The Navigation Economic Technologies Program

November 1, 2005

NETS

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An Overview of the U.S. Inland Waterway System

US Army Corps of Engineers®

IWR Report 05-NETS-R-12

Navigation Economic Technologies

The purpose of the Navigation Economic Technologies (NETS) research program is to develop a standardized and defensible suite of economic tools for navigation improvement evaluation. NETS addresses specific navigation economic evaluation and modeling issues that have been raised inside and outside the Corps and is responsive to our commitment to develop and use peer-reviewed tools, techniques and procedures as expressed in the Civil Works strategic plan. The new tools and techniques developed by the NETS research program are to be based on 1) reviews of economic theory, 2) current practices across the Corps (and elsewhere), 3) data needs and availability, and 4) peer recommendations.

The NETS research program has two focus points: expansion of the body of knowledge about the economics underlying uses of the waterways; and creation of a toolbox of practical planning models, methods and techniques that can be applied to a variety of situations.

Expanding the Body of Knowledge

NETS will strive to expand the available body of knowledge about core concepts underlying navigation economic models through the development of scientific papers and reports. For example, NETS will explore how the economic benefits of building new navigation projects are affected by market conditions and/or changes in shipper behaviors, particularly decisions to switch to non-water modes of transportation. The results of such studies will help Corps planners determine whether their economic models are based on realistic premises.

Creating a Planning Toolbox

The NETS research program will develop a series of practical tools and techniques that can be used by Corps navigation planners. The centerpiece of these efforts will be a suite of simulation models. The suite will include models for forecasting international and domestic traffic flows and how they may change with project improvements. It will also include a regional traffic routing model that identifies the annual quantities from each origin and the routes used to satisfy the forecasted demand at each destination. Finally, the suite will include a microscopic event model that generates and routes individual shipments through a system from commodity origin to destination to evaluate non-structural and reliability based measures.

This suite of economic models will enable Corps planners across the country to develop consistent, accurate, useful and comparable analyses regarding the likely impact of changes to navigation infrastructure or systems.

NETS research has been accomplished by a team of academicians, contractors and Corps employees in consultation with other Federal agencies, including the US DOT and USDA; and the Corps Planning Centers of Expertise for Inland and Deep Draft Navigation.

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An Overview of the U.S. Inland Waterway System

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EXECUTIVE SUMMARY

Water transportation is an integral part of the transportation system in the United States. For many commodities and locations, transportation by barge is a more efficient and economically sound form of transporting goods than either rail or truck. The U.S. waterway system is comprised of 12,000 miles of navigable waterway, containing 230 lock sites that manage 275 lock stations. The general purpose of this report is to provide an overview of the inland waterway system both in general and for particular waterways. The waterways described in detail include the Mississippi, the Ohio River Basin, the Gulf Intercoastal Waterway, and the Pacific Coast systems. Specific objectives are to: 1. examine growth patterns for the waterway system as a whole, as well as individual river systems; 2. identify the commodities that specific systems transport and why this makes empirical sense; 3. describe how and why the waterway system works the way it does. The majority of the data used in this survey has been provided by the US Army Corps of Engineers (USACE) or taken from USACE websites.

The data indicate that the primary commodity being transported over the whole of the system is Petroleum and Petroleum products; however, there are substantial differences across waterways and waterway segments. Specifically, Coal and Petroleum account for well over half of the market. Other goods shipped along the waterway system include: chemicals, crude materials, manufactured goods, and food and farm products. Looking at the waterway system from a time dimension, total waterborne commerce has been increasing at a steady rate. This increase is largely a result of increased foreign traffic, as domestic traffic has remained largely stagnant over the twenty years of the survey. Below is a short summary, by system, of major facts that point to the size of the inland waterway system and the primary commodities shipped on each of the largest waterways.

Mississippi River System

- Reflects 9,000 miles of navigable waterway, including about 1800 miles of the Mississippi Main stem and the primary rivers that flow into it, including the Illinois, Missouri, and Ohio rivers.
- 715 million tons shipped in 2001
- 29 locks
- Primary shipments: coal, food and farm products, petroleum, crude materials and chemicals

The Mississippi System is the primary inland waterway system, stretching from Minnesota to Louisiana, and capturing traffic from the Illinois, Missouri and Ohio River systems. The main stem of the Mississippi System dominates the system in terms of traffic movements, so much so that in 2001, some 70.5% of all goods shipped on the waterway were moved along this main stem. This traffic transported via the Mississippi System has increased by about 32.5% since 1982; however, this growth seems to have remained largely stagnant since 1995. As for the composition of this traffic, the primary commodity transported is coal, which totals 26% of all commerce shipped in 2001, followed closely by food and farm products and petroleum.

Ohio River Basin System

- Contains 2,800 miles of navigable waterway
- 275 million tons transported in 1999
- 60 locks
- Primary Shipments: coal, aggregates, petroleum, grains and chemicals

The Ohio River Basin (ORB) system covers approximately 2,800 miles of navigable waterway. The majority of the 275 million tons transported (180 million) are shipped within the basin itself, using the 60 lock and damn facilities maintained by the USACE. The primary commodity shipped through and within the Ohio River Basin is coal, largely due to the large amount of reserves in the region. However, there are also significant amounts of aggregates, petroleum, grains and chemicals shipped on the Ohio River Basin System.

Gulf Intercoastal Waterway System (GIWW)

- Contains 1,109 miles of navigable waterway
- 112 million tons shipped in 2001
- 10 locks
- Primary shipments: petroleum, chemicals, crude materials and coal

The Gulf Intercoastal Waterway has 1,109 miles of navigable waterway on which a significant portion of the United States' commodities are transported. Petroleum is the largest commodity shipped through this system, making up 48.5 % of shipments, followed by chemicals and crude materials accounting for 21% and 18%, respectively. From 1982 to 1988 there was tremendous growth along the Gulf Intercoastal Waterway System with shipments increasing by nearly 42%; however, the growth rate has since stagnated if not decreased.

The Pacific Coast System

- Contains 596 navigable miles
- 50 million tons shipped in 2001
- Eight locks
- Primary shipments: food and farm products, petroleum, crude materials, chemicals, and primary manufactured goods

The Pacific Coast system, which is composed of the Columbia, Snake, and Willamette Rivers, is somewhat different than the other systems discussed both because of its size (only 596 total navigable miles) and because it is not connected to any other waterway system instead flowing directly into the Pacific Ocean. On the Pacific Coast System, agricultural products are the main source of commerce making up 43% of all shipments, while petroleum products are the second largest commodities transported at 19%. The system's growth had shown some growth since 1982, but has seen no significant growth as of late.

1. INTRODUCTION

1.1 GENERAL OVERVIEW

The inland waterway system of the U.S. is vast both in geographic area and tonnages of goods carried. The total network consists of nearly 12,000 navigable miles and offers the benefit of direct access to ocean ports from the nation's interior, often without seasonal difficulties (Great Lakes and Upper Mississippi regions excluded).

Geographically, the system connects all but nine of the fifty states, with a majority of those nine falling within the southwest (Arizona, Colorado, Utah, Wyoming). Figure 1-1 illustrates this waterway network which stretches inward from ocean ports with a majority of the system located within the eastern half of the U.S. In fact, all of the states located east of the Mississippi River have access to this waterway system with several river systems, most notably the Mississippi and Ohio, serving as major arteries. Much like the arteries that supply blood to different parts of the body, these river arteries allow traffic to flow to/from smaller outlying navigable rivers to major port facilities and markets.

The entire system, from ocean ports inward, falls under the jurisdiction of the United States Army Corps of Engineers (USACE), whose responsibility is to operate and maintain all waterway infrastructure needs. These duties can include (but are not limited to) constructing, operating and maintaining waterway dams and locks as well as dredging the waterway channels themselves. Currently, this entails the upkeep of 230 lock sites, incorporating 275 lock chambers; all of which support a wider private infrastructure of over nine thousand commercial waterway facilities. These navigable waterways are also utilized for means other than transportation of goods; namely for municipal and agricultural irrigation, hydropower (dams), recreation and flood control along with general regional development. Additionally, it should

be noted that the USACE delineates the entire waterway system into four geographic sections: 1) the Atlantic Coast, 2) the Gulf Coast, Mississippi River System and Antilles, 3) the Great Lakes, and 4) the Pacific Coast, Alaska and Hawaii. For the purpose of this report we focus specifically on the Mississippi River System, the Ohio River Basin, the Gulf Coastal Waterway and the Pacific Coast River System.

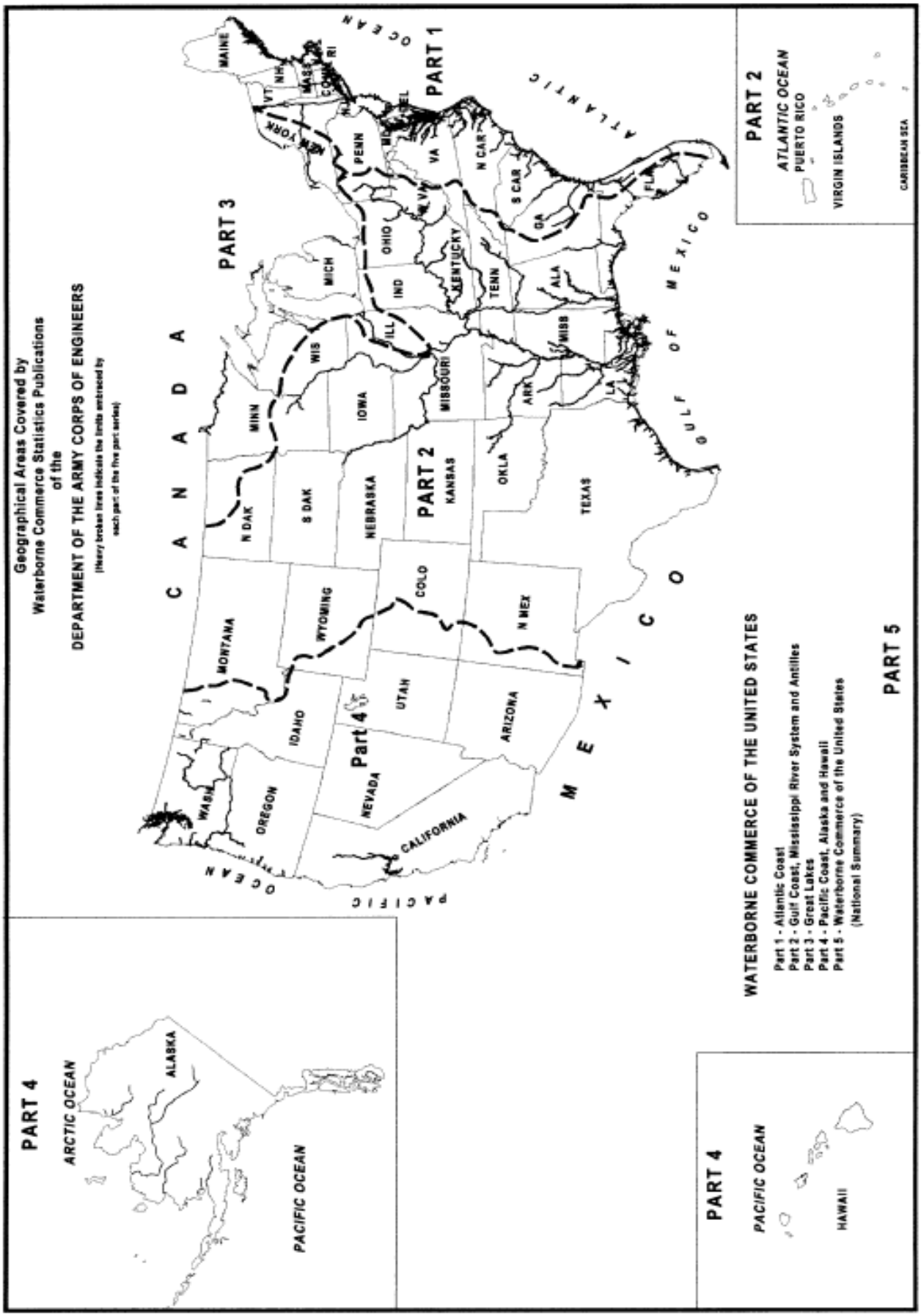


FIGURE 1-1: The Inland Waterway System

1.2 THE DISTRIBUTION OF WATERBORNE ACTIVITIES & FACILITIES

The majority of large ports are located along coastal waters. In fact, of the 189 large port facilities (designated as those handling 250K tons annually) only 25 are considered inland. Although inland facilities comprise only 13% of the total large ports, they account for 47% of the domestic short tons handled and 80% of domestic ton-miles carried.

Port facilities can also be delineated as deep or shallow water. Waterways greater than 12 feet of draft are considered deep, while shallow waterways are usually at 9 feet (except sections of the Snake and Columbia Rivers, which have portions 14 – 15 feet deep, but are still considered shallow waterways). The waterway system as a whole is comprised of 4,869 deep-water facilities and 4,319 shallow water facilities (47% of total). The majority of shallow water ports (55%) are located inland with 97% of the USACE lock sites and 96% of the lock chambers located upon shallow waterways.

The majority of large ports, handling both foreign and domestic traffic, are located along the coastlines. Of the largest 25 ports, all are coastal facilities with only four exceptions: Huntington (WV), Pittsburgh, St. Louis and Duluth-Superior (MN/WI). The first three of these are inland ports, while Duluth-Superior is located on the Great Lakes.

The Mississippi River System flows into the Gulf of Mexico through Louisiana, making both Louisiana and Texas important states for waterborne commerce. Specifically, Louisiana and Texas account for the two largest shares of total waterborne commerce with 496M and 454M short tons, respectively. California follows a distant third with 186M short tons and Pennsylvania and Illinois are fourth and fifth with 125M and 122M short tons, respectively.

Provided below in Table 1-1 are two tables listing the top 100 ports for 2001, based upon total annual tonnage. Column two identifies the 'type' of port, with 'C' being a coastal facility, while 'I' represents an inland facility and an 'L' signifies a lakeside port.

Table 1-1 Leading U.S. Ports in 2001

(Millions of Short Tons and Percent Change from 2000)

			Domestic		Foreign		Total[1]	
Rank	**Type[2]**	**Port**	**Tons**	**%**	**Tons**	**%**	**Tons**	**%**
1	C	South Louisiana, LA, Port of	116.9	-1.9	95.7	-1.1	212.6	-1.6
2	C	Houston, TX	64.5	2.9	120.6	-2.7	185.1	-.8
3	C	New York, NY and NJ	70.2	-2.8	67.3	3.6	137.5	.2
4	C	New Orleans, LA	35.3	-7.8	50.3	-2.7	85.6	-4.9
5	C	Beaumont, TX	17.1	6.9	62.0	1.9	79.1	2.9
6	C	Corpus Christi, TX	23.7	-1.4	53.9	-5.9	77.6	-4.6
7	I	Huntington, WV, OH, KY	76.7	-.3	0.0	0	76.7	-.3
8	C	Long Beach, CA	16.1	-7.6	51.6	-1.7	67.6	-3.2
9	C	Texas City, TX	18.1	-10.8	44.1	16.8	62.3	7.2
10	C	Baton Rouge, LA	40.8	-4.1	20.7	-9.0	61.4	-5.8
11	C	Plaquemines, LA, Port of	37.3	-3.9	23.4	12.3	60.7	1.7
12	I	Pittsburgh, PA	53.0	-1.7	0.0	0	53.0	-1.7
13	C	Lake Charles, LA	20.9	2.2	31.9	-1.9	52.8	-.3
14	C	Los Angeles, CA	6.4	6.0	45.0	6.9	51.4	6.8
15	C	Valdez, AK	51.0	9.8	0.0	-99.8	51.0	6.0
16	C	Mobile, AL	20.1	-16.9	28.0	-4.9	48.1	-10.3
17	C	Philadelphia, PA	13.4	-4.5	32.9	23.1	46.4	13.6
18	C	Tampa, Fl	28.3	-10.5	17.4	17.9	45.8	-1.4
19	C	Baltimore, MD	16.7	15.0	25.4	-3.6	42.1	3.0
20	L	Duluth-Superior, MN and WI	26.5	-5.8	13.3	-1.7	39.8	-4.5
21	C	Norfolk Harbor, VA	10.3	-1.6	27.0	-15.2	37.3	-11.9
22	I	St. Louis, MO and IL	34.4	3.3	0.0	0	34.4	3.3
23	C	Portland, OR	14.3	-12.4	17.0	-5.3	31.3	-8.7
24	C	Freeport, TX	5.2	-6.3	24.9	6.5	30.1	4.0
25	C	Pascagoula, MS	11.1	5.8	18.5	2.1	29.5	3.5
26	C	Portland, ME	2.0	-12.6	26.4	.0	28.5	-1.1
27	C	Charleston, SC	6.1	35.2	17.1	3.5	23.3	10.3
28	C	Port Arthur, TX	7.7	-9.5	15.1	25.6	22.8	11.1
29	L	Chicago, IL	19.3	-3.7	2.6	-31.5	22.0	-8.2
30	C	Port Everglades, FL	12.3	-7.5	9.6	4.4	21.9	-2.6
31	C	Paulsboro, NJ	8.3	-9.2	12.9	-18.2	21.3	-14.9
32	C	Richmond, CA	11.2	23.5	10.0	-2.9	21.2	9.5
33	C	Boston, MA	8.2	-2.8	12.4	.5	20.6	-.8
34	C	Seattle, WA	5.6	-35.5	14.9	-3.3	20.5	-14.9
35	C	Tacoma, WA	8.1	-1.5	12.4	-11.7	20.5	-7.9
36	C	Savannah, GA	2.5	-10.1	16.9	.9	19.4	-.6
37	C	Marcus Hook, PA	10.9	22.6	8.2	-33.0	19.1	-9.7
38	C	Jacksonville, FL	8.9	-12.9	8.9	-6.1	17.8	-9.6
39	L	Detroit, MI	12.3	2.3	4.7	-10.9	17.0	-1.8
40	I	Memphis, TN	16.9	-7.5	0.0	0	16.9	-7.5
41	C	Anacortes, EA	14.8	-7.4	2.0	-2.7	16.8	-6.9
42	C	Honolulu, HI	11.8	7.6	4.8	5.1	16.6	6.8
43	I	Cincinnati, OH	14.1	-1.7	0.0	0	14.1	-1.7
44	C	Newport News, VA	7.2	.3	6.7	.5	13.9	.4
45	L	Indiana Harbor, IN	12.8	-17.2	0.7	9.5	13.6	-16.1
46	C	San Juan, PR	7.6	-2.4	5.2	-14.0	12.8	-7.5
47	C	Oakland, CA	1.6	-17.3	10.7	4.2	12.3	.9
48	L	Two Harbors, MN	11.9	-9.1	0.0	0	11.9	-9.1
49	L	Cleveland, OH	9.1	-23.4	2.7	10.4	11.9	-17.6
50	L	Ashtabula, OH	5.1	-.6	5.8	-18.9	10.9	-11.3

