Waterway Traffic Forecasts for the Upper Mississippi River Basin

Volume IV: Prepared Animal Feeds

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1.0 INTRODUCTION

Prepared animal feeds (PAFs) comprise a substantial portion of the freight traffic on the Upper Mississippi River. In 1992, they accounted for approximately 5% of the waterborne freight traffic on the three different river segments[1] of the Upper Mississippi River Basin.

The Navigation Data Center classifies a number of different commodities as PAFs; While barge data are not available for any one of the sub-groups, export data for the New Orleans Custom's District indicate that the two most important commodities in terms of tonnage are Corn Gluten Feed and Soybean Meal. Together, these two commodities accounted for an average of 79% of the PAF exports out of the New Orleans Custom's District between 1990 and 1994. It is reasonable to assume that PAF traffic on the Upper Mississippi River is similar; like grain and soybeans, almost all of it originates in the Study Area and moves to Louisiana export markets (See Figure 1-1). As a result, this report focuses on Corn Gluten Feed and Soybean Meal.

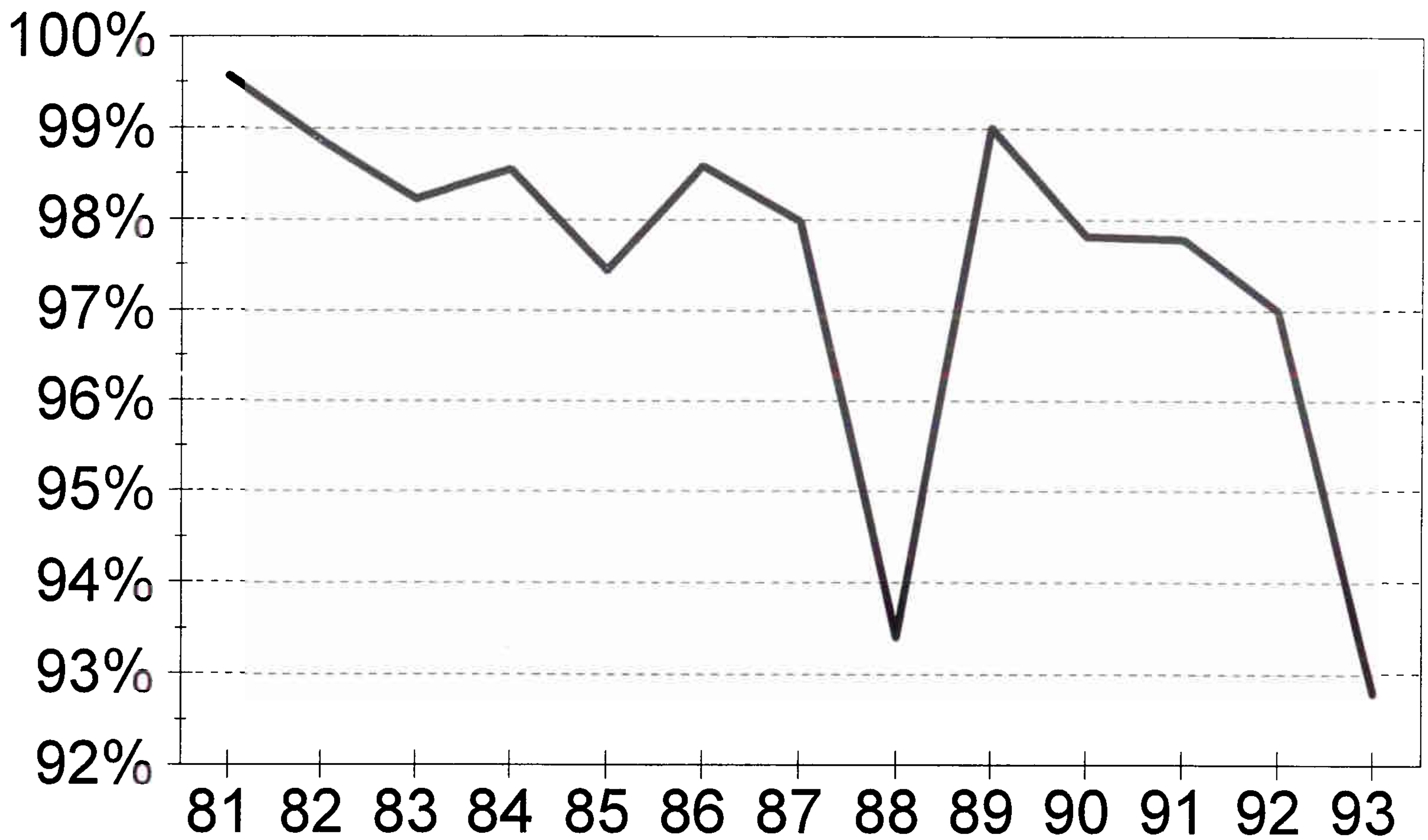
The following analysis is divided into three sections. The first section identifies the major supply regions of prepared animal feeds and the second section looks at demand areas. In the final section, the production and consumption analyses are combined to generate waterway traffic forecasts for the Upper Mississippi River Basin.

[1] Minneapolis/St. Paul to the Mouth of the Missouri River; Mouth of the Missouri River to Mouth of the Ohio River; Illinois River.

Figure 1-1

PAF* Barge Shipments to Louisiana

% of Total PAF Barge Shipments



*Prepared Animal Feeds

2.0 PRODUCTION

This sections identifies the relevant supply regions which give rise to animal feed traffic on the Upper Mississippi River. Since they constitute most of the waterborne animal feed traffic, the analysis will focus exclusively upon soybean meal and corn gluten feed.

Soybean Meal

Figure 2-1 presents soybean crushing and meal production data for the entire US. In 1993, it can be seen that the US crushed over 1.25 billion bushels of soybeans, generating over 30 million tons of soybean cake and meal. On average, these data indicate that each bushel of soybeans crushed between 1984 and 1993 yielded 47.5 pounds of soybean cake and meal. As shown in Figure 2-2, such yields have been fairly stable since 1988.

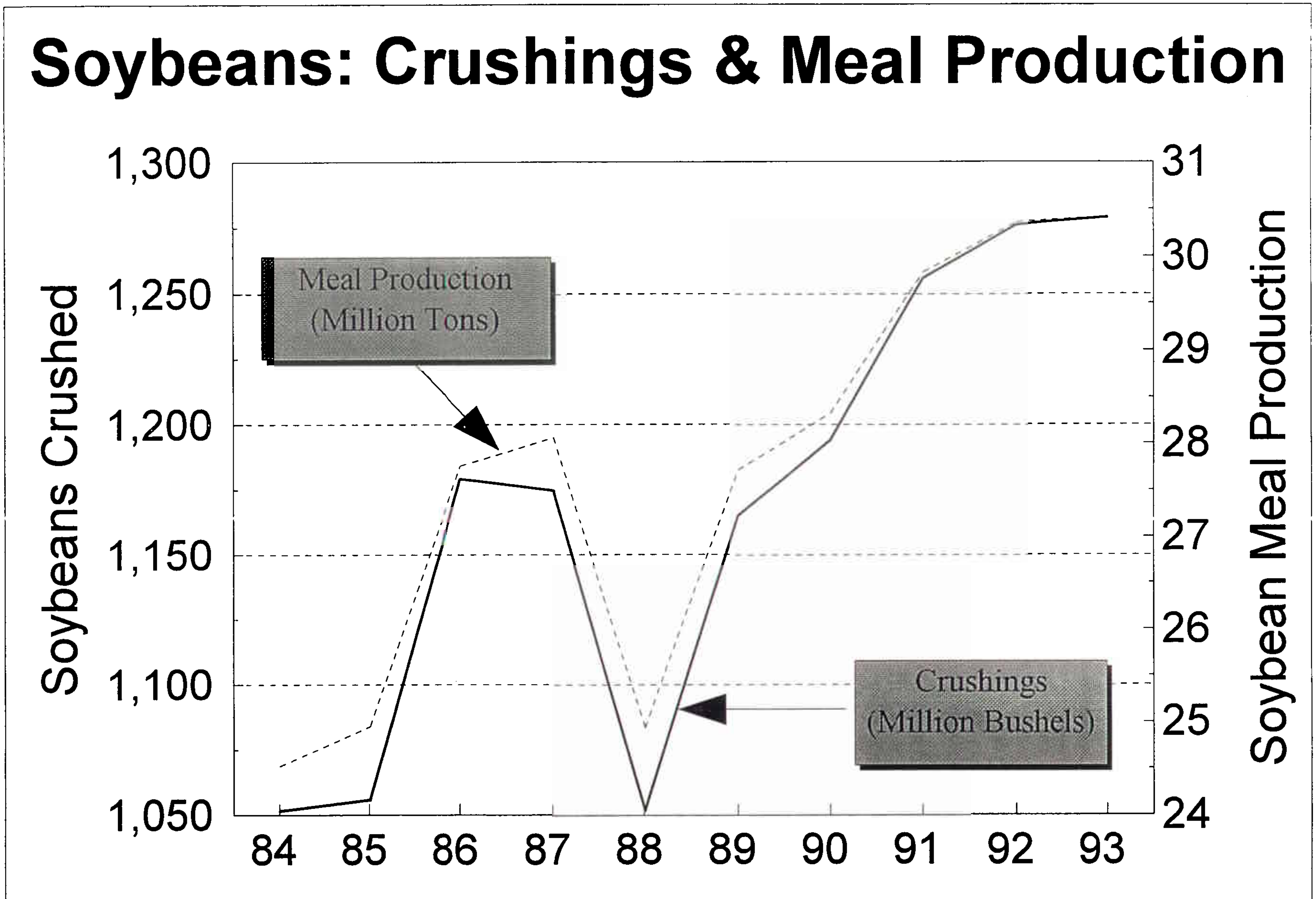
Soybean meal production levels are determined by domestic and foreign demand for high protein feeds. High protein animal feeds are utilized predominately by the poultry and hog sectors. The US exports both raw soybeans and soybean meal to help foreign demand sources meet their high protein requirements. Many countries prefer to import raw soybeans and then process the beans themselves; however, they resort to importing meal when the profit margins on crushing the beans become too low. As a result, one would suspect an inverse relationship between US raw soybean exports and US meal production levels. Such a relationship is not evident in a two dimensional graph since US and foreign crop sizes have relatively larger impacts on US soybean export levels.

