Less

Company	1995	Market Share[1]	Company	2002	Market Share[1]
American Commercial Barge Line	21%		American Commercial Lines LLC	30%	
American River Transportation	15%		American River Transportation	15%	
Peavey Barge Lines	5%		Ingram Barge Co.	15%	
Cargill Marine & Terminal Inc.	5%		AEP Memco LLC	6%	
Superior Barge Lines	4%	51%	Cargill Marine & Terminal Inc.	5%	71%
RiverWay Co.	4%		RiverWay Co.	5%	
Ohio River Co.	4%		Vessel Leasing LLC	2%	
ORGulf Transport Co.	3%		Teco Barge Line	2%	
Alter Barge Line Inc.	3%		Alter Barge Line	1%	
National Marine Inc.	3%	68%	S C F Marine	1%	82%
Total Capacity (1,000 Short Tons)	16,862			16,665	

[1]Market Share: the left column indicates individual company market share, the right column includes market share totals for the top five and ten companies.
Source: USACE, NDC.

firms increased from 69% of fleet capacity in 1995 to 87% in 2002. The largest operators in 2002 are American Commercial Lines, American River Transportation, and Ingram Barge Company, with 30%, 15%, and 15%, respectively. Additional details regarding vessel ownership on the Mississippi River and GIWW Series by draft is presented in Appendix A.

Conduct

Price Discovery

The only publically available time series pricing information regarding the barge industry is the weekly information reported by the U.S. Department of Agriculture, Agricultural Marketing Service (AMS). AMS reports rates for six ranges on the Mississippi River System for barge grain rates to the Gulf in its weekly Grain Transportation Report. They include Minneapolis/St. Paul, Minnesota; Mid-Mississippi between Clinton, Iowa to St. Louis; Illinois River; St. Louis, Missouri; between Owensboro, Kentucky (the Lower Ohio); and between St. Louis and Cairo, Illinois.

The barge rate trade is based on Benchmark Tariff Rates that were established in 1976. For example, the Minneapolis, Minnesota tariff rate is 6.19 dollars and the spot market averaged 215% during 2003. The average rate, from the Mississippi River to ports on the lower River for 2003 is calculated as $6.19 and 215% or 13.31 dollars. The spot barge market rates published by AMS are based on information collected from the Merchants Exchange St. Louis. The tariff barge rates are depicted in Figure 16.

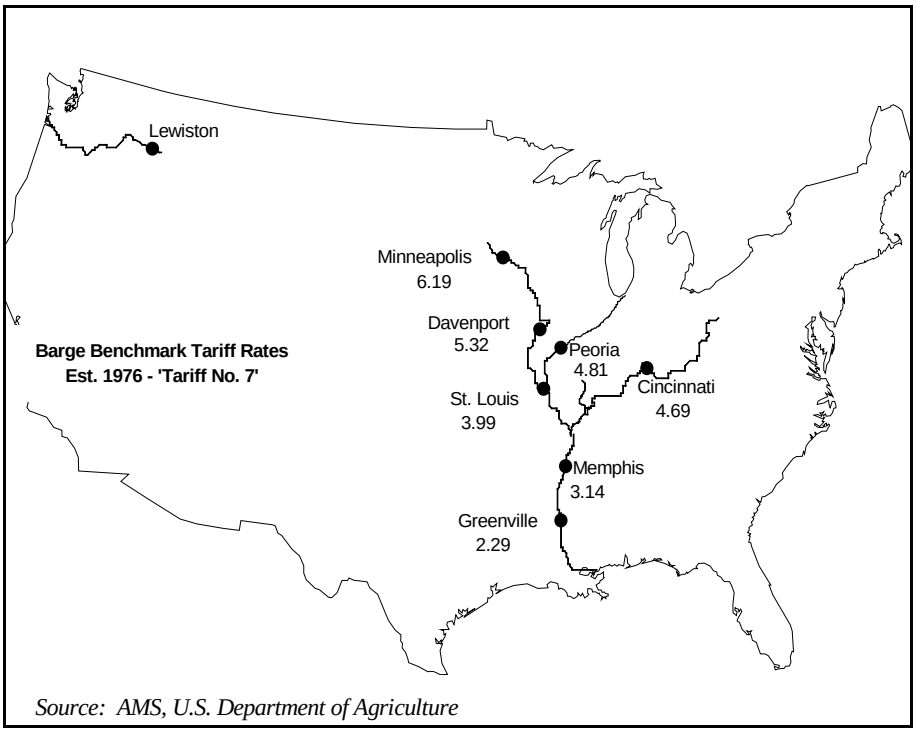

Figure 16. Barge Benchmark Tariff Rates

The Twin Cities, Illinois River and St. Louis-Cairo are included for a geographic profile of rate trends on the Mississippi River between 1980 and 1993. The weekly AMS published rates are converted to real 2003 dollars. The average revenue per ton-mile is computed for visual detection of trends in the barge rate, as illustrated in Figure 17. The rates all appear to be fairly stable to slightly declining.

The three rates are found to be highly correlated with values as measured by the Pearson Product-Moment correlation coefficients of 0.92 and greater ($p<.0001$) (Table 11). Rates averaged 248.49, 213.69, and 181.79 dollars per ton for the Twin Cities, Illinois, and St. Louis-Cairo origins. The coefficients of variation are similar among the point/ranges as expected, ranging from .38 for the Twin Cities to .43 for St. Louis-Cario. These statistics suggest that the relationship among the origins is relatively stable over time, as expected.

Table 11. Barge Rate Characteristics and Correlations

	Mean	Standard Deviation	Correlation* Among Origins	
			Illinois River	St. Louis-Cario
Twin Cities	248.49	94.30	.9542	.9228
Illinois River	213.69	86.14		.95403
St. Louis-Cario	181.79	78.00		

**All coefficients are significant at the 1 percentile.*
Source: U.S. Department of Agriculture, 2004.

A simple logarithmic regression model is used for statistical verification of trends in the real barge prices. In the analysis, the real average monthly barge rate (RBRATE) is regressed on year (TIME) for each of the three origins.

$$\ln RBRATE = \beta_0 + \beta_1 \ln TIME$$

Results provide evidence that barge rates in each of the water series shows a slight decreasing annual rate trend over the 23-year period, with TIME coefficient ranging from -0.15 to -0.18 (Table 12). The Twin Cities rates appear to be declining at a slower rate than the Illinois River and St. Louis-Cario rates. The results are statistically significant at the 1 percentile level. The declining rates may be related to efficiency gains associated with technology or operations. The scope of this research does not investigate the source, and different sources, of these gains. The regression results do, however, provide statistical validity to the barge rate trends.

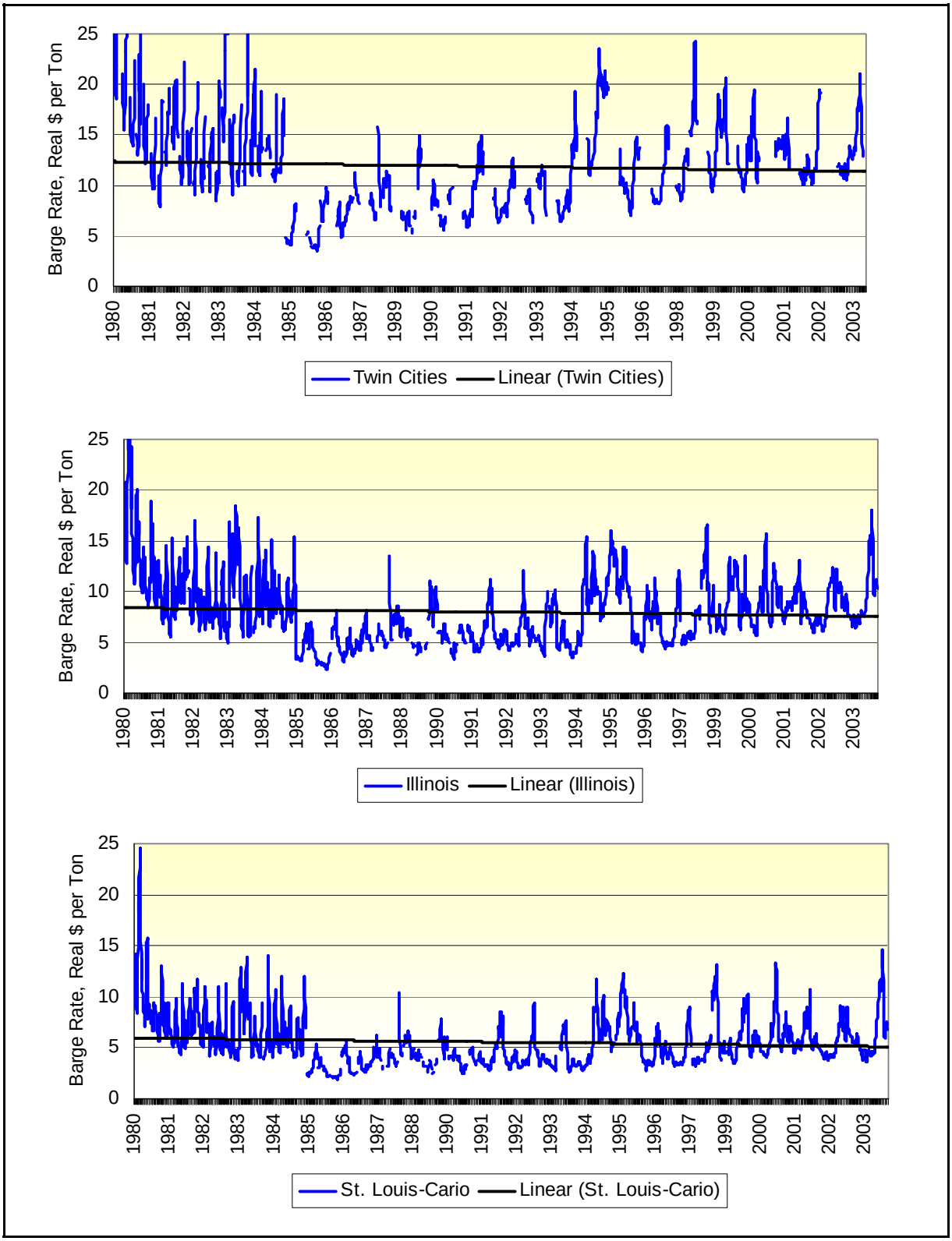

Figure 17. Grain Barge Rates on the Upper Mississippi River, Illinois River, and Lower Mississippi River, 1980 to 2004

