EP-20

SHIPPING: THE WORLD CONNECTION

by
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and
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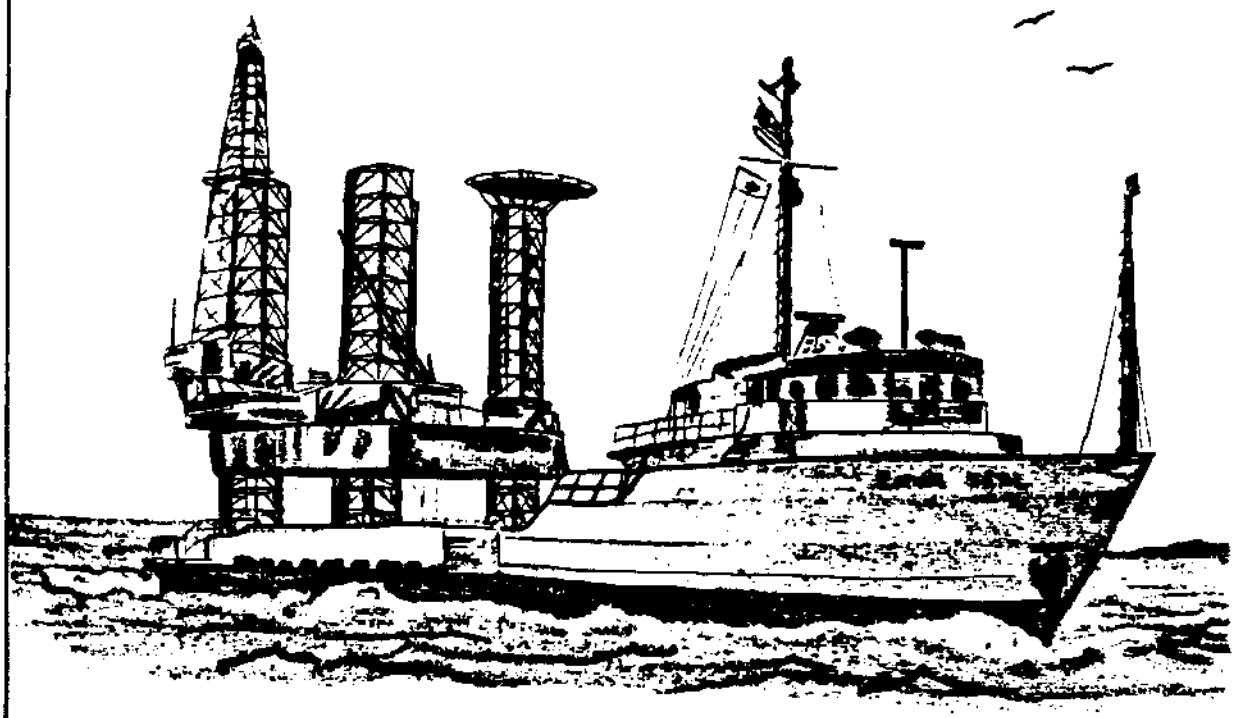

TEACHER GUIDE

OEAGLS-Oceanic Education Activities for Great Lakes Schools

OEAGLS Investigation #20

Completed December 1980
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TEACHER GUIDE

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Ohio Sea Grant Education

OVERVIEW

This investigation provides information on the importance of the Great Lakes in international trade. In Activity A students identify the countries involved in shipping through the Port of Toledo and classify the types of imports and exports handled there in one shipping season.

Activity B provides an explanation of how ships can go from the ocean to the higher elevations of the Great Lakes. Students construct and demonstrate a working model of a series of locks. Activity C is a crossword puzzle using terms from A and B.

PREREQUISITE STUDENT BACKGROUND:

Students should be able to identify countries and continents using an atlas.

MATERIALS:

Activity A: colored pencils (one or two per student), reference maps from world almanac or atlas.

Activity B: (per team of four students): two half-gallon or quart milk cartons, small toy boat, scissors or sharp knife, modeling clay or waterproof tape, water, sink or stream table, 1 small block of wood about one inch thick.

OBJECTIVES:

When students have completed this investigation, they should be able to:

1. Discuss the importance of the Great Lakes in world shipping.
2. Explain what is meant by the registry flags of commercial ships.
3. List the main types of products imported and exported through the Port of Toledo.
4. Explain how ships can go from the ocean to the higher elevations of the Great Lakes.

SUGGESTED APPROACH

Activities A and C are best done by students working individually, although A may require the sharing of reference maps. Activity C may be used as a means of evaluating student understanding of the materials in the investigation. For Activity B, students work in teams of three or four. The entire investigation can usually be completed in three class periods if models of locks are constructed outside of class.

A twenty-nine minute film entitled "The Great Lakes Connection" (1978) is available on free loan from Modern Talking Picture Service in New Hyde Park, NY 11040. The film follows the ore carrier Cason J. Calloway through the upper lakes and the Soo Locks. It includes a discussion of the history of the Great Lakes and the possibility of winter shipping.

The same Modern Talking Picture Service has a 30-minute film, "The Great Lakes" which includes more than shipping. There is an overview of the importance of the lakes in general, historically, economically, and ecologically, as well as footage about locks, dredging, winter shipping and canals. It is best to use only one of these two films, because they contain some sections which are identical.

The Great Lakes Historical Society in Vermilion can recommend other local film sources in Ohio.

NOTE: Information to teachers is enclosed in boxes in this guide.

SHIPPING: THE WORLD CONNECTION

by

Rosanne W. Fortner and Ray Pauken
Ohio Sea Grant Education Program

INTRODUCTION

When the United States of America proclaimed itself in 1776 to be an independent nation, all of its cities were busy sea ports. The young nation clung to the ocean, finding there a source of food, an avenue for trade, and a barrier against the powerful nations of Europe. Two hundred years later the population centers of America are still linked to bodies of water. In fact, more than 3/4 of the U.S. population can be found in those states which border the Great Lakes and the ocean.

--G. Mangone, Americans and the World of Water

Our waterways connect us with the rest of the world. The Great Lakes have twenty-two international deep-water ports joined to the world ocean by a series of locks and channels called the St. Lawrence Seaway. The system creates a waterway 2340 miles long through which goods may be shipped to and from the heart of America.

OBJECTIVES: When you have completed these activities, you should be able to:

1. Discuss the importance of the Great Lakes in world shipping.
2. Explain how ships can go from the ocean to higher elevations of the Great Lakes.
3. Explain what is meant by the registry flags of commercial ships.
4. List the main types of products imported and exported through the Port of Toledo.

ACTIVITY A: WHERE GO THE BOATS?

KEYWORDS: cargo, register, flag of convenience.

"Green leaves a-floating,
Castles on the foam,
Boats of mine a-boating,
Where will all come home?"

Robert L. Stevenson, "Where Go the Boats?"

Ships flying the flags of over 50 nations regularly use the trade routes of the Great Lakes. They make these waterways the world's most important inland water transportation system by connecting interior America with the markets of the world.

MATERIALS: Outline map (page 4), cargo information from the Port of Toledo for a portion of one year, two colored pencils, world map for reference.

PROCEDURE

On the following pages are listed the comings and goings of international trade ships at the Port of Toledo, Ohio. Not all of the ships in port were listed, but they provide an idea of what is happening in world shipping and how Lake Erie is involved.

A. Find the Great Lakes on your world map (page 4). Label the Port of Toledo (on Lake Erie) with an X.

B. Look at the International Shipping tables for the Port of Toledo (pages 5-7). Notice the columns labelled "From" and "To". These tell you where a ship is coming from (its last port) and where it is going next. For some ships these ports were not known.

C. Now look at the column labeled "Flag." This tells the country in which a ship is registered. The ship flies that country's flag.

D. Use one colored pencil to shade in all those countries listed under either "To" or "From" for the ships given. Use a reference map to find out where these countries are.

E. With a second colored pencil, make slash lines through any country listed in the "Flag" column.

A-E. Students use the International Shipping tables to construct a map as shown on page 6. To find all the countries needed they should have access to a standard world map or large globe. For younger students you may need to mark the tables to indicate the continent for each country. Also, small reference maps sometimes do not show Cyprus and Malta. Both are islands in the Mediterranean Sea.

Answer the following questions based on the table and your completed map. Put your answers on your answer sheet.

1. The shipping season opens when shipping lanes and locks are free of ice. When did the shipping season open in this example year?

T1 The shipping season opened in April.

2. When did the season close? Why?

T2. The season closed in December because of ice in the shipping lanes and locks.

3. About how much of the world was affected by trade with the Port of Toledo in this example year?

T3. Two-thirds to three-fourths of the world was affected by trade through Toledo in this example.

4. Which two flags are most frequently flown by international trade ships using the Port of Toledo?

T4. Flags of Greece and Yugoslavia were most frequently flown.

5. Did ships flying these flags actually sail to or from those countries?

T5. Ships under those flags did <u>not</u> come or go from those countries.

6. Are these countries the leaders in world trade? (Consult the <u>World Almanac</u> for recent years.) Discuss this answer with the rest of the class.

T6. The countries are <u>not</u> leaders in world trade.

The last part of this investigation calls for speculation by the students. Accept all reasonable answers and discuss them. According to Robin Burton ("Flags of Convenience," Sea Frontiers 21(5): 294-302), a person who owns a merchant ship and registers it in another country to save money on taxes and wages is using that country's flag for convenience. In the recent past (up until about 1975) many of these convenience countries did not require inspection of vessels or training credentials for crew members. It was not uncommon for safety conditions to be neglected, ships to fall into disrepair, and crew members to be speaking five different languages. Now, international regulations are becoming tighter and many ships under flags of convenience are there for fuel savings and income tax relief only, with safety and training standards checked regularly.

7. Classify Toledo's outgoing products (exports) as being foods, manufactured goods, timber, or miscellaneous. For each continent tally up the number of ships carrying each type of product out of Toledo, and record the numbers in the chart on your answer sheet.