Table 3-12 in Volume II presented soybean crushing data for selected states for 1987-1994. The state distribution of soybean meal production will be very similar to the crushing distribution presented in that table. Soybean processing plants crush soybeans to produce joint products of meal and oil. Almost two-thirds of the value of soybeans comes from the meal, which is used as a high-protein livestock feed[1]. As a result, processors attempt to maximize the amount of meal yielded from crushing their soybeans. This means the amount of meal yielded from each bushel of soybeans is fairly stable across states. Small variances do exist as a result of the different types of soybeans that are crushed in different regions; however; these variances are insignificant for the purposes of this study.

To reiterate the main finding in Table 3-12 in Volume II, the following states account for almost 70% of the US soybean crush: Arkansas (2.9%), Illinois (19.18%), Indiana (6.39%), Iowa (17.41%), Kansas (4.23%), Minnesota (7.07%), Missouri (5.65%), and Ohio (6.58%). Note that almost 50% of all of the soybeans crushed in the US were processed in facilities located in the five-state study area.

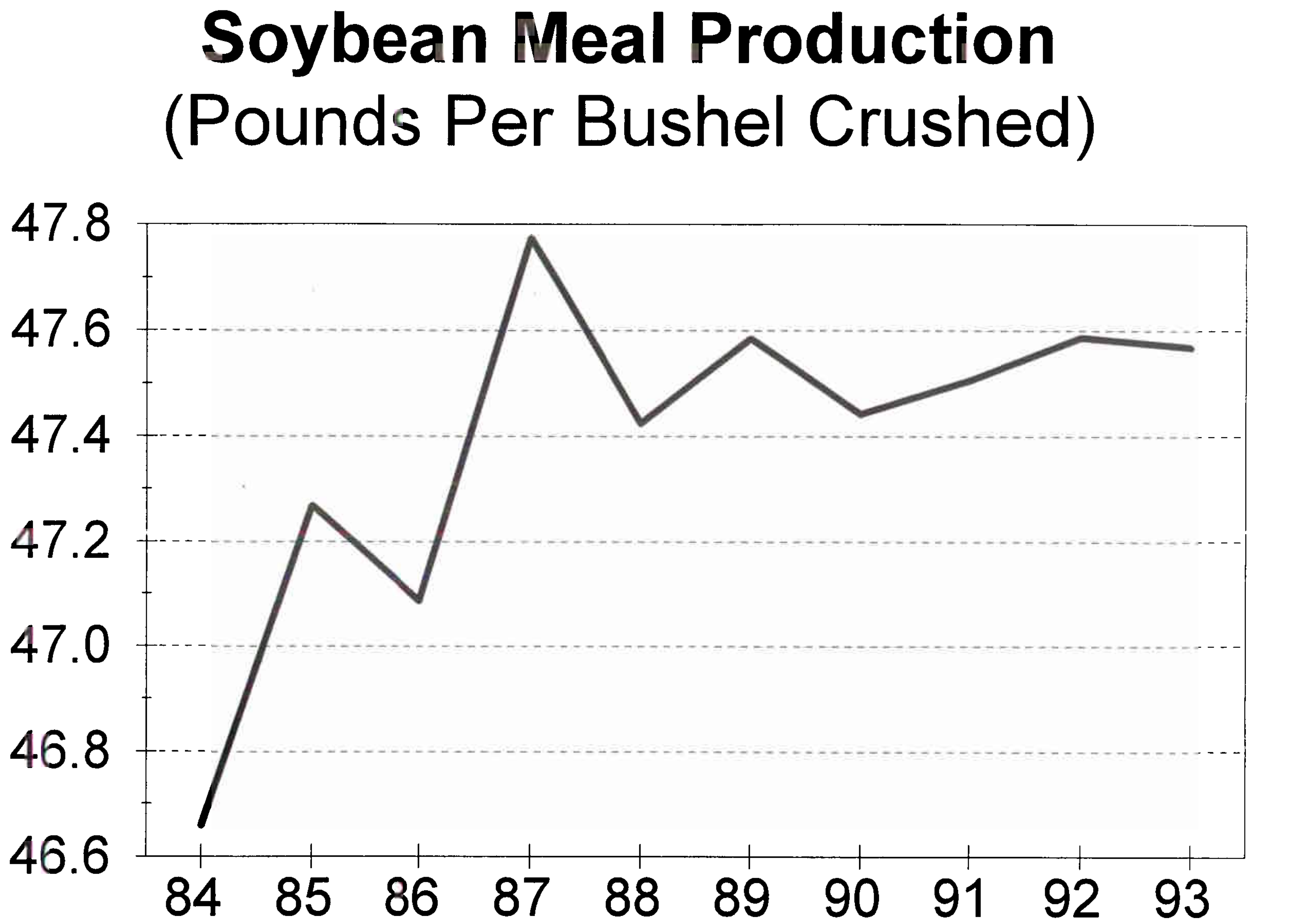
[1] Only a very small percentage (1%-2%) of soybean meal is consumed directly by humans.

Figure 2-1



Source: Agricultural Statistics, USDA, 1994.

Figure 2-2



Source: Agriculture Statistics 1994, USDA.

Corn Gluten Feed

Corn gluten feed is a by-product of the corn wet milling process. As a result, consumer demand for corn sweeteners, starches, and ethanol determines how much corn gluten feed is produced.

In 1992, the wet corn milling industry produced approximately 11.9 billion pounds of corn gluten feed. That figure was just over 30% higher than the 1987 amount of 9.1 billion pounds.

The wet corn milling industry consumed over 1.3 billion bushels of corn in 1992. On average, that implies that each bushel of corn consumed by the wet corn milling industry yielded 9.2 pounds of corn gluten feed.

Production of corn gluten feed is concentrated in the corn belt, where most of the wet corn milling facilities are located. These facilities were identified in Table 3-3 and Table 3-5 in the Volume II. Our state estimates of the amount of corn used to produce sweeteners, starches and ethanol (see Table 3-2 and Table 3-4 in Volume II) indicate that almost 72% of such consumption occurs in Illinois, Iowa and Indiana.

It should be noted that both ethanol and corn sweetener production are protected by government legislation. A favorable tax structure which provides sales tax breaks to ethanol users has allowed ethanol producers to maintain a competitive position against other producers of reformulated and oxygenated fuels. Likewise, sugar quotas protect the corn sweetener industry. These issues are raised because the removal of these subsidies would probably result in a decline in the production of corn gluten feed.

