MANAGEMENT ISSUES

THE GREAT DREDGING DECISION

OBJECTIVES

Students will:

1. be able to evaluate positive and negative effects of dredging the Mississippi River to maintain a 9-foot channel for commercial navigation.

2. develop an appreciation for the cooperative management of the River's natural resources.

METHODS

Students role-play individuals representing differing perspectives and concerns related to a complex issue.

Specialized Terms:

dredge - an apparatus for scooping or sucking up mud, sand, rocks, etc., as in deepening or clearing channels, harbors, etc.

dredging - to enlarge or clear out a river channel with a dredge

GREAT - the Great River Environmental Action Team, authorized by congress to assess problems associated with multipurpose use of the river and develop recommendations for improved river management

wetland - swamps or marshes, serve as excellent habitat for wildlife

upland - land elevated above other land, as above land along a river

Grade Level: 6 - 12

Subjects: Math, Social Studies

Duration: 2 to 3 45 minute periods

Group Size: Individual, small group and large group

Setting: Classroom

Key Vocabulary: GREAT, dredging, dredge, wetland, upland, main channel

Materials:
- *role-playing cards*
- *map handout*
- *alternatives handout*

BACKGROUND

The Corps of Engineers is mandated by the U.S. government to maintain a 9-foot deep, 400-foot wide channel for commercial navigation on the Mississippi River. They do this through many methods:

- regulating water levels at the locks and dams;
- construction of structures called wing dams to direct the flow of water to the center of the channel to decrease deposition of sand in the main channel by increasing water velocities in the area;
- closing dams across the opening of a side channel to prevent water from going into side channels, thereby maintaining flow in the main channel;
- dredging of material from the main channel in areas that are less than 10.5 feet deep and/or less than 400 feet in width, or where tows have reported "bumpings" or groundings, and cannot be "kept deep and wide" by one or more of the above methods.

Mechanical (left) and hydraulic dredging of the main navigation channel.

Approximately 650,000 cubic yards of sand are dredged from the Mississippi River each year in the Corps of Engineers' St. Paul District (Pools 1-10). However, the amount of material dredged increases the further downstream you go on the Mississippi River. Prior to 1980, the Corps of Engineers placed sand in whatever area was most convenient. For example, dredged material was placed directly into the water adjacent to the dredge cut (area being dredged), on islands, in wetlands, or below the dredge cut where the current had scoured out a deep hole. This indiscriminate placement of dredged material often destroyed valuable fish and wildlife habitat.

In 1974, under the leadership of the two principle management agencies on the river, the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service, an interagency team was organized to identify and assess the problems associated with multipurpose use of the river and develop recommendations for improved management

of the river. This action led to the creation of GREAT, the Great River Environmental Action Team. The Upper Mississippi River was divided into three study reaches, each covered by its own study team called GREAT.

The first of these studies completed was the GREAT I study for the reach from the head of navigation in Minneapolis-St. Paul, Minnesota to Guttenberg, Iowa. From 1974 through 1980, this Team carried out an extensive program of research and pilot action projects, addressing total river resource requirements. This study was the beginning of a new era of river management, one that emphasized cooperative management of the entire resource.

The GREAT I Team was made up of the following representatives:

- *U.S. Department of the Interior - Fish and Wildlife Service
- *U.S. Department of Defense - Army Corps of Engineers
- *U.S. Department of Agriculture - Soil Conservation Service
- *U.S. Department of Transportation - Coast Guard
- *U.S. Environmental Protection Agency
- *State of Iowa - Iowa Conservation Commission (Now Iowa DNR)
- *State of Minnesota - Department of Natural Resources
- *State of Wisconsin - Department of Natural Resources
- Minnesota-Wisconsin Boundary Area Commission
- Upper Mississippi River Conservation Committee
- General Public

* = Voting member

Temporary disposal site. Note "bathtub" of water in center of sand area. This bathtub will eventually be filled with sand to a height of 30-40 feet above the water before being moved to a permanent upland disposal site.

One of the responsibilities of GREAT was to respond to the concerns and impacts of indiscriminate placement of dredged material. This team systematically developed plans for each pool of the Mississippi River by estimating the amount of dredged material that would come from the main channel and determining the best location to dispose of the material. The best locations for disposal sites were in areas where public and private groups had access to the sand for other uses (beneficial use sites).