Table 12. Empirical Results for Barge Rate Time Trend Model

	Empirical Results	
	β_1	R^2
Twin Cities *(n=827)*	-0.15045*	.20
Illinois River *(n=1218)*	-0.17094*	.24
St. Louis-Cario *(n=1205)*	-0.17999*	.24

**Significant at the 1 percentile.*

Prices are largely determined through contracts. Price differentiation is employed for favorable contract terms such as longer contract terms and higher volumes. The spot market prices published by the USDA are used to manage risk in the agreement. For instance, if the spot market prices rise above an agreed upon level, higher contract prices are triggered. Evidence that the spot market is reflective of real market conditions is provided by this information.

Performance

Industry performance is often assessed in terms of return on investment and productivity, in terms of revenue per unit. Industry performance and productivity measures provide important benchmarks for intra industry investment decisions, as well as for attracting external investor dollars. Neither a standardized measure of industry productivity or performance was identified in the review of previous barge industry literature. Crude productivity measures and review of financial market information presented in this section offer some insight into barge industry performance.

The revenue per ton-mile presented above does offer some insight into productivity. To the degree that the declining trend can be attributed to efficiency gains in labor and technology, the barge industry productivity is increasing. The regression results presented in Table 12 show that the revenue per ton-mile significantly declined between 1980 and 2003. The bulk of these gains, however, appear to have occurred in the early 1980's as regressions on time periods between 1986 and 2003 and, 1990 and 2003, did not produce statistically significant results for the time parameter.

Comparing the barge industry revenue per-ton-mile to that of the rail industry soybean and corn shipment, the rail revenue per-ton-mile trend line slope is -0.09 compared to the barge slope of -0.01 (Figure 18). The comparison is limited to the 1981-2000 time period based on data included in the rail industry study (Bitzan, et al., 2003). The grain revenue per-ton-mile trends for corn, soybean, and wheat shipments are presented in Appendix B. The rail industry trend line also exhibits more stability in the year-to-year movements after the initial pricing adjustments made in the five years subsequent to rail deregulation. Between 1986 and 2000, rail revenue per-ton-mile is characterized by a coefficient of variation of 0.06 compared to 0.16 for barge.

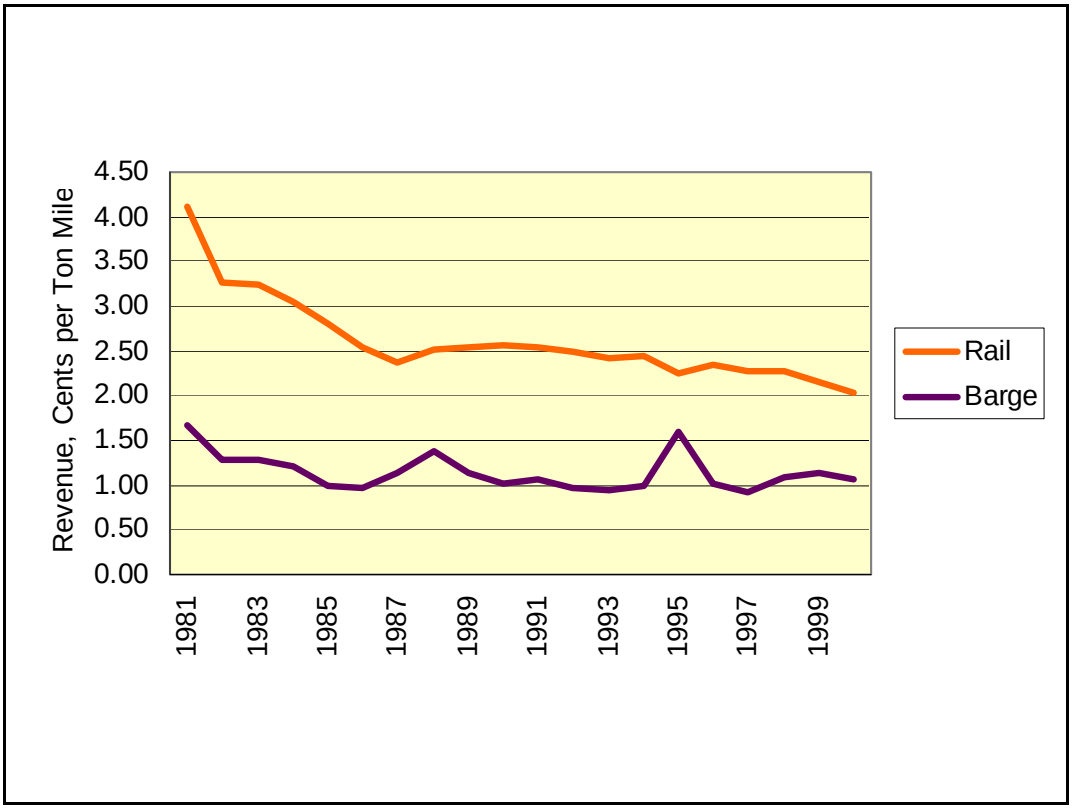

Figure 18. Barge and Rail Industry Grain Rate Trends, 1981 to 2002

A second measure based on industry, rather than commodity data, is developed to compare the commonly used freight productivity measure of revenue per-ton-mile. Revenue per-ton-mile was estimated for barge, truck, and rail in 1997 and 2002 (Table 13). Ton-mile statistics for each of

Table 13. Revenue Per-Ton-Mile for Truck, Rail, and Water Freight Transportation, 1997 and 2002

Mode	Ton Miles (billion)		Revenue (billion)		Revenue per Ton Mile		Change
	1997	2002	1997	2002	1997	2002	
Truck	75,566	103,021	141.2	165.6	0.00187	0.00161	-14%
Rail*	49,394	60,620	9.0	8.6	0.00018	0.00014	-23%
Water	55,450	52,150	23.5	22.6	0.00042	0.00043	2%

*Adjusted to reflect approximately 32% of ton miles are attributed to Class II railroads (Bitzan et al., 2003).
SOURCE: U.S. Department of Transportation, 2004a and 2004c; U.S. Census, 2004

the modes is based on the Commodity Flow Survey (U.S. Department of Transportation, 2004a.). Total industry revenues for total truck and water transportation, other than passenger, are based on U.S. Census Bureau Economic Census comparative statistics (U.S. Census, 2004). Rail

industry revenue for Class I carriers was attained from Surface Transportation Board (U.S. Department of Transportation, 2004c). The comparison across modes shows a 2% increase in revenue per-ton-mile for freight water movements, compared to declines of 14% and 23%, respectively, for the truck and rail industries.

FINANCIAL CONDITION and PERFORMANCE

Information on barge companies serving the lower Mississippi were gathered from company annual reports, Hoovers, Merchant Public Utility Manual, Yahoo! finance, as well as company web sites. There are 13 barge companies serving this area, unfortunately little information is available because many of the companies are privately held. Of the 13 companies, only four are publically owned. This section contains a brief description of the companies and financial information, when available.

The 13 barge companies include: American Commercial Barge Lines (ACBL), Ingram Barge Co, American River Transportation, AEP MEMCO, Kirby Inland Marine, Crounse Corporation, Cargill Marine & Terminal Inc., TECO Barge Line, Canal Barge Company Inc., Riverway Co., Alter Barge Line Inc., Eastside River Transportation, and Campbell Transportation Co.

Company Description

American Commercial Barge Lines LLC

American Commercial Barge Line (ACBL) headquarters are in Jefferson, Indiana. ACBL owns and operates 4,300 vessels as reported by 2002 data. The US fleet includes 2,760 covered barges, 620 open barges, and 410 tank barges, along with about 140 tow boats (Hoovers). ACBL transports dry cargo, including coal, grain, steel products and bulk ores. ACBL is the second largest transporter of liquid cargoes, transporting petroleum and chemicals throughout the Inland River system in both unit and integrated tow configurations. ACBL annually moves more than 45 million tons of cargo to domestic markets. Figure 19 illustrates the ACBL locations. The company went into bankruptcy and was purchased by Danielson Holding. It was reported in the New York Times (March 1, 2002) that Danielson Holding would pay around $34 million in cash and stock to purchase the barge firm American Commercial Lines. In addition, Danielson assumed existing senior notes totaling $58.5 million.