Toledo Exports

Number of Ships To

Product	Europe	Asia	Africa	South/Central America
Food	𝍸 𝍸 𝍸 𝍸 𝍸 ///	𝍸 ///	𝍸 /	
Raw Materials for Industry	𝍸 ///			
Manufactured Goods	///		///	//
Miscellanous	//			/

8. Classify imports as being foods, manufactured goods, raw materials for industry, and miscellaneous. For each continent tally up the number of ships carrying each type of product into Toledo, and record the numbers in the chart on your answer sheet.

NOTE: The product listed as "coke" is a porous, solid material that forms when coal is burned in the absence of oxygen. Coke is a fuel used in certain metallurgical industries such as steelmaking.

Toledo Imports

Number of Ships From

Product	Europe	Asia	Africa	South/Central America
Food	/			
Raw Materials for Industry	𝍸 𝍸 𝍸 /	/		
Manufactured Goods	𝍸 𝍸	/		
Miscellanous	𝍸 ///			

9. With which continent does the Port of Toledo carry on the most trade?

T9. Europe provides most of the trade through Toledo.

10. What is the main export to that continent?

T10. The main export to Europe is food.

11. What is the main import from that continent?

T11. The main import is raw materials for industry.

12. Based on the imports chart, what is one of the main industries in Europe?

T12. From the list of raw materials on pages 5-7 of the Student Guide, mining (to get the raw materials) is shown to be a major European industry.

13. Based on the export chart, what U.S. product do the developing nations of Africa need most?

T13. Africa gets food through Toledo.

14. The ships on pages 5-7 carry different amounts of the cargoes listed. If you consider the <u>number</u> of ships only, which is greater from the Port of Toledo, imports or exports?

T14. Exports exceeded imports in this example year.

Toledo is only one of twenty-two deep water ports on the Great Lakes. Using the information from this activity, based on part of one year's shipping from one port, you can probably begin to see how important the Great Lakes are in world trade.

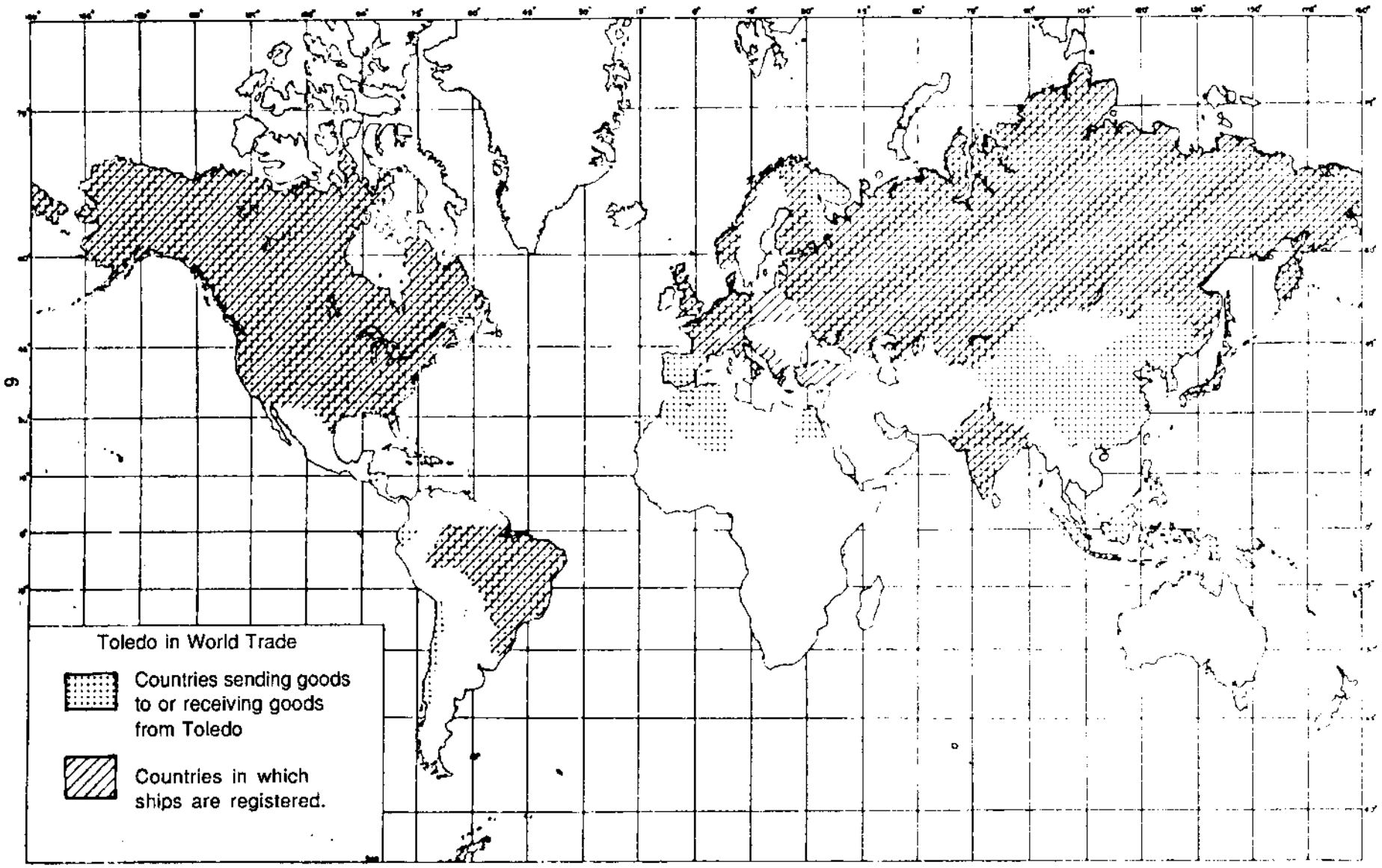
15. If ocean going ships could not reach Toledo and other Great Lakes ports, how would U.S. products have to be transported?

T15. Railroads and trucks would have to transport goods if the St. Lawrence Seaway were not available. These are less energy efficient and more expensive forms of transport. See OEAGLS "Shipping on the Great Lakes" activity.

NOTE: Some statistics indicate the importance of Lake shipping. You may wish to share these figures with your students:

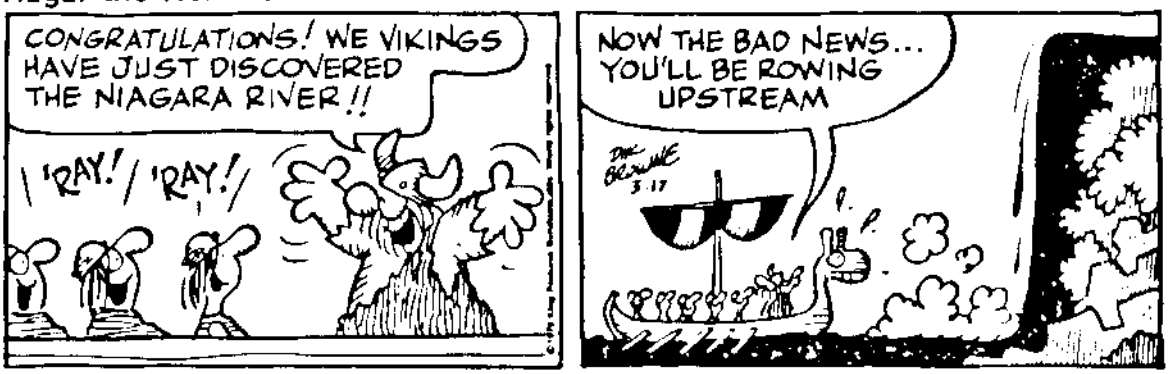
1985	Total Net Tonnage	135.7	Million Tons
1986	Total Net Tonnage	128.7	Million Tons
	Total bulk shipments (grain, coal and iron ore)	107.7	Million Tons

The decline in Great Lakes shipping in 1986 was due almost entirely to a decrease in iron ore shipping, down 12.2%. Since iron ore is used exclusively in the steel-making process, the slump in Great Lakes shipping mirrors the condition of the domestic steel industry. Shipping figures through July of 1987 showed an increase over 1986 tonnage for the same period (52.9 million compared to 50.6 million tons in 1986).

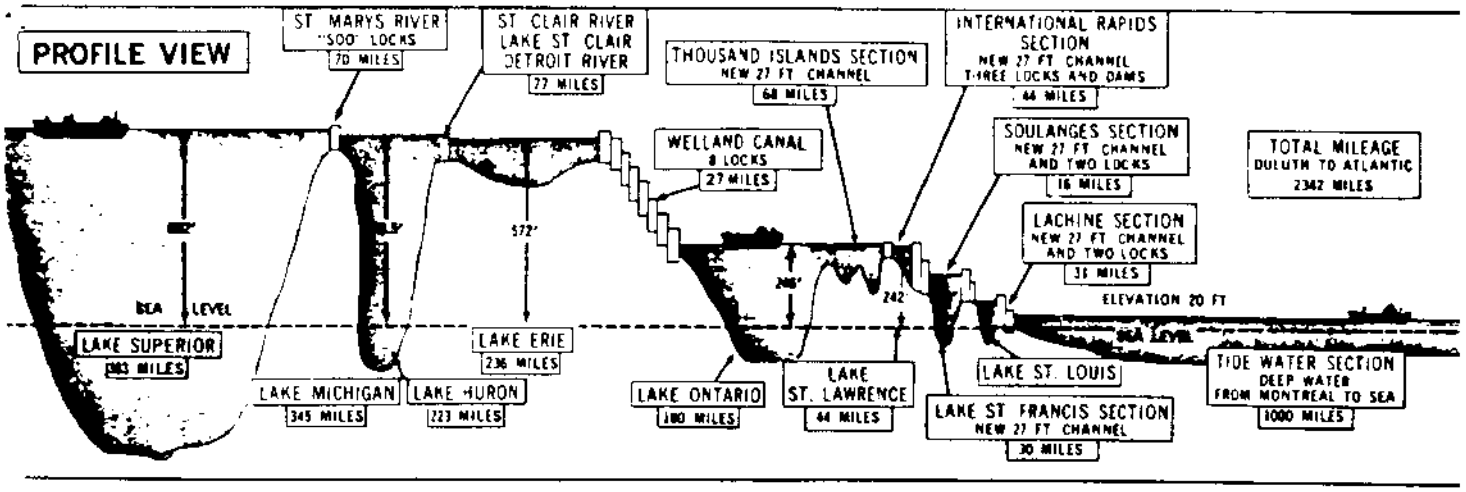

Toledo in World Trade
Countries sending goods to or receiving goods from Toledo
Countries in which ships are registered.

