ESO 965

THE WATERWAY USER CHARGE AND ITS POTENTIAL IMPACT ON OHIO GRAIN SHIPMENTS

By

Thomas G. Myers and Donald W. Larson

An interim report prepared for the Ohio Department of Agriculture on a contract with the Department of Agricultural Economics and Rural Sociology at The Ohio State University and the Ohio Agricultural Research and Development Center.

October 1, 1982

ESO 965

THE WATERWAY USER CHARGE AND ITS POTENTIAL IMPACT ON OHIO GRAIN SHIPMENTS

By

Thomas G. Myers and Donald W. Larson

An interim report prepared for the Ohio Department of Agriculture on a contract with the Department of Agricultural Economics and Rural Sociology at The Ohio State University and the Ohio Agricultural Research and Development Center.

October 1, 1982

THE WATERWAY USER CHARGE AND ITS POTENTIAL IMPACT ON OHIO GRAIN SHIPMENTS

By

Thomas G. Myers and Donald W. Larson*

This is the seventh interim report on a series of studies analyzing transportation services for Ohio Agriculture. The authors wish to thank Karlene Robison, Kathy Weaver and Janice Christensen for their most valuable assistance in the preparation of this report.

*Technical Assistant and Professor, respectively, Department of Agricultural Economics and Rural Sociology, The Ohio State University, and the Ohio Agricultural Research and Development Center.

Executive Summary

There has been a considerable amount of controversy over the past several years concerning legislative proposals that are designed to levy a charge against those persons transporting commodities on the U.S. inland waterway system. The purpose of these proposals is to eliminate the current federal expenditures required for the operation and maintenance of this waterway system. The objective of this report will be to discuss the impact of such a waterway user charge on Ohio agriculture. The various types of user charges that will likely be enacted along with the possible consequences of their implementation will be presented. The significance of this issue to Ohio agriculture is evidenced by the large volumes of Ohio grain that are annually shipped on this country's inland waterway system. There were 47 million bushels of grain shipped by barge from Cincinnati in 1980. This is in addition to the 182 million bushels of grain that were shipped from Ohio ports on Lake Erie in that same year.

Until recently, the Federal government had assumed the financial responsibility for the development and maintenance of the U.S. inland waterway system (See Figure 1). The only exception to this has been the minimal lockage fees that have been collected for transit on the St. Lawrence Seaway System. The U.S. share of these fees for grain shipments amounts to only $ .14 per metric ton or approximately 0.4 cents per bushel. However, this situation changed in 1978 with the passage of the Inland Waterway Revenue Act. The purpose of this legislation is to collect a tax on diesel fuel consumed by barge operators on the inland waterway system. The Act established a fuel tax of 4 cents per gallon beginning in October, 1980 and also specified incremental tax increases to 10 cents per gallon by 1985. In addition to this, the Reagan Administration is in

favor of further legislation that would enact user charges substantial enough for the recovery of 100% of the inland waterway nagivation costs.

One of the essential items that must be considered before enacting a waterway user charge is to estimate the economic ramifications of such a proposal. Although this will obviously be determined by many variables, the consensus of the majority of the available literature on the subject indicates that in the long run, the majority of the economic burden of a waterway user charge will be borne by the shipper. This means that for the transportation of grain and other agricultural commodities, the farmer will be forced to absorb the majority of the costs of this tax due to the fact that he will likely be receiving a lower average market price for his products. The actual amount of the economic burden will be determined in part by the competitive pricing actions of the railroads and barge operators who transport agricultural commodities. Assuming that the barge rates will increase when the user charge is enacted, railroads have a choice of either raising their rates along with the barge rates or else maintaining their rates at the same level and enjoying the benefits of increased market share. The higher the railroads raise their rates in response to a barge rate increase, the higher will be the overall economic load placed upon the farmer.

Another important factor that will directly influence the amount of economic burden paid by Ohio's farmers is the type of user charge that is enacted. There are two basic types of user charges. One is a uniform system-wide fee under which all traffic pays a tax at the same rate, regardless of the portion of the inland waterway system on which it travels. The second method is a segment-specific charge whereby traffic pays a fee that reflects the costs of operating and maintaining only that particular

portion of the inland waterway system. Due to the fact that the Ohio and Lower Mississippi Rivers are relatively inexpensive to maintain, Ohio farmers will be taxed at a much lower rate if a segment-specific type of waterway user charge is enacted.

There have been several research studies conducted attempting to estimate the amount of decrease in grain prices that farmers will receive as a result of a waterway user charge. The methodologies and results of four of these studies will be presented in greater detail later in this report. One of the more extensive studies was conducted by the U.S. Army Corps of Engineers and its results indicate that a segment-specific waterway user charge for the recovery of 100% of the navigation costs on the inland waterway system will add an additional 2.2 cents per bushel to the cost of transporting grain by barge from Cincinnati to Baton Rouge. The additional cost for this same shipment under a system-wide user charge is 5.3 cents per bushel. Furthermore, the Corps of Engineers indicates that a waterway user charge for the Ohio ports of Toledo and Huron will result in an additional cost of 0.4 and 0.5 cents per bushel of grain transported from each respective port area.

The information presented in this report indicates that for the transportation of agricultural commodities, the majority of the costs of the implementation of a waterway user charge will be borne by the farmer in the long run. Due to the fact that a segment-specific waterway user charge appears to have the least financial impact on Ohio, the authors of this report feel that the implementation of this particular type of user charge will be the most advantageous for Ohio's farmers.

The Waterway User Charge
And Its Potential Impact on Ohio Grain Shipments

Introduction

The implementation of a waterway user charge is a policy that has received an increased amount of attention over the past several years. This issue is of great significance to this country's agricultural sector due to the important role that water plays in the U.S. grain transportation system. In a survey of 1977 grain movements, barges moved 34.7 percent of the interstate shipments of corn, 24.4 percent of the wheat, and 45.7 percent of the soybeans. The importance of barges is even greater in export shipments where river movement accounted for 50.3 percent of the corn receipts at port areas, 29.1 percent of the wheat receipts, and 60.7 percent of the soybean receipts.[1/]

Waterway transportation is a significant factor in the transportation of Ohio grain. This is readily evidenced by the fact that in 1980 there were 182 million bushels of grain shipped from Ohio ports on Lake Erie. In addition to this, there were 47 million bushels of grain shipped by barge from Cincinnati in that same year.