3.0 CONSUMPTION

This section looks at the different markets of animal feed use and determines which ones have a bearing on animal feed traffic on the Upper Mississippi River.

Soybean Meal

Figure 3-1 shows domestic and export consumption shares of US soybean cake and meal production. Since the mid 1980s, the export share has declined slightly as South American meal exports have become more competitive and major importers have shifted to processing more raw soybeans.

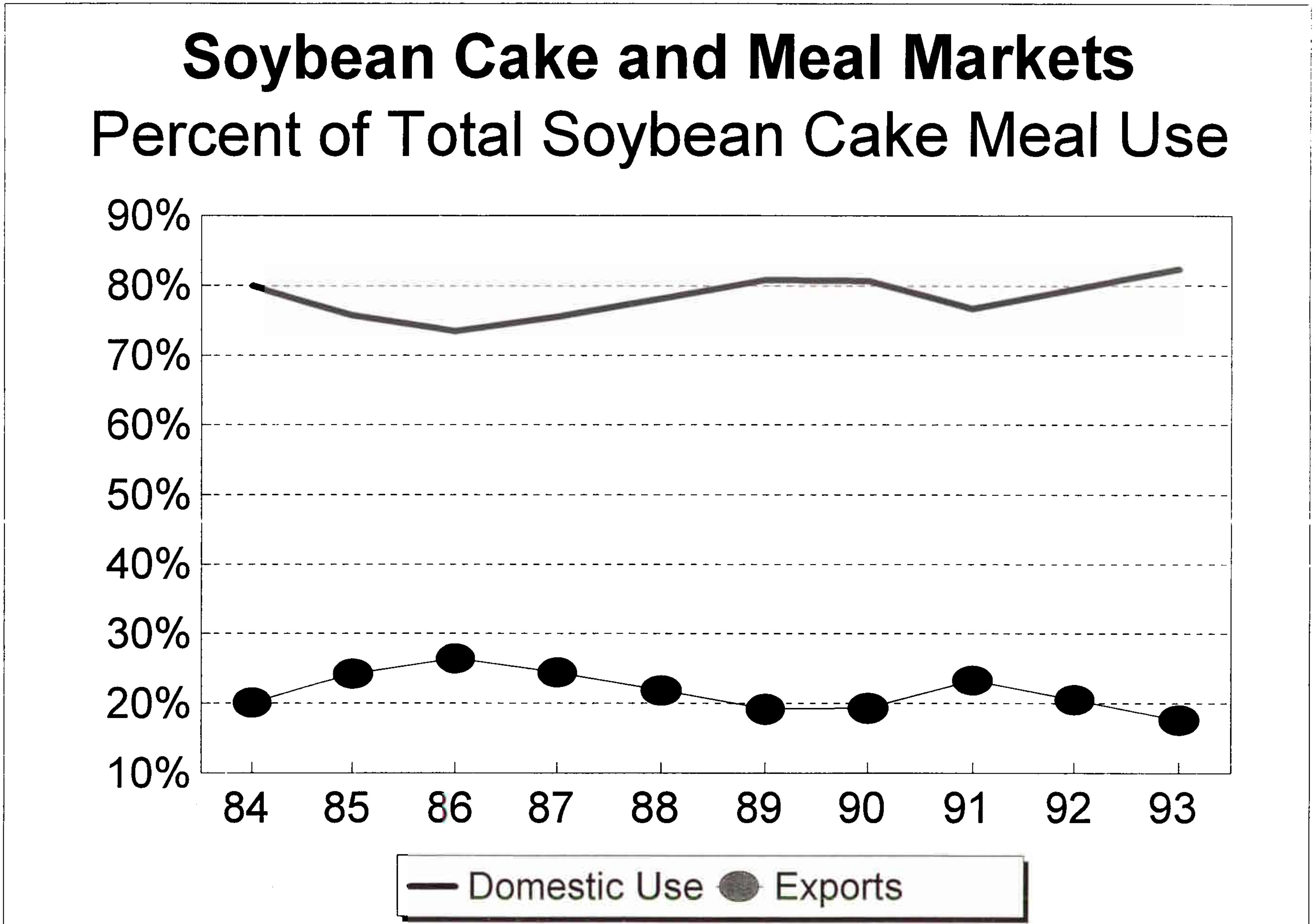
As stated in Section 2.0, domestic demand for soybean meal is used almost entirely for animal feed. Only a very small percent (1-2 percent) of the meal is used for food. In the US, poultry and swine consume 75% to 80% of the soybean meal used for animal feed.

The five-state study area maintains over 50% of the US hog inventory, but has lost over two percentage points since 1983. A large part of this decrease is due to the strong and recent expansion of hog farms in the Southeast (AL, FL, GA, MS, NC, SC, TN). The Southeast's share of the US hog inventory jumped from less than eleven percent in 1990 to over 16% in 1994. The Mid-South (AR, LA, OK, TX) and Far-West (AZ, CA, CO, ID, MT, NM, NV, OR, UT, WA, WY) have also realized slight increases in their shares and together account for approximately 6% of the US inventory of hogs. The Plains (KS, ND, NE, SD) and the North Midwest (IN, MI, OH) together have lost over three percentage points since 1983; each sustains close to 13% of the US hog inventory.

The geographic distribution of US broiler production has changed very little since 1983. The Southeast dominates the industry and produces 50% of the domestic broilers. The Mid-South has accounted for 24% of the US broiler production since 1987, while the Far West has consistently provided 5%. The five-state study area has been gradually gaining share, which is currently just over 3%.

Hens and pullets are not as regionally concentrated as broilers are. The Southeast still maintains the largest share, which has dropped from 26% in the early 80s to 24% in the early 90s. The Far-West exhibited the other noticeable decline: a two-and-a-half percentage point loss from 17.5% to 14%. The Mid-South, Plains , and five-state study area each gained share over the period. The Mid-South has seen a percentage point gain and now raises 13.4% of the domestic hens and pullets. The Plains' share increased steadily from 2.4% in 1983 to almost 4% in 1994. Since 1987, the five-state study area has acquired almost three percentage points; it now raises over 13% of the hens and pullets grown in the US.

Figure 3-1



Source: Agricultural Statistics 1994, USDA.

Table 3-1 presents the distribution of US soybean meal and cake exports by foreign destination. It can be seen that these exports are more evenly dispersed than was found with the grains and raw soybeans. In the future, North Asia's share should start to increase as China changes from being a net exporter to a net importer of soybean meal. Between 1990 and 1994, China maintained a positive net trade balance of 1.2 million tons; in 1995 they had a negative trade balance of .65 million tons and analysts are predicting that next year will see their trade balance falling further to negative 1.5 million tons. Such changes are likely to continue over the next several years as China attempts to sustain its increasing demand for meat and concomitant growth in their livestock and poultry sectors.

Most of the US soybean meal exports move through southern Louisiana ports. Over the past five years, the New Orleans custom's district has accounted for 73.2% of the US soybean meal exports. The remaining exports have been carried by Detroit (5.4%), Duluth (3.4%), Pembina (3.8%) and Norfolk (6.7%). The New Orleans share is not likely to fall since its ports serve soybean crushing facilities located not only in the Study Area but also in Arkansas and Mississippi. In addition, handling soybean meal requires special equipment which is not readily available in all US ports.

Table 3-1

US Soybean Meal and Cake Exports by Foreign Destination
(Percent of Total US Soybean Meal and Cake Exports)

Region	1990	1991	1992	1993	1994
Africa	8.19%	6.17%	4.35%	5.64%	5.47%
Australia and New Zealand	0.95%	2.48%	1.77%	2.73%	6.65%
Canada	12.12%	12.56%	10.17%	13.61%	16.83%
Caribbean	2.98%	3.46%	2.95%	4.50%	5.54%
Central America	3.10%	3.53%	3.96%	4.56%	6.04%
Europe	7.05%	1.37%	9.52%	14.23%	6.83%
F.S.U.	34.36%	44.11%	24.96%	16.43%	9.79%
Mexico	5.46%	5.87%	7.90%	3.81%	8.55%
Middle East	8.98%	6.63%	8.63%	9.08%	10.36%
North Africa	4.11%	2.26%	0.81%	2.51%	3.32%
North Asia	0.46%	0.46%	6.02%	4.92%	1.80%
South America	7.79%	8.23%	10.09%	11.41%	11.47%
South Asia	4.45%	2.87%	8.87%	6.56%	7.35%

Source: *US Exports History: 1990-1994*, CD-ROM, Bureau of the Census, U.S. Department of Commerce.