Figure 19. American Commercial Barge Lines Locations.
Source: www.acbl.net/ACBL/ACBL_territory.asp

Ingram Barge Co.

Ingram Barge Co is owned by Ingram Industries Inc. a privately held company that is into books and boats. The company owns 4,209 vessels to use for transport. Ingram Book Groups is one of the largest wholesale book distributors in the United States. Hoovers provided a 2003 estimate for Ingram Industries sales at $2,200.0 million. However, no reference was made to the amount that was due to the barge company. Their office is located in Nashville, TN., and they have 6,730 employees.[5]

AEP MEMCO LLC

American Electric Power Company, Incorporated is headquartered in Columbus, Ohio. It purchased MEMCO Barge Line in 2001. AEP MEMCO owns 1,592 vessels. AEP is a top North American wholesale energy company; it markets and trades electricity, natural gas, and other commodities and has interest in independent power plants. Other operations include natural gas transportation, storage, and processing; barge transportation; and telecommunications infrastructure services. The MEMCO Barge Line service area is illustrated in Figure 20.

[5]Contact was attempted with the Assistant Vice President to gain additional information, but no phone call was returned.

Figure 20. MEMCO Barge Lines Service Area.
Source: http://www.memcobarge.com/servServiceArea.asp

Elmwood Marine Services is a subsidiary of MEMCO Barge Lines. Elmwood Marine Services owns and operates in three divisions: Elmwood Dry Dock and Repair offers shipyard services with four dry-docks, two fabrication shops, and a full service machine shop; Elmwood Fleet Services offers 500 fleet spaces along the Mississippi River; and Elmwood's River Repair and Cleaning facility cleans 1,100 barges a month, repairs 1,400 barges a month, and dry-docks 100 barges per month. Only company-wide data was available and it was impossible to separate out the barge line financial data to generate ratios for comparative purposes.

Kirby Inland Marine LP

Kirby Inland Marine is a subsidiary of Kirby Corporation located in Houston, Texas. It is reported they operate 860 vessels and 214 inland towboats and have a short-ton capacity of 2,129,120. Kirby Inland Marine claims to be the largest transporter of bulk liquid products by tank barge on the Mississippi River System and the Gulf Intercoastal Waterway. From Brownsville, Texas to St. Marks, Florida, from New Orleans, Louisiana to Minneapolis, Minnesota, and on many of the tributaries of the Mississippi River, Kirby barges and towboats load, transport and discharge critical cargos that feed literally hundreds of industries (Figure 21).

Kirby Corporation also owns and operates a diesel engine service, but this service only accounts for approximately 13.5% of their revenue (2003 Annual Report). Financial ratios were generated based on data from Yahoo Financials and Kirby Corporation's 2003 Annual Report and are reported later.

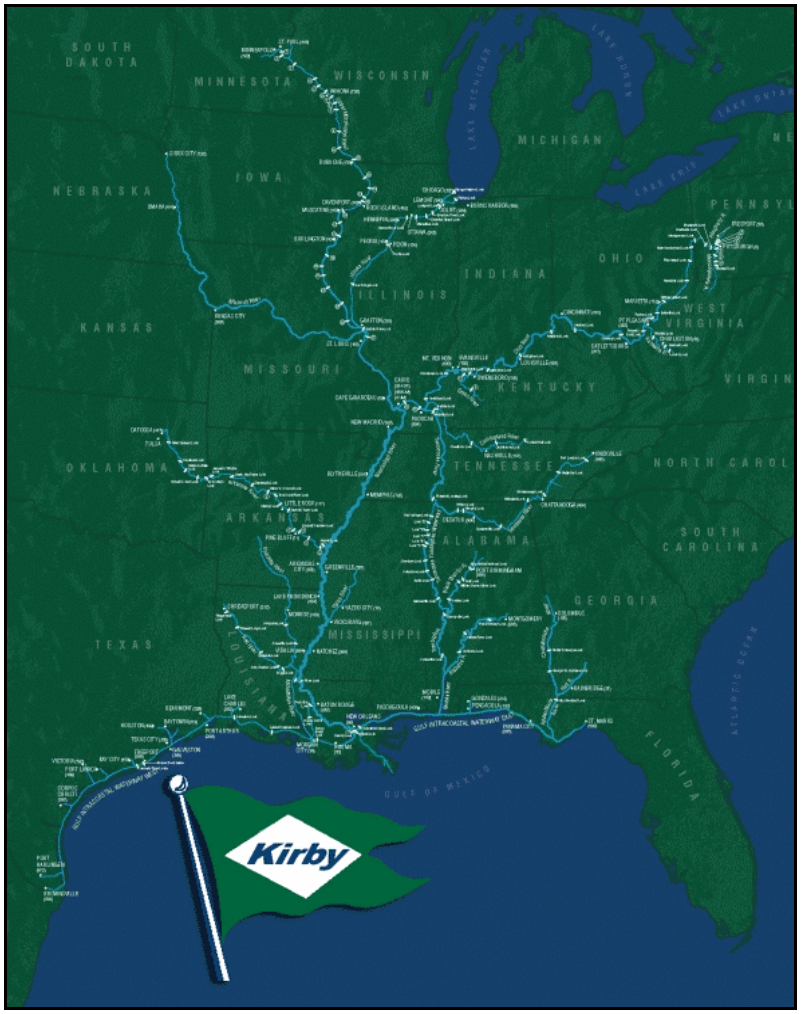

Figure 21 Kirby Inland Marine.
Source: www.kirbycorp.com/inland/waterway.cfm

American River Transportation

American River Transportation is a privately held company that owns 2,199 vessels. No financial information was available.

Crounse Corporation

Crounse Corporation is a privately held company. They own 805 vessels, otherwise little information is available about this company (www.crounse.com). They have two offices which are located in Paducah, KY and Maysville, KY. There is some question about the financials obtained for the company.[6]

Cargill Marine & Terminal Inc.

Cargill Marine & Terminal Inc. is a privately held company and no financial information was available. They are reported to have 744 vessels.

TECO Barge Line

TECO Transport is a subsidiary of TECO Energy, Inc. TECO Barge Line is a full-service river barge line that transports dry bulk and break products on the inland waterway system. TECO has more than 750 barges and ranks among the leading river barge companies serving the Mississippi, Illinois and Ohio rivers for domestic and export markets. Financial data was only available on TECO Energy Inc. No individualized subsidiary data could be located through Hoovers, Merchent Public Utility Manual or Yahoo Finance. The map (Figure 22) illustrates where TECO Transport subsidiaries are located.

Canal Barge Company Inc.

Canal Barge Company, Incorporated is located in New Orleans, Louisiana. It is a privately held company with $120.0 million in sales and 430 employees (Hoovers). They own 553 vessels. In addition to navigating vessels throughout the U.S. inland waterway system, the barge operator provides management, storage, and transportation services and has international freight transportation operations. No financial information was available.[7]

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[6]In an attempt to gain financial information, contact was made with Mr. Steven Little, the Company President. He declined to share company financial information. Financial information was found to be available to Hoovers Premium members. However, President Steven Little indicated that no financial data has been shared and any information available at Hoovers or anywhere else would not be reliable.

[7]A phone call was made to request financial numbers for this analysis. The Vice President of Finance and Administration declined to share this information.

Figure 22. TECO Transport Locations.
Source: www.tecobargeline.com/TTT.html

Riverway Co.

No financial data was available on this privately held company. They own 515 vessels.

*Alter Barge Line Inc***.**

Alter Barge Line Inc. has provided transportation of goods along the inland waterways of America since 1960. Alter Barge Line Inc. Is reported to own 384 vessels. It is a privately held company with very little information available and no financial information available. Offices are in Bettendorf, Iowa and Alton, Illinois. Fleets are available at Mi. 475 on the Upper Mississippi and Mi. 114 on the Lower Mississippi.

Eastside River Transportation

No financial information was available on this privately held company. They are reported to own 200 vessels.

Campbell Transportation Co.

Campbell Transportation Co. (CTC) primarily hauls bulk commodities on the Ohio, Kanawah, Big Sandy, Monogahela and Allegheny Rivers as illustrated below. CTC is headquartered near Charleroi, Pennsylvania, on the Monongahela. CTC also has a major facility at Point Pleasant, West Virginia on the Ohio (Figure 23). CTC is reported to operate 420 vessels with 521,109 short-ton capacity. CTC is a privately held firm with no financial data available.