ACTIVITY B: HOW DO LOCKS WORK?

Hagar the Horrible



Lake Superior is 602 feet above sea level. In order for ships to go from the Atlantic Ocean to the Great Lakes and back for international trade, the United States and Canada have constructed a series of locks that raise and lower ships to the levels of the lakes, rivers and ocean. Because of this system, 80% of the world's cargo ships can now sail as far west as Lake Superior.



U.S. Army Corps of Engineers

MATERIALS: Two half-gallon or quart milk cartons, small toy boat, scissors or sharp knife, modeling clay or fiber tape, water, sink or stream table.

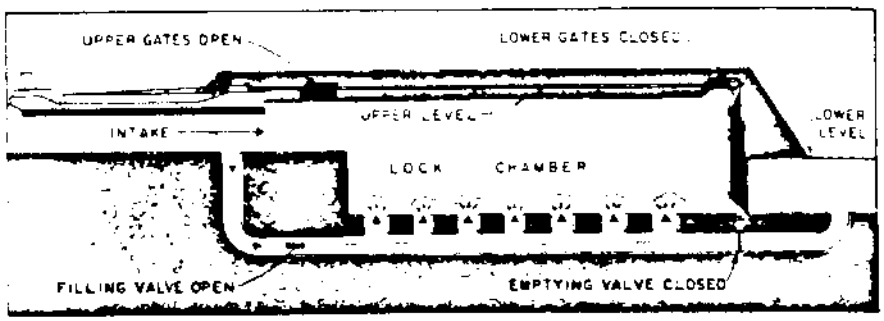
PROCEDURE

The pictures below show how locks operate to raise and lower ships to the different levels of the St. Lawrence Seaway.

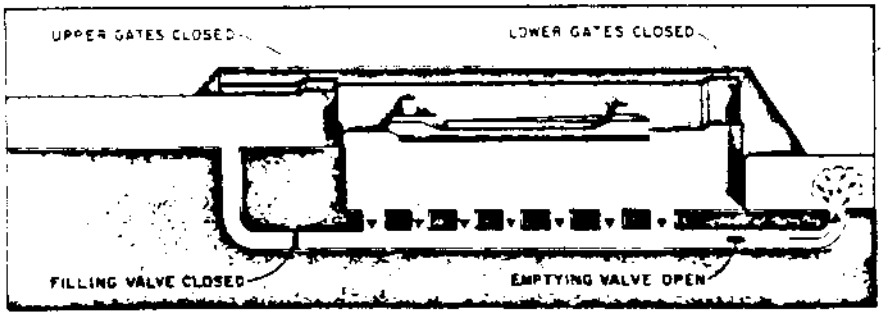
HOW NAVIGATIONAL LOCKS OPERATE

These diagrams show how a ship is lowered in a lock; a ship is raised by reversing the operation. No pumps are required; the water is merely allowed to seek its own level.

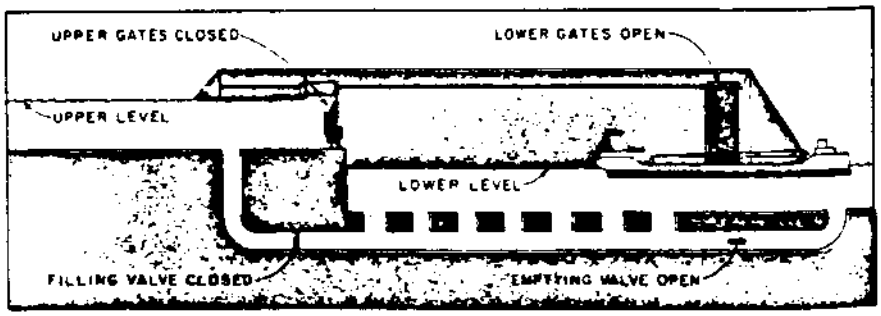
With both UPPER GATES and LOWER GATES closed, and with the EMPTYING VALVE closed and the FILLING VALVE open, the LOCK CHAMBER has been filled to the UPPER LEVEL. The UPPER GATES have then been opened allowing the ship to enter the LOCK CHAMBER.



Now the ship is in the LOCK CHAMBER. The UPPER GATES and the FILLING VALVE have been closed, and the EMPTYING VALVE has been opened to allow water to flow from the LOCK CHAMBER to the LOWER LEVEL.



The water level in the LOCK CHAMBER has gone down to the LOWER LEVEL, the LOWER GATES have been opened, and the ship is leaving the LOCK CHAMBER. After this, the lock is ready for an upbound ship to come in and be lifted, or may be filled (as above) to lower another downbound ship.



U.S. Army Corps of Engineers

If construction of the model locks is done in class, it should be carefully supervised. You will probably find that sharp paring knives work best for cutting the doors, and for younger children you should do the cutting yourself. You may prefer to have certain students construct the locks at home with parental supervision.

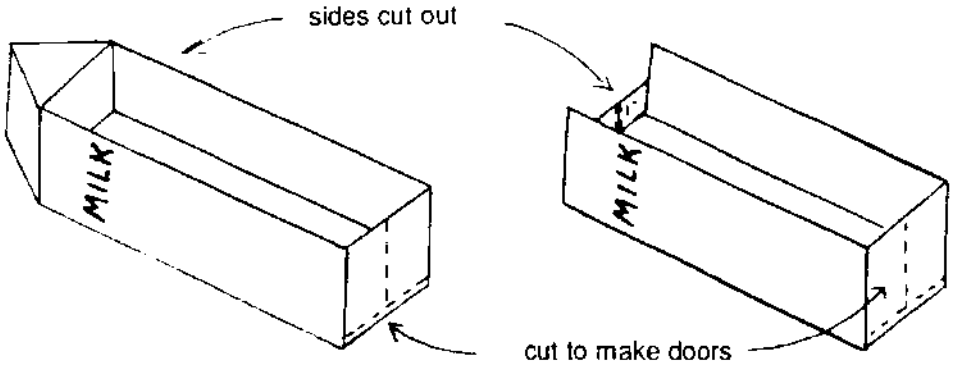
Note in the first illustration that doors do not go all the way to the bottom of the carton. A tiny flip, even 1/8 of an inch, is enough to help hold the doors closed. You may also need small pieces of modeling clay or heavy paper clips to hold the doors closed at the top when water is present.

While the models are being used, point out to students the differences between the models and the way real locks work, as illustrated in their Student Guide. Some students may want to vary their models to make them more realistic, such as making holes in the bottom of each carton, plugging the holes with stoppers, then unplugging the holes to let water levels equalize. Water really does not leave the lock cambers through the gates.

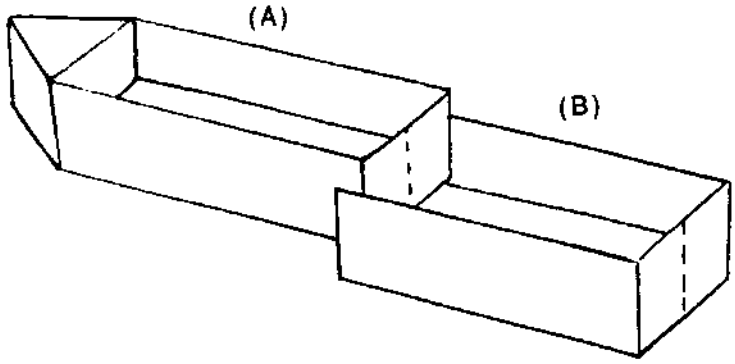
Students who prepare a successful model may want to extend the locking system to several more layers. The Welland Canal between Lakes Erie and Ontario, for instance, has a series of 8 locks. The only limitation on such experimentation is the depth of the lowest container; when the uppermost lock is filled, its water level cannot exceed the height of the base container or the entire system will overflow.

You can construct a model of a lock and use it to raise and lower a boat to three different water levels.

A. Cut two milk cartons as this picture shows:

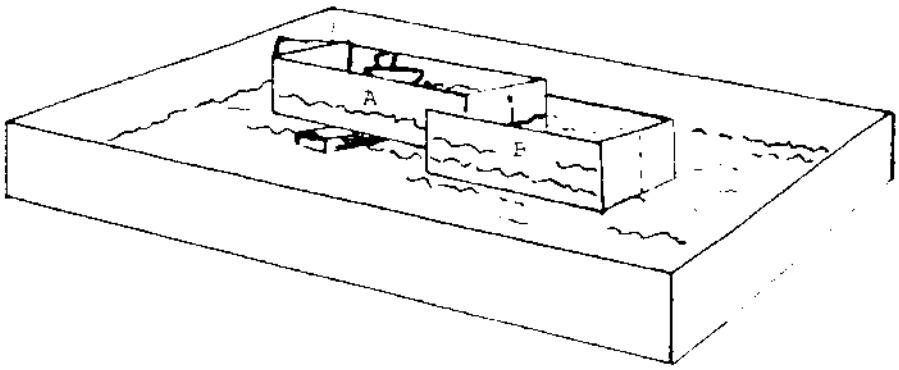


B. Connect the two cartons as shown below, using modeling clay or heavy tape around the edges to be sure water will not leak out where the cartons are joined together.



C. Add water to a sink or stream table to make an "ocean" about 5 cm deep. Put your model locks into the "ocean" with the open side up and all doors tightly closed.

D. Pour water into Carton B until it comes up to meet the bottom edge of Carton A. Then pour about 5 cm of water in Carton A. Place a small toy boat in Carton A. You may need a block of wood to prop up the end of A. Your set-up should look like this:



E. Slowly open the doors of Carton A to let the water levels in A and B become the same. Move the boat into Carton B.

F. Open the doors of Carton B slowly and let the boat move out into the ocean.

G. To bring the boat back upstream do the following:

a. open the doors of B and move the boat into Carton B

b. close the B doors and open the A doors

c. add water to Carton A until the boat is raised higher than the bottom of Carton A (The water for filling real lock chambers always comes from the upstream lake or river.)

d. move the boat into Carton A

e. close the A doors and add water to the original 5 cm depth. Your boat is now ready to enter the upstream areas at this higher level.