If it was not possible to get the material to such a site, the material was stockpiled at a temporary site and later moved to beneficial use sites. In some cases, the sand was permanently left on the river islands. The height of dredged material piles varies, typically being 30 to 40 feet in height. One of the benefits of making the placement piles higher is that less acreage will be needed to accommodate the amount of material to be dredged. However, high piles of dredged material can cause negative impacts by being easily erodible or detract from the aesthetics of the river.

In later years a group of recreation specialists prepared plans for beach development and enhancement. If possible, the Corps places dredged material in areas that will benefit river recreationists. However, very little sand can be disposed of this way (2,000 to 6,000 cubic yards).

MATERIALS

- role-playing cards
- map handout
- alternatives handout

PROCEDURES

The purpose of this activity is to reenact the process by which the GREAT team developed recommendations for the disposal of dredged material.

Hypothetical Situation: A dredge cut near River Town is to be reviewed by the GREAT to discuss alternatives for the disposal of approximately 20,000 cubic yards of dredged material every two years. Currently, sand is being placed in the water adjacent to the main channel.

Following are the alternative disposal sites (see figure for location of sites), the cost associated with placing sand at that site, environmental impacts and the estimated quantity of sand that can be placed at the site. Although financial cost is a main concern when determining a placement site, it must be considered along with the "environmental cost" of material placement. The GREAT has been directed to provide a plan for the placement of dredged material for the next 40 years (400,000 cubic yards).

- Any combination of alternatives can be used.
- The acreage of the disposal areas can be decreased, but they cannot be increased.
- The height of the dredged material placement sites can be decreased or increased to a height of not more than 40 feet.

- Beach enhancement cannot total more than 6,000 cubic yards of material over 40 years.

1. Provide students with the background information. Generate an initial discussion with them about some of the possible costs, benefits and impacts from the dredging of the main channel for navigation, considering it from a variety of perspectives. Use the "pros and cons" provided below for each of the alternatives as a reference to expand on the discussion. Also, discuss how wildlife and fish use different parts of the river.

2. Ask each student to choose the role of an individual to become or represent for the purpose of this activity - or assign roles randomly. Cut out the examples of roles that are included and pass them out to each of the students. If you do not have enough to go around, assign more than one student to some of the roles. Establish a balanced variety of roles with people having conflicting values and concerns relating to the potential impacts of dredge material placement. The diversity of viewpoints was an important aspect of the GREAT's mission.

3. Hand out the area map and list of alternatives with the cost of each alternative. Remind them that any combination of sites can be used or just one site can be chosen. To calculate the amount of material a site can hold if you know the acreage: (This formula can be used to calculate capacity of a site if only part of the site is used.)

   (# of acres) X 4840 sq yards X (# yards in height the pile can be) = total cubic yards per acre

4. Ask students to prepare for their role, developing a short position paper for use as background for the dramatization of their role. Have the students expand on their roles if they want to, however, they must represent the basic theme of the role they are playing.

5. The students will role-play their position and make presentations to the entire group. In GREAT, only the state and federal agencies made the final decision. Therefore, it will be these agencies that will decide on which dredge plan to implement. The agencies that could vote are shown in the background material with an asterisk. Only one vote per agency. Remind the agency representatives that they must also consider public comments in making their decisions.

6. After all students have made their presentations, ask the GREAT Team to render a decision.

7. Following the GREAT Team's decision, have a brief class discussion to summarize the "pros and cons" that emerged from the students presentations. Identify and list the benefits, if any, and costs or liabilities, if any, because of the selected plan. Include effects on people, plants and animals.

ASSESSMENT

During:

1. Check that each student's position paper identifies the values/beliefs of the role he/she will be portraying.

2. Monitor student presentations during the GREAT Debate.
   - Does the student's discussion represent the role assigned?
   - Does the student advocate for a plan that matches the values of the role played?
   - Does the student listen to, and attempt to understand, the other viewpoints being portrayed even though they may differ from those he/she is portraying?

3. Monitor student Involvement in the class discussion.

After:

1. Have each student write a brief essay describing his or her personal recommendation for a 40-year dredge maintenance plan. The students might expand their position papers, or "start from scratch" in writing their essays. The essay should include any positive and/or negative effects on people, plants and animals resulting from the selected plan.

2. Or, have the student answer the following questions:

   a) Name two or more possible human benefits that result from dredging.

   b) Name two or more possible negative consequences to humans that result from dredging.

   c) Name two or more possible benefits to plants and animals due to dredging. (Dredging on the river is also used to create fisheries habitat in the backwaters by removing sand and silt that has filled in lakes and side channels making them less desirable for fish).

   d) Name two or more possible negative consequences to plants and animals due to dredging.

   e) Identify four or more agencies or special interest groups involved in management of the river.