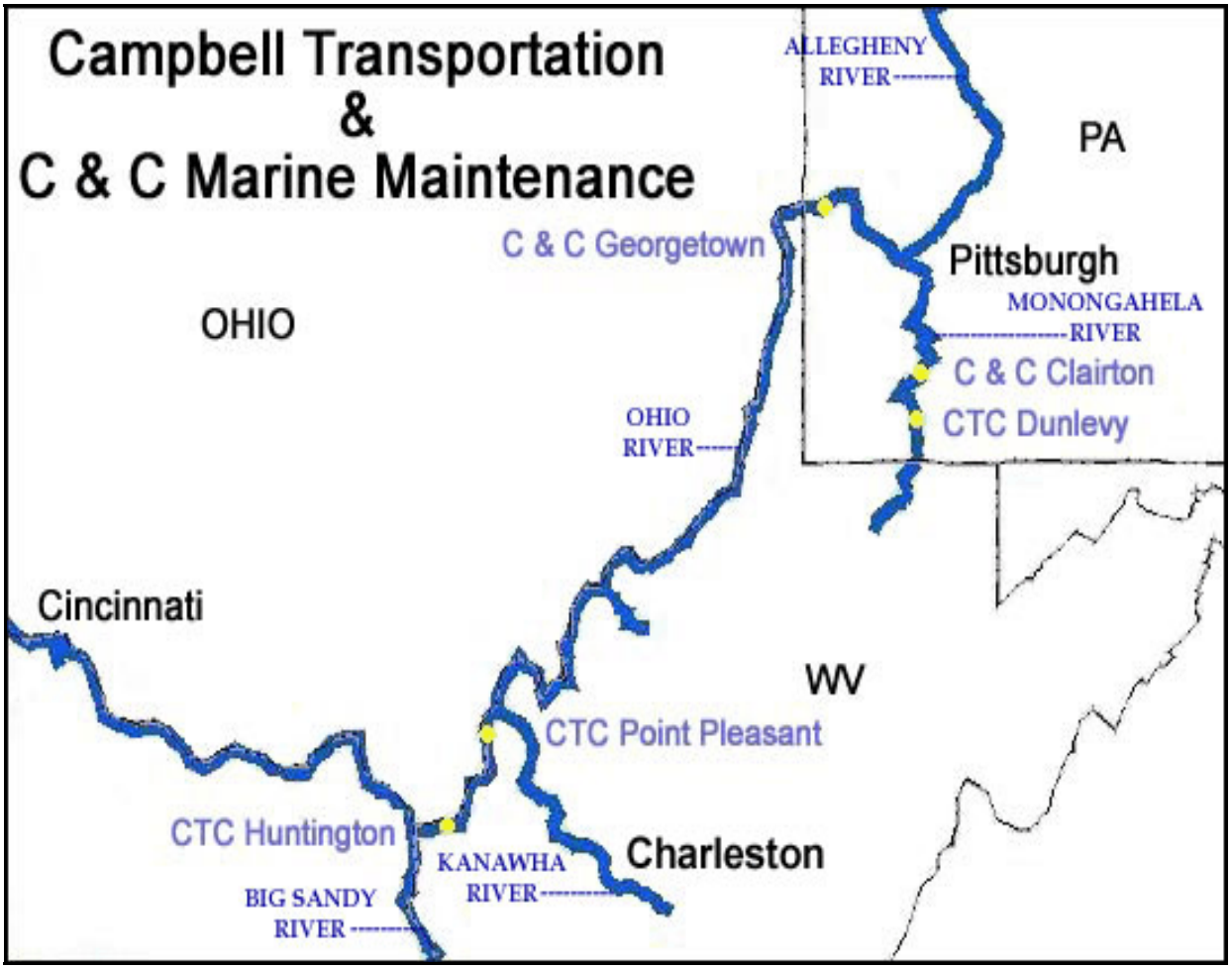


Figure 23. Campbell Transportation Co.
Source: http://www.barges.us/map.html

Financial Ratios

Financial ratios are used in this section to point out relationships that are not obvious from raw financial data (balance sheets and income statements). Looking at the ratios within different companies within the same industry highlights the factors associated with successful and

unsuccessful firms. The numbers can be used to reveal strong firms and weak firms, overvalued and undervalued firms.

The ratios examined within this section include return on equity (ROE), return on assets (ROA), gross profit margin, and debt ratio. Below is a brief explanation of what each ratio considers and why it is important.

Return on equity (ROE) is an important profit indicator to shareholders of the firm. It is calculated by dividing net income by total equity. It is used to measure the after tax profits that accrue to the common shareholders since preferred stock dividends, if any, are subtracted before arriving at net income. This ratio is useful for analyzing the ability of the firm's management to realize an adequate return on the capital invested by the owners of the firm. ROE is one of the quickest ways to gauge whether a company is an asset creator or a cash consumer. By relating the earnings generated to the shareholder's equity, it can be identified how much cash is created from the existing assets. If the return on equity is 20%, then 20 cents of profit is created for each dollar of current equity.

Return on assets (ROA) is a critical indicator of profitability. It is calculated by dividing net after tax profit by total assets. This ratio is a measure of the efficiency of a company in generating returns from its assets, without being affected by management financing decisions. A ROE of 20% means that the company produces $1.00 of profit for every $5.00 it has in assets. The time series trend of ROA gives a quick indication whether the business is continuing to earn an increasing profit on each dollar of assets. A falling ROA is a sign of trouble.

Gross profit margin links sales and profits. It is calculated by dividing the gross margin by sales. The ratio shows the profits relative to sales after the direct production costs are deducted. It may be used as an indicator of the efficiency of the production operation and the relation between production costs and selling price.

The debt ratio is calculated by dividing total liabilities by total assets. This ratio shows how much of the firm's assets are financed by debt versus equity and provides important information about the prospects for future financing. If a firm has excessive debt, it will experience difficulty in locating additional debt financing. A firm in this situation will only be able to borrow at high interest rates, if at all. However, if the ratio is low, which means virtually no debt, it may indicate a failure to use relatively lower cost borrowed funds to raise the return earned on the common stock.

Return On Equity Comparison

This calculation compares the American Commercial Barge Line to Kirby Corporation for the years of 2001 to 2003. Kirby Corporation is in fair condition with 13%, 8%, and 11% ROE for years 2001 to 2003, respectively (Figure 24). This indicates that for 2001, 13 cents of profit was generated for each dollar of current assets. Although the number declined in 2002 and rose in 2003, it is considerably more favorable than American Commercial Barge Lines (ACBL). In

2002 ACBL had an ROE of 3.5% meaning that 3.5 cents were created for each dollar that was originally invested. This value decreased in 2002 and ACBL actually lost $1.60 for each dollar originally invested. No industry wide number could be found to provide a comparison.

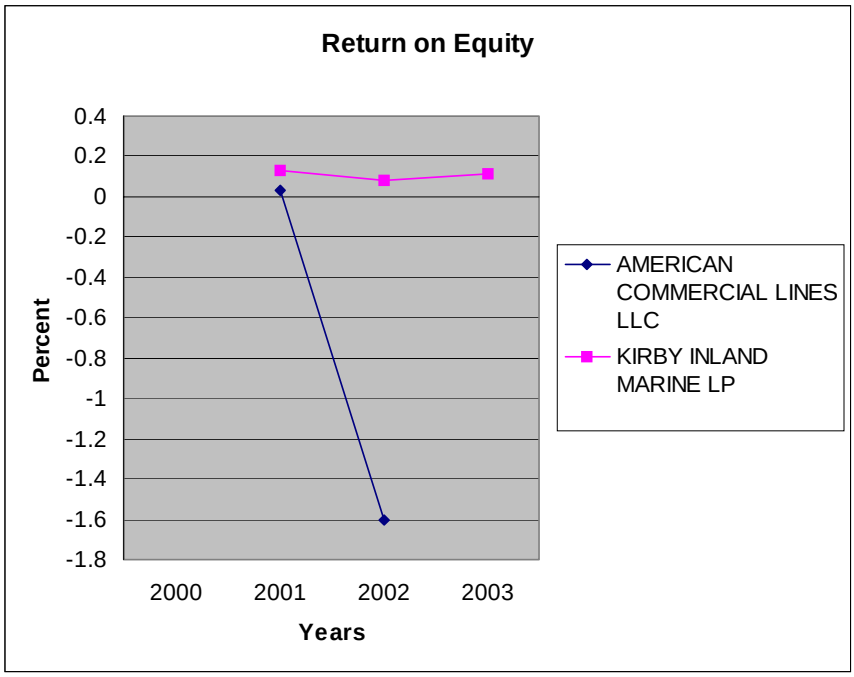


Figure 24. Return on Equity for Kirby and ACBL, 2001 to 2003.

Return On Assets Comparison

When looking at ROA as a percentage, it identifies the rate of return needed to determine whether investing in a company makes sense. It is appropriate to measure this value against the interest rate on debt and cost of capital to identify the company's performance. When making this comparison, it is not a good indication if the company is getting out less from its investments than what it is paying to finance those investments. However, an ROA that is better than the cost of debt does indicate the company is making some money. The ratio for Kirby Corporation and ACBL is illustrated in Figure 25. Kirby Corporation is doing fair with values of approximately 35%, 23%, and 31% in 2001, 2002, and 2003, respectively. Whereas, ACBL has negative values, which is not a good sign for their investors.