H. Answer the following questions on your answer sheet about what you have learned:

1. In an actual lock system, what does Carton A represent?

T1. In a real situation, Carton A represents a lock in a lake whose water level is higher than water levels downstream.

2. Where does the water go when it flows out of B (in a real situation)?

T2. Water flowing out of B would go into a river, lake or ocean whose water level was lower than A. If A represents Lake Erie, for example, B represents Lake Ontario and the water flowing out of B goes into the St. Lawrence River.

3. During which steps would the emptying valve be open? Closed?

T3. The emptying valve is open when the water level in a lock is being lowered and when ships are leaving the lock. The emptying valve is closed when the lock chamber is being filled for ships going upstream.

4. During which steps would the filling valve be open? Closed?

T4. The filling valve is open when a lock chamber is being filled for ships going upstream. The filling valve is closed when the water level in the lock is being lowered for ships going downstream.

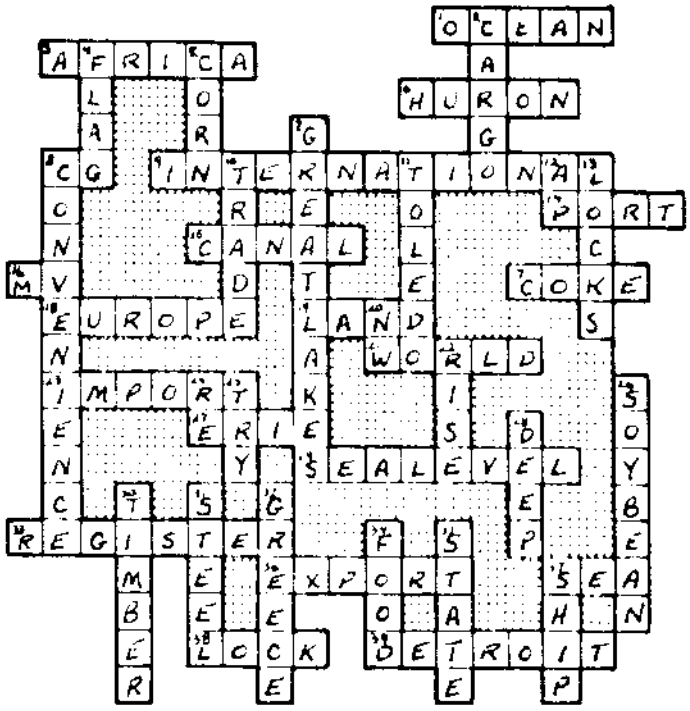
5. When the lock gates are opened, the level of water in the lock chamber is the same as which other water level?

T5. Gates open only when the water level in the lock is the same as the water level downstream.

ACTIVITY C: CAN YOU USE YOUR SHIPPING KNOWLEDGE?

PROCEDURE

Here is a crossword puzzle that makes use of some of the new words and ideas you have learned in this investigation. Use the definitions to fill in the squares.



ACROSS

1. A major body of salt water.
3. Continent that imports food for developing nations.
6. The Great Lake with only one deep-water port.
8. Coast Guard (abbreviation).
9. Between countries.
14. Place where ships load and unload.
15. The Welland _____ connects Lakes Erie and Ontario.
16. Merchant Vessel (abbreviation).
17. One of Toledo's imports: furnace or foundry ____.
18. The continent trading most often through Toledo.
19. If it were not for the Seaway, goods would have to go over _____.
21. The Seaway opened inland America to ____ trade.
23. A product coming into the country.
27. Toledo is on Lake _____.
29. The Great Lakes are above ___ ___ (two words).
33. A ship owner must _____ his ship in some country and fly that country's flag.
36. A product leaving the country.
37. Another name for #1 ACROSS.
38. This helps ships go into waters at a higher elevation.
39. A major manufacturing city between Lakes Erie and Huron.

DOWN

2. The products carried by a ship.
4. Every trading ship flies some country's_____.
5. A major grain export from Toledo.
7. Superior, Michigan, Huron, Erie, and Ontario.
8. Flags chosen to save money are flags of _____.
10. To exchange one thing for another.
11. A major port in Ohio.
12. Associated Press (abbreviation).
13. Plural of #38 ACROSS.
20. A compass direction.
22. To go up, as the water level in a lock.
24. To attempt.
26. A vegetable crop exported from Toledo.
28. Only 22 Great Lakes ports are _____ enough for ocean-going ships.
30. An export from American forests.
31. A metal used for manufacturing.
32. Name of country whose flag is often flown for convenience.
34. Most of Toledo's exports can be classified as _____.
35. Toledo is in the _____ of Ohio.
37. Vehicle used for transportation on the water.

REVIEW QUESTIONS

1. List the continents that send goods to or receive products from the Port of Toledo.

R1. Europe, Asia, Africa, South and Central America trade with Toledo.

2. What is the main product exported through the Port of Toledo?

R2. The main products exported are foodstuffs.

3. What is the main type of product imported?

R3. The main products imported are raw materials for industry.

4. What determines the length of the Great Lakes shipping season?

R4. When the shipping lanes are open or closed down because of ice.

5. Why might a company register its ships in a foreign country if the ships do not trade with that country?

R5. Tax relief, lower fuel prices, and lower insurance rates are the most common reasons today.

6. Explain how ships can go from the ocean to the higher elevations of the Great Lakes.

R6. The ships go through a system of locks that raise the vessels a few feet at a time.

EXTENSIONS

The Propeller Club of the United States sponsors a program through which a school can "adopt" a ship of the American Merchant Marine and exchange correspondence with it. Classes in grades 5-8 are eligible to participate.

For complete details, contact:

The Propeller Club of the United States
"Adopt-a-ship" Plan
Suite 413
1730 M Street, NW
Washington, DC 20036
(202) 223-1401

The OEAGLS Investigation EP-13: Shipping on the Great Lakes involves the transport of products from city to city within the Lakes themselves. It includes consideration of the cost and energy efficiency of various types of transportation. This would be an excellent way to follow up the current investigation.

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EVALUATION ITEMS

1. The Great Lakes are

   1. mildly involved with international shipping.
   2. not involved with international shipping.
   *3. very much involved with international shipping.
   4. involved only with shipping from one lake to another.

2. The flag always flown on a commerical ship shows

   1. where the ship unloads its cargo.
   2. where the ship picks up its cargo.
   *3. in what country the ship is registered.
   4. in what country the ship was built.

3. The major type of cargo shipped to the Port of Toledo is

   1. foodstuffs.
   2. manufactured goods.
   3. miscellanous goods.
   *4. raw materials for industry.

4. From the Port of Toledo, the products that are shipped are chiefly

   *1. foodstuffs.
   2. manufactured goods.
   3. miscellanous goods.
   4. raw materials for industry.

5. Even though Lake Superior is 600 feet above the level of the sea, it is still used by ocean going ships. These ships reach this 600 foot level by means of which of the following?

   1. elevators
   2. dikes
   *3. locks
   4. water ladders

6. What foreign continent provides most of the trade at the Port of Toledo?

   1. Africa
   2. South/Central America
   3. Asia
   *4. Europe

7. Water to fill the lock chamber comes through

   1. waterfalls and rapids.
   *2. the valves that open the upper level.
   3. water pumps.
   4. the gates that allow the ships in and out.

8. After a ship enters the lock chamber from the upper level and the gates are closed, which of the following happens to get the boat down to the lower level?

   1. The exit gates are opened, allowing the water to rush out.
   2. The water is pumped out through drainage hoses.
   *3. The emptying valve is opened, allowing the water to seek its own level.
   4. The lock chamber is lowered mechanically until the water level in the lock equals the lower level.

9. Registry flags of different countries are flown on some ships even though the ships are not from those countries. This is done to save money on taxes. These flags are called

   1. flags of proposal.
   *2. flags of convenience.
   3. flags of trade.
   4. flags of international regulation.

10. The annual shipping season in the Great Lakes closes down when:

    1. the grain elevators along Lake Erie and Lake Ontario close.
    2. the steel mills in Youngstown, Gary and Pittsburgh shut down.
    *3. ice closes the shippping lanes and locks.
    4. the workmen aboard the ships take their annual leave.

4. During which steps would the filling valve be open?_____

   Closed?_____

5. When the lock gates are opened, the level of water in the lock chamber is the same as which other water level?_____

Review Questions

1. List the continents that send goods to or receive products from the Port of Toledo.

   _____

2. What is the main product exported through the Port of Toledo?_____

3. What is the main type of product imported?_____

4. What determines the length of the Great Lakes shipping season?_____

5. Why might a company register its ships in a foreign country if the ships do not trade with that country?_____

6. Explain how ships can go from the ocean to the higher elevations of the Great Lakes. _____

   _____

8. For each continent tally up the number of ships carrying each type of product to Toledo, and record the numbers in the following chart.

Toledo Imports

Number of Ships From

Product	Europe	Asia	Africa	South/Central America
Food				
Raw Materials for Industry				
Manufactured Goods				
Miscellanous				

9. With which continent does the Port of Toledo carry on the most trade?_____

10. What is the main export to that continent?_____

11. What is the main import from that continent?_____

12. Based on the imports chart, what is one of the main industries in Europe?

_____

13. Based on the export chart, what U.S. product do the developing nations of Africa need most?

_____

14. Which is greater from the Port of Toledo, imports or exports?_____

15. How would U.S. products have to be transported?_____

_____

Activity B: How do locks work?

1. In an actual lock system, what does Carton A represent?_____

2. Where does the water go when it flows out of B (in a real situation)?_____

3. During which steps would the emptying valve be open? _____

   Closed?_____

Name _____

Shipping: The World Connection
Answer Sheet

Activity A: Where Go the Boats?