The purpose of this report will be to discuss the impact of a waterway user charge on Ohio agriculture. The first section of this report will describe the structure of the U.S. inland waterway transportation system as well as present a summary of the legislative and historical activities that have been instrumental in its development. The next section of this report

will present the composition of the current user charge and also explain the various types of tax that will likely be implemented in order to collect this and future waterway user charges.

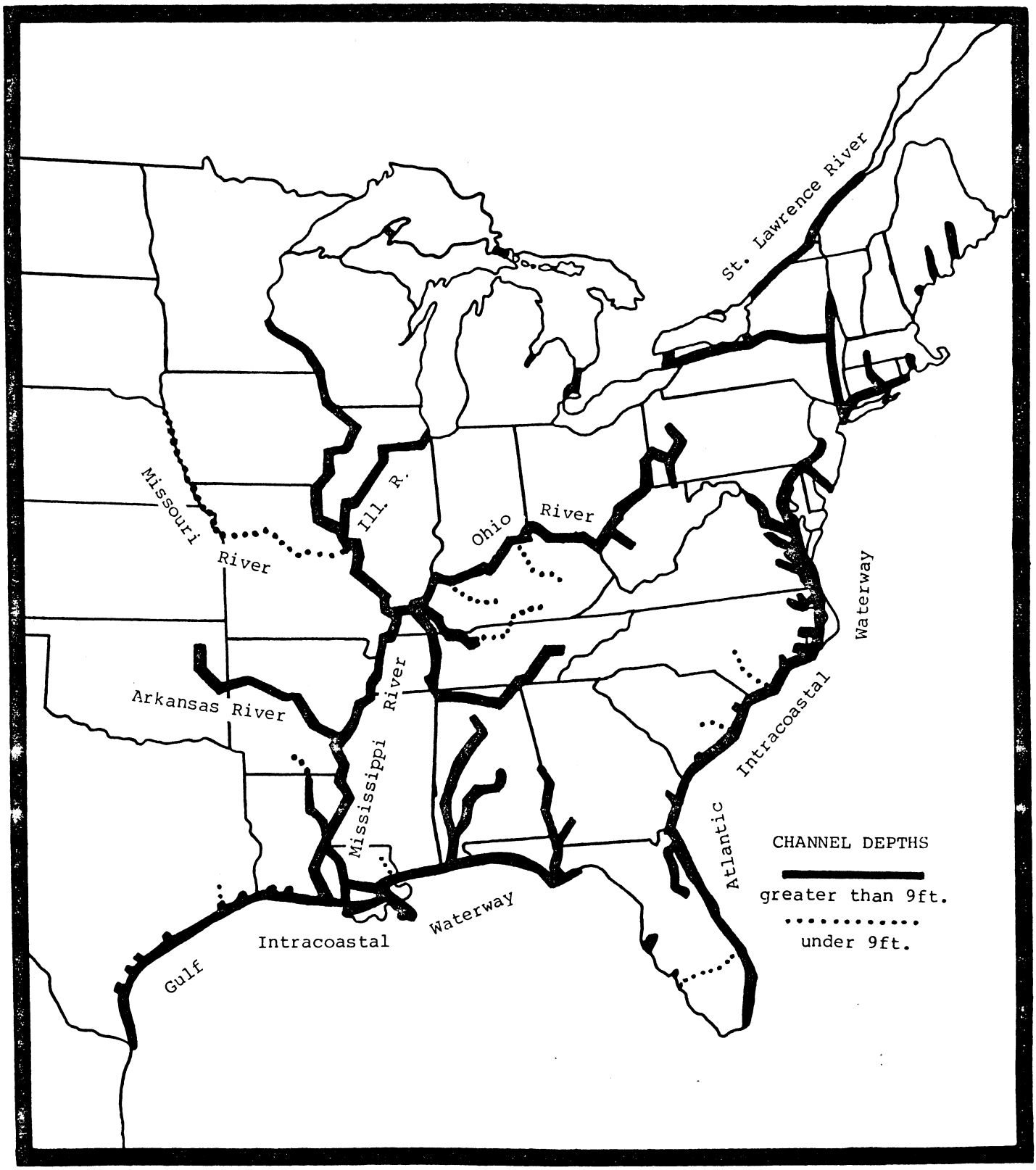
The final section of this report will present a review of the major economic research that has been conducted concerning this subject. This latter section will also include the various estimates that have been made regarding the effect that the user charge will have on the price paid to farmers in Ohio for their grain.

The U.S. Inland Waterway System

The U.S. inland waterway system, which includes the Mississippi River System, the Great Lakes, the Atlantic and Gulf Intracoastal Waterways, and the Pacific Coast Waterways, consists of 25,543 miles of navigable channels of varying depths. Figure 1 shows the major waterways in the eastern half of the U.S. While shipments on the Pacific coast waterways, especially grain, have been increasing rapidly over the past several years, as of 1978 the waterways shown in Figure 1 accounted for more than 99 percent of the total ton-miles of waterway traffic in the U.S.[2/]

Ohio grain that is shipped via water travels by one of two methods. The first method is travel on the Great Lakes from Ohio's two grain shipping ports on Lake Erie: Toledo and Huron. Grain that is shipped from either of these ports is loaded onto a "laker," a ship that is especially adapted for travel on the

Figure 1: The Eastern U.S. Inland Waterway System



Great Lakes and has a capacity of approximately 25,000 tons, or a "salty," an oceangoing vessel that carries cargoes directly between Great Lakes ports and overseas ports. The majority of this grain is bound for foreign destinations such as Canada and Western Europe. The maximum allowable "draft"* on the Great Lakes and St. Lawrence Seaway channels is 27 feet.

The second method by which grain is shipped via water from Ohio is barges. Barges are large, rectangular vessels that can be tied together with several other barges to form a single integrated unit. This larger "unit" is then pushed by a towboat and the entire combination is called a tow. The principal barge loading sites for grain in Ohio are at Portsmouth and the Cincinnati area. Each barge has a capacity of about 1,500 tons and the average number of barges in a grain tow moving on the Ohio River is six. The majority of this grain is transported to large export terminals at New Orleans or Baton Rouge. The maximum allowable draft on the Ohio River is nine feet.