Leading U.S. Ports in 2001 -- continued

(Millions of Short Tons and Percent Change from 2000)

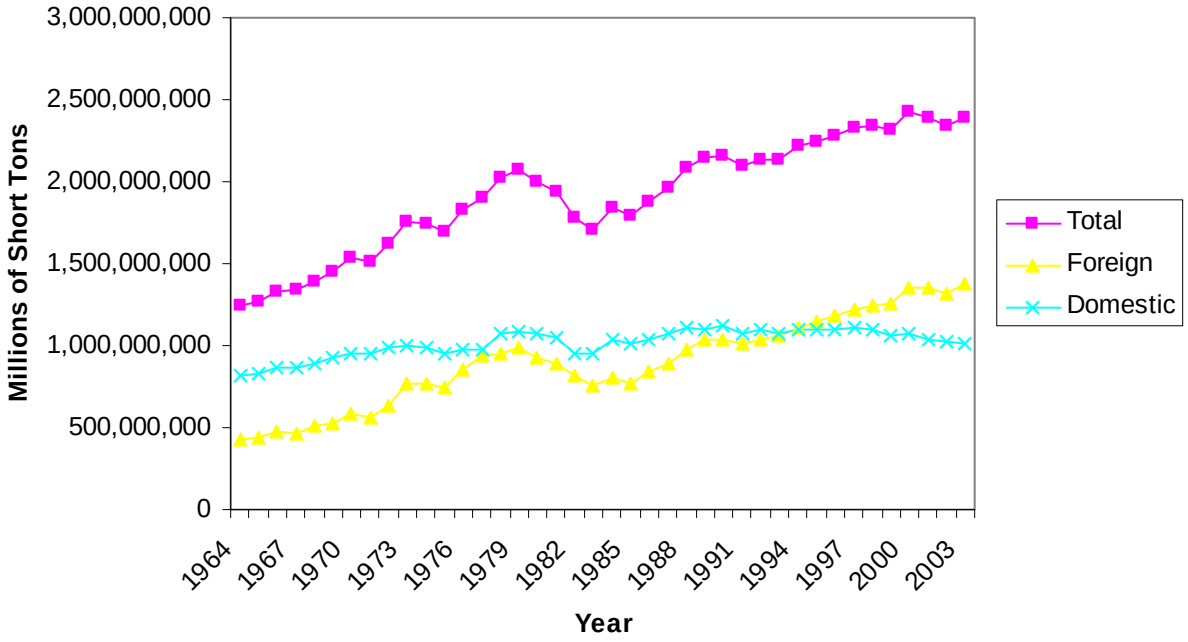
			Domestic		Foreign		Total[1]	
Rank	Type[2]	Port	Tons	%	Tons	%	Tons	%
51	L	Toledo, OH	4.5	-23.7	6.0	-18.7	10.5	-20.9
52	L	Conneaut, OH	3.8	-30.6	6.6	31.0	10.5	-1.1
53	C	New Haven, CT	6.8	-1.8	3.1	-16.3	9.9	-6.9
54	L	Presque Isle, MI	7.6	-7.0	1.8	-27.4	9.5	-11.8
55	I	Louisville, KY	9.1	-.9	0.0	0	9.1	-.9
56	C	Matagorda Ship Channel, TX	2.6	-24.4	6.5	-9.0	9.1	-13.9
57	C	Galveston, TX	5.1	41.1	3.9	-41.9	9.0	1.8
58	C	Providence, RI	5.7	1.7	3.3	1.9	9.0	1.8
59	L	Gary, IN	8.5	-9.5	0.4	29.2	8.9	-8.3
60	L	Burns Waterway Harbor, IN	6.9	-5.3	1.9	-10.9	8.7	-6.5
61	C	New Castle, DE	5.2	-4.3	3.4	8.2	8.6	.3
62	C	Miami, FL	1.1	-22.0	7.4	3.0	8.5	-1.1
63	L	Calcite, MI	7.3	2.2	1.1	-23.0	8.3	-1.9
64	L	Stoneport, MI	7.9	4.6	0.2	-33.0	8.1	3.2
65	L	Lorain, OH	7.6	-45.6	0.3	9.4	7.9	-44.5
66	C	Albany, NY	5.6	4.3	1.7	114.1	7.3	18.6
67	C	Vancouver, WA	2.3	-31.5	4.8	9.7	7.0	-8.0
68	L	Escanaba, MI	6.9	-19.7	0.0	0	7.0	-19.3
69	C	Kalama, WA	1.2	10.7	5.4	15.6	6.6	14.7
70	C	Wilmington, DE	1.3	16.5	5.1	26.1	6.4	24.1
71	C	Nikishka, AK	3.3	64.0	3.0	-1.5	6.4	-24.7
72	L	Port Inland, MI	5.2	4.1	1.1	108.9	6.3	14.2
73	C	Wilmington, NC	3.0	-18.6	3.2	5.5	6.2	-7.6
74	C	Barbers Point, Oahu, HI	3.9	11.6	2.2	-33.2	6.1	-10.3
75	C	Camden-Gloucester, NJ	2.5	3.6	2.6	-4.8	5.1	-.9
76	I	Nashville, TN	4.8	7.1	0.0	0	4.8	7.1
77	L	St. Clair, MI	4.8	-13.2	0.0	-100.0	4.8	-13.2
78	I	Vicksburg, MS	4.7	-4.7	0.0	0	4.7	-4.7
79	C	Victoria, TX	4.7	-7.3	0.0	0	4.7	-7.3
80	I	St. Paul, MN	4.7	-11.2	0.0	0	4.7	-11.2
81	L	Sandusky, OH	1.5	100.9	3.2	9.1	4.6	27.6
82	C	Bridgeport, CT	3.4	3.2	1.2	22.3	4.6	7.7
83	C	Portsmouth, NH	0.6	-30.4	3.9	6.5	4.4	-.4
84	C	Port Canaveral, FL	1.5	6.2	2.9	1.5	4.4	3.1
85	L	Silver Bay, MN	4.3	-20.0	0.0	-100.0	4.3	-20.2
86	I	Kansas City, MO	4.3	11.9	0.0	0	4.3	11.9
87	C	Brownsville, TX	1.8	29.8	2.3	22.3	4.1	25.5
88	C	Chester, PA	0.3	-3.6	3.7	104.4	4.0	86.8
89	L	Marine City, MI	3.9	.4	0.0	-85.6	3.9	-2.3
90	C	Port Manatee, FL	1.4	-22.7	2.4	-2.6	3.8	-11.2
91	C	Kahului, Maui, HI	3.5	1.8	0.2	0	3.7	6.3
92	C	Longview, WA	0.5	-49.7	3.1	-1.7	3.6	-12.7
93	C	Palm Beach, FL	2.2	30.1	1.3	4.1	3.5	19.3
94	C	Fall River, MA	2.8	2.3	0.6	-11.6	3.4	-.6
95	L	Milwaukee, WI	1.7	-25.3	1.6	34.0	3.4	-4.7
96	C	Penn Manor, PA	0.1	-18.0	3.2	-5.4	3.3	-5.8
97	L	Port Dolomite, MI	2.9	-3.0	0.4	79.4	3.3	2.8
98	L	Alpena, MI	3.1	-3.2	0.1	-18.7	3.3	-4.0
99	C	Ponce, PR	0.1	-41.2	3.1	49.6	3.2	42.6
100	C	Morehead City, NC	1.1	-27.6	2.1	-28.2	3.1	-28.0

Source: The U.S. Waterway System-Transportation Facts, U.S. Army Corps of Engineers, (2002)

1.3 TOTAL WATERBORNE COMMERCE & PRINCIPAL COMMODITIES SHIPPED

Waterborne commerce tonnages have increased over time. In fact, as shown in Figure 1-2, total tonnages have increased steadily since 1962. Figure 1-2 also shows that this increase in total tonnages shipped has been largely the result of increased foreign traffic, as opposed to domestic traffic.

FIGURE 1-2: Total Waterborne Commerce of the U.S., 1964-2003

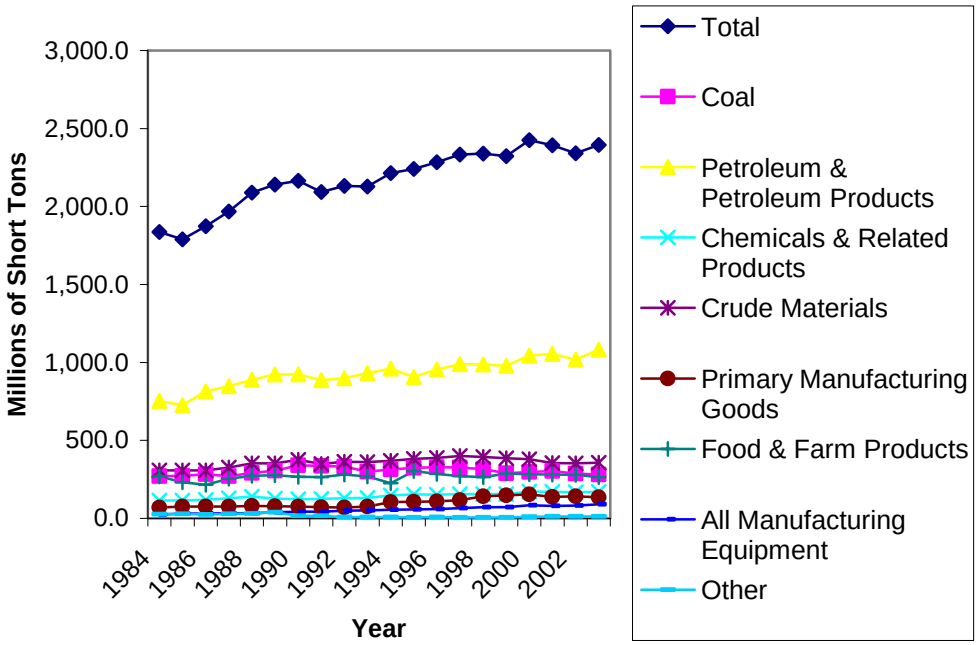


Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 1-2*

By commodity, Figure 1-3 and Table 1-2 show that the dominant product carried on the waterway system is petroleum and its related products which account for 750 to 1000M tons per

year. Crude materials at approximately 350M tons and coal with approximately 300M tons round out the top three commodities carried on the waterway system.

FIGURE 1-3: Total Waterborne Commerce by Commodity, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 1-3*

TABLE 1-2: Total Waterborne Commerce by Commodity, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	1,836.0	1,788.4	1,874.4	1,967.5	2088.0	2140.4	2163.9	2092.1	2132.1	2128.2
Coal	271.8	273.9	283.9	271.3	292.2	304.8	339.9	336.8	332.2	300.4
Petroleum & Petroleum Products	753.5	726.4	815.6	847.7	887.7	922.7	923.5	886	899.6	930.6
Chemicals & Related Products	115.1	114.3	118.6	129	138.8	127.8	123.8	125.1	128.7	131.6
Crude Materials	307.1	307.1	308.4	327.1	352	353.2	374.9	348.9	364	360.6
Primary Manufacturing Goods	69.3	76.9	76	76.5	79.5	77.8	76	71.8	70.1	76.8
Food & Farm Products	268.3	231	215.2	254.1	273.4	276	267.5	263.9	280.4	269.3
All Manufacturing Equipment	25.1	29.8	31.4	33.6	33.8	38.4	42.2	43.6	49	51.1
Other	25.8	29.1	25.5	28.2	30.5	39.7	16.5	16	8	7.9
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	2214.8	2240.4	2284.1	2333.1	2339.5	2322.6	2424.6	2393.3	2340.3	2394.3
Coal	314.1	324.5	328.7	326.0	316.1	289.2	297.0	303.3	286.9	281.2
Petroleum & Petroleum Products	961.3	907.1	954.4	988.2	987.4	979.1	1043.9	1055.3	1017.9	1080.5
Chemicals & Related Products	146.9	152.9	152.3	156.6	156.5	155.7	172.4	169.7	167.6	171.3
Crude Materials	369.3	381.7	388.7	400.9	394.3	386.6	380.3	354.0	352.0	358.0
Primary Manufacturing Goods	105.0	106.3	108.9	117.0	141.0	147.4	153.0	137.1	140.8	134.7
Food & Farm Products	225.8	303.2	284.9	271.7	265.7	287.9	283.3	281.9	280.0	265.7
All Manufacturing Equipment	54.9	57.8	59.0	66.1	71.8	71.5	83.6	80.3	81.9	90.0
Other	7.3	6.9	7.2	6.6	6.6	5.2	11.1	11.7	13.2	12.8

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 1-5*

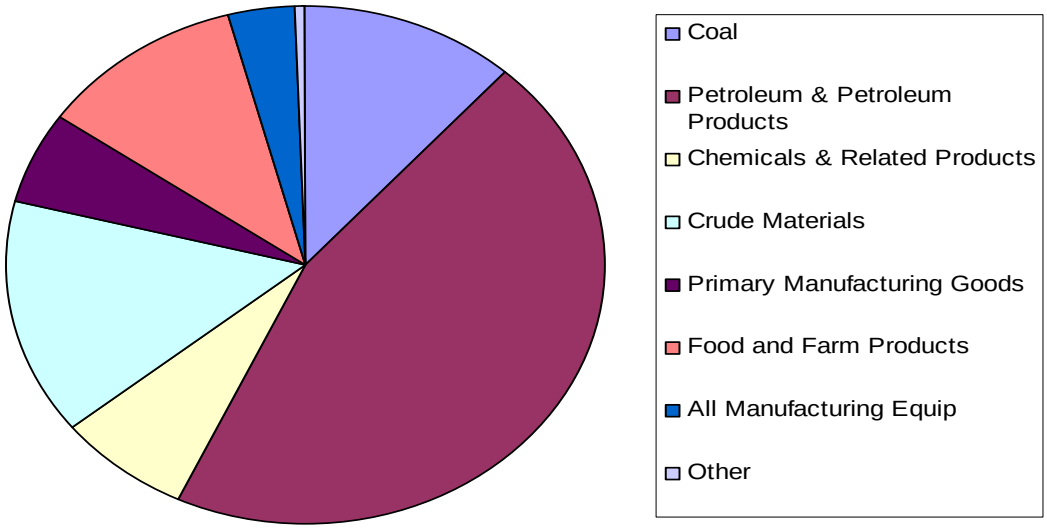
From an international perspective, Table 1-3 and Figures 1-4, 1-5 and 1-6 show tonnages of commodities shipped as either foreign or domestic based. Foreign commodity traffic is dominated by petroleum, food and farm products and crude materials third. Alternatively, domestic traffic consists largely of petroleum, coal and crude materials.