Corn Gluten Feed

To ensure cost-effective growth and maturity of their livestock and poultry, farmers frequently attempt to find the optimal amounts of starch and protein that their animals need. As starches, feed corn and corn gluten feed can to some extent be substituted with each other.

US farmers generally don't like to use corn gluten feed. Using corn gluten feed separately requires special storage and handling procedures which US farmers don't have or don't like. In Europe, it is used in compound feeds. Feed rationing practiced in Europe is more strict than it is in the US and European farmers utilize relatively more compound feed compared to their US counterparts. Compound feeds are generally produced off-farm, where the storage and handling problems associated with corn gluten feed can be minimized in large-scale, centralized feed mills. In the US, demand for compound feed is not strong as US farmers have opted for traditional on-farm feed production (ground and mixed on the farm).

In addition, corn price supports in Europe have made corn gluten feed an attractive alternative to feed corn in Europe. European feed grain prices are protected by a variable levy; however, corn gluten feed is currently not covered under this levy and is considered duty free.

For these, reasons, almost all of the corn gluten feed produced in the US has historically been exported to Europe. Between 1990 and 1994, Europe received 99.6% of all US corn gluten feed exports. 98.6% of those exports move through Louisiana ports.

This situation is likely to change in the foreseeable future as Europe begins to reduce its price supports on corn in response to GATT. European demand for corn gluten feed is likely to fall, lowering its price in the US and making it more attractive to US farmers. Exactly how this demand will be met is not certain; but some analysts are predicting that farmers will buy and use it in its natural form since drying it is very expensive. If this is the case, it is likely that such demand will be met by livestock and poultry operations located very close to the wet milling facilities since handling the product will require close cooperation between the farmer and the corn gluten feed producer[1].

[1] *Outlook for Grain Byproducts*, Presented by Harry Ambrose, USDA Agricultural Outlook Conference, 1992.

4.0 WATERWAY TRAFFIC PROJECTIONS

4.1 Forecast Methodology

The forecast methodology used to develop the waterway traffic projections of animal traffic is similar to the one used for grains and oilseeds (see Volume II). The methodology is appropriate when the waterborne tonnage of a given commodity consists almost exclusively of shipments from the Study Area to Louisiana export markets. Animal feed meets this criteria since almost all of the animal feed traffic on the Upper Mississippi River originates in the Study Area and moves downstream to Louisiana. Between 1981 and 1993, Louisiana received on average over 97% of the animal feed traffic originating in the Study Area.

In summary, the approach entails two major steps: (1) forecasting the level of exports likely to pass through the Louisiana ports; and (2) allocating part of that amount to origins within the Study Area. The first step was conducted differently for each of the three commodity sub-groups within animal feeds (soybean meal, corn gluten feed, and other animal feeds). The resulting forecasts were then aggregated before proceeding with the second step.

4.2 Forecasts of Louisiana Exports

Soybeans

To estimate the level of soybean meal exports out of Louisiana, we applied the same procedure used to forecast the level of grain exports out of Louisiana ports. First, total US exports of soybean meal was estimated as the residual of domestic production minus domestic consumption. Changes in stock levels were assumed to be zero since they have been insignificant historically. We then used Louisiana's historical share of US soybean exports (average from 1990 through 1994) to derive the forecast of the amount of soybean meal expected to pass through Louisiana ports. As pointed out in Section 3.0, there is little evidence that this share will change significantly in the future.

Forecasts of US soybean meal production are based upon SCI's projections of the US soybean crush, presented in Appendix A in Volume II. It was assumed that each bushel of soybeans crushed would yield 47.5 pounds of meal. This yield is an average based upon data from 1988 through 1993 and is plotted in Figure 2-2. As can be seen in the graph, the ratio has been fairly constant since 1988. It should be noted that if the yield increases as a result of technological improvements, actual soybean meal production could be higher than anticipated.

Forecasts of domestic consumption are based upon anticipated needs for high protein animal feed by the livestock and poultry sectors. Such needs were implicitly assumed in SCI's projections of the amount of corn used for feed (shown in Appendix A in Volume II). To develop the domestic demand forecasts, SCI's estimates of corn feed use were first converted from bushels to tons. Next, it was assumed that the following ratios would remain constant throughout the forecast horizon: corn feed's share of total feed concentrates (63.27%) and soybean meal's share of total feed concentrates (12.21%). The ratios chosen are averages of USDA data from 1988-1993. Between 1988 and 1993, corn feed's share of total feed concentrates exhibited a slight upward trend while soybean meal's share remained fairly flat. Given these assumptions, the following formula was used to forecast US demand for soybean meal:

$$SoybeanMeal_F = (CornFeed_{SCI} \div \frac{CornFeed_B}{TotalConcentrates_B}) * \frac{SoybeanMeal_B}{TotalConcentrates_B}$$

The subscript "F" refers to the forecast period; "B" refers to the base period (in this case, 1988-1993); and "SCI" refers to projections developed by Sparks Companies, Inc..

Figures 4-1 through 4-3 display projections for US soybean meal production, domestic consumption, and exports, respectively.

Corn Gluten Feed

As pointed out in Section 3.0, diminishing price supports on European corn is likely to have a large impact on the amount of corn gluten feed exported out of the US. Exports could fall or remain relatively constant but it is unlikely that they will see any growth in the near future. We have chosen to hold exports constant at their current levels, assuming that substitution to corn will take place gradually.

Other Animal Feed

It was assumed that the remaining animal feed exports would grow at the same rate as soybean meal exports and corn gluten feed exports combined.

Forecasts of total animal feed exports out of Louisiana are plotted in Figure 4-4.