Past and Present Legislation

In order for these large vessels to move on the inland waterway system, an enormous amount of physical improvements first needed to be made. Until recently, the policy of this country's Federal government has been to finance these improvements. This commitment by the Federal government dates back to the colonial period.[3/] At that time elected representatives recognized the importance of safe, navigable waterways to the

*"Draft" is the minimum water depth necessary to avoid grounding a vessel.

economic development of the United States. Although the Erie Canal, which was completed in 1825 and financed by the State of New York, is an example of a successful non-federal inland waterway project, most individual states lacked the necessary incentives and financial resources needed to improve and maintain interstate waterways. Because of this, the Federal government assumed the responsibility for developing and maintaining this nation's river resources.[4/] In 1824, Congress created the Corps of Engineers within the Department of the Army to plan, construct and maintain inland waterways. The original legislation stipulated that the navigable waterways be open to all wishing to use them without fees or taxes of any kind. Formal congressional support for this policy was reinforced by the Rivers and Harbors Act of 1884 which stated:

> "No tolls or operating charges whatever shall be levied upon or collected from any vessel, dredge, or other water craft for passing through any lock, canal, canalized river, or other work for the use and benefit of navigation, now belonging to the United States or that may be hereafter acquired or constructed...."

This policy statement evolved during a period of history when the expenditure of tax dollars for waterway improvements was small, and the freight transportation industry was dominated by the railroads. Therefore, many legislators of that period viewed promotion of water transportation as an inexpensive means of encouraging competition for the railroads.[5/]

However, the economic environment in which the transportation industry operates today has changed significantly since the 19th century. Not only have the public expenditures necessary

to keep the inland waterway system operating properly become very large (See Table 1), but also the competitive balance between the railroads and the barge industry has become more equal.

The idea of discontinuing public funding for waterway improvements is not entirely recent. Recognition of the changing transportation environment led to executive branch proposals during the term of every President since 1940 to recommend that Congress adopt some form of user fee for the inland waterways.[6/] Following a series of long debates, formal legislative action was taken with the passage of the Inland Waterway Revenue Act of 1978 (Title II of Public Law 95-502). With this law, Congress established waterway user fees in the form of a fuel tax on commercial traffic for partial recovery of costs of operation, maintenance and new construction on the inland waterway system.[7/] The Act established a fuel tax of 4 cents per gallon beginning in October, 1980 and also specified incremental tax increases to 10 cents per gallon by 1985. These tax levels are expected to recover approximately 20-25 percent of allocated costs.[8/] This tax was last revised in October, 1981 to 6 cents per gallon. Assuming that the fuel efficiency of a tow consisting of 6 barges is 408 ton-miles per gallon, the current fuel tax has added approximately 0.5 cents per bushel to the cost of transporting grain from Cincinnati to Baton Rouge.

President Reagan, as a part of his efforts to reduce the size of the Federal budget deficit, has supported plans for the implementation of even higher user fees. Eric Beshers, the Deputy Director of Policy for the U.S. Department of Transporta-

Table 1. Federal Expenditures for Operation, Maintenance and Captial Construction Projects on Selected Waterway Segments, 1979-1982

Waterway Segment	Fiscal Year	Operation and Maintenance	O & M Amount Subject to Recovery	Construction Subject to Recovery	Total Costs Subject to Recovery
			($1,000)		
Upper Mississippi River	1979	44,784	38,489	0	38,489
	1980	47,110	40,228	0	40,228
	1981	48,833	40,721	0	40,721
	1982	54,342	46,629	31,756	78,385
Lower Mississippi River	1979	57,771	36,144	0	36,144
	1980	55,270	34,774	0	34,774
	1981	64,668	40,400	0	40,400
	1982	76,937	44,211	151	44,362
Ohio River	1979	27,179	24,063	0	24,063
	1980	28,492	25,293	0	25,293
	1981	27,502	24,396	0	24,396
	1982	30,471	26,933	2,057	28,990
Arkansas River	1979	27,173	13,782	0	13,782
	1980	26,857	13,155	0	13,155
	1981	44,026	29,778	0	29,778
	1982	30,606	15,535	0	15,535
Illinois River	1979	13,402	12,017	0	12,017
	1980	12,057	10,813	0	10,813
	1981	12,143	10,838	0	10,838
	1982	13,920	12,477	1,445	13,922
Missouri River	1979	31,291	3,824	0	3,824
	1980	30,709	3,695	0	3,695
	1981	30,587	3,605	0	3,605
	1982	32,794	4,377	0	4,377
Lake Ontario	1979	656	656	0	656
	1980	609	609	0	609
	1981	1,676	1,676	0	1,676
	1982	1,050	1,050	0	1,050
Lake Erie	1979	42,660	42,660	0	42,660
	1980	36,384	36,384	0	36,384
	1981	31,184	31,184	0	31,184
	1982	33,492	33,492	0	33,492

Table 1. Cont'd

Waterway Segment	Fiscal Year	Operation and Maintenance	O & M Amount Subject to Recovery	Construction Subject to Recovery	Total Costs Subject to Recovery
			($1,000)		
Lake Huron	1979	9,817	3,311	0	3,311
	1980	13,309	5,669	0	5,669
	1981	13,866	5,083	0	5,083
	1982	16,318	7,261	0	7,261
Lake Michigan	1979	14,950	14,950	0	14,950
	1980	10,429	10,429	0	10,429
	1981	15,499	15,499	0	15,499
	1982	19,207	19,207	0	19,207
Lake Superior	1979	3,466	3,019	0	3,019
	1980	2,472	2,268	0	2,268
	1981	3,429	3,199	0	3,199
	1982	3,204	2,974	0	2,974

Source: U.S. Army Corps of Engineers, Shallow and Deep Draft Navigation Cost Recovery Analysis

tion, spoke at a waterway user charges conference in June, 1982 on the present intent of the Reagan Administration concerning this matter. He stated that the President will push for 100 percent cost recovery of inland waterway navigation costs through the collection of user charges. Although Mr. Beshers felt that the next two sessions of Congress would be unable to reach a compromise on the proposals, he stated that the financing of the inland waterway system by the private sector in the near future seems "inevitable."