TABLE 1-3: Principle Commodities in Waterborne Commerce 2002-2003 (millions of short tons)

	2002	2003	% Change
Total Commerce	2,340.30	2,394.30	2.3
Coal	286.9	281.2	-2
Petroleum & Petroleum Products	1,017.90	1,080.50	6.2
Chemicals & Related Products	167.6	171.3	2.2
Crude Materials	352	358	1.7
Primary Manufacturing Goods	140.8	134.7	-4.4
Food and Farm Products	280	265.7	-5.1
All Manufacturing Equip	81.9	90	10
Other	13.2	12.8	-2.7
Foreign Commerce	1,319.30	1,378.10	4.5
Coal	59.9	67.6	12.9
Petroleum & Petroleum Products	669.2	719.7	7.5
Chemicals & Related Products	94.5	95.6	1.1
Crude Materials	137.2	146.4	6.7
Primary Manufacturing Goods	98.4	93	-5.5
Food and Farm Products	182.5	174.8	-4.2
All Manufacturing Equip	67.3	71.3	6
Other	10.2	9.6	-5.8
Domestic Commerce	1,021.00	1,016.10	-0.5
Coal	227	213.5	-5.9
Petroleum & Petroleum Products	348.7	360.8	3.5
Chemicals & Related Products	73.1	75.7	3.6
Crude Materials	214.7	211.6	-1.5
Primary Manufacturing Goods	42.4	41.7	-1.7
Food and Farm Products	97.6	90.9	-6.8
All Manufacturing Equip	14.6	18.7	28.4
Other	3	3.2	8.3

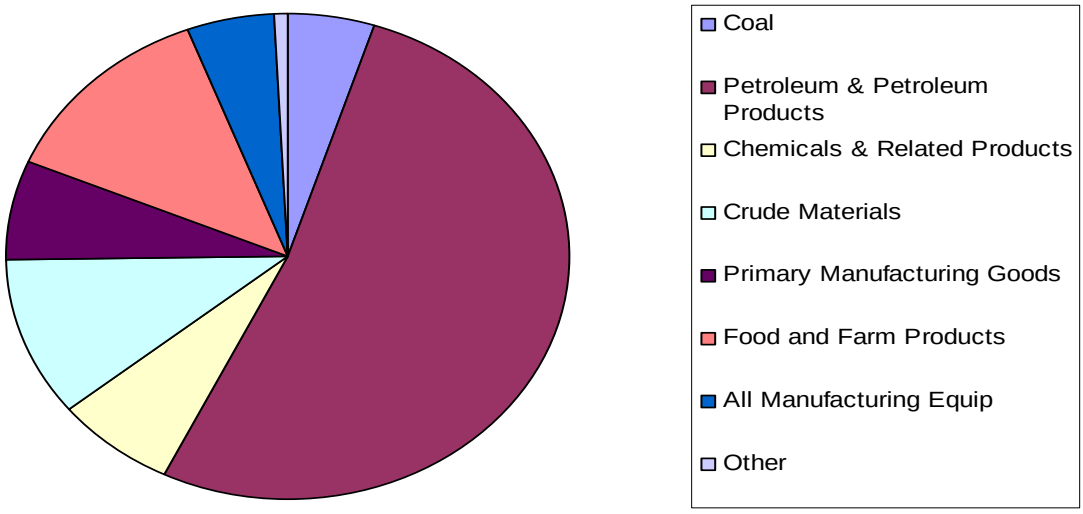
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 2-4*

FIGURE 1-4: Principle Commodities in Waterborne Commerce, 2003 (Total)



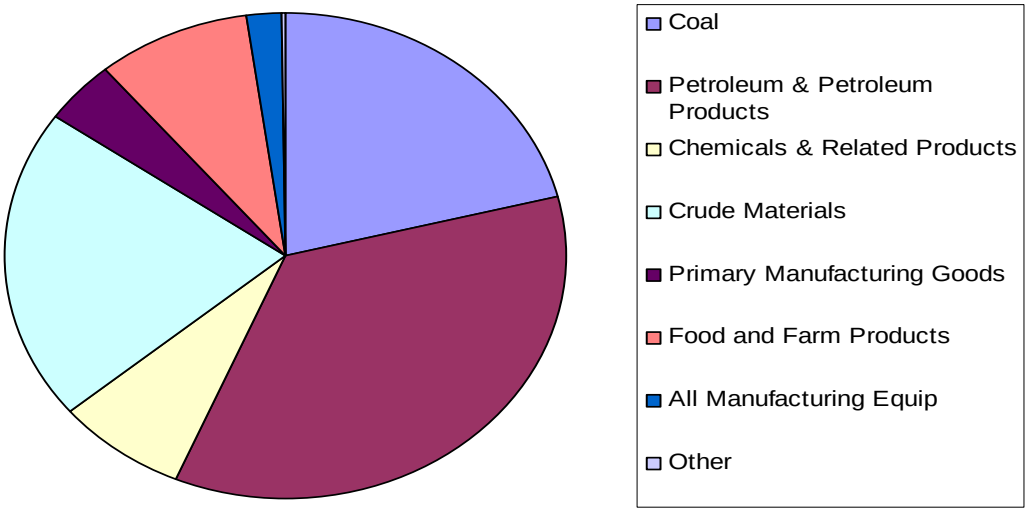
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 2-2*

FIGURE 1-5: Principle Commodities in Waterborne Commerce, 2003 (Foreign)



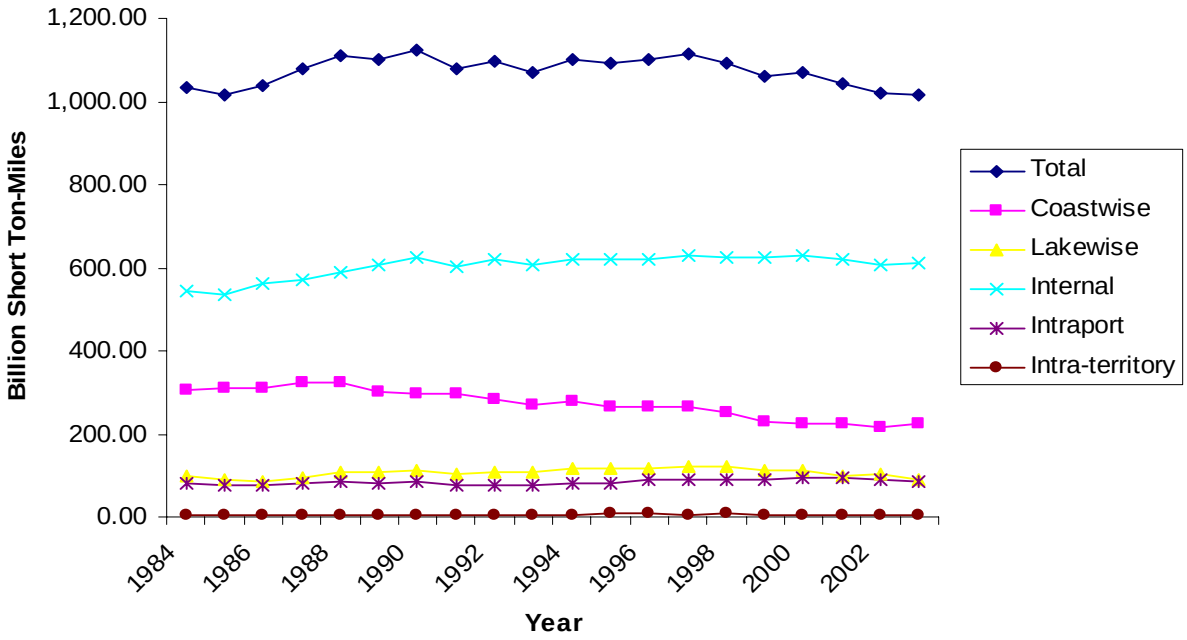
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 2-2*

FIGURE 1-6: Principle Commodities in Waterborne Commerce, 2003 (Domestic)



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 2-2*

FIGURE 1-7: Domestic Waterborne Commerce, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 1-6*

Broken down by type of traffic, domestic traffic has seen intraport and lakewise shipments remain steady with internal domestic commerce slightly increasing over time and coastwise domestic traffic decreasing as seen in Figure 1-7 and Table 1-4.

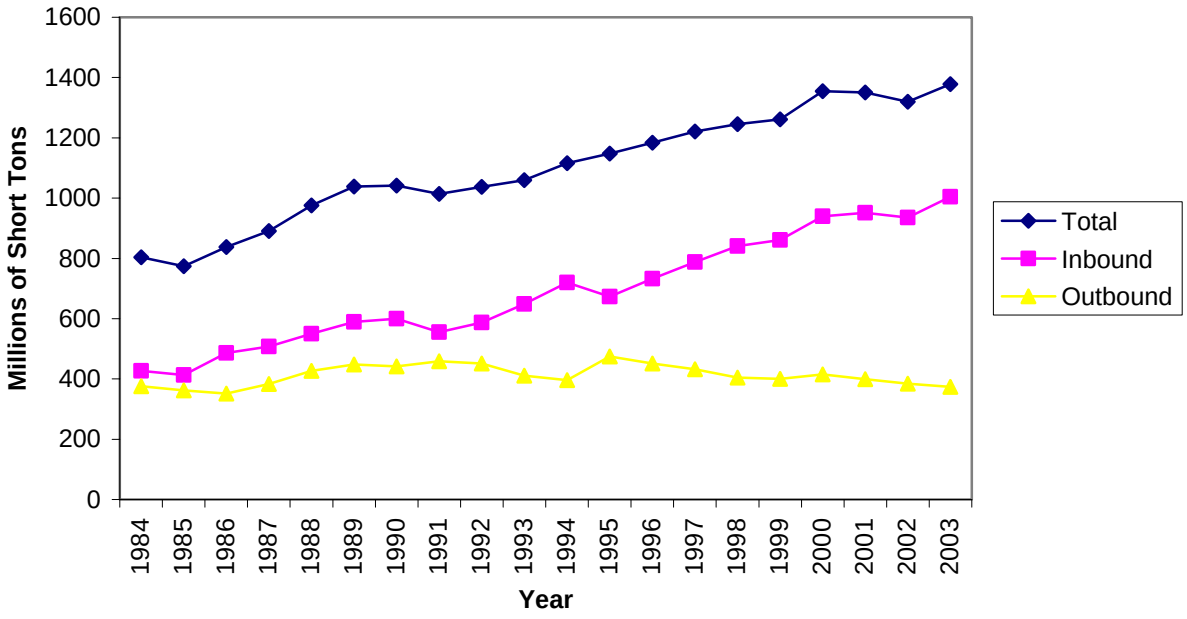
TABLE 1-4: Domestic Waterborne Commerce, 1984-2003 (billion short ton-miles)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	1,032.70	1,014.10	1,037.20	1,076.50	1,111.80	1,102.50	1,122.30	1,078.60	1,094.60	1,068.20
Coastwise	307.7	309.8	308	323.5	325.2	302	298.6	294.5	285.1	271.7
Lakewise	98	92	87.4	96.5	109.7	109.1	110.2	103.4	107.4	109.9
Internal	542.5	534.7	560.5	569.8	588.1	606	622.6	600.4	621	607.3
Intraport	81.1	74.3	77.4	82	83.7	80.2	86.4	75.6	76.8	74.4
Intra-territory	3.4	3.4	4	4.7	5.1	5.2	4.5	4.6	4.2	5
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	1,099.00	1,093.00	1,100.70	1,112.50	1,094.10	1,061.80	1,069.80	1,042.50	1,021.00	1,016.10
Coastwise	277	266.6	267.4	263.1	249.6	228.8	226.9	223.6	216.4	223.5
Lakewise	114.8	116.1	114.9	122.7	122.2	113.9	114.4	100	101.5	89.8
Internal	618.4	620.3	622.1	630.6	625	624.6	628.4	619.8	608	609.6
Intraport	82.9	83.1	89	89.8	90.1	88.7	94.6	93.2	90	86.9
Intra-territory	5.9	6.9	7.3	6.3	7.2	5.9	5.5	5.9	5.1	6.4

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 1-8*

Foreign waterborne commerce, displayed in figure 1-7 and table 1-6 has grown over time, with the primary growth coming from inbound traffic, which has shown steady gains since 1984.

FIGURE 1-8: Foreign Waterborne Commerce Inbound and Outbound Traffic, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 1-4*

TABLE 1-5: Foreign Waterborne Commerce Inbound and Outbound Traffic, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	803.3	774.3	837.2	891	976.2	1,037.90	1,041.60	1,013.60	1,037.50	1,060.00
Inbound	427.1	412.7	486.1	507.7	549.9	589.5	600	555.4	586.7	648.8
Outbound	376.2	361.6	351.2	383.3	426.3	448.4	441.6	458.2	450.8	411.3
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	1,115.70	1,147.40	1,183.40	1,220.60	1,245.40	1,260.80	1,354.80	1,350.80	1,319.30	1,378.10
Inbound	719.5	672.7	732.6	788.3	840.7	860.8	939.7	951.8	934.9	1,004.80
Outbound	396.2	474.7	450.8	432.3	404.7	400	415	399	384.3	373.3

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 1-6*

2. COMMODITY FLOWS OF THE U.S. WATERWAY SYSTEM

2.1 INTRODUCTION

Relative to other modes of transportation, water-based transportation garnishes a relatively small portion of total commodities carried. Specifically, according to the 1997 Economic Census, water moved 9.8% of total ton-miles of national transportation needs. This was based upon 5.1% of total ton-miles having a relative value of 1.1% for all goods transported. The dominant modes were truck and rail, each transporting nearly identical portions of total ton-miles (38.5%). Trucks, however, captured 70% of both total tons and value transported.

However, the role of waterways is critical, especially considering the prevalence of multi-mode shipments. Approximately 6% of total tons, 10% of ton-miles and 18% of combined value is shipped via multi-mode transports. But, of these shipments, water travel was a component in over half (54.5%) of these transactions. Water travel was also involved with 50% of total tons carried. As such, water-based travel proves a more integral component of the U.S. transportation system than a casual glance would suggest.

Multi-mode transportation seemed to be getting more important over the years 1993 – 1997, when multi-mode transportation increased 6.8%. Interestingly, truck and water (T&W) decreased 14.4%, but was nearly offset by an increase of 10.5% in rail and water (R&W) shipments. It should be noted that 70% of ton-mile shipments for T&W are greater than 100K pounds. For R&W, shipments over 100K pounds accounted for 99.7% of all ton-miles shipped, which is nearly identical for that of shallow draft (single mode).

When focusing solely upon shallow draft (i.e., inland waterways), single mode shipments accounted for 8.5% of national ton-miles with an average distance traveled of 253 miles. These shallow draft shipments increased by 32% in value shipped over the years 1993 – 1997, 14% in total tons hauled and 15% in ton-miles.

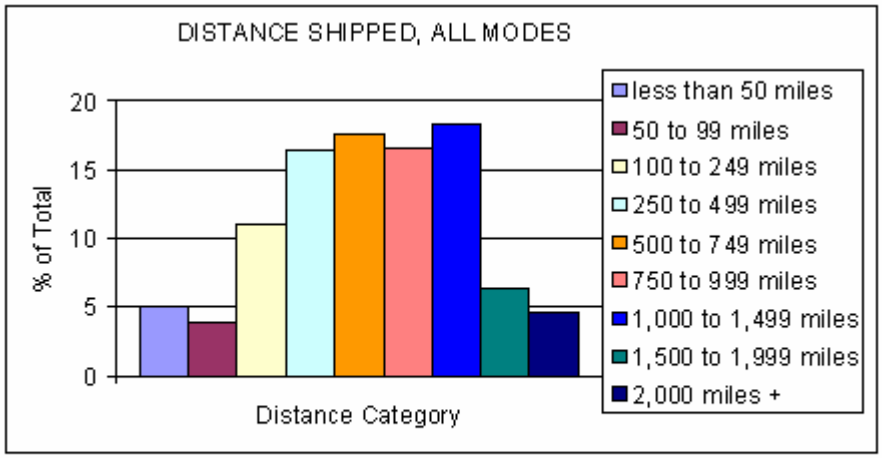


Figure 2-1

Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

Stepping back to ascertain the transportation picture in its entirety, a few graphs will be in order. To start, the Figure 2-1 depicts the distribution of all transported goods over select distances, inclusive of all modes. As can be readily seen, the distribution is relatively evenly cast over distances of 250 to 1,500 miles. However, shallow draft distances are considerably longer as seen in Figure 2-2.