1. When did the shipping season open in this example year? _____

2. When did the season close? _____

   Why? _____

   _____

3. About how much of the world was affected by trade with the Port of Toledo in this example year?

   _____

4. Which two flags are most frequently flown by international trade ships using the Port of Toledo?

   _____ _____

5. Did ships flying these flags actually sail to or from those countries? _____

6. Are these countries the leaders in world trade? _____

7. For each continent tally up the number of ships carrying each type of product out of Toledo, and record the numbers in the following chart.

Toledo Exports

Number of Ships To

Product	Europe	Asia	Africa	South/Central America
Food				
Raw Materials for Industry				
Manufactured Goods				
Miscellanous				

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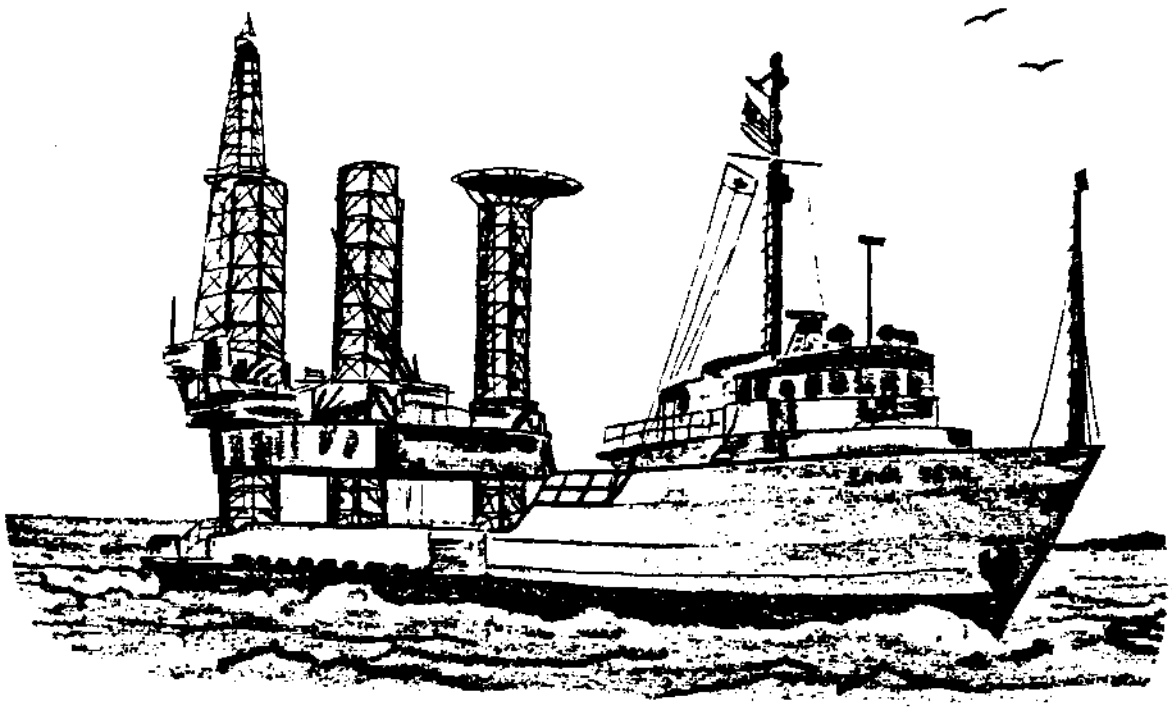
EP-20

Ohio Sea Grant

SHIPPING: THE WORLD CONNECTION

by
Rosanne W. Fortner, The Ohio State University
and
Ray Pauken, Columbus Public Schools



OEAGLS–Oceanic Education Activities for Great Lakes Schools

OEAGLS Investigation #20

Completed December 1980
Revised December 1982 and August 1987

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SHIPPING: THE WORLD CONNECTION

by

Rosanne W. Fortner and Ray Pauken
Ohio Sea Grant Education Program

INTRODUCTION

When the United States of America proclaimed itself in 1776 to be an independent nation, all of its cities were busy sea ports. The young nation clung to the ocean, finding there a source of food, an avenue for trade, and a barrier against the powerful nations of Europe. Two hundred years later the population centers of America are still linked to bodies of water. In fact, more than 3/4 of the U.S. population can be found in those states which border the Great Lakes and the ocean.

--G. Mangone, *Americans and the World of Water*

Our waterways connect us with the rest of the world. The Great Lakes have twenty-two international deep-water ports joined to the world ocean by a series of locks and channels called the St. Lawrence Seaway. The system creates a waterway 2340 miles long through which goods may be shipped to and from the heart of America.

OBJECTIVES: When you have completed these activities, you should be able to:

1. Discuss the importance of the Great Lakes in world shipping.
2. Explain how ships can go from the ocean to higher elevations of the Great Lakes.
3. Explain what is meant by the registry flags of commercial ships.
4. List the main types of products imported and exported through the Port of Toledo.

ACTIVITY A: WHERE GO THE BOATS?

"Green leaves a-floating,
Castles on the foam,
Boats of mine a-boating,
Where will all come home?"

Robert L. Stevenson, "Where Go the Boats?"

Ships flying the flags of over 50 nations regularly use the trade routes of the Great Lakes. They make these waterways the world's most important inland water transportation system by connecting interior America with the markets of the world.

MATERIALS: Outline map (page 4), cargo information from the Port of Toledo for a portion of one year, two colored pencils, world map for reference.

PROCEDURE

On the following pages are listed the comings and goings of international trade ships at the Port of Toledo, Ohio. Not all of the ships in port were listed, but they provide an idea of what is happening in world shipping and how Lake Erie is involved.

A. Find the Great Lakes on your world map (page 4). Label the Port of Toledo (on Lake Erie) with an X.

B. Look at the International Shipping tables for the Port of Toledo (pages 5-7). Notice the columns labelled "From" and "To". These tell you where a ship is coming from (its last port) and where it is going next. For some ships these ports were not known.

C. Now look at the column labeled "Flag." This tells the country in which a ship is registered. The ship flies that country's flag.

D. Use one colored pencil to shade in all those countries listed under either "To" or "From" for the ships given. Use a reference map to find out where these countries are.

E. With a second colored pencil, make slash lines through any country listed in the "Flag" column.

Answer the following questions based on the table and your completed map. Put your answers on your answer sheet.

1. The shipping season opens when shipping lanes and locks are free of ice. When did the shipping season open in this example year?

2. When did the season close? Why?

3. About how much of the world was affected by trade with the Port of Toledo in this example year?

4. Which two flags are most frequently flown by international trade ships using the Port of Toledo?

5. Did ships flying these flags actually sail to or from those countries?

6. Are these countries the leaders in world trade? (Consult the World Almanac for recent years.) Discuss this answer with the rest of the class.

7. Classify Toledo's outgoing products (exports) as being foods, manufactured goods, timber, or miscellaneous. For each continent tally up the number of ships carrying each type of product out of Toledo, and record the numbers in the chart on your answer sheet.

8. Classify imports as being foods, manufactured goods, raw materials for industry, and miscellaneous. For each continent tally up the number of ships carrying each type of product into Toledo, and record the numbers in the chart on your answer sheet.

9. With which continent does the Port of Toledo carry on the most trade?

10. What is the main export to that continent?

11. What is the main import from that continent?

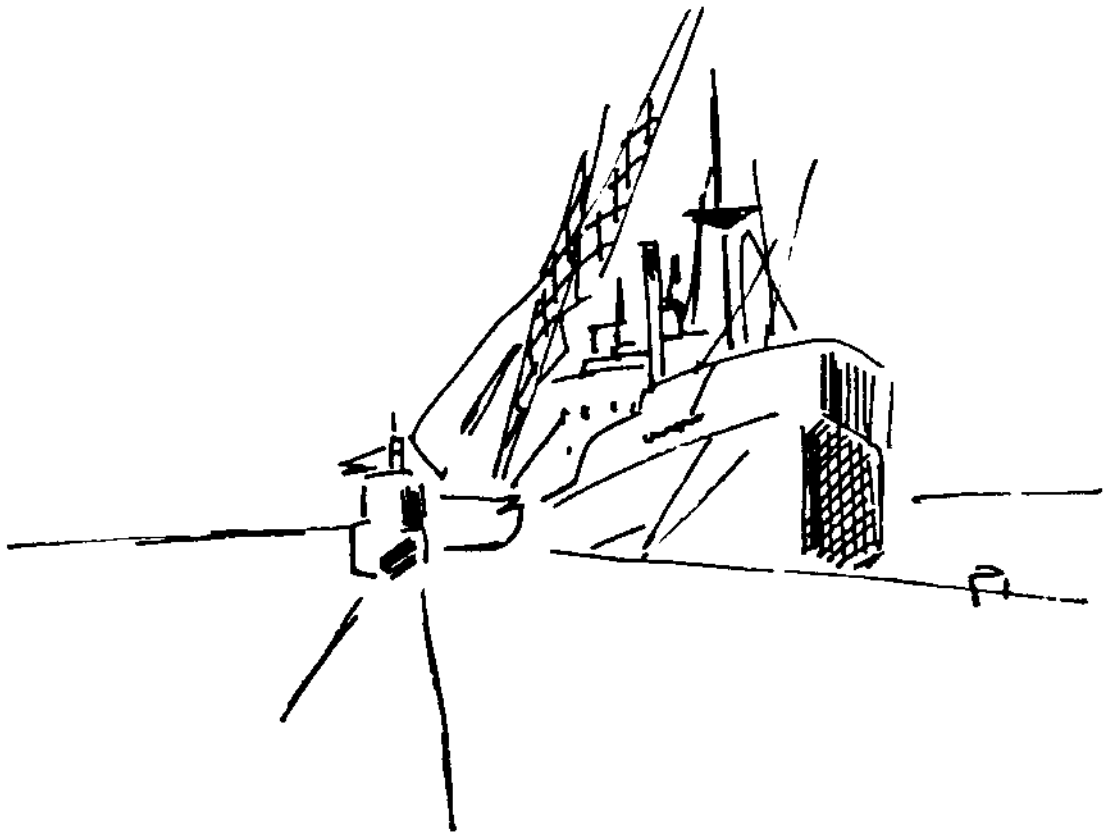
12. Based on the imports chart, what is one of the main industries in Europe?