There are two pieces of legislation concerning waterway user charges currently being considered by the House of Representatives and the Senate. They are both similar in that they propose the recovery of costs presently incurred by the U.S. Army Corps of Engineers for commercial navigation. The first proposal concerns the recovery of "deep-draft" navigation costs and has been entitled House Bill H.R. 5073 and Senate Bill S. 809. "Deep-draft" refers to those channels and ports of the United States that are of a federally authorized depth of fourteen feet or more. This includes the Great Lakes and the St. Lawrence Seaway. The second legislative proposal has been designated as House Bill H.R. 6078 and Senate Bill S. 810 and it pertains to "shallow-draft" navigation cost recovery. The latter proposal applies to both the Ohio and Mississippi Rivers. The remainder of this report will consider these two proposals separately. The next sections of this report will be concerned with the issues surrounding "shallow-draft" navigation cost recovery. The final sections of this report will discuss the factors affecting "deep-draft" navigation cost recovery.

Shallow-Draft Navigation Cost Recovery

Economic Considerations

The passage of a bill to impose a waterway user fee is a very sensitive political and economic task due to the potentially large sums of money to be gained or lost by shippers, carriers and even consumers. The manner in which the user fee is implemented will be an important factor in determining which persons gain or lose those sums of money. There are two basic ways to go about levying a waterway user charge. One is to impose a uniform system-wide fee under which all traffic pays a tax at the same rate, regardless of the portion of the inland waterway system on which it travels. The alternative method is the segment-based tax under which traffic is charged a fee at a rate which reflects the government's cost of operating and maintaining the specific river segment on which that traffic is moving.[9/] The system-wide charge could possibly be implemented in the form of a fuel tax, a uniform ton-mile tax or a uniform license fee for towboats and/or barges. A segment-specific charge would likely be put in effect as a lockage fee, a ton-mile tax that varies by waterway segment, or a variable license fee for towboats and/or barges. These various types of fees are summarized in Table 2.

Table 2. Types of Waterway User Fees

I. System-Wide Fees	II. Segment-Specific Fees
A. Fuel tax	A. Lockage fee
B. Uniform ton-mile tax	B. Variable ton-mile tax
C. Uniform license fee	C. Variable license fee

One of the most important considerations to be made when deciding upon a type of user-charge to be implemented is the economic ramification of that particular type of charge. For example, a system-wide fuel tax may not be economically equitable for all the users of the national waterway system. The reason for this is that some segments of the waterway system cost a considerably greater amount of funds to operate and maintain than others. Table 1 illustrates this point. With a uniform system-wide user fee, those persons that ship goods on the waterway segments that are cheaper to maintain are being forced to subsidize those persons that ship goods on the relatively more expensive waterway segments. On the other hand, if a segment-specific user charge is enacted, there may be several waterway segments in the U.S. on which barge traffic will come to a virtual halt due to the expensive user fees.

Due to the interdependent structure of this country's national transportation system, the imposition of a waterway user charge may have any of several effects. The major items to be considered are: (1) Change in barge profits and rates, (2) Change in railroad profits and rates, (3) Shift in volume of goods moved by each competitive mode, and (4) Change in farm prices. As was mentioned previously, the objective of this report is to describe the effect that the waterway user charge will have on farm prices. However, a consideration of these other variables is essential in order to properly describe that effect.