EXTENSIONS

1. Change roles and conduct the planning effort again. Note any differences in the results, as well as your perceptions of the process and experience.

2. Visit a beneficial use site or a dredge disposal site near you. Contact the local Corps of Engineers' office or State Department of Natural Resources office for the location nearest you. If the Corps of Engineers is dredging in the river nearby you could possibly visit the site to watch one in operation.

3. Research into other aspects of the GREAT studies. Adapt the activity to address recreation, development, and other topics of interest to your students.

PROS AND CONS OF EACH ALTERNATIVE

ALTERNATIVE 1:

Pros:

- The site is easily accessible for beneficial use by public and private groups via the road.
- Use of the upland site will not directly impact wildlife or fisheries.
- The wetland site is large enough to accommodate all material for more than 40 years of dredging.

Cons:

- The wetland is used by waterfowl as a feeding and resting area during spring and fall migration and as a nesting and brood rearing site in the summer. The wetland is also used by spawning and juvenile fish.
- The upland site has documented historic sites (Native American village site) and its use must not disturb the buried village site or burial mounds.
- Any use of the wetland site will impact wildlife, waterfowl and fisheries habitat, if used to the full capacity, the entire wetland will be filled in about 40 years.

ALTERNATIVE 2:

Pros:

- This site is large enough to accommodate all material for more than 40 years

Cons:

- Any use of this site will impact the wildlife on the island.
- The site is not accessible for beneficial use unless the sand is hauled to site 1.
- It will cost $1,500 per acre to remove the trees and prepare the site for disposal of the dredged material.
- A survey will need to be done to see if archeological sites are present on the island.

ALTERNATIVE 3:

Pros:

- This site is large enough to accommodate all material for more than 40 years.

Cons:

- Any use of this site will impact the aquatic vegetation bed and eventually fill up most of it by directly placing dredged material on top of it and indirectly due to erosion of the sand off the disposal site into the bed.
- The site is not accessible for beneficial use unless the sand is hauled to site 1.
- The aquatic vegetation bed is used by migratory waterfowl that use this area as a feeding and resting area during spring and fall migration. The aquatic vegetation bed is also used by spawning and juvenile fish.
- The area on which sand will be deposited is also a large mussel bed and is home to many different species of mussels. Any disposal of material in this area will impact the mussel beds by covering them up (mussels are very sedentary and cannot move to another location to avoid disturbance).

ALTERNATIVE 4:

Pros:

- This site is large enough to accommodate all material for more than 40 years.

Cons:

- The scour hole may be used by sturgeon, paddlefish, walleye and sauger. It is known to be a wintering area for catfish. There are no other known scour holes of this kind in the rest of the pool. Use of this site will continually disturb it and make it unusable by fisheries for much of the time.
- It is unknown where the sand that is put into the site and rescoured out goes. Some believe that it may go downstream and cause dredging problems elsewhere. Others believe that the sand will be moved into the backwaters, eventually causing them to become shallower and impact fisheries habitat.
- Disposal of material in this site may impact a nearby mussel bed.
- The sand cannot be used beneficially.
- The sand is not removed from the river system.

ALTERNATIVE 5:

Pros:

- There will be very little impact to the aquatic environment.

Cons:

- The island is presently being used by many different species of turtles for nesting. Use of this site will disturb turtle nesting.
- Only half of the material for a 40-year dredge disposal plan can be accommodated at this site

ALTERNATIVE SITES FOR "THE GREAT DREDGING DECISION"

(Student copy)

ALTERNATIVE 1: This site is composed of both an upland area that is currently in agriculture and a large wetland. The upland area is 40 acres in size, however much of the site contains archeological sites (a Native American village site and burial mounds). Therefore, only 2.6 acres can be used and will accommodate approximately 50,000 cubic yards of material filled to a height of 12 feet. The adjacent wetland area is 35 acres and can accommodate > 500,000 cubic yards if the entire wetland is filled to a height of 9 feet.

Cost: $5.00 per cubic yard to move the sand to either part of the site from the dredge cut.
$3.00 per cubic yard if > 100,000 cubic yards of sand is moved from a temporary site.

ALTERNATIVE 2: This site is a 40 acre island that is covered by bottom land hardwoods. This island is prime habitat for many species of neotropical migrants (songbirds) and other wildlife. It is unknown whether there are any archeological sites present on the site. If the entire island is cleared of trees, > 500,000 cubic yards of material can be disposed of on the island at a height of 9 feet.