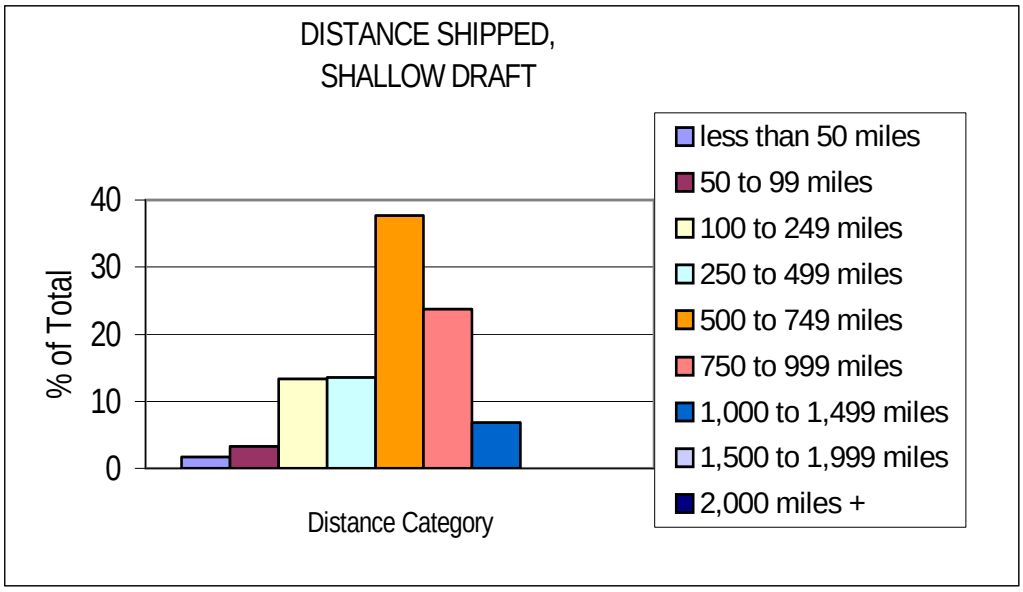


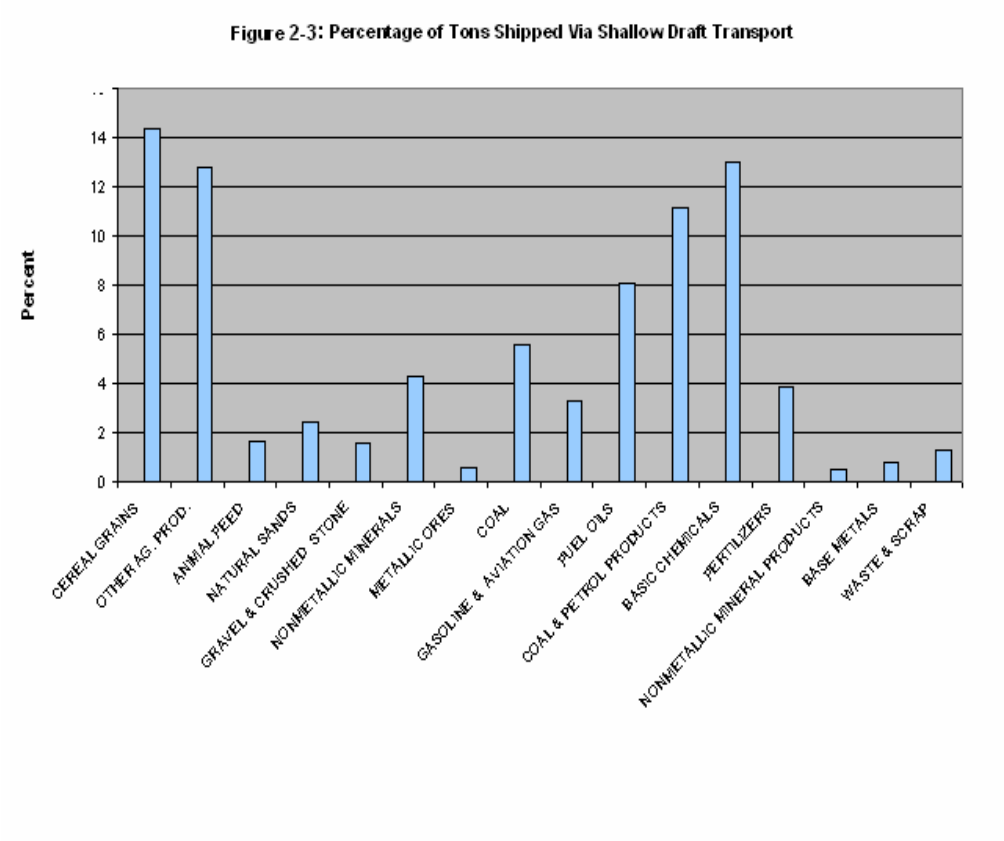
Figure 2-2
Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

Additionally, when taking into account multi-mode distances, there appear to be distinct differences between the distributions of rail and water versus that of truck and water. Rail and water (R&W) distances were primarily over longer ranges (750 – 1500mi.), while truck and water trips were shorter in duration, evenly distributed from 250 to 1000 miles. Only 12% of distances were of 2000 miles or greater for T&W.

2.2 RELEVANT SHALLOW DRAFT COMMODITIES

Of the 43 Standard Classification of Transported Goods (SCTG) commodity classifications listed within the 1997 Economic Census, there are 16 relevant groupings for shallow draft transportation. These, not surprisingly, are all bulk commodities. The emphasis upon bulk transportation reflects the inland waterway's natural comparative advantage in hauling these large-scale commodities.

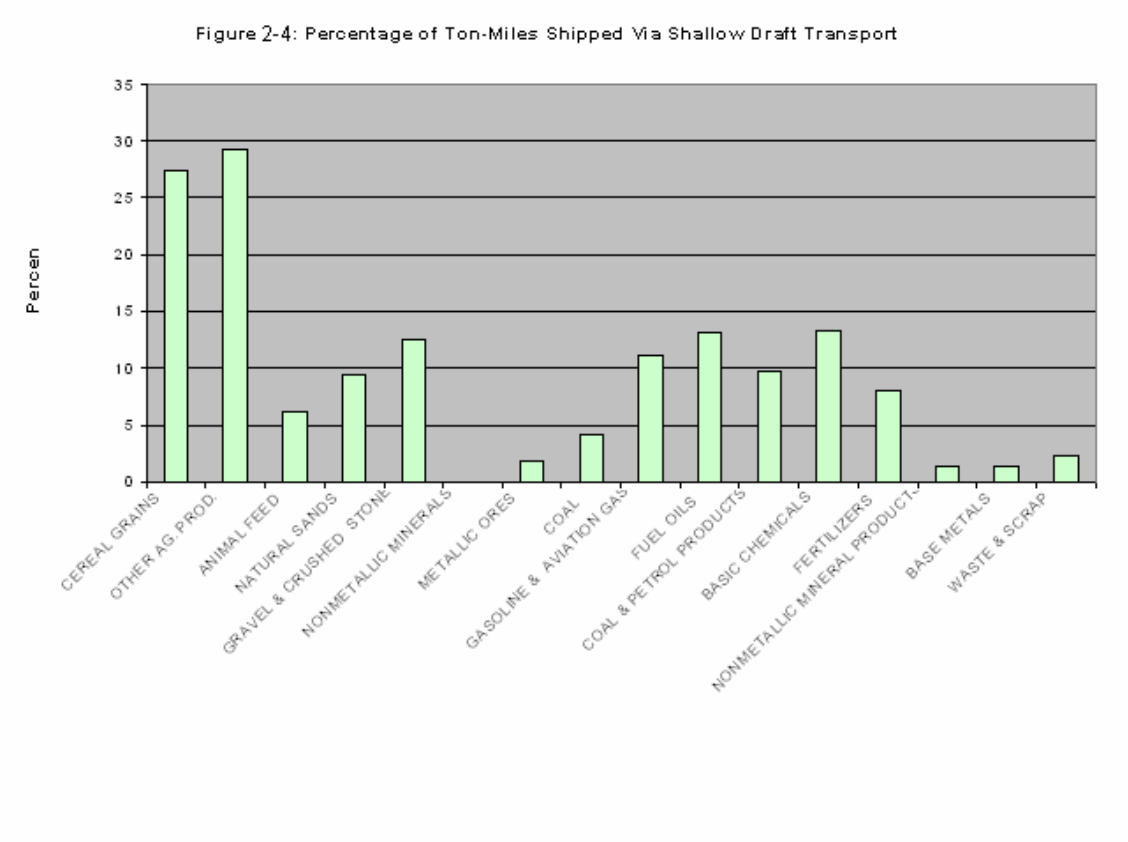
Figure 2-3 depicts each of the sixteen significant commodities evaluated with relation to the percentage of tons carried by shallow draft transport as compared to other modes shipping that particular good. As can be seen, all commodities were under fifteen percent, with only five above 8%. The remaining eleven commodities all exhibited low percentages of relative transport totals. As should be expected, coal, petroleum products and agricultural products all were amongst those commodities with relatively higher total carrying ratios.



Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

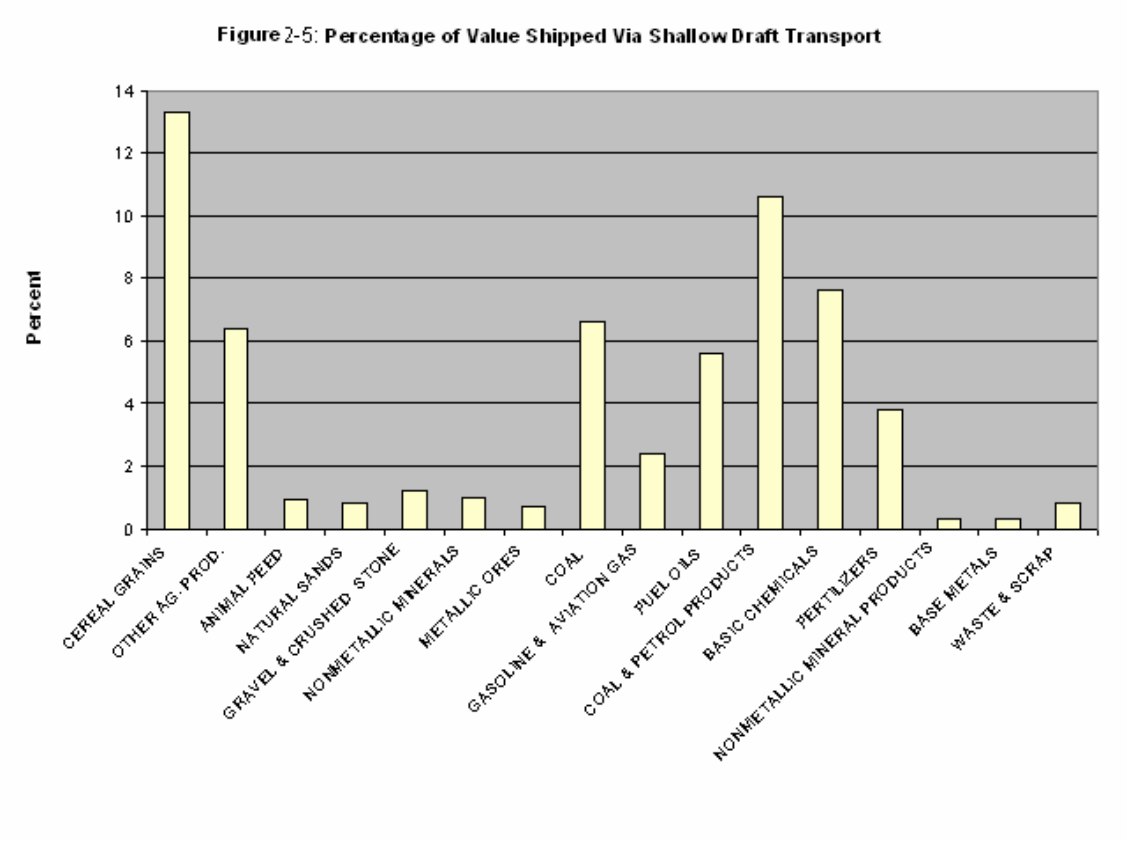
Figure 2-4 shows the percentage of ton-mile shipped via shallow draft transportation. In terms of ton-miles, eleven primary water-borne commodities (coal and petroleum, basic chemicals) showed percentages of approximately 10% or greater. Of particular interest are the two similar commodities: Cereal Grains (SCTG 2) and Other Ag. Products (SCTG 3). Both

were significantly higher than the other commodities, with percentages of 27.4 and 29.3, respectively. Others, namely Nonmetallic Minerals (SCTG 13) were non-tractable due to "high variability or other reasons" within the data, as stated in the 1997 Transportation Census.



Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

Figure 2-5 paints a similar picture to the previous two graphs, this time in terms of the value the product transported. Again, agricultural products are the dominant commodities. Cereal Grains in particular mimicked earlier percentages in both tons and ton-miles, here showing that over 13% of total value was transported via internal waterways. SCTG 19 (Coal and Petroleum Products) along with Coal (SCTG 15) and Basic Chemicals (SCTG 20) additionally exhibited percentages in excess of 6.5%.



Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

In terms of the average distance carried, the commodities can be categorized into three groupings. Specifically, three agricultural commodities (Cereal Grains, Other Ag. Products, Animal Feed) made up the first group with an average distance well over 800 miles. The second class, consisting of mineral-based goods, were carried over more moderate distances (400- 800 miles, on average) and consisted of the 'mineral group' (i.e., Nonmetallic Minerals, Metallic Ores, Base Metals, Waste and Scrap) along with Basic Chemicals (400 mile avg.). The final grouping is that of commodities with smaller average transport distances (sub-400 miles) or simply insufficient data to correctly ascertain (Fuel Oils, for example). The average distance traveled for each of these commodities is shown below in Figure 2-6.

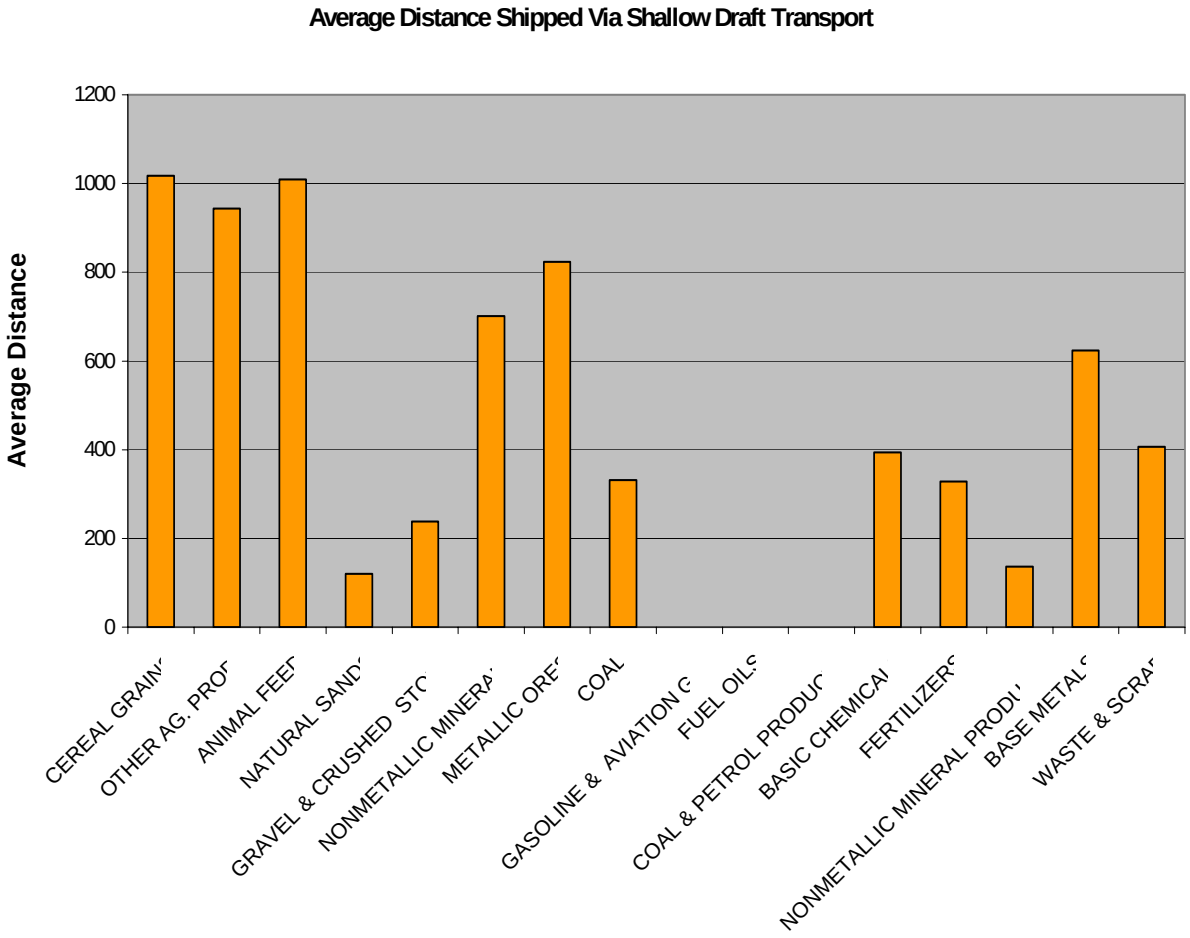


Figure 2-6

Source: 1997 Commodity Flow Survey, based on the 1997 Economic Transportation Survey

THE MISSISSIPPI RIVER SYSTEM

3.1 INTRODUCTION

Stretching from the upper reaches of Minnesota to the Gulf of Mexico and dropping from an elevation of 1475 feet above sea level, the Mississippi is the second longest river in North America (only the Missouri is longer). As part of a navigable waterway system, it begins in Minneapolis and flows for over 1800 miles as it joins other waterway arteries. Specifically, south of Minneapolis, the navigable portion of the Mississippi later couples with both the Missouri and Illinois rivers near St. Louis. Flowing further southward, in proximity to Cairo, Illinois, it is wedded with another major waterway discussed above, namely that of the Ohio and its adjoining tributaries. On its pathway to the Gulf, the enlarged Mississippi additionally incorporates the Arkansas and Ouachita rivers as it approaches the end of its journey. Thus, the Mississippi River itself is one of many interconnected waterways which are part of a larger embodiment, designated the Mississippi River Main Stem.