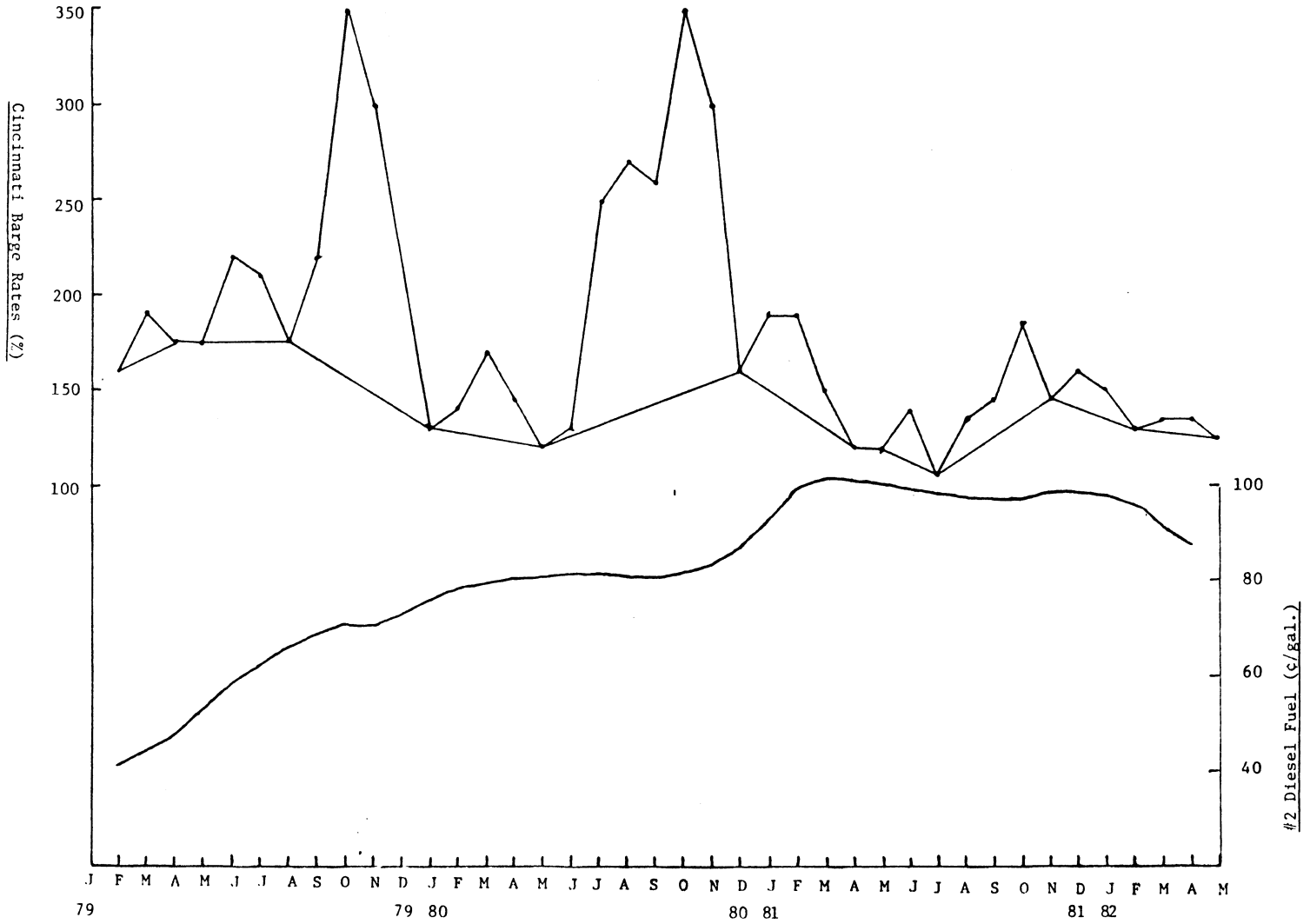
Barge Profits and Rates

It seems logical to assume that the implementation of a waterway user charge would cause an immediate increase in barge rates. However, this may not necessarily prove to be true. An investigation of the past fluctuations of barge rates will help to verify this point.

The substantial increase in the price of diesel fuel that has occurred over the past several years caused an increase in the level of variable costs of barge operators. The implementation of a waterway user charge, such as a tax on diesel fuel, would likewise cause a similar increase in variable operating costs. It is for this reason that an examination of the fluctuation of barge rates in the face of diesel fuel price increases may be useful in predicting barge rate changes prompted by user charges. Contrary to this logic, Figure 2 indicates that barge rates fluctuate very little in response to an increase in diesel fuel prices. Figure 2 also illustrates the marked seasonality of barge rates due to the abrupt increase in barge rates each year during the harvest season for grain. This indicates that barge rates are influenced by the demand for and the supply of barge transportation.

Barge rates also reflect the quality and availability of service in other modes of transportation. Labor strikes and car shortages in the railroad industry have caused temporary but substantial increases in barge rates as grain shippers and other rail users are forced to seek transportation alternatives.[10/]

Figure 2. Cincinnati Barge Rates and the Price per Gallon of #2 Diesel Fuel, 1979-82



Source: Telephone Interview and Department of Energy, Monthly Energy Review.

While the peak rates for barge transportation appear to be influenced by supply and demand factors, basic economic theory should lead one to believe that the lower barge rates are determined by variable cost factors. For example, during periods of weak demand for barge transportation and subsequent low rates, a barge operator will be better off to leave his barges sit idle than to transport goods at a rate that does not even cover his variable costs of operation. Following this line of reasoning, rising variable costs will increase the minimum barge rate that the operators will accept. Even though the maximum barge rates will not be directly affected by an increase in variable costs, the average barge rate that is charged to shippers will rise.

Railroad Profits and Rates

The railroad and barge industries closely compete for the transportation of many bulk commodities such as coal, fertilizer and grain. Because of this fact, the implementation of a waterway user charge will also have a direct impact on the railroad industry. Furthermore, the railroad industry's reaction to this changing market structure will be a major factor in determining the overall economic consequences caused by the user charge.

As a further explanation, assume that the waterway user charge will cause an increase in the average barge rate. The railroads have two basic pricing strategies that they can follow in response to this. The first alternative would be to raise their rates in concert with the barge rates. In this

case, the railroads would receive increased revenues without incurring an increase in costs but there also would be no diversion of traffic from the barge mode to rail. The second pricing strategy that the railroads could choose would be to maintain their rates at current levels and benefit from the increase in traffic as shippers switch from barge to rail.

The above explanation is admittedly very simplified as there are many other factors that determine barge and rail rates. Predicting how the railroads will actually respond is quite difficult to do. However, this explanation does demonstrate the far-reaching effects that a waterway user charge may have and the number of factors that must be considered before estimating future impacts of such a tax.

Change in Transportation Mode

As mentioned previously, the levels of traffic diversion from barge to rail will depend on the pricing strategies that the two industries choose to follow. The barge operators may choose to accept a lower profit margin and thus preserve their relative share of the transportation market.

A report entitled, "Inland Waterway User Taxes and Charges", which was prepared for Congress by the U.S. Departments of Commerce and Transportation, attempted to estimate the overall impact of various types of waterway user charges. This report stated: "Overall, perhaps the most striking general point that emerges from the analysis is the very strong future water traffic growth that is forecast, with or without user charges.

Under the maximum diversion case, a system-wide fuel tax with no rate response by the railroads, tonnage in the year 2000 is estimated to be 50 percent greater than in 1977, although it is nine percent less than it would be without user charges."[11/] The large amount of growth that is predicted for the barge transportation industry should help to reduce the long-term impact of user charges. As more traffic moves on the waterways, the cost of operation and maintenance can be spread out over more tons of cargo. It should be pointed out that the above-mentioned study predicts that the barge industry will likely experience a drop-off in traffic as rates go up to reflect user charges. It may take four to five years for the industry to recover and... "some small, marginal operators might not survive the transition period."[12/]

Farm Prices

Another very important point concerns which group will actually bear the economic burden of the tax. Some studies on the subject have assumed that all of the increased costs will immediately be passed directly to the farmer. In the short-run however, most of the research tends to indicate that the barge operators and terminal elevator owners will absorb some of the costs by accepting lower margins. Nevertheless, in the long run the consensus of the available information agrees that the farmer will bear the majority of the economic burden in the form of reduced grain prices. There have been several extensive research studies that have made estimates of the decrease in grain

prices that Ohio farmers will be forced to accept. Those individual studies along with a brief summary of their methodologies and assumptions will be presented here.[13/]

1. Binkley, James, Leonard Shabman, Joseph Havlicek, William Luppold, Richard Stillman, Walter Spilla and Dave Kinyon, "Navigation User Charges: Impact on the Transportation of Agricultural Products," Bulletin 121, Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University, Blacksburg, Ohio, 1979.

The Binkley study was the first attempt to measure the impact of waterway user charges on national grain flows. A linear programming model is used to replicate corn, soybean and wheat flows during the 1970-1971 crop year and to estimate the effects of a system-wide fuel tax equal to .084 cents per ton-mile and of segment specific ton-mile taxes. Grain movements on the Mississippi, Illinois, Ohio, Missouri, Arkansas, and Tennessee rivers are analyzed. Specific locations on these rivers are allowed to both ship and receive grain. Export grain is transshipped through Gulf, Great Lakes and West Coast ports. The transportation costs are based upon 1975 rail, barge and ocean rates as collected from industry sources and estimated truck and handling charges. The user charges were at a level that would recover 100 percent of 1975 inland waterway operations and maintenance expenditures from all river traffic. A separate model is used for each crop; the models include 164 corn, 161 soybean and 134 wheat regions.