Figure 4-1

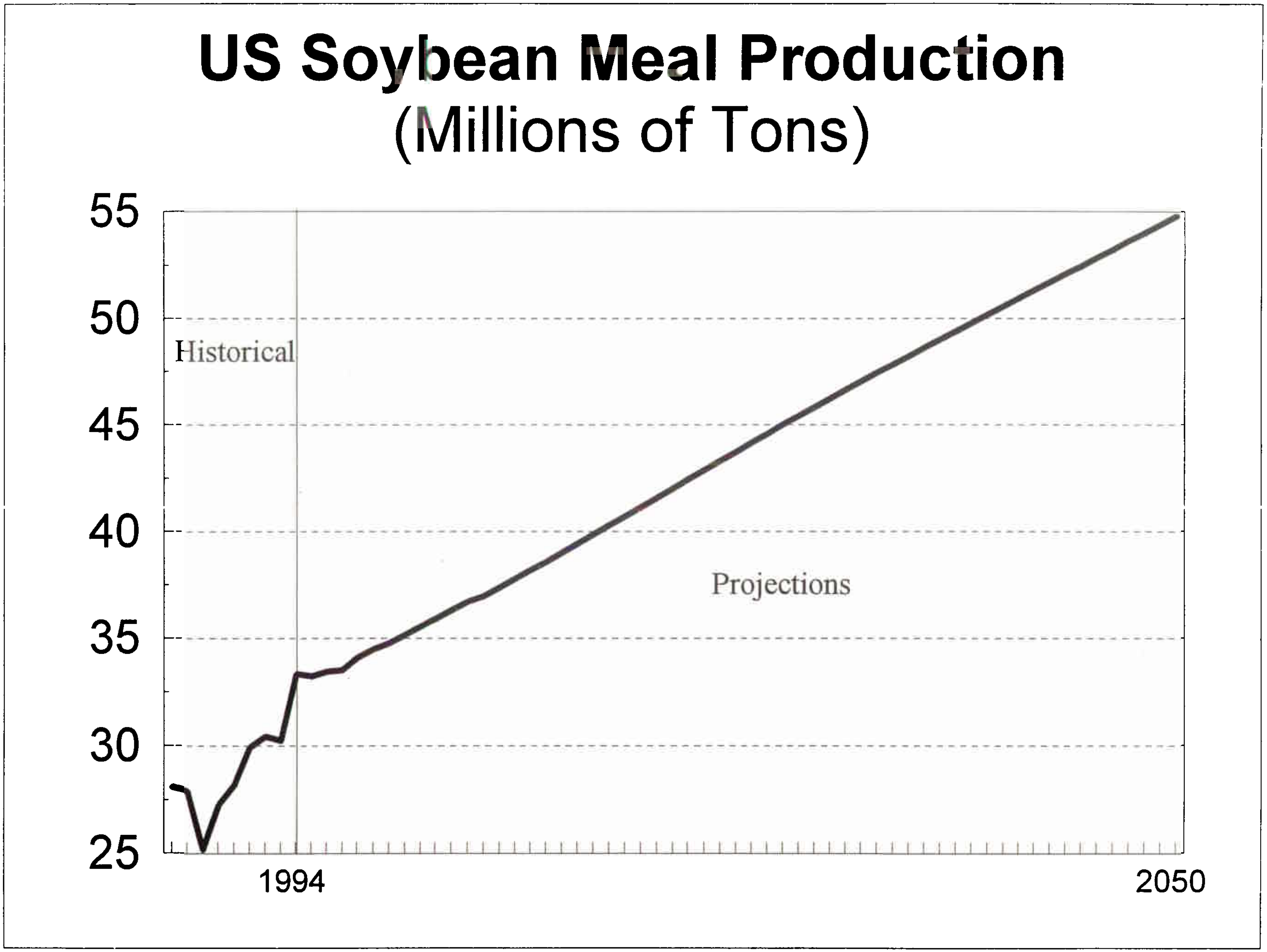

US Soybean Meal Production
(Millions of Tons)
55
50
45
40
35
30
25
Historical
Projections
1994
2050

Figure 4-2

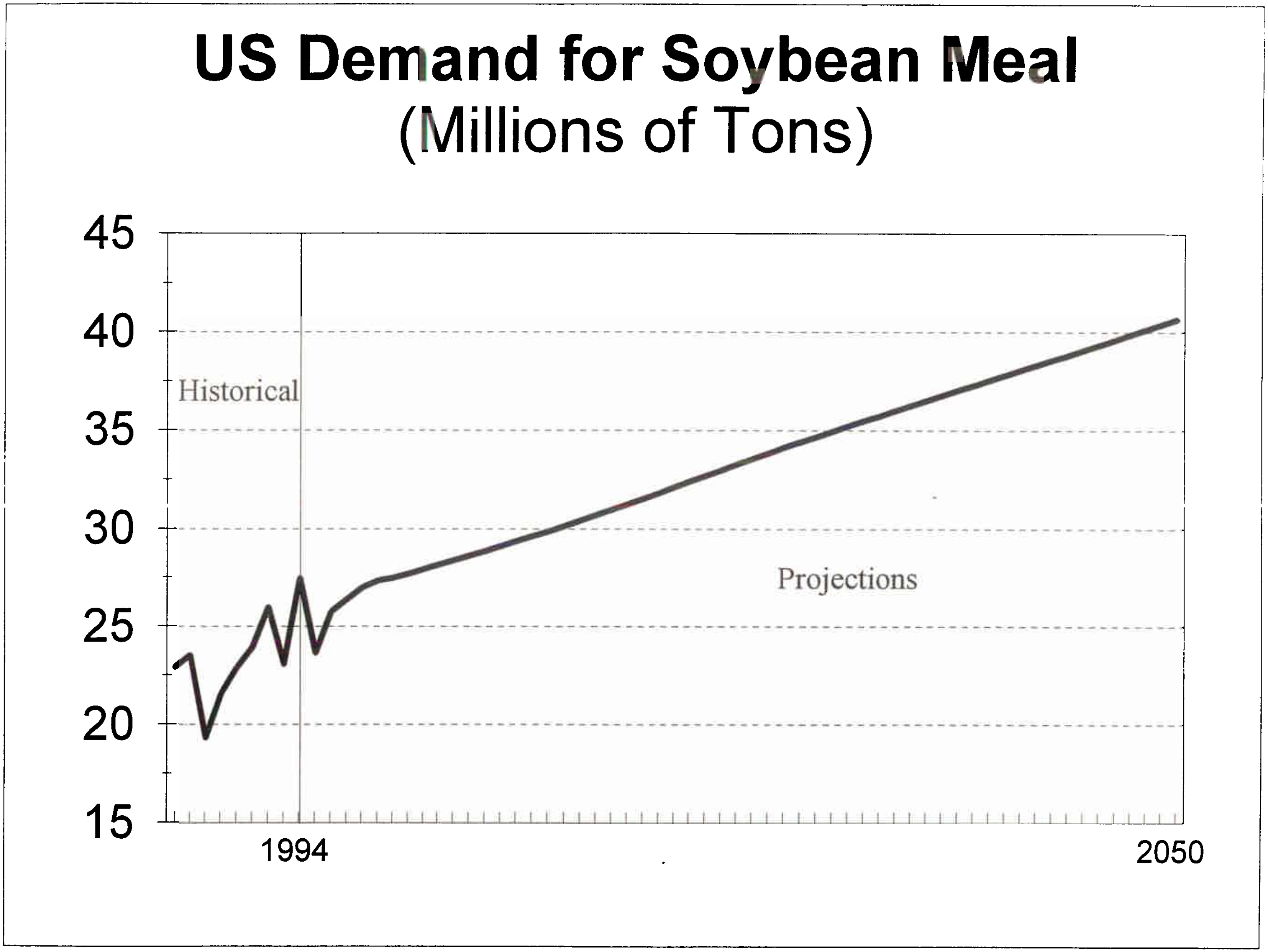

US Demand for Soybean Meal
(Millions of Tons)
45
40
35
30
25
20
15
Historical
Projections
1994
2050