Considering the Mississippi River itself, the river is often divided into two sections: the Upper Mississippi River and the Lower Mississippi River. The Upper Mississippi River stretches from Cairo, IL to Minneapolis, MN while the Lower Mississippi River is considered the portion of river between New Orleans, LA and Cairo, IL. The division of the river into these particular sections is due to the differences in river attributes along each section. The Upper Mississippi River uses a series of locks to allow transportation on the northern part of the Mississippi River, transportation that would not occur in the absence of the locks. South of Cairo, IL. no locks are present due to the depth of this portion of the river. Because the locks slow traffic along the river as barges must pass through one at a time, the Upper Mississippi is usually considered a separate waterway. Not surprisingly, the amount of traffic on the river

system increases as one moves down river as shown in Table 3-1. Note that this table has the Mississippi River divided into three not two sections. In Table 3-1 the Upper Mississippi is the section of the river between Minneapolis, MN and the mouth of the Missouri River. The Middle Mississippi is the section of river between the mouth of the Missouri River and the mouth of the Ohio River. Finally, the Lower Mississippi is below the mouth of the Ohio River. Notice that traffic on the Lower Mississippi is more than double that on the Upper Mississippi, with traffic in the Middle Mississippi being approximately 50% larger than that on the Upper Mississippi.

TABLE 3-1: Total Waterborne Commerce on the Mississippi River by Section, 1993-2002

Upper Mississippi	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Farm Products	39.1	37.9	46.8	45.7	41.1	40.8	47.8	43.9	41.0	46.8
Metals	3.3	6.1	5.0	3.9	4.7	5.5	4.9	6.0	4.2	5.2
Coal	8.4	10.3	9.0	8.6	7.5	8.8	8.6	7.9	7.6	7.4
Crude Petroleum	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Nonmetallic Minerals	7.3	8.8	8.6	8.0	9.5	8.5	9.7	10.2	10.4	10.0
Forest Products	0.1	0.2	0.3	0.3	0.2	0.3	0.3	0.4	0.3	0.4
Industrial Chem	3.6	4.3	4.0	3.8	4.1	4.2	3.9	3.9	3.4	3.5
Agricultural Chem	3.8	4.5	3.7	3.3	3.0	3.4	3.2	3.4	3.5	3.5
Petroleum Products	6.4	7.4	6.8	6.7	7.7	8.0	7.3	7.5	8.2	7.2
Other	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.0
Total	72.2	79.4	84.4	80.4	77.8	79.6	85.7	83.3	78.8	84.1
Middle Mississippi	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Farm Products	48.8	46.6	56.0	54.6	51.9	51.6	59.8	55.3	52.5	57.4
Metals	4.3	7.5	6.6	5.2	6.1	7.2	6.2	7.9	5.6	6.3
Coal	19.5	22.1	22.7	23.1	22.2	23.1	22.9	23.4	24.2	23.8
Crude Petroleum	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Nonmetallic Minerals	12.2	15.8	17.4	14.8	16.7	16.9	20.0	18.5	19.2	17.4
Forest Products	0.2	0.3	0.3	0.4	0.3	0.4	0.5	0.7	0.4	0.4
Industrial Chem	3.9	4.6	4.4	4.3	4.5	4.7	4.5	4.4	3.9	4.0
Agricultural Chem	4.6	5.2	4.4	4.0	3.8	4.1	3.7	3.9	4.3	4.2
Petroleum Products	5.6	6.7	6.2	6.6	6.9	7.7	7.0	7.4	8.8	7.9
Other	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0
Total	99.1	108.9	118.3	113.0	112.5	115.8	124.7	121.6	119.1	121.5

Lower Mississippi	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Farm Products	73.3	68.0	79.1	75.6	71.8	69.7	79.1	77.3	78.1	80.6
Metals	14.7	20.9	20.8	19.7	20.6	22.9	23.3	26.9	21.0	24.1
Coal	34.2	35.4	32.8	30.7	29.3	28.4	23.7	23.8	25.0	22.5
Crude Petroleum	1.1	1.9	2.2	2.0	2.2	2.2	2.4	2.1	1.6	1.3
Nonmetallic Minerals	23.3	30.0	31.1	29.3	31.2	31.6	36.7	33.4	31.8	29.7
Forest Products	0.8	0.9	0.8	1.3	1.5	1.3	1.1	1.3	0.7	0.7
Industrial Chem	10.4	11.1	11.1	11.0	11.2	10.9	10.7	10.7	10.0	10.0
Agricultural Chem	8.7	9.5	8.9	8.0	7.9	8.5	8.2	8.4	9.5	8.6
Petroleum Products	17.1	18.7	17.9	18.1	18.1	19.8	19.3	20.2	22.8	20.9
Other	0.2	0.2	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.1
Total	183.8	196.8	205.1	195.9	193.9	195.9	204.9	204.3	200.6	198.3

Source: *Waterborne Commerce of the United States, Calendar Year 2002, Part 2 – Waterways and Harbors Gulf Coast, Mississippi River System and Antilles, U.S. Army Corps of Engineers (2003)*

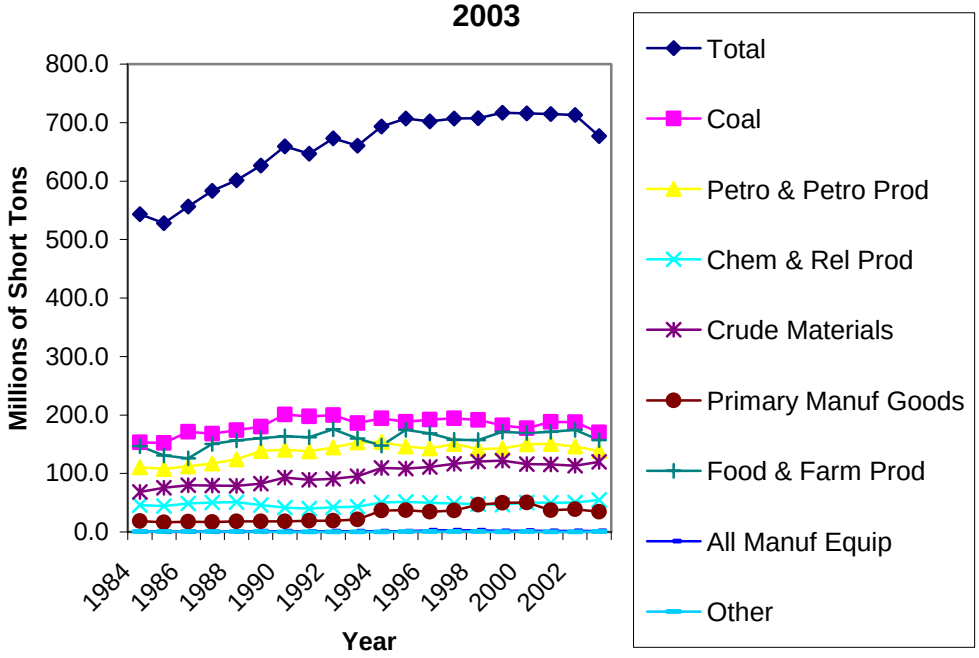
Stepping back even further, the Mississippi River Main Stem is part of a yet larger grouping, the Mississippi River System shown below in Figure 3-1. This designation of 'system', in its widest definition, includes also the Ohio River Basin, discussed below. As such, the Mississippi River System is inclusive of the Ohio River and its seven arteries.

Figure 3-1: The Mississippi River System

3.2 ATTRIBUTES

Figure 3-2 and Table 3-2 show the total waterborne commerce by commodity for the Mississippi River system. Coal is the Mississippi System's dominant quantity carried, totaling 25.2% of all commerce transported in 2003. However, coal is closely matched in relative percentages with two other commodity categories: Food and Farm Products (23.2%) as well as Petroleum and Petroleum Products (20.5%).

FIGURE 3-2: Total Waterborne Commerce by Commodity for the Mississippi River System, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-2*

TABLE 3-2: Total Waterborne Commerce by Commodity, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	543.5	527.8	556.4	583.4	601.6	626.4	659.1	646.6	673.1	660.4
Coal	153	152	171.1	167.9	173.8	180.3	200.8	197.5	199.7	186.1
Petro & Petro Prod	110.5	107.6	112.1	116.9	124.4	138.2	140.9	137.9	144.6	153
Chem & Rel Prod	45.7	44.4	48.6	50.6	50.8	45.8	41.8	40	42	43.5
Crude Materials	68.2	75.6	80	79.5	78.6	82.6	92.8	89	91.1	95.4
Primary Manuf Goods	18.6	16.5	17.5	17.1	18.3	18.1	18.3	19.4	18.9	21.6
Food & Farm Prod	146.5	130.6	125.8	150.4	156.4	160.1	163.4	161.9	175.7	159.6
All Manuf Equip	0.6	0.7	0.8	0.6	0.8	1.1	1	0.8	0.9	1.1
Other	0.4	0.4	0.3	0.4	0.4	0.4	0.1	0.1	0.2	0.2
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	693.3	707.2	701.8	707.1	707.4	716.9	715.5	714.8	712.8	676.8
Coal	194.2	188.1	192.3	194.2	191.5	182.4	177.2	188.4	187.9	170.3
Petro & Petro Prod	153.6	146.2	143.0	150.3	141.6	143.0	150.0	150.6	146.3	138.7
Chem & Rel Prod	50.3	51.4	49.9	48.9	47.4	46.6	50.3	49.9	50.4	54.5
Crude Materials	109.7	108.3	111.0	116.6	120.5	121.9	115.8	115.7	113.0	120.0
Primary Manuf Goods	36.5	37.3	34.6	36.7	46.5	49.8	50.4	37.0	39.0	34.2
Food & Farm Prod	147.7	174.5	168.3	157.6	157.0	171.2	169.0	171.1	174.4	157.2
All Manuf Equip	1.1	1.2	2.5	2.5	2.6	1.8	2.1	1.8	1.5	1.5
Other	0.2	0.3	0.3	0.3	0.3	0.2	0.7	0.1	0.2	0.4

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-2*

Examining the Mississippi River itself, Table 3-3 and Figures 3-3 to 3-5 show the principle commodities shipped. Food and Farm Products are the dominant commodity carried (32.7% of total), reflecting the westerly geographical positioning of the Mississippi River itself relative to that of the system as a whole. Another inescapable trait in the river's positioning is the direct connection to the Gulf of Mexico. Here the strong flow of oil from offshore derricks as well as that imported from other countries pushes petroleum and its related products to be the Main Stem's second largest commodity, with 26.6% of the total shipments.

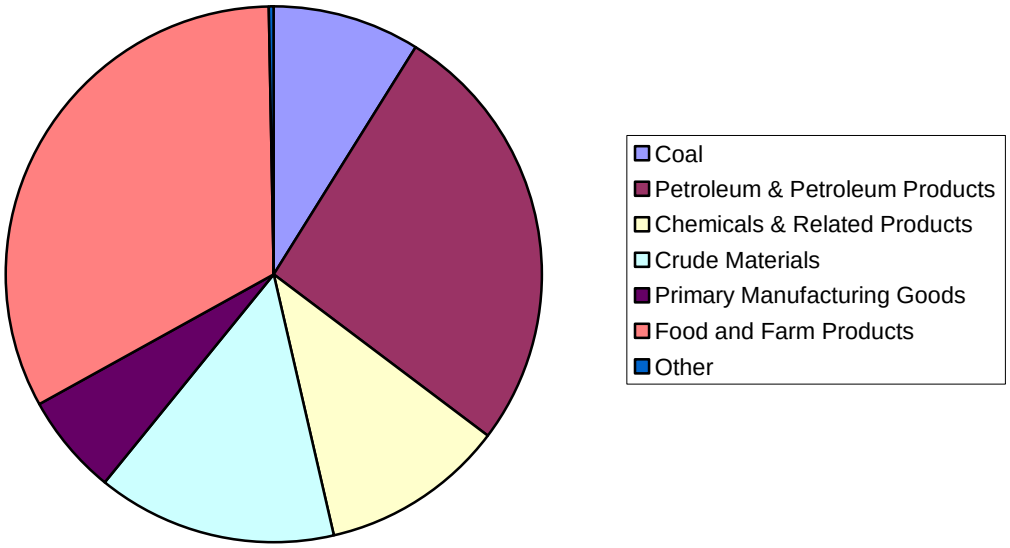
Foreign commerce upon the Main Stem of the Mississippi is largely reflective of that on the system as a whole, with two dominating commodities, Food and Farm Products as well as petroleum and its related products. Unlike system-wide domestic commerce, however, Main Stem domestic commerce is relatively more balanced between several commodities. Whereby coal captured 35% of system domestic shipments, less than 15% of Main Stem shipments are coal. Also noteworthy is that both chemicals and agricultural products each enlarged their relative percentages when moving from a Mississippi River System perspective to that of a Main Stem viewpoint.