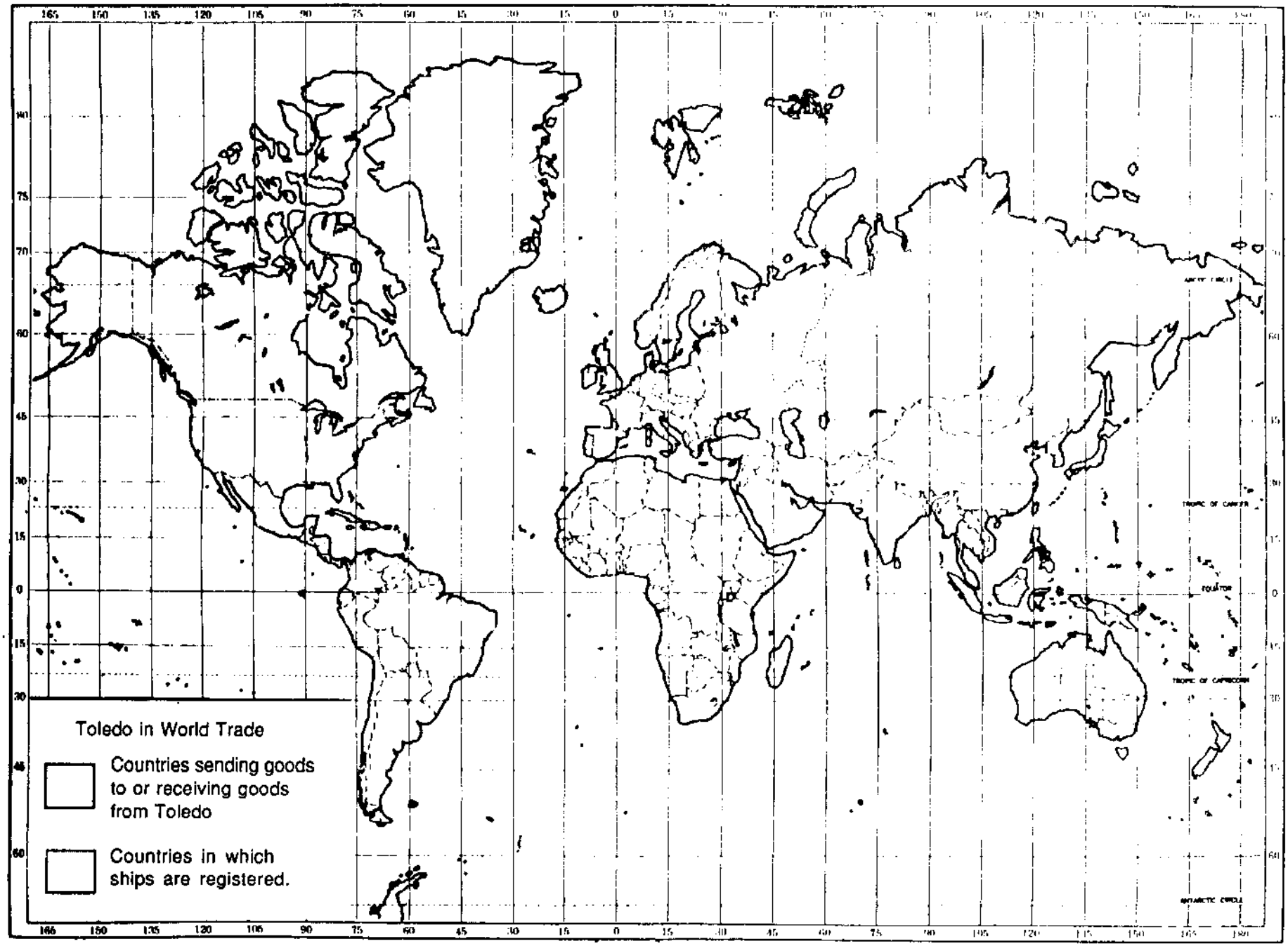
13. Based on the export chart, what U.S. product do the developing nations of Africa need most?

14. The ships on pages 5-7 carry different amounts of the cargoes listed. If you consider the <u>number</u> of ships only, which is greater from the Port of Toledo, imports or exports?

Toledo is only one of twenty-two deep water ports on the Great Lakes. Using the information from this activity, based on part of one year's shipping from one port, you can probably begin to see how important the Great Lakes are in world trade.

15. If ocean going ships could not reach Toledo and other Great Lakes ports, how would U.S. products have to be transported?




Toledo in World Trade
Countries sending goods to or receiving goods from Toledo
Countries in which ships are registered.
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
ANTARCTIC CIRCLE

PORT OF TOLEDO
INTERNATIONAL SHIPPING
(a portion of one year)

April

Vessel Name	Flag	Cargo In	From	Cargo Out	To
Hermine	France	- - -	- - -	Soybeans	Spain
Arkandros	Liberia	- - -	- - -	Jeeps	Morocco
Makarska	Yugoslavia	Wine	Italy	Timber	Italy
Paula L. Russ	Germany	Machinery	Germany	Timber	Germany
Baltic Skou	Denmark	Chrome Ore	Norway	- - -	- - -
Redsea Venture	Liberia	Liquid Fertilizer	Netherlands	- - -	- - -
Span Terza	Italy	Foundry Coke	Belgium	- - -	- - -
Eglantine	France	Steel	France	- - -	- - -
Sealord	Panama	- - -	- - -	Wheat	Morocco
Parthenon	Greece	- - -	- - -	Corn	England

May

Comas	Singapore	- - -	- - -	Soybeans	Russia
Thurdrecht	Netherlands	- - -	- - -	Corn	Scotland
Hilary B	Singapore	Raw Sugar	Panama	- - -	- - -
Tozui Maru	Japan	- - -	- - -	Soybeans	Japan
Kapitan Panfilov	Russia	Aluminum	Russia	- - -	- - -
Zabrze	Poland	- - -	Europe	Timber	Belgium
Milanos	Spain	Steel	Italy	- - -	- - -
Jadro	Yugoslavia	Miscellanous	Italy	- - -	- - -
Valya Kotik	Russia	- - -	Europe	Timber	Netherlands
Auctoritas	Italy	- - -	- - -	Soybeans	Italy

June

Peter L	Greece	Raw Sugar	Honduras	Wheat	Algeria
Victoria Faith	England	- - -	- - -	Corn	Morocco
Lake Aniara	Norway	Liquid Fertilizer	Netherlands	- - -	- - -
Arctic	Canada	- - -	- - -	Corn	Belgium
Rubens	England	Foundry Coke	Germany	Corn	W. Germany
Delchim Cevennes	France	- - -	- - -	Petroleum Prod.	France
Federal Calumet	Liberia	Furnace Coke	Germany	Corn	Netherlands
Lynton Grange	England	Steel	England	- - -	- - -
George L	Greece	Furnace Coke	Belgium	Corn	Netherlands
Union Pride	Greece	Miscellanous	Canada	Autos	Chile

July

Vessel Name	Flag	Cargo In	From	Cargo Out	To
Shura Kober	Russia	- - -	Europe	Cob Pellets	England
Baarn	Netherlands	Machinery	Germany	Machinery	Netherlands
Hosei Maru	Japan	- - -	- - -	Soybeans	Japan
Teesta	India	Steel	India	Wheat	Algeria
Zabat-Dos	Spain	Zinc	Spain	Corn	Spain
Marcos Souza Dantos	Brazil	- - -	Brazil	Machinery	Brazil
Koper	Yugoslavia	- - -	- - -	Wheat	Nigeria
Lake Katya	Liberia	Liquid Fertilizer	Netherlands	- - -	- - -
Sugar Crystal	England	Steel	England	- - -	- - -
Satya Kamal	India	Chrome Ore	Norway	- - -	- - -

August

C. Mehmet	Turkey	Steel	France	- - -	- - -
Carchester	England	- - -	England	Corn	England
Kiyo	Liberia	- - -	- - -	Soybeans	Japan
Katherine	Greece	- - -	- - -	Corn	Scotland
Prvi Februar	Yugoslavia	Furnace Coke	Belgium	- - -	- - -
Blumenthal	Germany	- - -	Ecuador	Miscellanous	Venezuela
C. Tahsin	Turkey	Steel	Belgium	- - -	- - -
Shirley Lykes	America	- - -	Italy	Machinery	Egypt
Tilly Russ	Germany	Miscellanous	Europe	Miscellanous	Europe
Dubrovnik	Yugoslavia	- - -	- - -	Corn	Scotland

September

Puhos	Finland	Urea	E. Germany	- - -	Duluth, MN
Hand Fortune	Panama	- - -	- - -	Corn	England
Zambrow	Poland	- - -	Belgium	Timber	Belgium
Adriatik	Yugoslavia	Furnace Coke	Belgium	Soybeans	Belgium
Torm Kristina	Denmark	- - -	- - -	Soybeans	Netherlands W. Germany
Ektor	Greece	Steel	France	- - -	- - -
Federal Clyde	England	- - -	- - -	Soybeans	W. Germany
Arkandros	Greece	- - -	- - -	Corn	Malta
Split	Yugoslavia	Miscellanous	Greece	Miscellanous	Yugoslavia
Meltemi II	Greece	- - -	- - -	Corn	England

October

Vessel Name	Flag	Cargo In	From	Cargo Out	To
Ever Honor	Cyprus	- - -	- - -	Soybeans	Netherlands
Totai Maru	Japan	- - -	- - -	Soybeans	Japan
Harmonious	Panama	Chrome Ore	Norway	- - -	- - -
Jean Lykes	America	- - -	Italy	Machinery	Egypt
Murray	Liberia	- - -	- - -	Soybeans	Japan
Zamosc	Poland	Zinc and Machinery	Belgium	Timber	Netherlands
Zinnia	England	- - -	- - -	Soybeans	Germany
Lena	Greece	- - -	- - -	Corn	Scotland
Providence	Panama	Furnace Coke	Germany	- - -	- - -
Caspiana	Greece	- - -	- - -	Corn	Italy