Gross Profit Margin

This ratio indicates what the company's pricing policy is and what the true mark-up margins are. This value is not an exact estimate of the company's pricing strategy, but does give a good indication of financial health. If a company does not have an adequate gross margin, it will not be able to pay for its operating and other expenses and build for the future. A company that has a gross margin of 65% has a mark-up of over 100% of the cost. In general, a company's gross

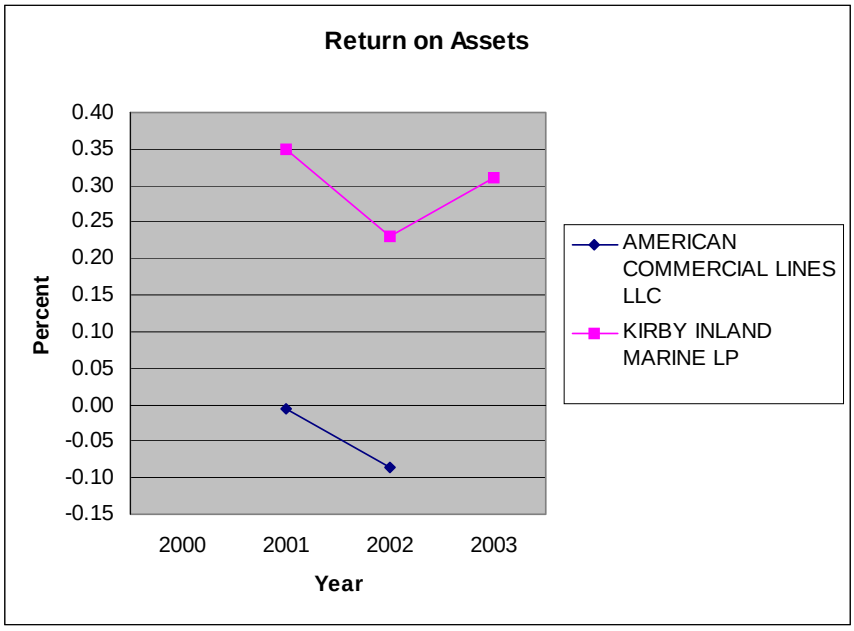


Figure 25. Return on Assets for Kirby and ACBL, 2001 to 2003.

profit margin should be stable. It should not fluctuate much unless the industry has been undergoing drastic changes which will affect the cost of goods sold or pricing policies. The comparison between Kirby and American Commercial lines shows that Kirby is more stable. Figure 26 also illustrates that ACBL has had some drastic changes in their company.

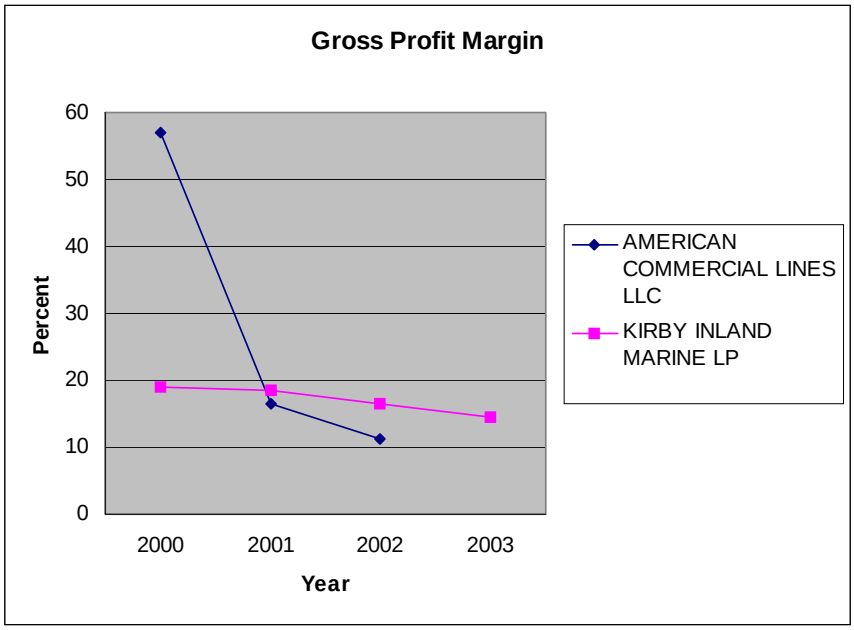


Figure 26 Gross Profit Margin for Kirby Corporation and ACBL, 2000 to 2003.

Debt Ratio

This ratio indicates what proportion of the company's assets are being financed through debt. This is not a particularly exciting ratio, but it is useful. A fairly low ratio means that the assets are financed more through equity rather than debt. The high ratio of ACBL shows the assets are financed more through debt than equity, where as the reverse is true for Kirby (Figure 27).
It was exceedingly difficult to locate financial data on barge companies serving the Lower Mississippi River system because most of the companies are privately held. However, even for publically held companies data was difficult to sift through. Some of the companies, AEP MEMCO and TECO Barge Lines are subsidiaries and their financial data is imbedded in the financial statements of their parent company. Separating their financial data to develop ratios was impossible. Therefore, comparisons were made between Kirby and ACBL. Kirby Corporations is doing fine, whereas the ratio clearly indicated ACBL was having financial problems which is explained by their bankruptcy and sale to Danielson Holding.

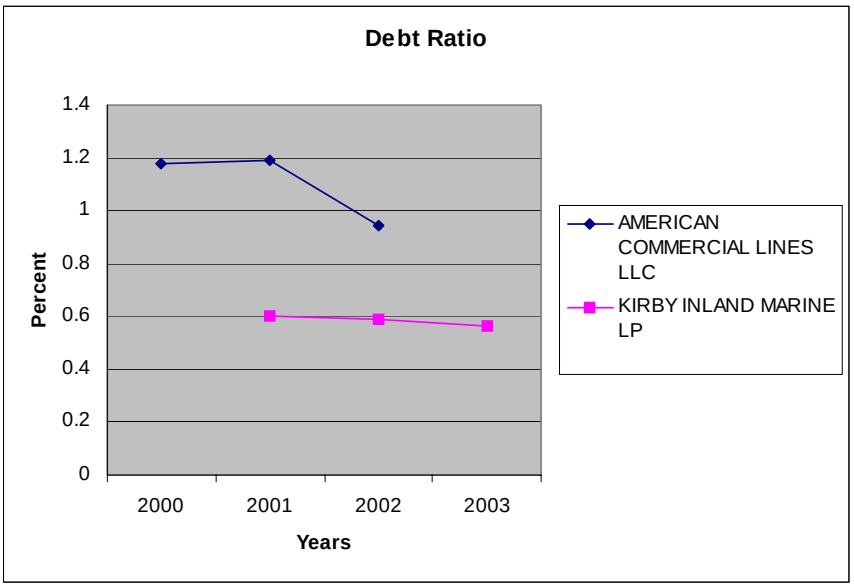


Figure 27. Debt Ratio for Kirby and ACBL, 2000 through 2003.

TECHNOLOGY

As with most industries there are several broad technological applications in various stages of development and adoption that will impact profitability. The inland barge industry is no different with changes in technology that will both improve operations and the type of service that is provided.

There are a number of changes taking place on the equipment side, two of which are mandated by law. One is double hulled barge development in which adoption is taking place at a faster

pace than mandated by law. This is in response to the concern of pollution resulting from petroleum spills that resulted in the Oil Pollution Act of 1990. Additionally, there are changes in bow design reducing the friction of the water against the hull, thereby improving fuel efficiency and speed. However, when all is said and done, the development that impacts barges themselves is largely marginal in nature. As one industry expert put it, barges have been around for 2000 years, since Cleopatra; they just get bigger and uglier. Another technology mandated by law is the change in diesel engines which have to meet new emission standards. This may have operational implications in areas such as fuel efficiency and maintenance.

There is one main new equipment technology that could have important positive impacts, the articulated tug barge (ATB) that results in improved maneuverability. It is believed that this type of equipment will replace the intercoastal petroleum tankers in the near future. Its adoption on the inland waterway system remains to be seen but some feel that it is a matter of time before it is widely used in that system as well.

Container on barge (COB) is also an innovation that could have considerable impact on the inland waterway system as well. Barge companies are moving containers from major port terminals to smaller barge class ports on barges. Osprey Lines is a leader in this innovation establishing service on the GIWW and also on the Mississippi inland waterway system. There is also activity on the east coast in the port of NY/NJ area. Further, the Port of Pittsburgh and Pittsburgh Barge Shippers Council are pursuing means to reduce impediments to COB. However, one drawback of COB is transit time. It would appear that where delivery time is not a major issue, or where other benefits such as a reduction in air pollution or congestion is a higher priority, that COB has the potential for market growth.

One of the greatest areas of technological change and innovation for the inland barge industry is in software development and communications. There are a number of companies that have developed advanced real time tracking systems and comprehensive enterprise software.[8] These commercial systems vary but have one thing in common, they are using the digital and communications revolution to improve management and operations of inland and other marine companies. Additionally, some larger companies have developed their own proprietary systems.

Some systems focus on tracking capability using GPS for a multitude of purposes such as fleet management to navigation. Others integrate ship-to-shore communications, sonar, etc. Still others provide real-time solutions by integrating vessel tracking, asset management, logistics, and integrated business management. Since the software development and communications industries are considered to be highly competitive it would seem that these technologies would continue to improve and develop to the benefit of the inland waterway carrier industry. Further, it seems that the technology is widely available to both large and small carriers, although smaller carriers might be limited to, or only need, less sophisticated, and thereby, less costly systems.