2. Data Resources, Inc. "The Economic Impact of Inland Waterway User Charges - The Impact of Waterway User Fees on Barge Traffic and Water Served Regions," National Technical Information Service, PB-82-196007, Springfield, VA, March 1982.

The Data Resource, Inc. (DRI) study is the fundamental analysis for the U.S. Department of Transportation 205 user charge study.** The DRI model estimates the impact of waterway user charges on 11 major classes of waterway traffic, including grain, coal, sand and gravel, petroleum and petroleum products, iron and steel, and chemical and fertilizers. The DRI analysis is the only study included in this discussion that does not use a linear programming model.

In the DRI study, inland waterway shipments and receipts on 20 river segments are projected to 1990 and 2000 based upon historical levels of traffic. Given these levels of traffic, projected public expenditures on inland waterway navigation related operations, maintenance, repair and construction are converted to per gallon and segment specific ton-mile taxes to recover 100 percent of annualized operations, maintenance, repair and construction expenditures. However, the addition of these initial tax levels to the estimated barge rates results in traffic diversions. The reduced waterway traffic no longer yields the desired level of cost recovery, so it becomes necessary to increase the user tax. The higher user tax is then applied to rates on the remaining traffic. This iterative process was repeated four times. By the fourth iteration, traffic tended to stabilize resulting in fuel taxes of 32.4 and 38.1

**U.S. Department of Transportation and U.S. Department of Commerce, "Inland Waterway User Taxes and Charges, Report of the Secretary of Transportation to the United States Congress Pursuant to Section 205, Public Law 95-502, the Inland Waterway Revenue Act of 1978", Washington, D.C., February 1982.

cents per gallon for 1985 and 1990 and in segment specific ton-mile taxes.

Diversion triggers are based on a survey of shipper perceptions of the sensitivity of each type of traffic to increased barge rates. In the case of grain, selected barge terminal grain drawing patterns were obtained for six sample days in 1979. Using the survey and grain drawing pattern results, DRI projects maximum distance from the river in which barges can compete with rail. As barge rates increase, this area shrinks. As a general rule for grain, the area in which barges can compete shrinks by 10 miles for each 1.25 cents per bushel increase in barge rates.

Because the DRI analysis includes 20 different inland waterway rivers and 11 commodity classes, the study is, of necessity, aggregative in nature. A highly aggregative approach works well for commodities like coal with relatively few origins (mines) and destinations (steam generating utility plants). The aggregative approach is less satisfactory for ubiquitous commodities like grain which have many origins and destinations. Therefore, the U.S. Department of Transportation contracted with Iowa State University (Baumel) to conduct a detailed analysis of the impact on inland waterway user charges on corn, wheat, soybeans and agricultural fertilizers. The DRI and Baumel analyses were conducted independently. At the same time, the two studies used the same basic USDA forecasts of grain production and exports and the DRI estimates of types

and levels of user charges. The U.S. DOT 205 report relies primarily on the Baumel study for its comments on grain and fertilizer costs and flows.

3. Baumel, C. Phillip, Robert Hauser and Jeffrey Beaulieu, "Impact of Inland Waterway User Charges on Corn, Wheat and Soybean Flows," National Technical Information Service, U.S. Department of Commerce, PB-82-196023, Springfield, VA, March 1982.

The Baumel study uses a linear programmming model to estimate the impact of inland waterway user charges on projected 1985 and 1990 corn, soybean and wheat flows. The 34.2 cents per gallon fuel tax in 1985 and 38.1 cents per gallon fuel tax in 1990, and segment specific ton-mile taxes used in the study are taken from the DRI study. The rivers included in the Baumel study are Mississippi, Illinois, Ohio, Missouri, Arkansas at Catoosa, Oklahoma, and the Columbia-Snake River. All grain barge shipments are assumed to move to export ports. Grain for export to foreign demand regions is transshipped through Gulf, Great Lakes, Atlantic or Pacific Northweat ports. There are 254 corn, 201 soybean and 159 wheat originating areas specified in the model.

The transportation costs used in the analysis are 1980 rail, barge, and ocean rates as collected from industry sources and estimated truck rates and handling charges. Grain can be shipped by rail to export ports or to barge loading points in multi-car or unit train rail shipments if, in 1980, one or more elevators in the supply region could load these size shipments. Barge rates are specified as either a contract or spot rate.

The Baumel grain analysis employs a variety of modal and port capacity constraints. In part, these restrictions were required because this analysis uses only one model for three crops. The one model approach recognizes that corn, soybeans and wheat compete for export and rail and barge space. Additionally, the specification of both single and multi-car rail rates for many regions required that multiple-car loading constraints be included. The alternative to the multiple-car loading constraints would have been to allow all grain to be transported on the least expensive multi-car rate in each origin region. Clearly, this would have understated transportation costs and the quantity shipped by barge. Of the over 18-multi-car constraints imposed in the model, about 102 became effective. Lock and Dam 26 is the most severe bottleneck on the Mississippi River System. Barge movements through these locks were constrained at 12 million bushels of grain per quarter. This constraint became effective in the 1985 base--no user charge--solution. However, as user taxes were applied, there was sufficient capacity at Lock and Dam 26 to handle the reduced volumes of river traffic. Finally, two time periods, corresponding to the navigation and winter seasons on the Upper Mississippi River were specified. River origins located on the Upper Mississippi could not ship grain during the winter months. Similarly, Great Lakes ports were closed to traffic during this period.

Table 3. Estimated Segment Specific Tax in Cents per Ton-Mile and Level of Fuel Tax as Used in the Linear Programming Analysis

	Linear Programming Analyses		
	Baumel (1985)		
River Segment	Segment	100% Rail* Response	Binkley (1975)
	- - - - Cents Per Ton Mile - - - -		
Upper Mississippi	0.25	0.23	0.10
Middle Mississippi	0.10	0.09	0.10
Lower Mississippi	0.07	0.06	0.04
Illinois	0.18	0.15	0.07
Ohio	0.05	0.05	0.05**
Missouri	0.32	0.26	0.82
Arkansas	1.31	1.79	3.55
Columbia-Snake	0.40	0.37	--
System-wide Fuel Tax	32.4¢/gallon		0.084¢** ton-mile

Source: "Computer Modeling Approaches to Evaluating Inland Waterway User Charge Impacts on Barge Grain and Fertilizer Traffic." C. Phillip Baumel and Jeffrey Beaulieu.