November

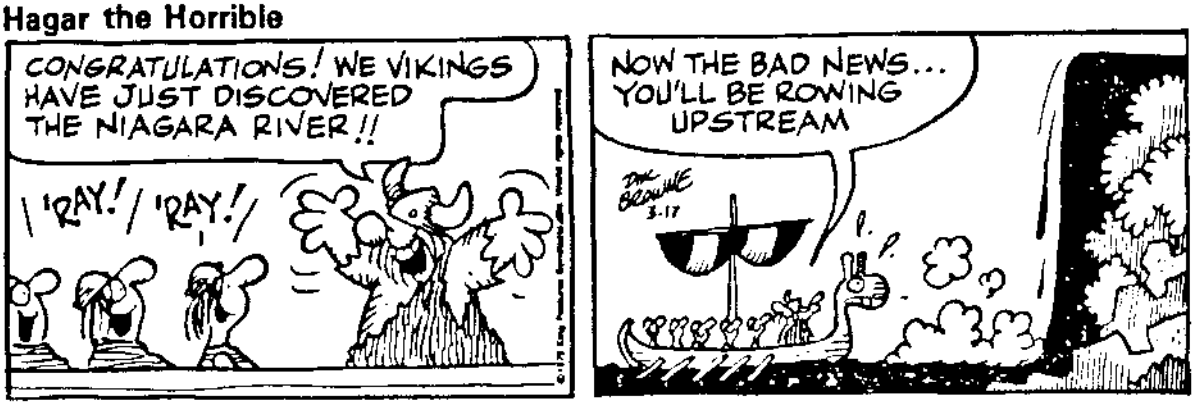
Boujniba	France	- - -	- - -	Corn	E. Germany
Atlantic Helmsman	Greece	Furnace Coke	Germany	Soybeans	Spain
Paul L. Russ	Germany	Miscellanous	Germany	Timber	Germany
Ondine	France	Steel	France	Wheat	China
Dunav	Yugoslavia	- - -	- - -	Soybeans	W. Germany
Kara	Finland	Metals	Finland	- - -	- - -
Efploia	Greece	Furnace Coke	Germany	- - -	- - -
Federal Seaway	Greece	- - -	- - -	Soybeans	Indonesia
Olympic Hope	Greece	Furnace Coke	Germany	Corn	Germany
Ashley Lykes	America	- - -	Italy	Machinery	Italy

December

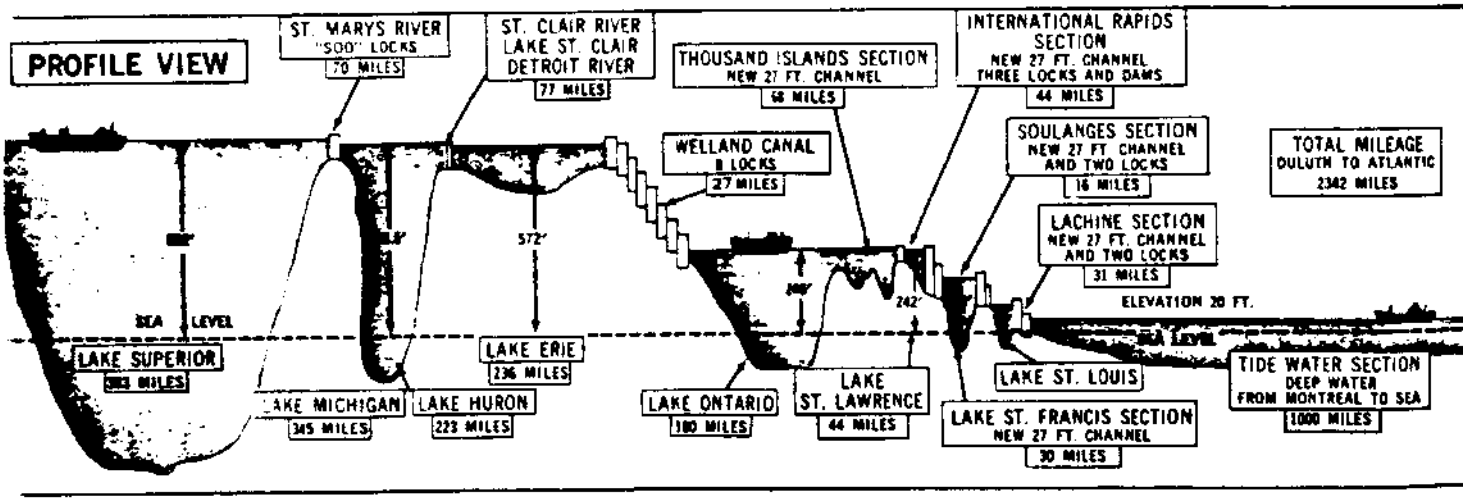
Thorswave	Norway	- - -	- - -	Timber	Germany
Federal Rhine	Liberia	- - -	- - -	Corn	Germany
Tokei Maru	Japan	- - -	- - -	Corn	England

ACTIVITY B: HOW DO LOCKS WORK?

Hagar the Horrible



Lake Superior is 602 feet above sea level. In order for ships to go from the Atlantic Ocean to the Great Lakes and back for international trade, the United States and Canada have constructed a series of locks that raise and lower ships to the levels of the lakes, rivers and ocean. Because of this system, 80% of the world's cargo ships can now sail as far west as Lake Superior.



U.S. Army Corps of Engineers

MATERIALS: Two half-gallon or quart milk cartons, small toy boat, scissors or sharp knife, modeling clay or fiber tape, water, sink or stream table.

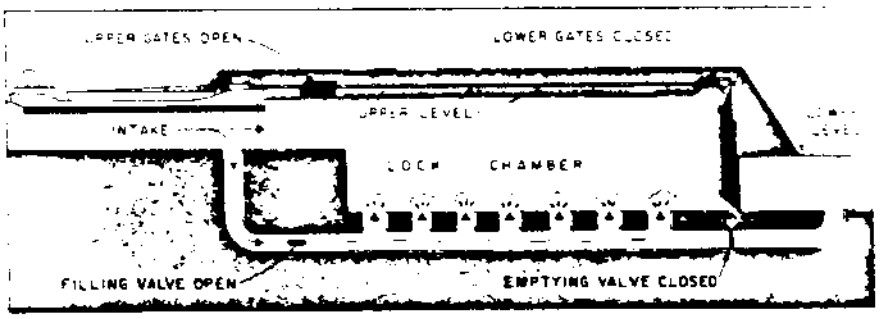
PROCEDURE

The pictures below show how locks operate to raise and lower ships to the different levels of the St. Lawrence Seaway.

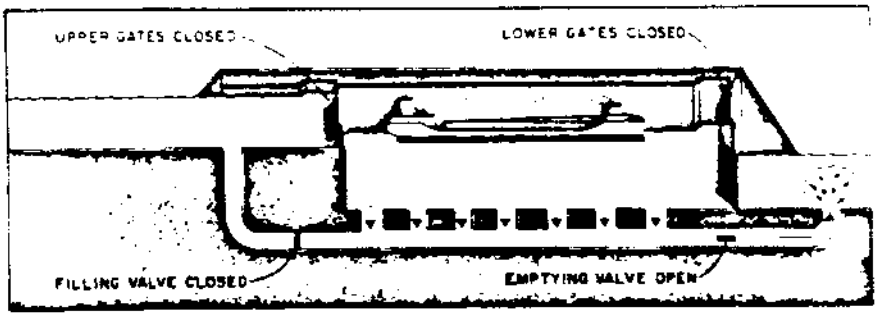
HOW NAVIGATIONAL LOCKS OPERATE

These diagrams show how a ship is lowered in a lock; a ship is raised by reversing the operation. No pumps are required; the water is merely allowed to seek its own level.

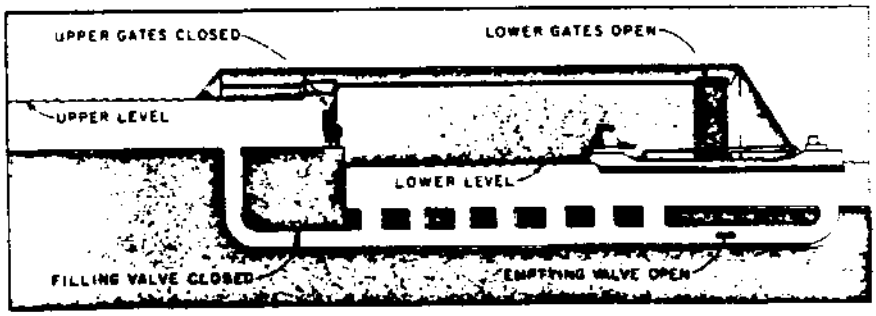
With both UPPER GATES and LOWER GATES closed, and with the EMPTYING VALVE closed and the FILLING VALVE open, the LOCK CHAMBER has been filled to the UPPER LEVEL. The UPPER GATES have then been opened allowing the ship to enter the LOCK CHAMBER.



Now the ship is in the LOCK CHAMBER. The UPPER GATES and the FILLING VALVE have been closed, and the EMPTYING VALVE has been opened to allow water to flow from the LOCK CHAMBER to the LOWER LEVEL.



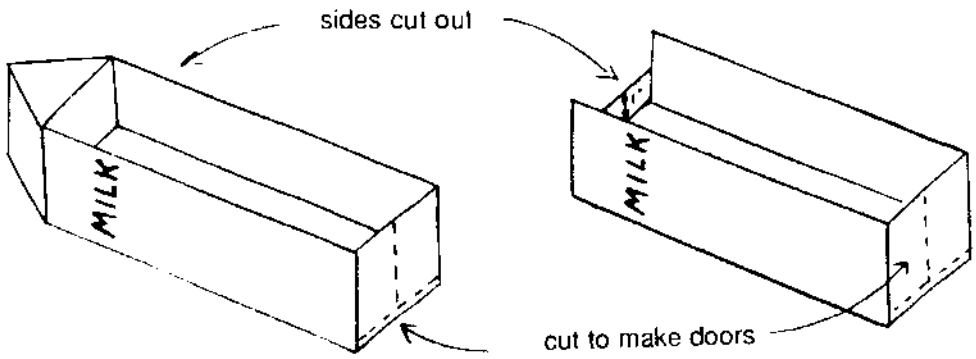
The water level in the LOCK CHAMBER has gone down to the LOWER LEVEL, the LOWER GATES have been opened, and the ship is leaving the LOCK CHAMBER. After this, the lock is ready for an upbound ship to come in and be lifted, or may be filled (as above) to lower another downbound ship.