TABLE 3-4: Principle Commodities in Waterborne Commerce for the Mississippi River Main Stem, 2002-2003 (millions of short tons)

	2002	2003	% Change
Total Commerce	501.70	478.00	-4.7
Coal	46.3	42.2	-8.9
Petroleum & Petroleum Products	132.60	127.00	-4.2
Chemicals & Related Products	48.5	52.7	8.5
Crude Materials	64.9	68.3	5.2
Primary Manufacturing Goods	34.1	29.5	-13.4
Food and Farm Products	173.5	156.5	-9.8
Other	1.7	1.8	5.3
Foreign Commerce	185.50	169.70	-8.5
Coal	2.2	3.1	40.9
Petroleum & Petroleum Products	55.5	48.2	-13.2
Chemicals & Related Products	13	14.9	14.1
Crude Materials	13.5	15.4	14.5
Primary Manufacturing Goods	13.1	9.5	-27.2
Food and Farm Products	87.4	77.8	-11
Other	0.8	0.9	7.6
Domestic Commerce	316.20	308.20	-2.5
Coal	44.1	39.1	-11.4
Petroleum & Petroleum Products	77.2	78.8	2.2
Chemicals & Related Products	35.5	37.8	6.4
Crude Materials	51.4	52.8	2.8
Primary Manufacturing Goods	21	20	-4.8
Food and Farm Products	86.1	78.8	-8.6
Other	0.9	0.9	3.2

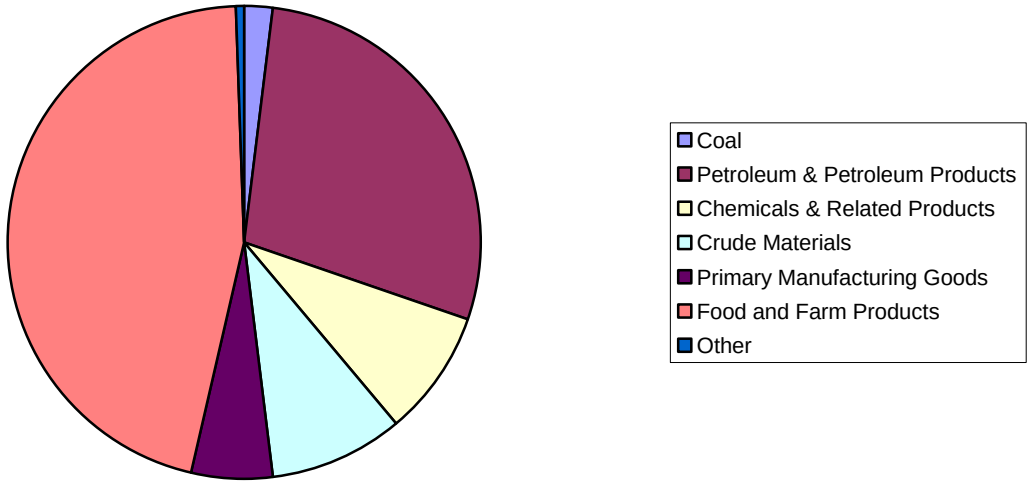
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-7*

FIGURE 3-3: Principle Commodities in Waterborne Commerce for the Mississippi River Main Stem, 2003 (Total)



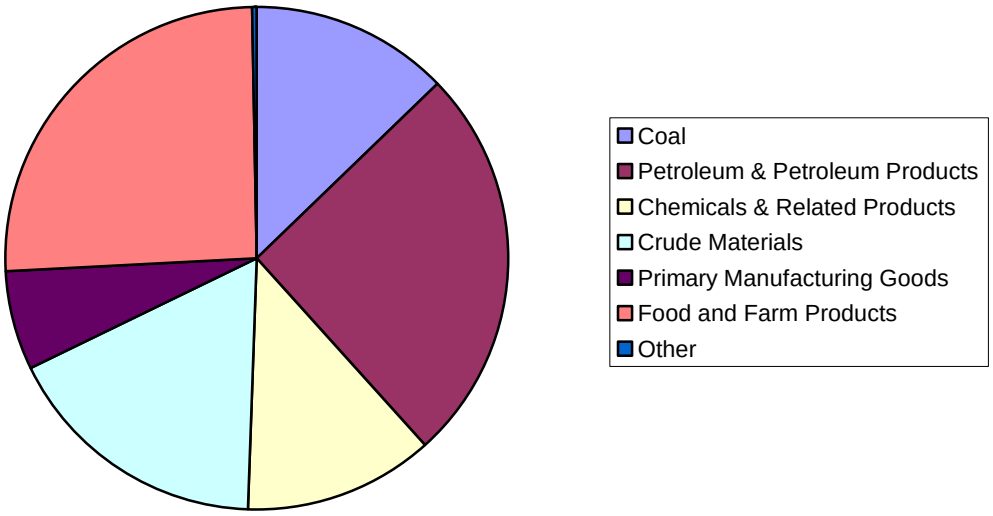
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-7*

FIGURE 3-4: Principle Commodities in Waterborne Commerce for the Mississippi River Main Stem, 2003 (Foreign)



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-7*

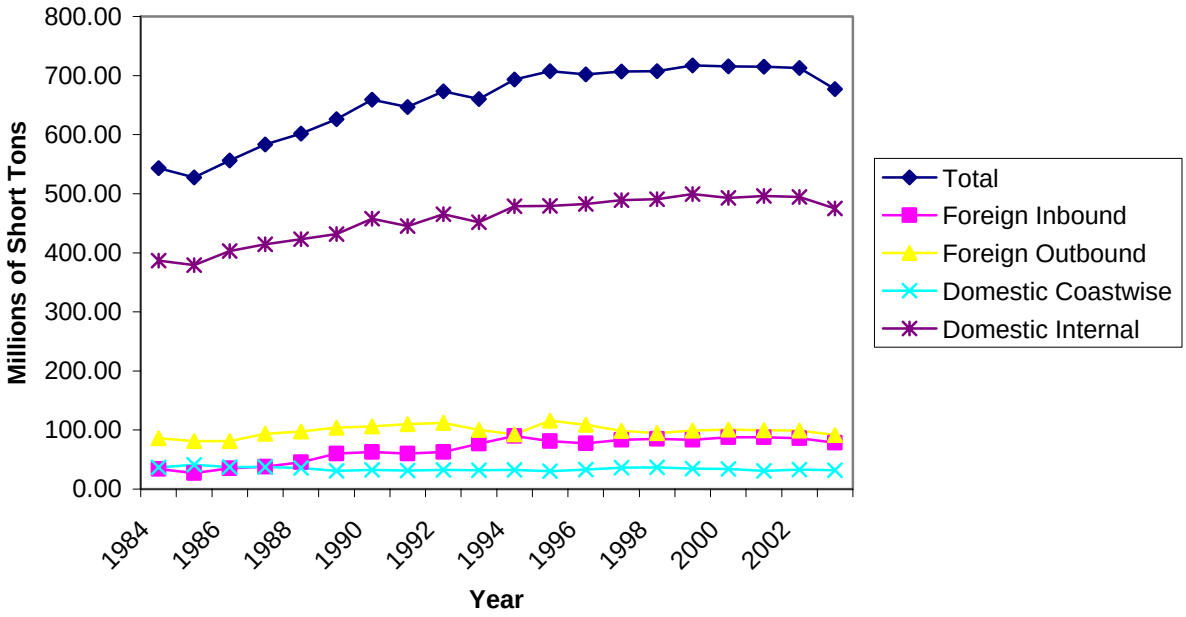
FIGURE 3-5: Principle Commodities in Waterborne Commerce for the Mississippi River Main Stem, 2003 (Domestic)



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-7*

Changing focus from a static positioning to that of a timeline, the Mississippi System has seen increasing usage as a waterway for freight traffic, as one may see from figure 3-6 and table 3-4. Specifically, since 1984, total commerce has increased from approximately 544 to 677 million tons (through 2003). This appears to be essentially a result of increasing domestic (internal) traffic. Further, traffic designated as domestic internal (as opposed to domestic *coastwise* shipments) accounted for nearly 70% of all traffic system-wide for 2001.

FIGURE 3-6: Types of Traffic on the Mississippi River System, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-1*

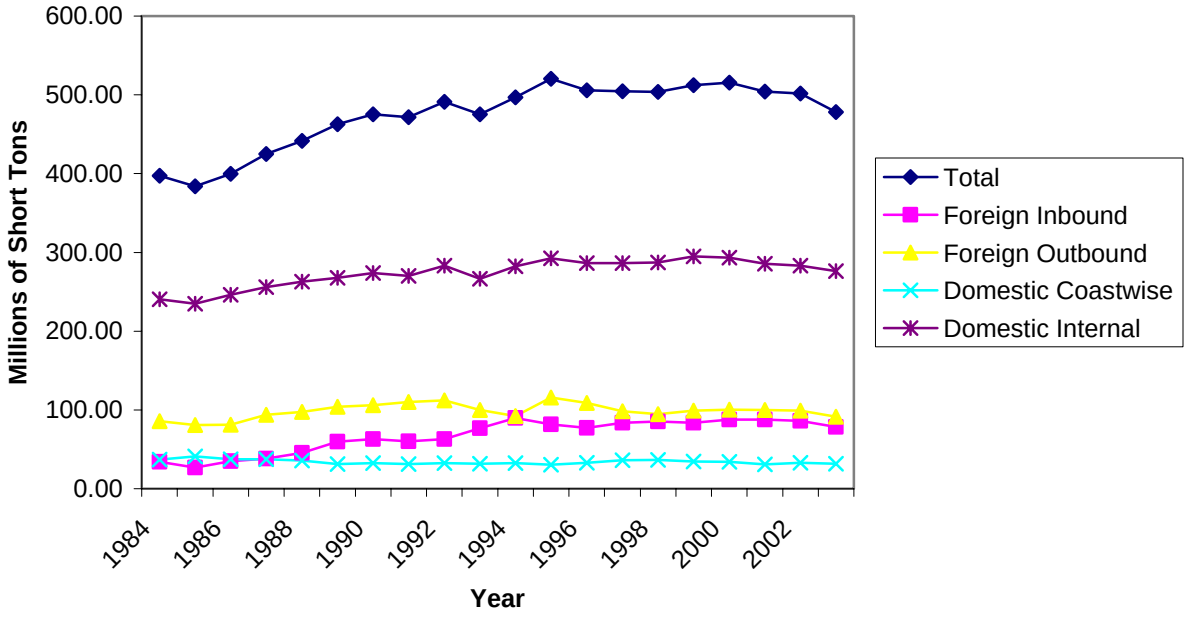
TABLE 3-4: Types of Traffic on the Mississippi River System, 1984-2003 (million short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	543.50	527.80	556.40	583.40	601.60	626.40	659.10	646.60	673.10	660.40
Foreign Inbound	34.1	27	35.1	38.1	45.3	59.9	63.1	60.1	63	76.9
Foreign Outbound	85.9	81	81.1	93.7	97.5	104	106	109.9	112.3	100
Domestic Coastwise	36.7	40.9	37.4	37.4	35.8	31.1	32.6	31.3	32.3	31.8
Domestic Internal	386.6	378.9	402.8	414.2	423	431.5	457.5	445.1	465.4	451.7
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	693.30	707.20	701.80	707.10	707.40	716.90	715.50	714.80	712.80	676.80
Foreign Inbound	89.8	81.5	77.3	83.5	85.2	83.5	87.7	87.8	86.3	78.4
Foreign Outbound	92.4	115.8	108.7	98.5	94.7	99.2	100.5	99.8	99.2	91.3
Domestic Coastwise	32.4	30.6	33	36.3	36.7	34.6	34.1	30.9	33	31.8
Domestic Internal	478.7	479.4	482.8	488.9	490.7	499.6	493.1	496.3	494.3	475.2

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-1*

Figure 3-7 and Table 3-5 show a similar increase in commerce along the Mississippi River's Main Stem over this period of time. Again, domestic internal traffic was the dominant type of traffic. Foreign traffic, measured in millions of (short) tons for both inbound and outbound shipments, was identical for the entire Mississippi System as well as the Main Stem portion. In 2003, foreign inbound amounted to 78.4 million tons while outbound registered 91.3 million tons.

FIGURE 3-7: Types of Traffic on the Mississippi River Main Stem, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-5*

TABLE 3-5: Types of Traffic on the Mississippi River Main Stem, 1984-2003 (million short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	397.30	384.00	399.90	425.00	441.50	462.70	475.30	471.70	491.00	475.10
Foreign Inbound	34.1	27	35.1	38.1	45.3	59.9	63.1	60.1	63	76.9
Foreign Outbound	85.9	81	81.1	93.7	97.5	104	106	109.9	112.3	100
Domestic Coastwise	36.9	40.9	37.4	37.4	35.8	31.1	32.6	31.3	32.4	31.8
Domestic Internal	240.4	235	246.3	255.8	262.9	267.8	273.6	270.3	283.3	266.5
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	496.80	520.30	505.60	504.70	503.90	512.30	515.60	504.20	501.70	478.00
Foreign Inbound	89.8	81.5	77.3	83.5	85.2	83.5	87.7	87.8	86.3	78.4
Foreign Outbound	92.4	115.8	108.7	98.5	94.7	99.2	100.5	99.8	99.2	91.3
Domestic Coastwise	32.4	30.6	33	36.3	36.7	34.6	34.1	30.9	33	31.8
Domestic Internal	282.2	292.4	286.5	286.5	287.3	295	293.3	285.6	283.3	276.4

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table x-x*

THE OHIO RIVER BASIN

4.1 INTRODUCTION

Encompassing 2,800 miles of navigable waterway, the Ohio River Basin is a significant system for inland barge commerce. Dominated by its namesake, the Ohio River, the Basin was responsible for transporting a total of 275 million tons of commodities in 1999.

In addition to the Ohio River itself, the system itself incorporates seven other rivers (Tennessee, Cumberland, Monongahela, Allegheny, Green, Kanawha, and Big Sandy Rivers) which run through or adjacent to nine states, namely: Alabama, Illinois, Indiana, Kentucky, Mississippi, Ohio, Pennsylvania, Tennessee and West Virginia. Furthermore, barges that operate within the Ohio River Basin can be found originating from or terminating at 12 other states: Arkansas, Florida, Georgia, Iowa, Kansas, Louisiana, Minnesota, Missouri, Nebraska, Oklahoma, Texas and Wisconsin.

Even after noting the breadth of the statewide area covered, the Ohio River itself remains the central artery within the Basin system, both in a static and dynamic sense. Geographically, the Ohio forms as the backbone for the system, stretching westward from Pittsburgh and flowing towards Cairo, Illinois, near its convergence with the Mississippi River. Additionally, the Ohio River also offers 981 miles of navigable waterway, the largest of the eight rivers that incorporate the Ohio River Basin (ORB) system. Dynamically, the Ohio acts as a funnel for the commerce traveling within the area. This is due both to the Ohio's geographic proximity (all rivers within the basin flow into the Ohio River) as well as its endpoint connection at the Mississippi River, itself a major artery for inland commerce. These two factors establish its relative dominance within the Basin system.

The Ohio River Basin waterway system offers many attractive attributes. The most attractive would most likely be that of its direct connection to the Mississippi River. It also contains a main artery, the Ohio River, which flows westward from a junction of two other waterways (Allegheny, Monongahela), connecting five other navigable passages. Additionally, it is endowed with an abundance of coal and effective transportation underpinnings, namely the waterways themselves. These traits, when incorporated with an arrangement of 60 locks and dams, facilitate the movement of large-scale barge traffic. Although the foremost commodity carried by volume is coal, the waterway provides a mode of travel for other multi-use products such as petroleum, grains, and chemicals. Overall, given the fundamental needs to society that these commodities satisfy, one can be assured that they will be demanded, in voluminous quantity, for the foreseeable future.

4.2 ATTRIBUTES

Of the 261.3 million tons noted transported along the Ohio River Basin in 2003, the dominant commodity carried was coal, accounting for 53.9% of total waterborne commerce as shown below in Table 4-1 and Figures 4-1 and 4-2. Directionally, 48 million tons ebbed out of the ORB while 46 million tons flowed into the system from outside. Most significantly, approximately 180 million tons traversed and remained within the Basin itself. To accomplish this, the ORB is endowed with an infrastructure of approximately 1000 facilities, docks and terminals. Many of these serve large metropolitan areas with accompanying ports. Listed in order of total waterborne commerce, the top five major port interchanges (1999) were Pittsburgh (53 million tons), Huntington, W. Virginia (22.3), Cincinnati (14.3), followed by Louisville (8.8) and Nashville (4.7). To allow barge traffic to traverse this vast waterway which is forced to overcome elevation changes, the system is composed of 60 lock and dam facilities. The US

Army Corps of Engineers (USACE) maintains these facilities and is responsible for their care. Of these 60 locales, 20 reside on the Ohio, nine each upon the Monongahela and Tennessee, the Allegheny follows with (8), the Cumberland (4), and the Kanawha and Green Rivers each with three. The remaining five facilities are located on the Kentucky (4) and Clinch Rivers (1), which are navigable and still in use but do not have any cargo tonnage.

As mentioned earlier, coal is the primary commodity hauled, encapsulating over half of all barge traffic. Utility companies are the principal recipients of these coal shipments, with 49 power plants located within the Basin and 12 others residing within neighboring states, also connected via waterways. Specifically, in 1999 power plants utilized 120 of the 151 million tons shipped within the Basin's waters, which encapsulated 79% of all coal shipped. The reason for this is twofold. First, coal is offered in abundance from within the region in high, low and medium sulfur contents. Second, the large river system encourages power plants to agglomerate nearby since they can utilize the waterway for two purposes: in-plant water needs as well as an efficient mode for receiving coal, a primary input for utilities.