[8]BOATRACS; Dimension ASD Enterprise Software; FURUNO USA; NAUTICAST; Avitech of Vienna , Austria; and others.

However, in the final analysis, technology will probably not change the industry in a way that transforms the type of service it delivers, providing basic place utility. However, it will provide better service with more reliability, real-time information for customers, better management, etc. It should be noted that this adoption in technology is taking place in the other freight modes as well.

FINDINGS AND SUGGESTIONS FOR FUTURE RESEARCH

The inland waterway system is a critical component of the U.S. freight transportation system. Much is known about freight movements throughout the system, however, little is published about the carriers and carrier industry that serves the system. This effort is an initial attempt to mitigate this lack of published information.

Information regarding the supply side of the inland waterway industry is scarce and difficult to identify. What's more, some of the information available, especially financial, is suspect. This is probably due to the nature of ownership of the firms. Many firms are privately held. However, there is data on the size and composition of the market these firms serve.

The number of ton-miles produced by water has been declining the past 25 years, while the ton-miles produced by other modes has been increasing or remaining steady. However, the decline in waterborne ton-miles is due mainly to a decline in coastwise movement and somewhat to a decline in lakewise movements. Inland waterway movement have been fairly steady for the past ten years. However, the rail and truck modes have been increasing the number of ton-mile they produce during this time period. Relative to these other competing modes, especially rail, barge is declining.

The inland waterway carriers operate over a fixed network of locks and dams on the upper Mississippi and an open system on the lower Mississippi. This fixed network is limited in scope serving only those locations on the natural network of rivers. In terms of the operating network this is similar to the rail network, and very dissimilar to the truck network which includes the street, road, and highway networks. Movements on this waterway network are concentrated on the Mississippi and Ohio rivers, and to a lesser extent the Tennessee and Illinois. The Mississippi and Ohio account for nearly 70 percent of all traffic in tons. An extensive system of river ports, ubiquitously located throughout the network, originate and terminate this traffic.

The inland barge industry is similar to the rail system in another way, it moves mainly bulk commodities including grain, chemical products, petroleum products, sand and gravel, and coal. Many of these, if not all, are low-value in nature. These movements are usually not as time sensitive as higher value, non-bulk products. This may explain the lack of growth in the barge market. Railroads began to compete for this river traffic when they were deregulated in 1980. It could be that rails have increased their market share of traditional grain river traffic in the past 15 years.

The inland waterway system that the barge companies operate on is publicly owned and operated, much like the street, road and highway network that the trucking industry operates on. Since government does not franchise carriers to operate on the system, entry is fairly easy from a institutional perspective. Additionally, capital does not seem to be an inhibiting factor for entry. There is ample evidence in trade publications of equipment for sale at prices that would allow the necessary capital to be raised to enter the industry. In fact, evidence suggests that there are a few large firms surrounded by a large number of smaller fringe competitors, called mom-and-pop operators, that enter and exit the industry as market conditions change.

There is also another aspect of the barge industry that similar to the trucking industry, the service that each barge company offers is largely indistinguishable from the service another barge company offers. This is true in the trucking industry as well. Since barges are unable to differentiate its service by what is transported differential pricing is not an option as in the railroad industry. Railroads have the ability not because they can differentiate the service they deliver but simply because they do operate over a fixed network which they own and many shippers are locationally captive to one point on the system and do not have good alternatives. This provides railroads with locational market power which allows them to use commodity tariffs that have been developed over more than a hundred years as a sophisticated differential pricing system. These two facts easy entry and indistinguishable service make it difficult for barges to raise prices above marginal cost. Thus, margins remain relatively thin in the industry.

There is evidence that supports this conclusion such as the large number of carriers that operate on the system, 894 on the Mississippi system and GIWW in 2002. This is an increase over 1995. Similarly, vessel capacity increased during this same time period. Further, investment in waterway floating stock has fluctuated drastically over the past 40 years. However, it should be pointed out that this is due in part to investment tax laws that stimulated barge investment by third parties.

Another indication of the general level of competitiveness is the market share of the top ten firms and the change in that market share over time. Although concentration has increased over time the top five firms still only accounted for 32 percent of the market in 2002. The top ten firms accounted for 41 percent. On the surface, this would seem far short of concentration to earn oligopoly profits. Additionally, the HH index indicates low levels of industry concentration.

Pricing behavior is also similar to the trucking industry. There is virtually no publically reported price data for the industry with exception of the weekly reported USDA data on grain. Prices are not transparent in other words. This is due to the fact that the industry makes rates with the customer on a contract basis and this information is not available to the public. Additionally, there is only a benchmark tariff which is a leftover form regulation some years ago.

Prices seem to be market based on a daily basis, which is also similar to the trucking industry. The grain barge rate data do indicate that prices fluctuate widely over time. This seems reasonable since it is difficult to adjust capacity over short periods of time. Thus, when demand

increases rapidly, prices spike in the short run. The reverse is true when demand falls. The same is true in the trucking industry.

Intra industry competition for the barge industry appears to be highly competitive on a day-to-day basis with easy entry and exit. Furthermore, regarding inter modal competition it seems that rail may be eroding some of the traditional barge market. What's more, rail prices are falling at a time when barge prices seem somewhat stable. If rail prices continue to decline in areas where rail and barge compete, a further erosion of traffic could take place although this is somewhat speculative. The bankruptcy of ACBL, one of the largest barge operators, is another indication of the nature of the industry. In short, the barge industry seems very similar to the trucking industry in structure, conduct, and performance. Both are characterized by a large number of carriers, relatively easy entry and exit, and rather homogeneous service services that lend themselves to thin margins and widely fluctuating rates.

This analysis has presented some insight into industrial organization of the barge sector. Several additional areas of study could be explored based on this initial work. They include, but are not limited to:

- Assess diversion of barge grain market to rail,
- Economic Assessment of Reservations/Scheduled Locking on the Mississippi River,
- Impacts of Security and Environmental Policy Changes on Barge Operations and Costs,
- Understanding Economies of Scale and Scope in the Barge Industry,
- Barge Industry Experiences with Differential Pricing,
- Impact of Increasing Sophistication of Rail Industry Differential Pricing on the Barge Industry Traffic Volumes and Revenues, and
- Technology Developments and Transfers in Barge Industry Safety.

REFERENCES

Bitzan, John, Kimberly Vachal, Tamara VanWechel, and Dan Vinje. (2003) *The Differential Effects of Railroad Pricing: U.S. Corn, Wheat, and Soybean Markets,* MPC-03-151, Upper Great Plains Transportation Institute, North Dakota State University.

Commodity Futures Trading Commission. (2000) *Applications of the Merchants Exchange of St. Louis for Destination as a Contract Market in Illinois Waterway Barge Freight Futures and St. Louis Barge Freight Futures*, Accessed November 8, 2003 at www.cftc.gov/dea/analysis/deabarge.htm?format=printable_xhtml.

General Accounting Office. (1999) *Changes in Railroad Rates and Service Quality Since 1990*, GAO/RECD-99-46, Washington, DC.

Howe, Charles. (1969) **Inland Waterway Transportation: Studies in Public and Private Management Investment Decisions**. Resources for the Future, Inc., Johns Hopkins Press, Baltimore, Maryland.

Innis, Harold. (1956) *The Fur Trade in Canada: An Introduction to Canadian Economic History*. University of Toronto Press, Toronto, Ontario.

MacDonald, James. (1989) Competition and Rail Rates for the Shipment of Corn, Soybeans, and Wheat, *Rand Journal of Economics*, 18(1): 151-163.

Mills, Edwin. (1967) An Aggregative Model of Resource Allocation in a Metropolitan Area, *The American Economic Review*, 57(2): 197-210.

O'Rourke, Laurence. (2002) *The Impact of Differential Pricing on Barge Freight Transportation*, Transportation Research Board, Annual Meeting 2003.

Taylor, George. (1951) **The Transportation Revolution, 1815-60**. Holt, Rinehart and Winston, New York.

U.S. Army Corp of Engineers. (2004) *Preliminary Waterborne Commerce of the United States, Calendar Year 2003*. Water Resources Support Center, Navigation Data Center, Alexandria, Virginia.

U.S. Army Corp of Engineers. (2003) *Waterborne Commerce of the United States, Calendar Year 2002, Vol. 1 - National Summaries*. Water Resources Support Center, Navigation Data Center, Alexandria, Virginia.

U.S. Army Corp of Engineers. (1997) *1996 National Totals and Selected Inland Waterways*. Water Resources Support Center, Navigation Data Center, Alexandria, Virginia.

U.S. Army Corps of Engineers. (2003) *Waterborne Transportation Lines of the United States, Calendar Year 2002, Vol. 1 - National Summaries*. Water Resources Support Center, Navigation Data Center, Alexandria, Virginia.

U.S. Army Corps of Engineers. (1996 to 2003) *NDC Publications and U.S. Waterway Data CD.* Water Resources Support Center, Navigation Data Center, Alexandria, Virginia.

U.S. Census. 2004. *2002 Economic Census, Transportation and Warehousing - Industry Series*, accessed online December 18, 2004 at www.census.gov/econ/census02/guide/INDRPT48.HTM.