Figure 4-3

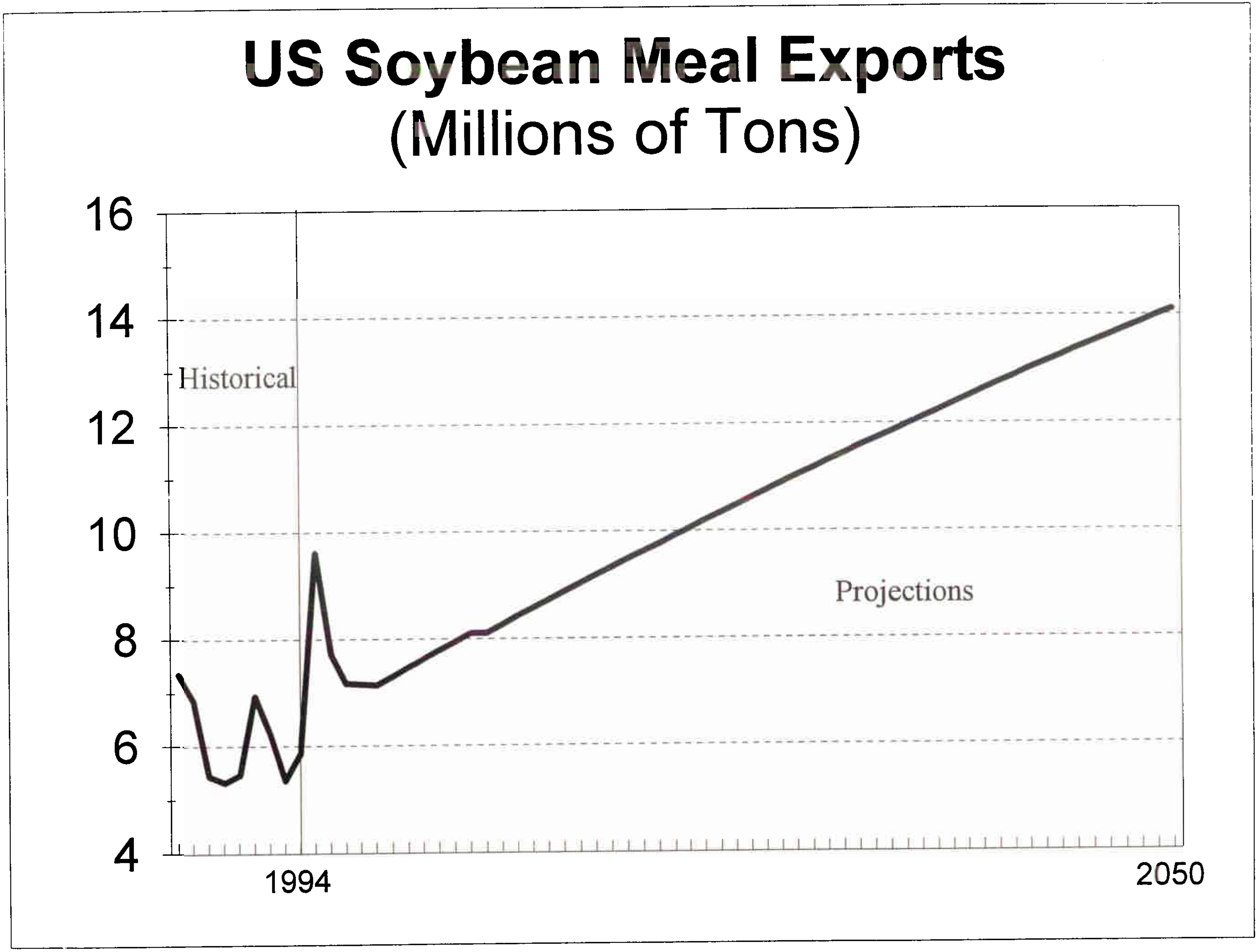
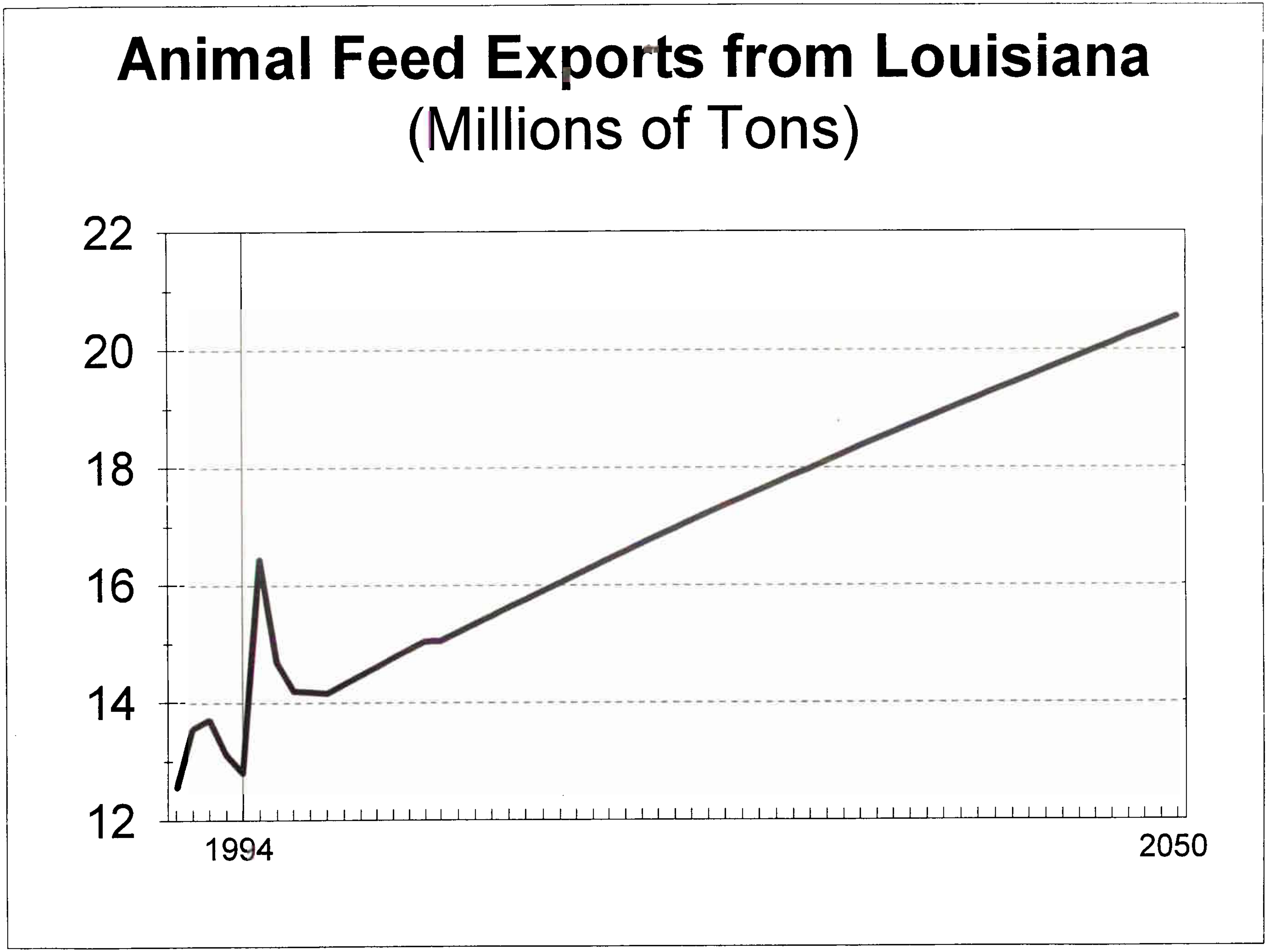

US Soybean Meal Exports
(Millions of Tons)
16
14
12
10
8
6
4
Historical
Projections
1994
2050

Figure 4-4


Animal Feed Exports from Louisiana
(Millions of Tons)
22
20
18
16
14
12
1994
2050

4.3 Waterway Traffic Forecasts for the Upper Mississippi River

Waterway traffic forecasts for the Upper Mississippi River are based upon the projections presented in Figure 4-4. These projections were allocated to the five-state study area and adjusted slightly for shipments to non-export markets. The forecast of total Study Area barge shipments of prepared animal feeds is shown in Figure 4-5. The Study Area's share of Louisiana exports has declined steadily since 1981. Therefore, we used the average share for 1990-1993 to allocate the projected Louisiana traffic. Using an average over the entire period would have added an upward bias to our forecast.

Total barge shipments of PAFs originating in the Study Area were then allocated to BEA origins based upon historical shares of Study Area traffic. These shares are presented in Table 4-1. Historic traffic levels by BEA are shown in Figure 4-6. Through traffic estimates were computed under the assumption that all traffic originating in the Study Area moves downstream and eventually leaves it. High and low estimates for the projections were developed using the amount of variance (in percentage terms) contained in the historical series of barge shipments of prepared animal feed originating in the Study Area. Appendix A contains the BEA traffic forecasts for Prepared Animal Feeds.

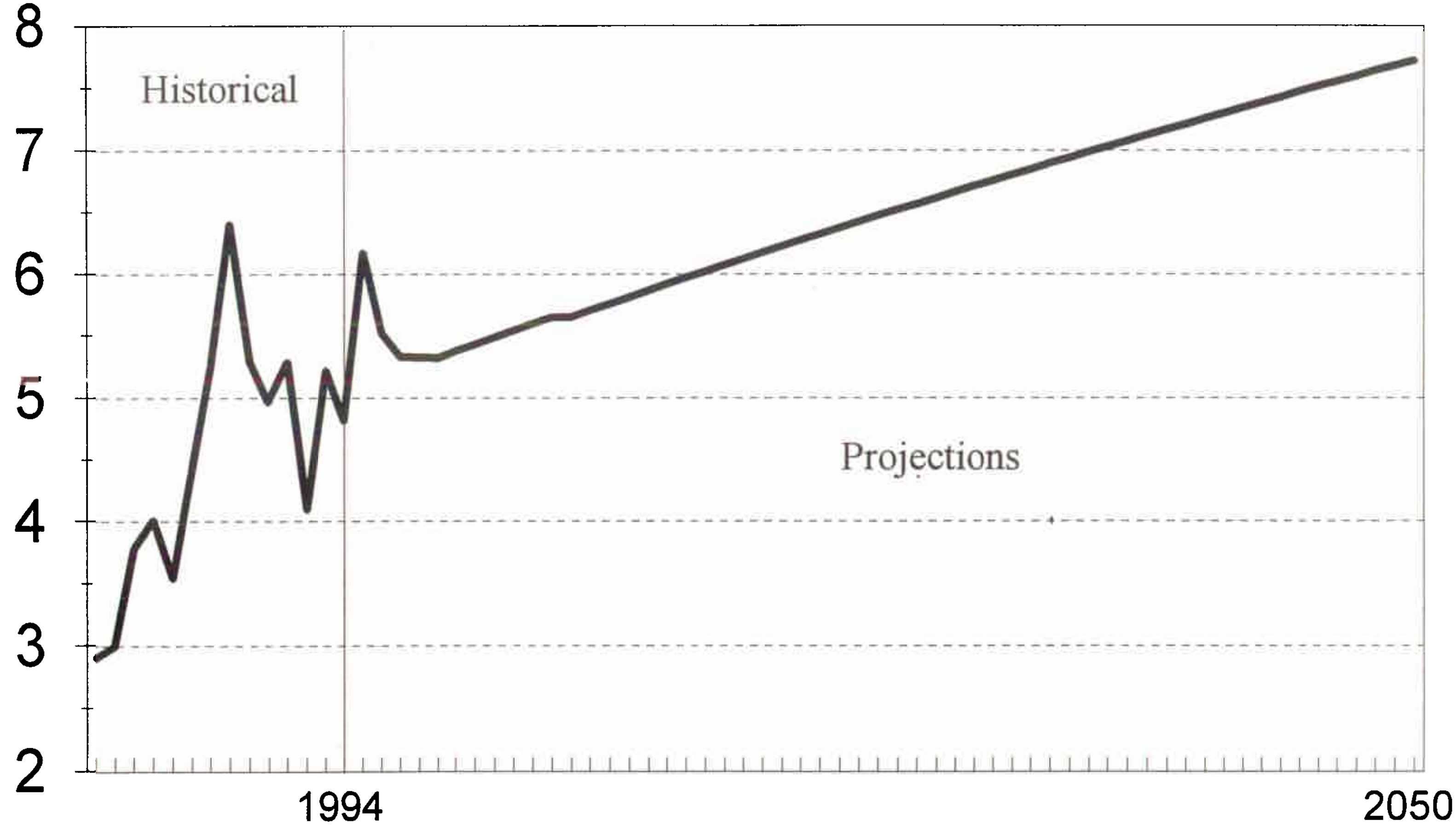
Table 4-1
Animal Feed Shipments by BEA Area
Percent of Study Area Animal Feed Shipments
Average: 1981-1993