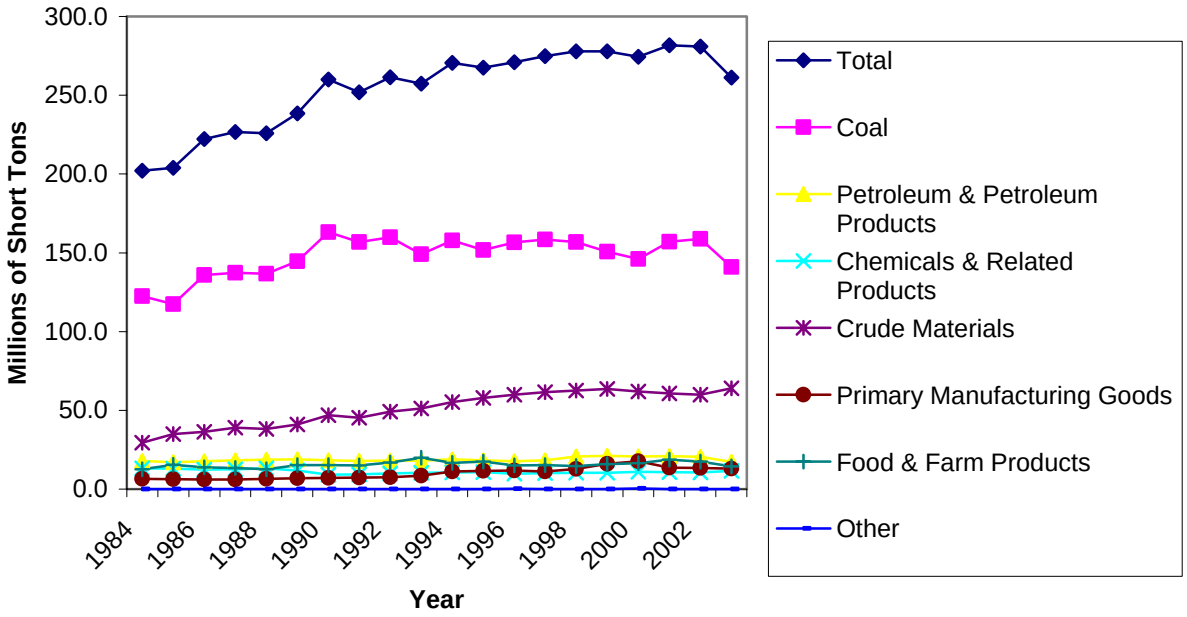
Regarding aggregate quantities, W. Virginia was the leading shipper of coal (40 million tons) with Kentucky and Illinois following (31 and 21 million tons, respectively). Leading receivers for coal shipments were Ohio (30.5), Indiana (17) and W. Virginia (16). Kentucky held the largest number of coal-fired power plants (12) with Ohio being in second, with 11.

TABLE 4-1: Total Waterborne Commerce by Commodity for the Ohio River System, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	202.2	203.9	222.2	226.7	225.9	238.4	260.0	251.9	261.4	257.3
Coal	122.5	117.3	135.9	137.3	136.7	144.6	163	156.8	159.8	149
Petroleum & Petroleum Products	17.9	17.1	17.6	18.2	18.6	18.8	18.3	17.8	18	18.1
Chemicals & Related Products	13.2	12.9	12.4	12.6	13.3	11.7	9.1	9.4	10	10.4
Crude Materials	29.4	34.9	36.4	39	38.1	41	47	45.3	49.1	51.1
Primary Manufacturing Goods	6.6	6.2	6.1	6.1	6.5	7	7.2	7.4	7.5	8.6
Food & Farm Products	12.5	15.4	13.8	13.5	12.5	15.2	15.3	15	16.9	20
Other	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	270.5	267.6	270.9	274.9	277.9	277.9	274.4	281.8	280.9	261.3
Coal	157.9	151.7	156.5	158.4	156.9	150.8	146.1	157.1	158.8	140.9
Petroleum & Petroleum Products	18.9	18.2	17.7	18.3	20.7	21.1	20.8	20.9	20.5	17.2
Chemicals & Related Products	10.6	10.7	9.8	10.1	10.3	10.3	10.9	10.7	10.6	11.5
Crude Materials	55.3	57.9	60.0	61.5	62.6	63.6	62.0	60.7	59.9	64.0
Primary Manufacturing Goods	11.2	11.6	11.7	11.1	12.7	16.1	17.7	13.6	13.4	13.1
Food & Farm Products	16.6	17.4	15.0	15.3	14.7	15.8	16.4	18.6	17.5	14.4
Other	0.1	0.1	0.2	0.0	0.1	0.1	0.5	0.1	0.1	0.1

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-8*

FIGURE 4-1: Total Waterborne Commerce by Commodity for the Ohio River System, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-8*

Figure 4-1 and Table 4-1 show that crude materials are the second largest commodity carried along the Ohio Basin System accounting for 24.5% of total waterborne commerce followed by petroleum and petroleum related products accounting for 6.6%. The demand for barge-transported petroleum products is driven by the fact that many Basin cities are without a connection to the petroleum product pipelines. Additionally, some products such as asphalt and residual fuel oils cannot be moved via pipelines, simply due to their physical properties. To meet this demand, there are 250 tank farms, terminals or affiliated facilities for petroleum products.

THE GULF INTERCOASTAL WATERWAY

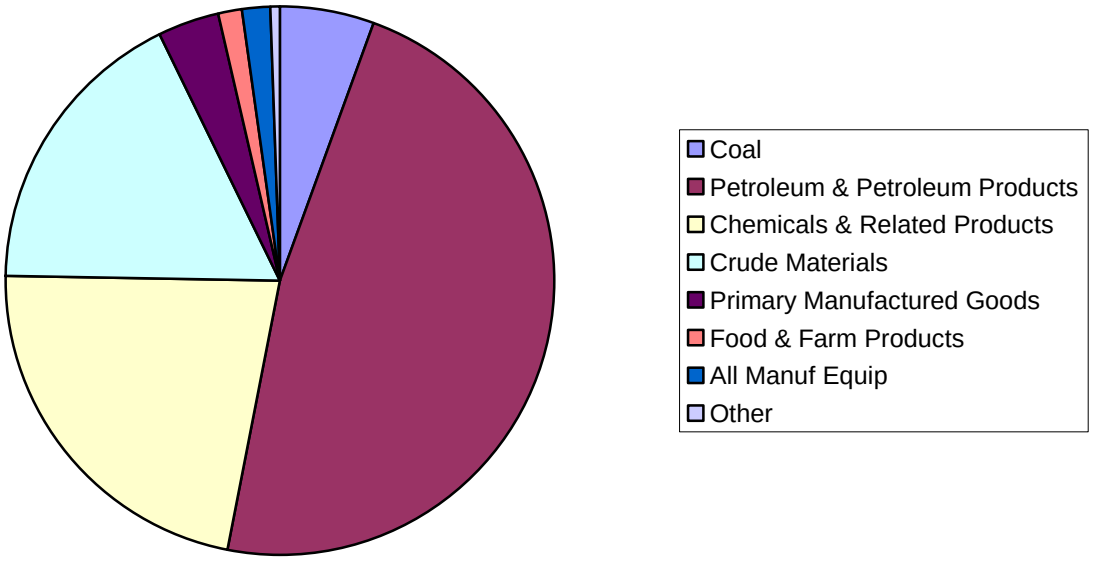
5.1 INTRODUCTION

Unlike the river systems discussed above, the Gulf Intercoastal Waterway (GIWW) is the largest component (1,109 miles) of a larger waterway system, labeled the Gulf Coast (comprising 1,992 miles). However, the Gulf Coast System is composed of various small rivers, navigable bayous and channels. It is more sprawling and haphazard than the easily defined and collected waterways such as the Mississippi or Ohio rivers. Instead, smaller samplings such as the Chocolate Bayou in Texas (13 miles) or Alabama's Black Warrior and Tombigbee Rivers make up compositional parts to the wider, Gulf System. Furthermore, the Gulf Intercoastal Waterway is itself bisected into two parts, an eastern portion as well the expected western section. The eastern portion stretches along the Gulf of Mexico from New Orleans to Key West while the western part encompasses New Orleans to Brownsville, Texas.

5.2 ATTRIBUTES

Given the GIWW's geographic positioning, petroleum is the dominant commodity, as depicted in Figure 5-1 and Table 5-1. As such, 47.6% of traffic was that of petroleum and its related products in 2003. The next largest commodities transported along the GIWW are chemicals (22.2%) and while crude materials (17.6%). All other commodities were 5.5% or less.

Figure 5-1: Principle Commodity Groups Transported on the Gulf Intercoastal Waterway, 2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-15*

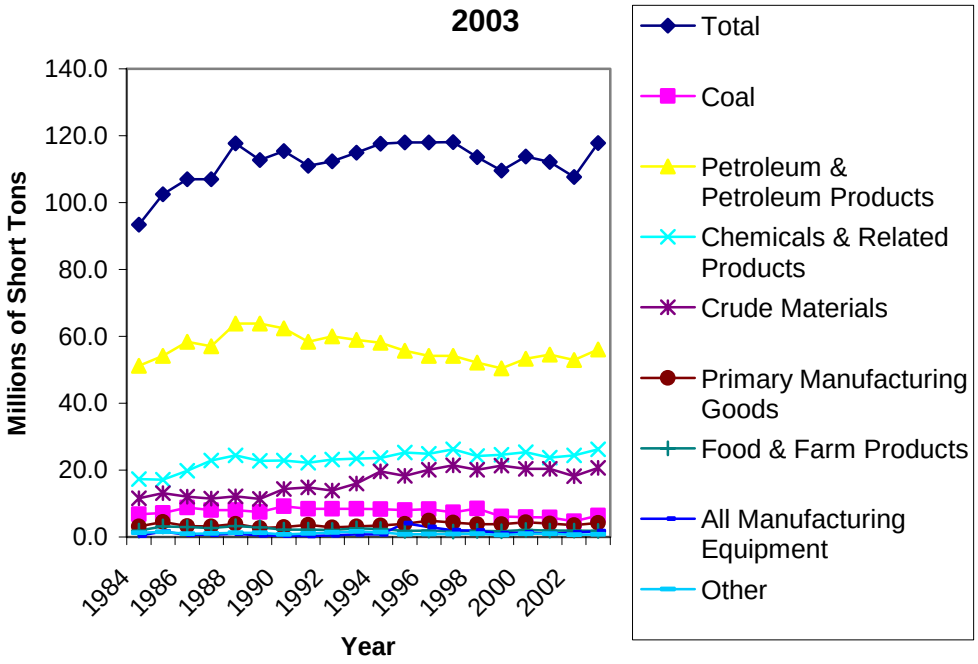
TABLE 5-1: Principle Commodities in Waterborne Commerce for the Gulf Intercoastal Waterway, 2002-2003 (millions of short tons)

	2002	2003	% Change
Total Commerce	107.70	117.80	9.5
Coal	4.7	6.4	35.1
Petroleum & Petroleum Products	52.90	56.10	6.2
Chemicals & Related Products	24.4	26.2	7.3
Crude Materials	18.2	20.7	13.3
Primary Manufactured Goods	3.5	4.2	20.4
Food & Farm Products	1.9	1.8	-8.4
All Manuf Equip	1.3	1.7	37.2
Other	0.7	0.8	6

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-15*

Figure 5-2 and Table 5-2 show that over time, total shipments have displayed a slight upward trend. By commodity, there is little change in the composition of total waterborne commerce on the Gulf Intercoastal Waterway over the years 1983-2003.

FIGURE 5-2: Total Waterborne Commerce by Commodity for the Gulf Intercoastal Waterway, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-14*

TABLE 5-2: Total Waterborne Commerce by Commodity for the Gulf Intercoastal Waterway, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	93.4	102.5	107.0	107.0	117.7	112.7	115.4	111.0	112.3	114.9
Coal	6.8	7.2	8.8	8	8	7.5	9.2	8.4	8.4	8.4
Petroleum & Petroleum Products	51.2	54.2	58.4	57	63.8	63.8	62.4	58.4	60	58.9
Chemicals & Related Products	17.3	17.1	19.8	22.9	24.4	22.8	22.9	22.2	23.2	23.4
Crude Materials	11.6	13.1	12.1	11.5	12.2	11.4	14.4	14.8	13.9	16
Primary Manufacturing Goods	3.2	4.5	3.3	3.2	3.9	2.7	3	3.6	2.9	3.2
Food & Farm Products	1.9	3.2	3	2.7	3.3	2.9	2.2	2.2	2.1	2.6
All Manufacturing Equipment	0.4	1.6	0.7	0.7	1	0.5	0.4	0.3	0.5	0.8
Other	1.2	1.5	1	1.1	1.2	1.2	0.8	1.1	1.3	1.6
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	117.6	118.0	118.0	118.1	113.6	109.6	113.8	112.2	107.7	117.8
Coal	8.3	8.0	8.3	7.4	8.5	6.1	5.9	5.8	4.7	6.4
Petroleum & Petroleum Products	58.1	55.7	54.2	54.2	52.2	50.4	53.3	54.5	52.9	56.1
Chemicals & Related Products	23.6	25.3	24.9	26.2	24.2	24.6	25.4	23.7	24.4	26.2
Crude Materials	19.6	18.3	20.1	21.4	20.1	21.3	20.4	20.4	18.2	20.7
Primary Manufacturing Goods	3.4	3.9	4.9	4.3	3.8	3.8	4.4	4.0	3.5	4.2
Food & Farm Products	2.4	1.8	1.9	1.6	1.8	1.7	2.1	1.9	1.9	1.8
All Manufacturing Equipment	0.8	4.1	3.0	2.0	1.9	1.1	1.3	1.0	1.3	1.7
Other	1.4	0.8	0.9	0.9	1.0	0.6	1.0	1.0	0.7	0.8

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-14*

Total commerce transported via the GIWW is essentially a function of domestic internal movements as shown in Figure 5-3 and in Table 5-3.

TABLE 1-4: Types of Traffic on the Gulf Intercoastal System, 1984-2003 (million short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992
Total	93.40	102.50	107.00	107.00	117.70	112.70	115.40	111.00	112.30
Foreign Inbound	-	0	0	0	0.4	0.3	-	-	-
Foreign Outbound	0	0	0.1	0	0.2	0.1	-	-	-
Domestic Coastwise	1	1.1	1.2	0.9	1.2	0.8	0.7	0.7	0.7
Domestic Internal	92.4	101.3	105.7	106.1	115.9	111.6	114.6	110.3	111.6
	1994	1995	1996	1997	1998	1999	2000	2001	2002
Total	117.60	118.00	118.00	118.10	113.60	109.60	113.80	112.20	107.70
Foreign Inbound	-	-	-	-	-	-	-	-	-	-
Foreign Outbound	-	-	-	-	-	-	-	-	-	-
Domestic Coastwise	1.3	1.2	1.1	1.3	1.9	1.9	0.8	0.7	0.8
Domestic Internal	116.3	116.8	116.9	116.8	111.6	107.7	113	111.5	106.9

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-13*

TABLE 5-3: Types of Traffic on the Gulf Intercoastal System, 1984-2003 (million short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	93.40	102.50	107.00	107.00	117.70	112.70	115.40	111.00	112.30	114.90
Foreign Inbound	-	0	0	0	0.4	0.3	-	-	-	-
Foreign Outbound	0	0	0.1	0	0.2	0.1	-	-	-	-
Domestic Coastwise	1	1.1	1.2	0.9	1.2	0.8	0.7	0.7	0.7	0.9
Domestic Internal	92.4	101.3	105.7	106.1	115.9	111.6	114.6	110.3	111.6	114.1
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	117.60	118.00	118.00	118.10	113.60	109.60	113.80	112.20	107.70	117.80
Foreign Inbound	-	-	-	-	-	-	-	-	-	-
Foreign Outbound	-	-	-	-	-	-	-	-	-	-
Domestic Coastwise	1.3	1.2	1.1	1.3	1.9	1.9	0.8	0.7	0.8	0.7
Domestic Internal	116.3	116.8	116.9	116.8	111.6	107.7	113	111.5	106.9	117.1

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-13*

THE PACIFIC COAST: COLUMBIA, SNAKE & WILLAMETTE RIVERS

6.1 INTRODUCTION

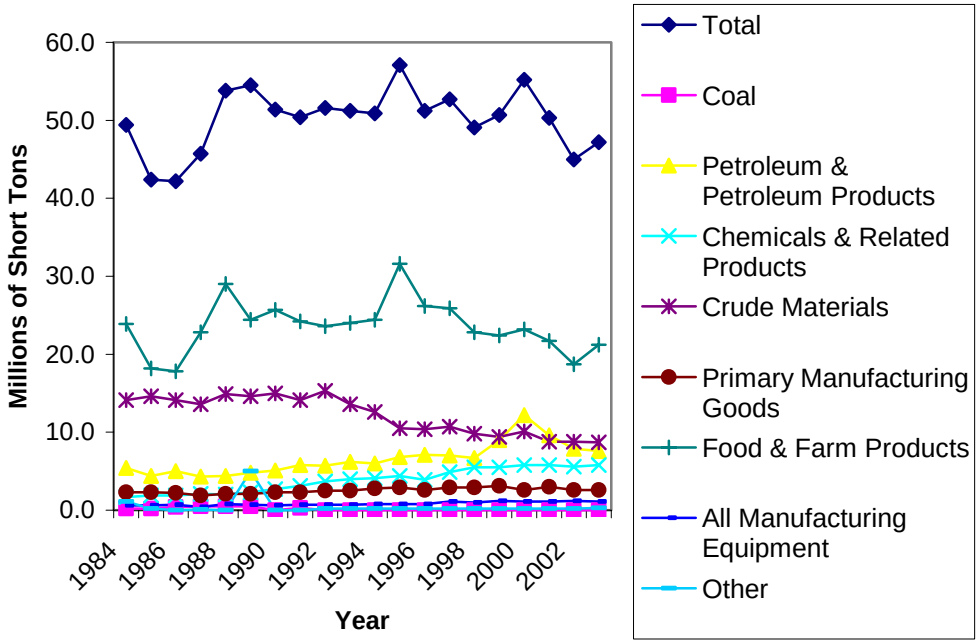
Slightly different than the interconnected and overlapping nature of the waterway systems examined thus far, the Columbia River System is independent of any other waterway connections, save the Pacific Ocean. Composed of three rivers (the Columbia, Snake, and Willamette) the entire system encompasses only 596 navigable miles, 141 miles of which is attributed to the Snake. Meanwhile, the Willamette River, which is navigable northward from Portland, Oregon to its meeting with the Columbia, encapsulates a total distance of 118 miles.