*100% Rail Response refers to the linear programming solution that results when the railroads raise their rates in concert with rising barge rates. This particular scenario produces the least amount of diversion of grain shipments from barge to rail.

**According to the American Waterway Operators, Inc., the energy efficiency for barges is 408 ton-miles per gallon. Using the above totals, this is equivalent to a system-wide fuel tax of 34.3 cents per gallon and a tax of 20.4 cents per gallon for the Ohio River.

Table 4. Estimated Increase in the Cost of Barging Corn to Baton Rouge on the Mississippi River System from User Taxes in Cents per Bushel

		FUEL TAX		SEGMENT TAX		
		Baumel	Binkley	Baumel		
River	Origin	32.4¢ per gallon	0.084¢ per ton-mile	No Rail Response	100% Rail Response	Binkley
Mississippi	Minneapolis, MN	3.99	3.72	6.49	5.91	3.19
	Clinton, IA	3.00	2.92	4.12	3.73	2.28
	St. Louis, MO	2.00	2.11	1.89	1.70	1.35
	Cairo, IL	1.50	1.70	1.41	1.27	0.88
	Osceola, AR	1.14	1.30	1.08	0.97	0.67
	Greenville, MS	0.63	0.72	0.59	0.54	0.37
Illinois	Seneca, IL	2.87	2.81	3.29	2.88	1.96
	Peoria, IL	2.59	2.58	2.82	2.48	1.78
	Havanna, IL	2.47	2.49	2.63	2.32	1.70
Ohio	Cincinnati, OH	2.46	2.88	2.11	1.92	1.60
	Louisville, KY	2.23	2.59	1.94	1.76	1.42
Missouri	Sioux City, IA	6.58	3.89	8.51	7.02	18.26
	Kansas City, MO	3.95	3.03	5.25	4.40	9.60
Arkansas	Catoosa, OK	3.60	2.74	17.46	10.72	45.87

Source: "Computer Modeling Approaches to Evaluating Inland Waterway User Charge Impacts on Barge Grain and Fertilizer Traffic." C. Phillip Baumel and Jeffrey Beaulieu.

The U.S. Army Corps of Engineers has also conducted an extensive study entitled, "Shallow-Draft Navigation Cost Recovery Analysis". This analysis was intended to specifically identify the impact of a waterway user charge such as the one proposed by Senate Bill S. 810 and House Bill H.R. 6078. The navigation costs subject to recovery are calculated in accordance with the formulas found in these legislative proposals. Amendment 1342 to S. 810 specifies that: "The Secretary of the Army, in connection with the Secretary of Transportation, shall levy ton-mile fees on commercial waterway transportation on the inland waterway system as follows:

> (1) System wide fees, at an initial rate of 1.5 mills per ton-mile on shipments originating after September 30, 1982, adequate to recover annually 100 per centum of anticipated operation and maintenance expenditures of the Tennessee Valley Authority and of the corps, irrespective of the source of such funds, assigned to commercial waterway transportation;
>
> (2) Segment-specific fees, starting after September 30, 1983, phased to provide for the full recovery of capital expenditures of the Tennessee Valley Authority and of the corps, irrespective of the source of such funds, assigned to commercial waterway transportation on the segment. Expenditures to be recovered shall be limited to funds appropriated for fiscal year 1983 and thereafter, with interest, over the economic life of the improved facility, but not to exceed a period of fifty years..."

Table 5 summarizes the waterway user charges that are specified by Amendment 1342 to S. 810.

Table 6 presents the same information as Table 5 except that a segment-specific ton-mile fee has been employed. Because capital construction costs are not to be recovered until 1983, only operation and maintenance expenditures have been included

Table 5. Summary of Shallow-Draft Navigation Cost Recovery Fees for Selected Waterways as Specified in Amendment 1342 to S. 810

Waterway Segment	Annual Operation and Maintenance Cost	1979 Ton-Miles	Uniform Ton-Mile Fee	Segment Revenue	Surplus/ Deficit
	($1,000)	(1,000)		($1,000)	($1,000)
Upper Mississippi	51,756	26,966,792	$.00150	40,450	-11,306
Lower Mississippi	46,484	81,258,413	$.00150	121,888	75,404
Ohio River	28,966	43,415,819	$.00150	65,124	36,158

Source: U.S. Army Corps of Engineers, Shallow-Draft Navigation Cost Recovery Analysis.

Table 6. Summary of Shallow-Draft Navigation Cost Recovery Fees Based on a Segment-Specific Ton-Mile Tax

Waterway Segment	Annual Operation and Maintenance Cost	1979 Ton-Miles	Segment-Specific Ton-Mile Fee	Segment Revenue
	($1,000)	(1,000)		($1,000)
Upper Mississippi	51,756	26,966,792	$.00192	$51,756
Lower Mississippi	46,484	81,258,413	$.00057	$46,484
Ohio River	28,966	43,415,819	$.00067	$28,966

Source: U.S. Army Corps of Engineers, Shallow-Draft Navigation Cost Recovery Analysis

in Tables 5 and 6. Because both of these tables have been calculated based on 1979 tonnages (post-diversion fiscal year 1983 tonnages have been projected to decrease by 3.6 percent),[14/] the amount of revenue collected will likely prove to be slightly exaggerated. Note, however, that with a segment-specific ton-mile tax there is no surplus or deficit for each river segment.

As stated earlier in this report, in the long-run the majority of the added transportation expense will be paid by farmers in the form of lower grain prices. A uniform ton-mile fee of $.00150 equates into an added cost of 5.3 cents to transport a bushel of grain from Cincinnati to Baton Rouge. Ohio farmers fare much better under the segment-specific ton-mile tax. In this case, a ton-mile fee of $.00067 for the Ohio River and $.00057 for the Lower Mississippi River results in a cost of 2.2 cents to transport a bushel of grain from Cincinnati to Baton Rouge.