U.S. Department of Agriculture. (2003) *Transportation of U.S. Grains, A Modal Share Analysis 1978 to 2000*, Agricultural Marketing Service, Transportation Services Branch accessed at www.ams.usda.gov/tmd/tsb/Modal_Share.pdf.

U.S. Department of Transportation. (2002) Bureau of Transportation Statistics, *National Transportation Atlas Database*, CD-ROM: BTS-02-05.

U.S. Department of Transportation. (2004a) Bureau of Transportation Statistics, based on data from the 1993, 1997, and preliminary 2002 Commodity Flow Survey, January 2004. Accessed online November 25, 2004 at www.bts.gov/programs/freight_transportation/html/table_06c.html.

U.S. Department of Transportation. (2004b) Freight Transportation , Improvements and the Economy, Federal Highway Administration, FHWA-HOP-04-005.

U.S. Department of Transportation. (2004c) Surface Transportation Board, Railroad Economic Data, accessed online December 11, 2004 at www.stb.dot.gov/econdata.nsf/.

Wilson, William. (1992) Asymmetric Effects of Deregulation. Upper Great Plains Transportation Institute, North Dakota State University, DP-92.

APPENDIX A. MISSISSIPPI RIVER AND GIWW SERIES VESSEL OWNERSHIP AND MARKET SHARE, BY DRAFT IN 1995 AND 2002

9-Foot and Less Loaded Draft

1995 Company	Capacity	Share	2002 Company	Capacity	Share
Covered Dry Cargo Barges					
AMERICAN COMMERCIAL BARGE LINE	3,522,603	21%	AMERICAN COMMERCIAL LINES LLC	4,966,349	30%
AMERICAN RIVER TRANSPORTATION	2,583,164	15%	AMERICAN RIVER TRANSPORTATION	2,562,290	15%
PEAVEY BARGE LINES	900,907	5%	INGRAM BARGE CO.	2,439,925	15%
CARGILL MARINE & TERMINAL	867,578	5%	AEP MEMCO LLC	1,066,060	6%
SUPERIOR BARGE LINES	742,259	4%	CARGILL MARINE & TERMINAL	873,112	5%
RIVERWAY CO.	664,780	4%	RIVERWAY CO.	791,536	5%
OHIO RIVER CO. THE	643,577	4%	VESSEL LEASING LLC - CH SUP I	284,919	2%
ORGULF TRANSPORT CO.	550,222	3%	TECO BARGE LINE	260,618	2%
ALTER BARGE LINE	549,962	3%	ALTER BARGE LINE	233,970	1%
NATIONAL MARINE	531,679	3%	S C F MARINE	188,429	1%
Total Capacity, Top 5 Market Share	16,861,763	51%	Total Capacity, Top 5 Market Share	16,664,860	71%
Open Dry Cargo Barges					
OHIO RIVER CO. THE	2,265,176	24%	INGRAM BARGE CO.	2,976,293	31%
INGRAM BARGE CO.	1,622,754	17%	CROUNSE CORPORATION	1,206,000	13%
AMERICAN COMMERCIAL BARGE LINE	1,273,459	13%	AEP MEMCO LLC	1,018,504	11%
CROUNSE CORPORATION	1,080,000	11%	AMERICAN COMMERCIAL LINES LLC	708,416	7%
MID-SOUTH TOWING CO.	601,381	6%	TECO BARGE LINE	545,000	6%
CANAL BARGE COMPANY	563,498	6%	CAMPBELL TRANSPORTATION CO.	447,947	5%
CAMPBELL TRANSPORTATION CO.	378,510	4%	CONSOLIDATION COAL CO. (RIVER	309,025	3%
M/G TRANSPORT SERVICES	364,858	4%	PARKER TOWING CO.	262,054	3%
WARRIOR & GULF NAVIGATION COMP	287,824	3%	WARRIOR & GULF NAVIGATION COMP	230,052	2%
CONSOLIDATION COAL CO. (RIVER	281,475	3%	CANAL BARGE COMPANY	225,167	2%
Total Capacity, Top 5 Market Share	9,588,333	71%	Total Capacity, Top 5 Market Share	9,514,831	68%
Deck Barges					
MCDONOUGH MARINE SERVICE	271,541	14%	LUHR BROS.	202,871	11%
LUHR BROS.	187,200	10%	MATERIAL SERVICE CORP.	131,048	7%
REED CRUSHED STONE COMPANY INC	162,900	8%	MULZER CRUSHED STONE	99,700	6%
PATTON-TULLY TRANSPORTATION CO	113,303	6%	RECO TRANSPORTATION	97,300	5%
MULZER CRUSHED STONE	107,800	6%	CANAL BARGE COMPANY	97,022	5%
CANAL BARGE COMPANY	98,198	5%	DAULTON GLENN E.	68,529	4%
DAVISON SAND & GRAVEL CO.	44,230	2%	S C F MARINE	45,222	3%
NUGENT SAND COMPANY	42,400	2%	PATTON-TULLY	40,950	2%

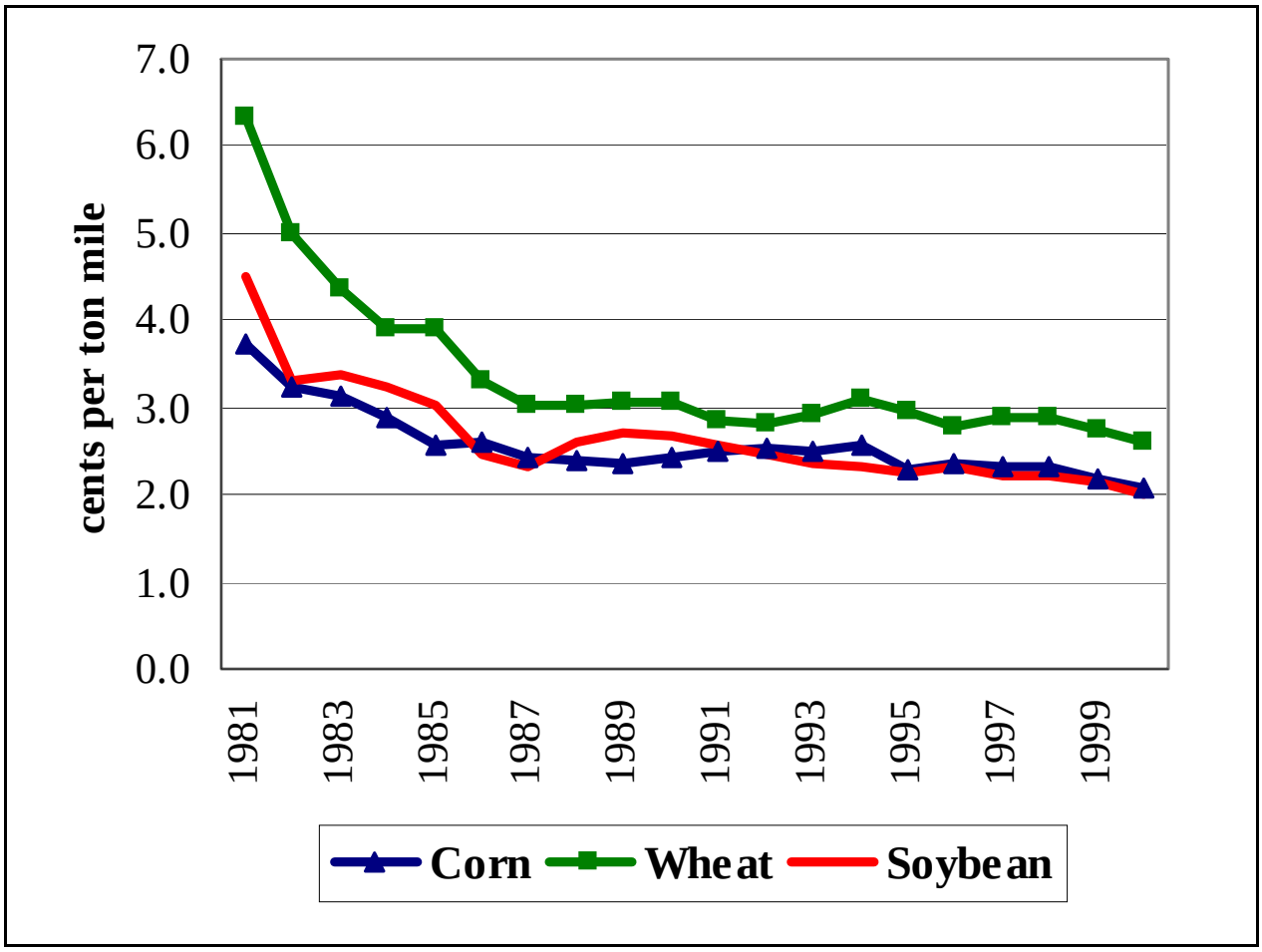
			TRANSPORTATION LL		
DAULTON GLENN E.	35,617	2%	AGGREGATE INDUSTRIES	35,600	2%
GRAY J. R.	34,739	2%	YAGER MATERIALS	34,640	2%
Total Capacity, Top 5 Market Share	1,923,236	44%	Total Capacity, Top 5 Market Share	1,807,132	35%
Tank Barges					
ASHLAND	365,136	10%	KIRBY INLAND MARINE LP	1,408,444	33%
AMERICAN COMMERCIAL BARGE LINE	279,806	8%	AMERICAN COMMERCIAL LINES LLC	618,710	14%
COASTAL TOWING	257,057	7%	MARATHON ASHLAND PETROLEUM LLC	375,253	9%
TPT TRANSPORTATION	193,802	5%	INGRAM BARGE CO.	235,071	5%
BRENT TRANSPORTATION CORP.	183,077	5%	COASTAL TOWING	199,859	5%
NATIONAL MARINE	176,172	5%	CANAL BARGE COMPANY	195,549	5%
CANAL BARGE COMPANY	166,748	5%	AMERICAN COMMERCIAL BARGE LINE	141,355	3%
NMS	150,296	4%	WAXLER TOWING CO.	81,959	2%
INGRAM BARGE CO.	149,280	4%	SOUTHERN TOWING CO.	48,629	1%
OMR TRANSPORTATION COMPANY	123,484	3%	AMERICAN RIVER TRANSPORTATION	46,426	1%
Total Capacity, Top 5 Market Share	3,624,121	35%	Total Capacity, Top 5 Market Share	4,296,624	66%