6.2 ATTRIBUTES

Figure 6-1 and Table 6-1 show the total waterborne commerce from 1984-2003 for the Columbia River, while Figure 6-2 and Table 6-2 illustrate this same measure for the Snake River. The Columbia River's principle commodity is agricultural products (Food and Farm Products), which was responsible for 44.9% of all river commerce in 2003. Crude materials were the second most transported commodity on the Columbia River (18.4%), while petroleum products were third (16.1%). For the Snake River, the top three commodities are the same as for the Columbia: Food and Farm Products (59.8%), Petroleum Products (34.2%) and Crude Materials (3.8%).

Over time, total traffic upon each river has been relatively stagnant. However, there have been large fluctuations in total traffic over short periods of time, with these fluctuations being caused by the fluctuations in Food and Farm Products being transported.

FIGURE 6-1: Total Waterborne Commerce by Commodity for the Columbia, 1984-2003



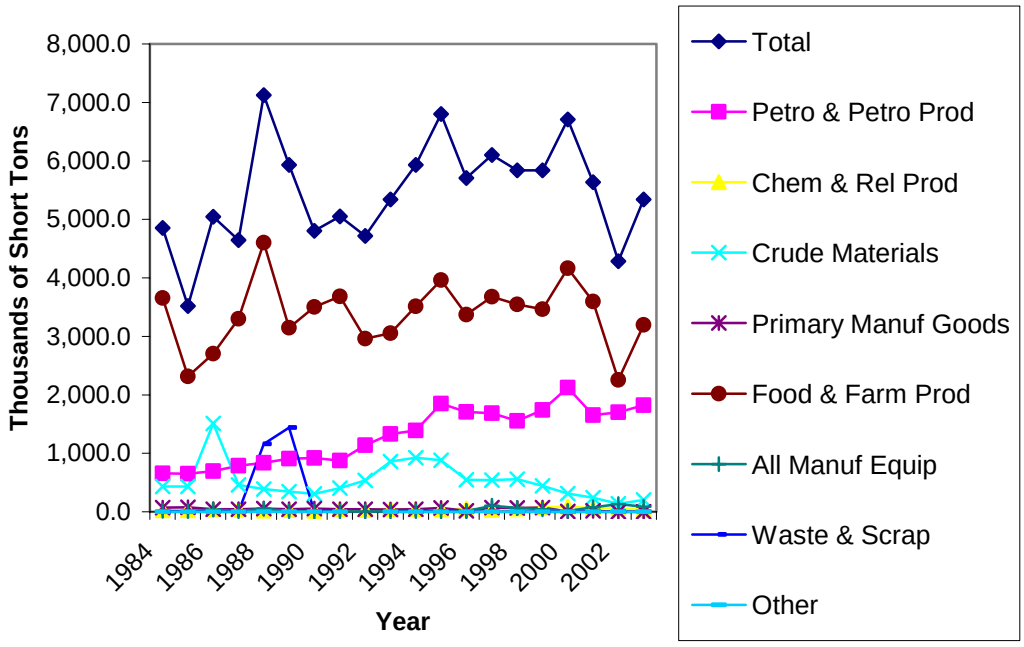
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-17*

TABLE 6-1: Total Waterborne Commerce by Commodity for Columbia, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	49.4	42.4	42.2	45.7	53.8	54.5	51.4	50.4	51.6	51.2
Coal	0.2	0.2	0.4	0.5	0.5	0.5	0	0.3	0	0
Petroleum & Petroleum Products	5.4	4.4	5	4.3	4.4	4.8	5.1	5.8	5.7	6.2
Chemicals & Related Products	1.7	1.9	1.9	2.1	2	2.3	2.7	3.1	3.7	4
Crude Materials	14.1	14.6	14.1	13.6	14.9	14.6	15	14.1	15.3	13.6
Primary Manufacturing Goods	2.3	2.3	2.2	1.9	2.1	2.1	2.3	2.3	2.5	2.5
Food & Farm Products	23.9	18.2	17.8	22.8	29	24.4	25.7	24.2	23.6	24
All Manufacturing Equipment	0.6	0.6	0.7	0.4	0.8	0.7	0.6	0.7	0.7	0.7
Other	1.1	0.2	0	0.1	0	5	0	0	0.2	0.2
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	50.9	57.1	51.2	52.7	49.1	50.7	55.2	50.3	45.0	47.2
Coal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Petroleum & Petroleum Products	6.0	6.8	7.1	7.0	6.7	9.0	12.2	9.6	7.9	7.6
Chemicals & Related Products	4.1	4.4	3.9	4.9	5.5	5.5	5.8	5.8	5.6	5.8
Crude Materials	12.6	10.5	10.4	10.7	9.8	9.4	10.1	8.8	8.8	8.7
Primary Manufacturing Goods	2.8	2.9	2.6	2.9	2.9	3.1	2.6	3.0	2.6	2.6
Food & Farm Products	24.4	31.6	26.2	25.9	22.8	22.4	23.2	21.7	18.7	21.2
All Manufacturing Equipment	0.8	0.8	0.8	1.1	1.0	1.2	1.1	1.1	1.2	1.1
Other	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-17*

FIGURE 6-2: Total Waterborne Commerce by Commodity for the Snake, 1984-2003



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-19*

TABLE 6-2: Total Waterborne Commerce by Commodity for Snake, 1984-2003 (millions of short tons)

	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Total	4,852.0	3,518.8	5,042.6	4,644.9	7125.1	5930.3	4804.0	5053.2	4719.3	5339.1
Petro & Petro Prod	654	652.7	694.8	789.5	839.1	908.4	920	875.1	1,140.40	1,328.90
Chem & Rel Prod	26.3	27.2	45.2	36.2	22.9	33.1	14.8	41.3	35.4	50.9
Crude Materials	429.8	434.5	1,512.80	461.3	390.3	347.2	304.8	404.1	533.6	858.6
Primary Manuf Goods	71.7	74.4	45.9	45.6	52.2	45.3	53.8	45	43.2	40
Food & Farm Prod	3,653.50	2,316.80	2,704.40	3,301.30	4,601.10	3,148.80	3,503.20	3,682.40	2,961.40	3,055.80
All Manuf Equip	16.7	13.2	38.5	10	57.2	9.9	7.3	5.3	5.3	4.9
Waste & Scrap	-	-	0.9	1	1,162.20	1,437.50	-	-		-
Other	-	-	-	-	-	-	-	-		-

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total	5929.1	6803.9	5707.4	6102.5	5840.0	5836.5	6707.1	5638.7	4283.8	5339.1
Petro & Petro Prod	1391.3	1847.6	1708.8	1683.2	1556.0	1739.0	2120.5	1652.3	1704.5	1823.9
Chem & Rel Prod	43.4	41.3	52.0	30.5	53.2	74.3	88.4	59.2	59.9	34.7
Crude Materials	925.9	878.9	548.5	540.2	556.2	444.7	312.5	241.4	136.0	201.6
Primary Manuf Goods	46.0	64.5	18.0	69.8	66.6	71.5	7.8	15.6	2.2	-
Food & Farm Prod	3510.7	3963.6	3369.1	3677.6	3544.6	3461.9	4162.7	3594.8	2251.8	3193.1
All Manuf Equip	11.8	8.0	10.8	101.3	63.5	45.1	15.2	75.3	129.3	85.8
Waste & Scrap	-	-	0.2	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-	-

Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-19*

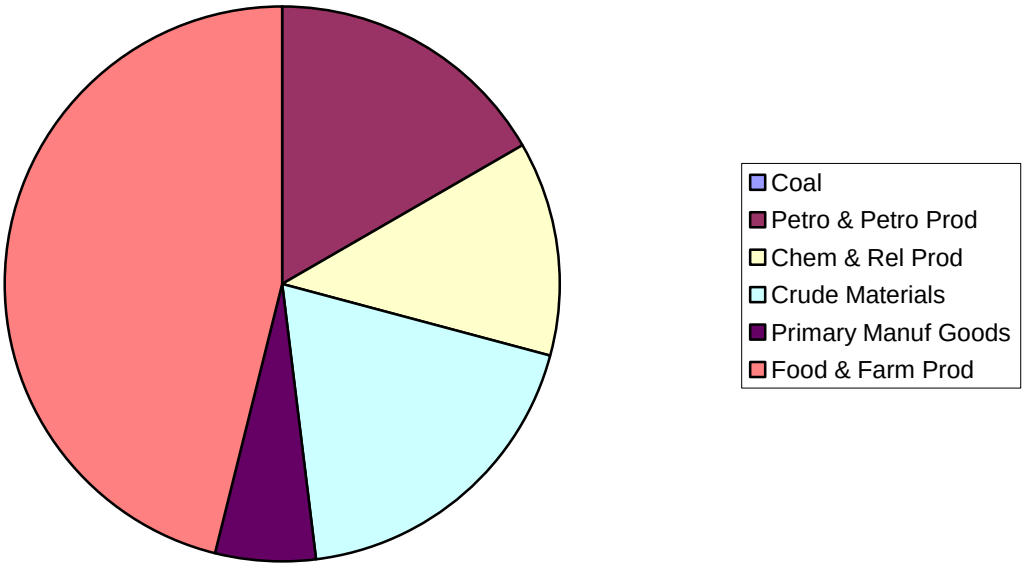
Of this traffic, foreign commerce made up 66.1% of the total tons shipped in 2003 on the Columbia River as shown in Table 6-3 and in Figures 6-3 through 6-5. Furthermore, the foreign commerce commodity distribution tends to mimic that of the commodity distribution of the Columbia as a whole, with agriculture products the leading quantity. However, domestic commerce differs significantly from that of foreign commerce. Here, petroleum and petroleum products account for 35.6% of domestic traffic.

TABLE 6-3: Principle Commodities in Waterborne Commerce for the Columbia, 2002-2003 (millions of short tons)

	2002	2003	% Change
Total Commerce	45.00	47.20	4.7
Coal	0	0	-99.7
Petro & Petro Prod	7.90	7.60	-4.4
Chem & Rel Prod	5.6	5.8	3.8
Crude Materials	8.8	8.7	-0.9
Primary Manuf Goods	2.6	2.6	0.5
Food & Farm Prod	18.7	21.2	12.9
All Manuf Equip	1.2	1.1	-7.8
Other	0.2	0.3	11.9
Foreign Commerce	29.50	31.20	5.7
Coal	0	0	-99.7
Petro & Petro Prod	1.8	1.8	1.3
Chem & Rel Prod	5.2	5.6	7.1
Crude Materials	3.7	4	9
Primary Manuf Goods	2.6	2.6	0.4
Food & Farm Prod	15.3	16.2	6.1
All Manuf Equip	1	1	2.3
Other	0.1	0.1	9.2
Domestic Commerce	15.50	16.00	2.9
Coal	0	0	-
Petro & Petro Prod	6.1	5.7	-6.1
Chem & Rel Prod	0.3	0.2	-47.7
Crude Materials	5.1	4.7	-8.1
Primary Manuf Goods	0.1	0.1	4.7
Food & Farm Prod	3.5	5	42.7
All Manuf Equip	0.2	0.1	-50.8
Other	0.2	0.2	9.1

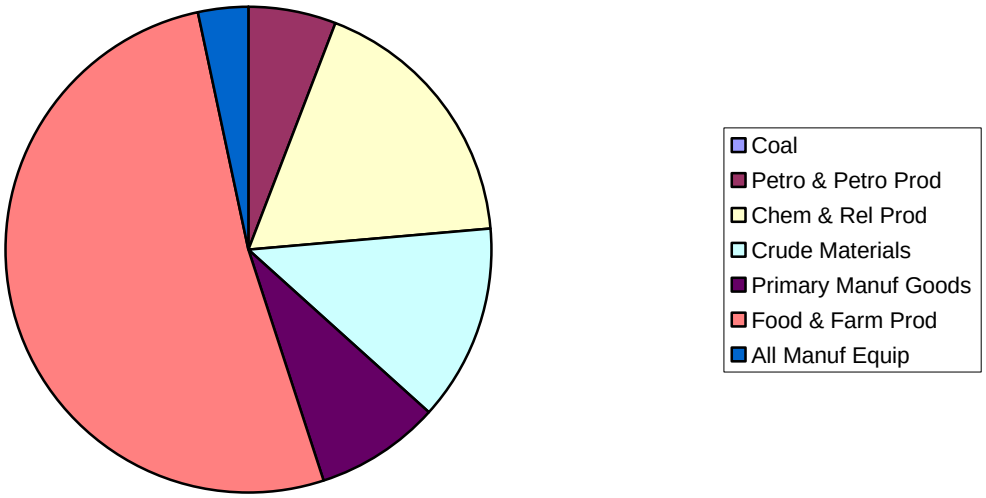
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-18*

FIGURE 6-3: Principle Commodities in Waterborne Commerce for the Columbia River, 2003 (Total)



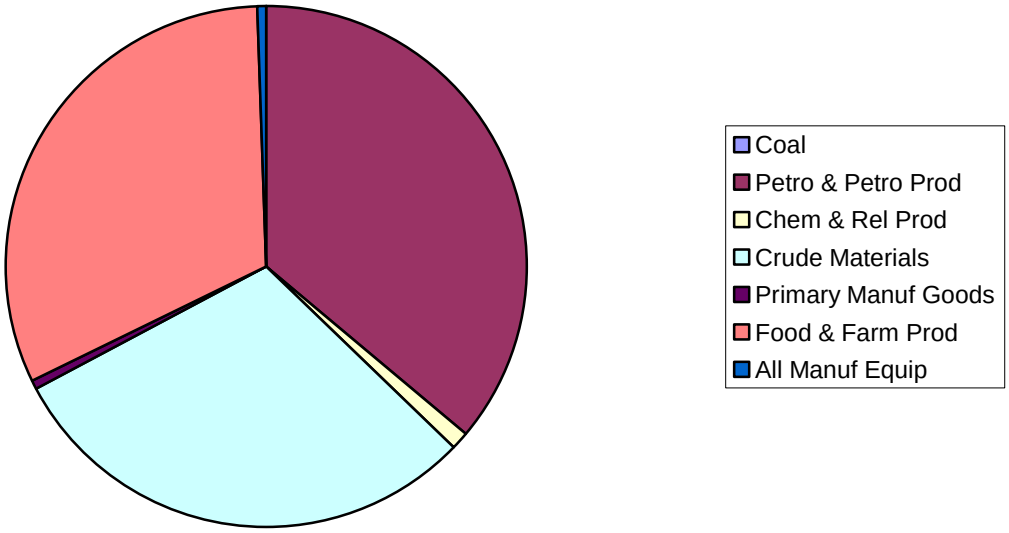
Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Table 3-18*

FIGURE 6-4: Principle Commodities in Waterborne Commerce for the Columbia River, 2003 (Foreign)



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-18*

FIGURE 6-5: Principle Commodities in Waterborne Commerce for the Columbia River, 2003 (Domestic)



Source: *Waterborne Commerce of the United States, Calendar Year 2003, Part 5 - National Summaries, U.S. Army Corps of Engineers (2004), Figure 3-18*

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- A **microscopic event model** that will generate routes for individual shipments from commodity origin to destination in order to evaluate non-structural and reliability measures.

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