Deep-Draft Navigation Cost Recovery

There has been a relatively small amount of research conducted pertaining to the effects of deep-draft navigation cost recovery. However, many of the same assumptions and considerations that have already been presented concerning shallow-draft navigation cost recovery are also significant to a discussion of deep-draft navigation cost recovery. The same types of waterway user fees that were presented earlier in this report (See Table 2) can also be used for the recovery of deep-draft navigation costs.

The primary research that has been published concerning this subject was completed by the U.S. Army Corps of Engineers (COE). This particular study was intended to evaluate the impact of a waterway user charge such as the one proposed by Senate Bill S. 809 and House Bill H.R. 5073. Some of the results of this research are presented in Table 7. The data for the COE report was collected and analyzed on a port-by-port basis. More specifically, a five year average of the annual navigation-related expenditures that have been required to keep each particular port operable were assessed to that port. This amount was then divided by the annual tonnage of cargo shipped out of each respective port in order to determine a recovery charge level in dollars per ton. The COE study further assumed that the greatest user charge that can be placed on any one port area will be $.228 per ton.

The two ports from Table 7 that are of the most importance to Ohio agriculture are Toledo and Huron. As can be seen from this table, the estimated waterway user charge for Toledo is $.128 per ton and $.172 for Huron. This amounts to a charge of only 0.4 and 0.5 cents per bushel of grain shipped from each respective port area. This is a relatively small amount when it is compared to the estimated 2.2 to 5.3 cents per bushel that may be charged to grain being shipped from Cincinnati.

As with the analysis of the shallow-draft navigation cost recovery, the overall impact of a deep-draft waterway user charge will depend on the actions of the ship and railroad

Table 7. Summary of Deep-Draft Navigation Cost Recovery Estimates for Major Grain Shipping Ports on the Great Lakes

Port Area	Annual Operation and Maintenance Cost	1978 Tonnage	O & M Cost Per Ton	Recovery Charge	Surplus/ Deficit
	($1,000)	(1,000)		($/Ton)	($1,000)
Duluth-Superior	$2,384	45,840	$ .052	$.052	$ 0
Chicago	1,020	1,563	$ .653	$.228	-$ 644
Milwaukee	1,391	4,495	$ .309	$.228	-$ 368
Saginaw	6,730	2,709	$2.485	$.228	-$6,114
Toledo	3,493	27,272	$ .128	$.128	$ 0
Huron	418	2,429	$ .72	$.172	$ 0

Source: U.S. Army Corps of Engineers, Deep-Draft Navigation Cost Recovery Analysis

operators. If the railroads should choose to raise their rates to coincide with the increased shipping rates, then very little diversion of grain shipments from "lakers" to the railroads will occur. However, if the railroads maintain their rates at the same level, then some diversion of grain shipments will likely occur. The most advantageous of the two scenarios for the Ohio farmer would obviously be for the railroads to maintain their rates at the same level.

Conclusions

The overall impact of the implementation of a waterway user charge will be determined by several factors. First of all, the specifics of the legislation concerning waterway user charges that is approved by the House and the Senate will play a large part in determining the final outcome. The type of user fee that is imposed along with the level of recovery that is specified are two of the most important variables to be determined. The competitive actions and reactions of the railroads and the barge and "laker" operators will be essential in deciding the levels of subsequent diversion in transportation mode as well as fixing the amount of the economic burden that is placed on farmers.

Another factor affecting Ohio's farmers that has yet to be touched on in this report is the likelihood that a waterway user charge will cause the price of farm inputs to rise. This is due to the fact that large volumes of fertilizer are transported from ocean ports to Ohio via the Mississippi River System and the St. Lawrence Seaway System.

The final conclusion of this report is to state that the majority of the economic burden of a waterway user charge will be borne by the shipper in the long run. This means that the farmer will absorb the majority of the costs of this tax as it affects the shipment of agricultural inputs and products. The results of a U.S. Army Corps of Engineers report indicate that a segment-specific user charge for the recovery of 100% of the navigation costs on the inland waterway system will add an additional 2.2 cents per bushel to the cost of transporting grain by barge from Cincinnati to Baton Rouge. The additional cost for this same shipment under a system-wide user charge is 5.3 cents per bushel. Furthermore, the Corps of Engineers indicates that a waterway user charge for the Ohio ports of Toledo and Huron will result in an additional cost of 0.4 and 0.5 cents per bushel of grain transported from each respective port area.

Footnotes

1/ Lowell, D. Hill, Issues in Waterway Transportation, Paper presented at Clemson, South Carolina, July 27, 1981, p. 3.

2/ 1978 Inland Waterborne Commerce Statistics, The American Waterways Operators, Inc., p. 2

3/ James Binkley, Leonard Shabman, Joseph Havlicek, et al., Navigation User Charges: Impact on the Transportation of Agricultural Products, Bulletin 121, Virginia Water Resources Research Center, p. 4.

4/ Michael W. Woolverton, Inland Water Transportation in Today's World, p. 2.

5/ Binkley, Shabman, Havlicek, et al., op. cit., p. 5.

6/ Binkley, Shabman, Havlicek, et al., op. cit., p. 5

7/ Dennis M. Conley and Lowell D. Hill, Impact of Waterway User Fees on Illinois Agriculture, AE-4527, March 1982, p. 1.

8/ Ibid, p. 1.

9/ Inland Waterway User Taxes and Charges, Report of the Secretary of Transportation to the United States Congress, Pursuant to Section 205, Public Law 95-502, The Inland Waterway Revenue Act, Department of Commerce, Washington, D.C., February 1982, p. 3.

10/ Michael J. Pesch and Donald W. Larson, Waterway Transportation for Ohio Agriculture, April 14, 1981, p. 11.

11/ Inland Waterway User Taxes and Charges, op. cit., p. 2.

12/ Inland Waterway User Taxes and Charges, op. cit., p. 2.

13/ C. Phillip Baumel and Jeffrey Beaulieu, Computer Modeling Approaches to Evaluating Inland Waterway User Charge Impacts on Barge Grain and Fertilizer Traffic, University of Illinois, June 24, 1982.

14/ Shallow-Draft Navigation Cost Recovery Analysis, U.S. Army Corps of Engineers, May 18, 1982, Section 0, p. 2.