10 to 13 Foot Loaded Draft

1995			2002		
Company	**Capacity**	**Share**	**Company**	**Capacity**	**Share**
Covered Dry Cargo Barges					
MARINE EQUIP. MANAGEMENT CORP.	359,567	9%	AMERICAN RIVER TRANSPORTATION	545,743	14%
AMERICAN RIVER TRANSPORTATION	277,317	7%	BUNGE NORTH AMERICA	428,553	11%
BUNGE CORPORATION	268,337	7%	AMERICAN COMMERCIAL LINES LLC	373,134	10%
CARGILL MARINE & TERMINAL	206,582	5%	INGRAM BARGE CO.	281,454	7%
EAGLE MARINE TRANSPORT CO.	176,363	5%	CARGILL MARINE & TERMINAL	219,269	6%
OLYMPIC MARINE COMPANY	102,789	3%	HEARTLAND BARGE MANAGEMENT	161,827	4%
MILLER ROBERT & ASSOCIATES	94,856	2%	SUNN ENTERPRISES	115,500	3%
SENSTAR CAPITAL CORPORATION	85,456	2%	MILLER ROBERT & ASSOCIATES	114,863	3%
FLOWERS J. RUSSELL	46,875	1%	S C F MARINE	112,604	3%
NEWPARK ENVIRONMENTAL SERVICES	44,100	1%	CHASE EQUIPMENT LEASING	98,077	3%
Total Capacity, Top 5 Market Share	3,834,923	34%	Total Capacity, Top 5 Market Share	3,791,447	49%
Open Dry Cargo Barges					
INGRAM BARGE CO.	866,995	34%	INGRAM BARGE CO.	866,995	38%
AEP MEMCO LLC	446,977	17%	AEP MEMCO LLC	446,977	20%
TECO BARGE LINE	195,164	8%	TECO BARGE LINE	195,164	9%
CANAL BARGE COMPANY	114,127	4%	CANAL BARGE COMPANY	114,127	5%
PINE BLUFF SAND & GRAVEL CO.	75,600	3%	PINE BLUFF SAND & GRAVEL CO.	75,600	3%
FLOWERS J. RUSSELL	59,882	2%	FLOWERS J. RUSSELL	59,882	3%
CAMPBELL TRANSPORTATION CO.	59,270	2%	CAMPBELL TRANSPORTATION CO.	59,270	3%
MON RIVER TOWING	46,190	2%	MON RIVER TOWING	46,190	2%
GREATER CINCINNATI MARINE LLC	37,272	1%	GREATER CINCINNATI MARINE LLC	37,272	2%
SERODINO	35,110	1%	SERODINO	35,110	2%
Total Capacity, Top 5 Market Share	2,578,327	66%	Total Capacity, Top 5 Market Share	2,269,686	75%
Deck Barges					
MCDONOUGH MARINE SERVICE (DIV.	220,895	12%	ALTER BARGE LINE	297,084	17%
DAULTON GLENN E.	152,679	8%	INGRAM MATERIALS COMPANY	181,400	11%
PINE BLUFF SAND & GRAVEL CO.	116,850	6%	PINE BLUFF SAND & GRAVEL CO.	155,844	9%
INGRAM MATERIALS COMPANY	110,200	6%	DAULTON GLENN E.	127,043	7%
CANDIES OTTO	67,200	4%	AMERICAN RIVER TRANSPORTATION	114,676	7%
REED CRUSHED STONE COMPANY INC	54,300	3%	CARGILL MARINE & TERMINAL	87,039	5%

MARTIN MARIETTA AGGREGATES	51,832	3%	CANAL BARGE COMPANY	68,045	4%
CANAL BARGE COMPANY	33,050	2%	IOWA FLEETING SERVICE	64,630	4%
MULZER CRUSHED STONE	25,200	1%	CANDIES OTTO L.L.C.	62,400	4%
PATTON-TULLY TRANSPORTATION CO	18,525	1%	LUHR BROS.	31,200	2%
Total Capacity, Top 5 Market Share	1,880,900	36%	Total Capacity, Top 5 Market Share	1,713,750	51%
Tank Barges					
HOLLYWOOD MARINE	489,716	13%	KIRBY INLAND MARINE LP	719,156	21%
DIXIE CARRIERS	199,484	5%	CENAC TOWING COMPANY	276,866	8%
MAGNOLIA MARINE TRANSPORT CO.	171,918	4%	BLESSEY MARINE SERVICES	226,656	7%
SABINE TRANSPORTATION COMPANY	152,031	4%	MAGNOLIA MARINE TRANSPORT CO.	193,895	6%
COASTAL TOWING	150,330	4%	FLORIDA MARINE TRANSPORTERS IN	170,073	5%
CENAC TOWING COMPANY	145,804	4%	MARYLAND MARINE	149,738	4%
HIGMAN TOWING CO.	123,580	3%	FLOWERS J. RUSSELL	135,106	4%
NATIONAL MARINE	117,648	3%	LE BEOUF BROS. TOWING CO.	125,973	4%
MARYLAND MARINE	108,168	3%	AMERICAN RIVER TRANSPORTATION	107,834	3%
HINES AMERICAN LINE	96,090	2%	AMERICAN COMMERCIAL BARGE LINE	103,493	3%
Total Capacity, Top 5 Market Share	3,882,803	30%	Total Capacity, Top 5 Market Share	3,467,212	46%

14 ft or Greater Loaded Draft

1995			2002		
Company	**Capacity**	**Share**	**Company**	**Capacity**	**Share**
Covered Dry Cargo Barges					
GULFCOAST TRANSIT COMPANY	356,050	26%	EASTSIDE RIVER TRANSPORTATION	528,254	33%
DIXIE FUELS LIMITED	69,400	5%	AMERICAN COMMERCIAL LINES LLC	274,820	17%
MILLER ROBERT & ASSOCIATES	65,736	5%	AMERICAN RIVER TRANSPORTATION	274,550	17%
OLYMPIC MARINE COMPANY	36,150	3%	FLOWERS J. RUSSELL	110,477	7%
HOLNAM	17,800	1%	CERES CONSULTING LLC	84,870	5%
BUNGE CORPORATION	17,764	1%	DIXIE FUELS LIMITED	69,400	4%
FLOWERS J. RUSSELL	16,392	1%	ALTER BARGE LINE	65,720	4%
AMERICAN COMMERCIAL BARGE LINE	13,660	1%	TOUAX LEASING CORP.	47,425	3%
INDEPENDENT CEMENT	6,271	0%	OLYMPIC MARINE COMPANY	33,740	2%
TERRAL RIVER SERVICE	5,482	0%	LAFARGE NORTH AMERICA	17,100	1%
Total Capacity, Top 5 Market Share	1,384,141	39%	Total Capacity, Top 5 Market Share	1,592,027	80%
Deck Barges					
HEEREMA OFFSHORE SERVICES U. S	123,000	30%	CERES CONSULTING LLC	126,862	39%
MCDERMOTT INCORPORATED	102,800	25%	CANDIES OTTO L.L.C.	30,635	9%
MCDONOUGH MARINE SERVICE	52,978	13%	MCDERMOTT J. RAY	29,000	9%
CANDIES OTTO	30,635	7%	INTER OIL	24,200	7%
CANAL BARGE COMPANY	16,204	4%	BEAN MERIDIAN L.L.C.	23,538	7%
GLOBAL PIPELINES PLUS	11,074	3%	CANAL BARGE COMPANY	20,404	6%
TWENTY GRAND MARINE SERVICE IN	11,000	3%	GLOBAL MATERIALS SERVICES LLC	16,400	5%
ISBELL & GUIDRY CO.	5,400	1%	H M C LEASING	16,000	5%
HARVEY GULF INT'L MARINE	5,147	1%	GLOBAL PIPELINES PLUS LLC	11,074	3%
ZITO TOWING	2,800	1%	OFFSHORE SPECIALTY FABRICATORS	7,300	2%
Total Capacity, Top 5 Market Share	410,580	79%	Total Capacity, Top 5 Market Share	323,685	72%

APPENDIX B. RAIL REVENUE PER TON MILE FOR GRAIN SHIPMENTS, REAL TERMS 1980 TO 2000