BEA Area	Origin Share
Chicago, IL	8.66%
Davenport-Rock Island	20.05%
Dubuque, IA	0.20%
La Crosse, WI	0.21%
Minneapolis-St. Paul, MN	7.63%
Peoria, IL	24.59%
Quincy, IL	0.29%
Springfield, Decateur, IL	1.50%
St. Louis, MO	36.87%

The BEA traffic forecasts were further used to construct estimates for the main river segments in the Upper Mississippi River System: the Illinois Waterway and the Mississippi River between the Twin Cities and the mouth of the Missouri River. Again, through traffic estimates are based on the assumption that all PAF traffic moves downstream and leaves the Study Area. These projections are located in Appendix B.

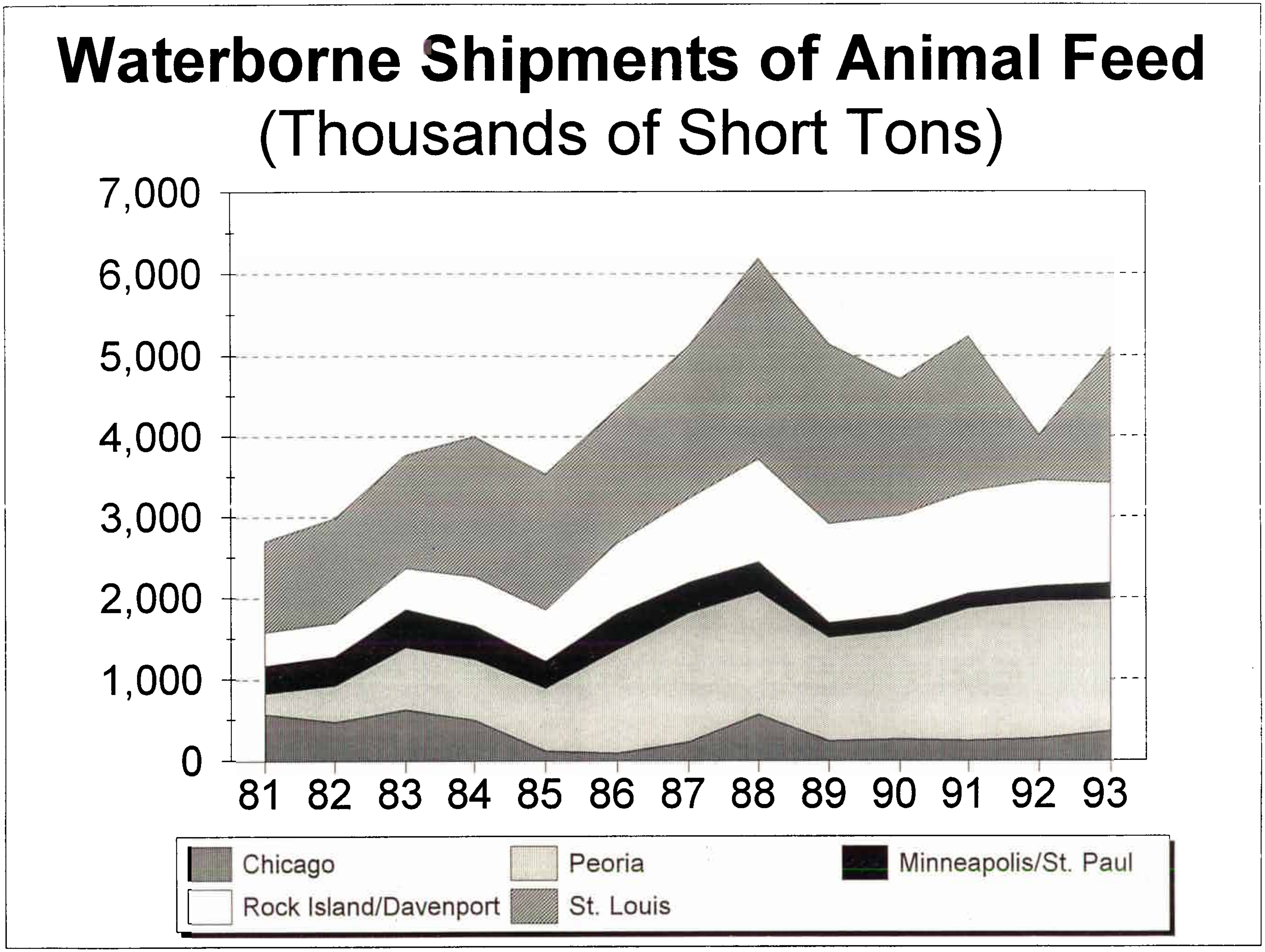
Figure 4-5

Study Area Barge Shipments of PAFs*
(Millions of Tons)



*Prepared Animal Feeds

Figure 4-6



Waterborne Shipments of Animal Feed
(Thousands of Short Tons)
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
81 82 83 84 85 86 87 88 89 90 91 92 93
Chicago
Peoria
Minneapolis/St. Paul
Rock Island/Davenport
St. Louis

APPENDIX A

Waterway Traffic Forecasts by BEA Area

Waterway Traffic Projections of Animal Feed for Chicago, Illinois (Thousands of Short Tons)									
Forecast	Originating Traffic			Through Traffic			Total Traffic		
Year	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	257	466	675	0	0	0	257	466	675
2005	270	490	709	0	0	0	270	490	709
2010	280	508	736	0	0	0	280	508	736
2015	292	531	769	0	0	0	292	531	769
2020	304	552	800	0	0	0	304	552	800
2025	316	573	830	0	0	0	316	573	830
2030	327	593	860	0	0	0	327	593	860
2035	338	613	888	0	0	0	338	613	888
2040	348	632	916	0	0	0	348	632	916
2045	359	651	943	0	0	0	359	651	943
2050	369	669	969	0	0	0	369	669	969

Waterway Traffic Projections of Animal Feed for Springfield/Decateur, Illinois (Thousands of Short Tons)									
Forecast	Originating Traffic			Through Traffic			Total Traffic		
Year	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	44	80	116	985	1,787	2,590	1,029	1,868	2,706
2005	47	85	122	1,036	1,879	2,723	1,082	1,964	2,845
2010	48	88	127	1,075	1,951	2,826	1,123	2,038	2,953
2015	50	92	133	1,122	2,036	2,951	1,173	2,128	3,083
2020	53	95	138	1,168	2,119	3,071	1,220	2,214	3,209
2025	54	99	143	1,212	2,199	3,187	1,266	2,298	3,330
2030	56	102	148	1,255	2,277	3,299	1,311	2,380	3,448
2035	58	106	153	1,297	2,353	3,409	1,355	2,459	3,562
2040	60	109	158	1,337	2,427	3,516	1,397	2,536	3,674
2045	62	112	163	1,377	2,498	3,620	1,439	2,611	3,783
2050	64	115	167	1,415	2,568	3,720	1,479	2,683	3,888