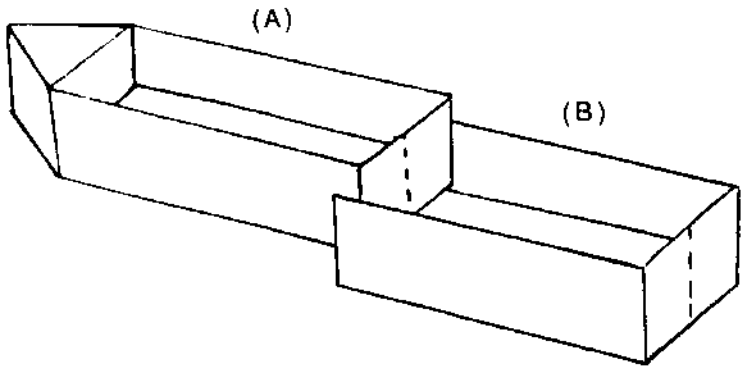
U.S. Army Corps of Engineers

You can construct a model of a lock and use it to raise and lower a boat to three different water levels.

A. Cut two milk cartons as this picture shows:

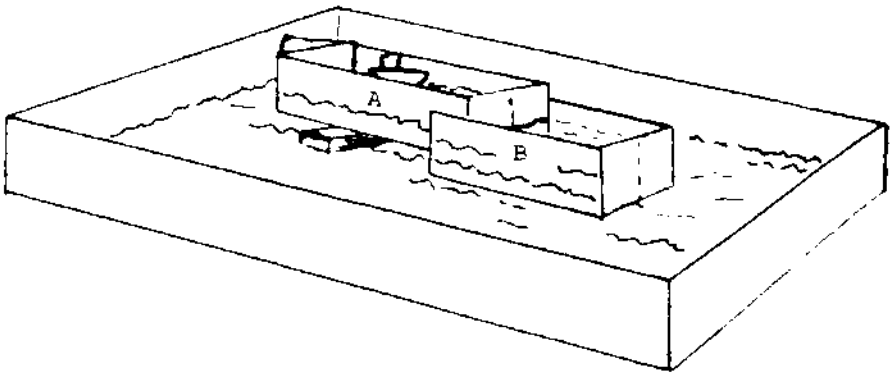


B. Connect the two cartons as shown below, using modeling clay or heavy tape around the edges to be sure water will not leak out where the cartons are joined together.



C. Add water to a sink or stream table to make an "ocean" about 5 cm deep. Put your model locks into the "ocean" with the open side up and all doors tightly closed.

D. Pour water into Carton B until it comes up to meet the bottom edge of Carton A. Then pour about 5 cm of water in Carton A. Place a small toy boat in Carton A. You may need a block of wood to prop up the end of A. Your set-up should look like this:



E. Slowly open the doors of Carton A to let the water levels in A and B become the same. Move the boat into Carton B.

F. Open the doors of Carton B slowly and let the boat move out into the ocean.

G. To bring the boat back upstream do the following:

a. open the doors of B and move the boat into Carton B

b. close the B doors and open the A doors

c. add water to Carton A until the boat is raised higher than the bottom of Carton A (The water for filling real lock chambers always comes from the upstream lake or river.)

d. move the boat into Carton A

e. close the A doors and add water to the original 5 cm depth. Your boat is now ready to enter the upstream areas at this higher level.

H. Answer the following questions on your answer sheet about what you have learned:

1. In an actual lock system, what does Carton A represent?

2. Where does the water go when it flows out of B (in a real situation)?

3. During which steps would the emptying valve be open? Closed?

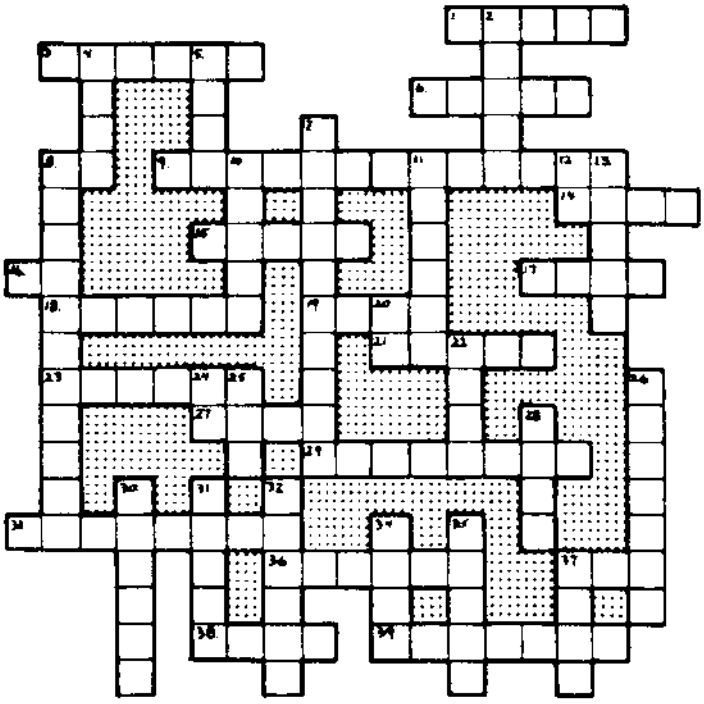
4. During which steps would the filling valve be open? Closed?

5. When the lock gates are opened, the level of water in the lock chamber is the same as which other water level?

ACTIVITY C: CAN YOU USE YOUR SHIPPING KNOWLEDGE?

PROCEDURE

Here is a crossword puzzle that makes use of some of the new words and ideas you have learned in this investigation. Use the definitions to fill in the squares.



ACROSS

1. A major body of salt water.
3. Continent that imports food for developing nations.
6. The Great Lake with only one deep-water port.
8. Coast Guard (abbreviation).
9. Between countries.
14. Place where ships load and unload.
15. The Welland _____ connects Lakes Erie and Ontario.
16. Merchant Vessel (abbreviation).
17. One of Toledo's imports: furnace or foundry ____.
18. The continent trading most often through Toledo.
19. If it were not for the Seaway, goods would have to go over _____.
21. The Seaway opened inland America to ____ trade.
23. A product coming into the country.
27. Toledo is on Lake _____.
29. The Great Lakes are above ___ ___ (two words).
33. A ship owner must _____ his ship in some country and fly that country's flag.
36. A product leaving the country.
37. Another name for #1 ACROSS.
38. This helps ships go into waters at a higher elevation.
39. A major manufacturing city between Lakes Erie and Huron.

DOWN

2. The products carried by a ship.
4. Every trading ship flies some country's_____.
5. A major grain export from Toledo.
7. Superior, Michigan, Huron, Erie, and Ontario.
8. Flags chosen to save money are flags of _____.
10. To exchange one thing for another.
11. A major port in Ohio.
12. Associated Press (abbreviation).
13. Plural of #38 ACROSS.
20. A compass direction.
22. To go up, as the water level in a lock.
24. To attempt.
26. A vegetable crop exported from Toledo.
28. Only 22 Great Lakes ports are _____ enough for ocean-going ships.
30. An export from American forests.
31. A metal used for manufacturing.
32. Name of country whose flag is often flown for convenience.
34. Most of Toledo's exports can be classified as _____.
35. Toledo is in the _____ of Ohio.
37. Vehicle used for transportation on the water.

REVIEW QUESTIONS

1. List the continents that send goods to or receive products from the Port of Toledo.

2. What is the main product exported through the Port of Toledo?

3. What is the main type of product imported?

4. What determines the length of the Great Lakes shipping season?

5. Why might a company register its ships in a foreign country if the ships do not trade with that country?

6. Explain how ships can go from the ocean to the higher elevations of the Great Lakes.

Name _____

Shipping: The World Connection
Answer Sheet

Activity A: Where Go the Boats?

1. When did the shipping season open in this example year? _____

2. When did the season close? _____

   Why? _____

   _____

3. About how much of the world was affected by trade with the Port of Toledo in this example year?

   _____

4. Which two flags are most frequently flown by international trade ships using the Port of Toledo?

   _____ _____

5. Did ships flying these flags actually sail to or from those countries? _____

6. Are these countries the leaders in world trade? _____

7. For each continent tally up the number of ships carrying each type of product out of Toledo, and record the numbers in the following chart.

Toledo Exports

Number of Ships To

Product	Europe	Asia	Africa	South/Central America
Food				
Raw Materials for Industry				
Manufactured Goods				
Miscellanous				

8. For each continent tally up the number of ships carrying each type of product to Toledo, and record the numbers in the following chart.

Toledo Imports

Number of Ships From

Product	Europe	Asia	Africa	South/Central America
Food				
Raw Materials for Industry				
Manufactured Goods				
Miscellanous				

9. With which continent does the Port of Toledo carry on the most trade?_____

10. What is the main export to that continent?_____

11. What is the main import from that continent?_____

12. Based on the imports chart, what is one of the main industries in Europe?

_____

13. Based on the export chart, what U.S. product do the developing nations of Africa need most?

_____

14. Which is greater from the Port of Toledo, imports or exports?_____

15. How would U.S. products have to be transported?_____

_____

Activity B: How do locks work?

1. In an actual lock system, what does Carton A represent?_____

2. Where does the water go when it flows out of B (in a real situation)?_____

3. During which steps would the emptying valve be open? _____

Closed?_____

4. During which steps would the filling valve be open?_____

   Closed?_____

5. When the lock gates are opened, the level of water in the lock chamber is the same as which other water level?_____

Review Questions

1. List the continents that send goods to or receive products from the Port of Toledo.

   _____

2. What is the main product exported through the Port of Toledo?_____
3. What is the main type of product imported?_____
4. What determines the length of the Great Lakes shipping season?_____
5. Why might a company register its ships in a foreign country if the ships do not trade with that country?_____
6. Explain how ships can go from the ocean to the higher elevations of the Great Lakes. _____

   _____

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