Waterway Traffic Projections of Animal Feed for Quincy, Illinois (Thousands of Short Tons)									
Forecast Year	Originating Traffic			Through Traffic			Total Traffic		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	9	16	23	832	1,510	2,188	841	1,526	2,210
2005	9	16	24	875	1,588	2,300	884	1,604	2,324
2010	9	17	25	908	1,648	2,387	917	1,665	2,412
2015	10	18	26	948	1,720	2,493	958	1,738	2,518
2020	10	18	27	987	1,790	2,594	997	1,809	2,621
2025	11	19	28	1,024	1,858	2,692	1,034	1,877	2,720
2030	11	20	29	1,060	1,924	2,787	1,071	1,943	2,816
2035	11	21	30	1,095	1,988	2,880	1,107	2,008	2,910
2040	12	21	31	1,130	2,050	2,970	1,141	2,071	3,001
2045	12	22	32	1,163	2,110	3,058	1,175	2,132	3,089
2050	12	22	32	1,195	2,169	3,143	1,208	2,191	3,175

Waterway Traffic Projections of Animal Feed for Peoria, Illinois (Thousands of Short Tons)									
Forecast Year	Originating Traffic			Through Traffic			Total Traffic		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	728	1,322	1,915	257	466	675	985	1,787	2,590
2005	766	1,390	2,013	270	490	709	1,036	1,879	2,723
2010	795	1,442	2,090	280	508	736	1,075	1,951	2,826
2015	830	1,506	2,182	292	531	769	1,122	2,036	2,951
2020	864	1,567	2,270	304	552	800	1,168	2,119	3,071
2025	896	1,626	2,356	316	573	830	1,212	2,199	3,187
2030	928	1,684	2,440	327	593	860	1,255	2,277	3,299
2035	959	1,740	2,521	338	613	888	1,297	2,353	3,409
2040	989	1,794	2,600	348	632	916	1,337	2,427	3,516
2045	1,018	1,847	2,677	359	651	943	1,377	2,498	3,620
2050	1,046	1,899	2,751	369	669	969	1,415	2,568	3,720

Waterway Traffic Projections of Animal Feed for La Crosse, Wisconsin (Thousands of Short Tons)									
Forecast	Originating Traffic			Through Traffic			Total Traffic		
Year	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	6	12	17	226	410	594	232	421	611
2005	7	12	18	238	431	625	244	443	642
2010	7	13	18	247	447	648	253	460	666
2015	7	13	19	257	467	677	265	480	696
2020	8	14	20	268	486	704	275	500	724
2025	8	14	21	278	504	731	286	519	751
2030	8	15	21	288	522	757	296	537	778
2035	8	15	22	297	540	782	306	555	804
2040	9	16	23	307	557	806	315	572	829
2045	9	16	23	316	573	830	325	589	854
2050	9	17	24	325	589	853	334	605	877

Waterway Traffic Projections of Animal Feed for Minneapolis/St. Paul Minnesota (Thousands of Short Tons)									
Forecast	Originating Traffic			Through Traffic			Total Traffic		
Year	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	226	410	594	0	0	0	226	410	594
2005	238	431	625	0	0	0	238	431	625
2010	247	447	648	0	0	0	247	447	648
2015	257	467	677	0	0	0	257	467	677
2020	268	486	704	0	0	0	268	486	704
2025	278	504	731	0	0	0	278	504	731
2030	288	522	757	0	0	0	288	522	757
2035	297	540	782	0	0	0	297	540	782
2040	307	557	806	0	0	0	307	557	806
2045	316	573	830	0	0	0	316	573	830
2050	325	589	853	0	0	0	325	589	853

Waterway Traffic Projections of Animal Feed for Dubuque, Iowa (Thousands of Short Tons)									
Forecast Year	Originating Traffic			Through Traffic			Total Traffic		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	6	11	15	232	421	611	238	432	626
2005	6	11	16	244	443	642	250	454	658
2010	6	12	17	253	460	666	260	471	683
2015	7	12	17	265	480	696	271	492	713
2020	7	13	18	275	500	724	282	512	742
2025	7	13	19	286	519	751	293	532	770
2030	7	13	20	296	537	778	303	550	797
2035	8	14	20	306	555	804	313	569	824
2040	8	14	21	315	572	829	323	587	850
2045	8	15	21	325	589	854	333	604	875
2050	8	15	22	334	605	877	342	621	899

Waterway Traffic Projections of Animal Feed for Davenport/Rock Island (Thousands of Short Tons)									
Forecast Year	Originating Traffic			Through Traffic			Total Traffic		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	594	1,078	1,562	238	432	626	832	1,510	2,188
2005	625	1,133	1,642	250	454	658	875	1,588	2,300
2010	648	1,176	1,704	260	471	683	908	1,648	2,387
2015	677	1,228	1,779	271	492	713	948	1,720	2,493
2020	704	1,278	1,852	282	512	742	987	1,790	2,594
2025	731	1,326	1,922	293	532	770	1,024	1,858	2,692
2030	757	1,373	1,990	303	550	797	1,060	1,924	2,787
2035	782	1,419	2,056	313	569	824	1,095	1,988	2,880
2040	806	1,463	2,120	323	587	850	1,130	2,050	2,970
2045	830	1,507	2,183	333	604	875	1,163	2,110	3,058
2050	853	1,548	2,244	342	621	899	1,195	2,169	3,143

Waterway Traffic Projections of Animal Feed for St. Louis, Missouri (Thousands of Short Tons)									
Forecast Year	Originating Traffic			Through Traffic*			Total Traffic		
	Low	Medium	High	Low	Medium	High	Low	Medium	High
2000	1,092	1,982	2,872	1,870	3,393	4,917	2,962	5,375	7,788
2005	1,148	2,084	3,019	1,966	3,568	5,169	3,114	5,652	8,189
2010	1,192	2,163	3,134	2,041	3,703	5,365	3,233	5,866	8,499
2015	1,244	2,258	3,272	2,130	3,866	5,601	3,375	6,124	8,873
2020	1,295	2,350	3,405	2,217	4,023	5,829	3,512	6,373	9,234
2025	1,344	2,439	3,533	2,301	4,175	6,050	3,645	6,614	9,583
2030	1,391	2,525	3,658	2,382	4,323	6,264	3,774	6,848	9,922
2035	1,438	2,609	3,780	2,462	4,467	6,472	3,899	7,076	10,252
2040	1,483	2,691	3,899	2,539	4,607	6,675	4,021	7,297	10,573
2045	1,527	2,770	4,014	2,614	4,743	6,872	4,140	7,513	10,886
2050	1,569	2,847	4,125	2,686	4,875	7,063	4,255	7,722	11,188

APPENDIX B

Waterway Traffic Forecasts by River Segment

Waterway Traffic Forecasts of Prepared Animal Feeds Twin Cities to Mouth of the Missouri River				
	Originating Traffic	Through Traffic	Total Traffic	
Year	(000 Short Tons)	(000 Short Tons)	(000 Short Tons)	AGR
91-93 avg	1,541	1,939	3,480	
2000	1,526	1,868	3,393	-0.31%
2005	1,604	1,964	3,568	1.01%
2010	1,665	2,038	3,703	0.75%
2015	1,738	2,128	3,866	0.87%
2020	1,809	2,214	4,023	0.80%
2025	1,877	2,298	4,175	0.74%
2030	1,943	2,380	4,323	0.70%
2035	2,008	2,459	4,467	0.66%
2040	2,071	2,536	4,607	0.62%
2045	2,132	2,611	4,743	0.58%
2050	2,191	2,683	4,875	0.55%

Waterway Traffic Forecasts of Prepared Animal Feeds				
Illinois Waterway				
	Originating Traffic	Through Traffic	Total Traffic	
Year	(000 Short Tons)	(000 Short Tons)	(000 Short Tons)	AGR
91-93 avg	1,939	0	1,939	
2000	1,868	0	1,868	-0.47%
2005	1,964	0	1,964	1.01%
2010	2,038	0	2,038	0.75%
2015	2,128	0	2,128	0.87%
2020	2,214	0	2,214	0.80%
2025	2,298	0	2,298	0.74%
2030	2,380	0	2,380	0.70%
2035	2,459	0	2,459	0.66%
2040	2,536	0	2,536	0.62%
2045	2,611	0	2,611	0.58%
2050	2,683	0	2,683	0.55%