Cost: $4.00 per cubic yard

ALTERNATIVE 3: This is where sand is being placed now. This site is adjacent to the main channel. This site is adjacent to a 60 acre bed of aquatic vegetation. It has a capacity of > 500,000 cubic yards if the sand is piled to a height of 9 feet.

Cost: $2.00 per cubic yard.

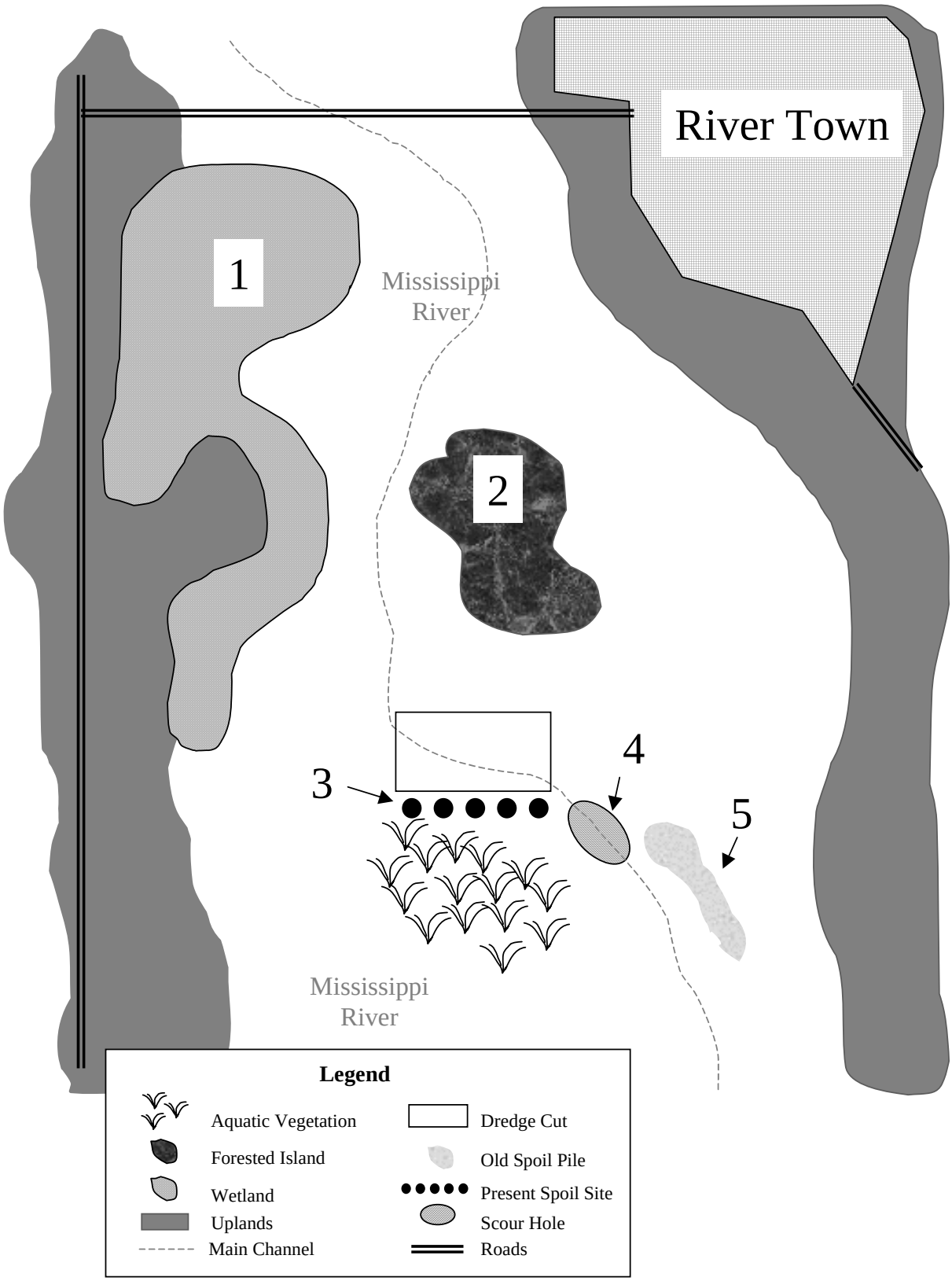
ALTERNATIVE 4: This site is a deep scour hole (approximately 45 feet deep and 3 acres in size) just downstream of the dredge cut. The Corps of Engineers predicts that the area will rescour within 2 years after placement of the dredged material in the hole. This means that it has almost an unlimited capacity.
Cost: $2.00 per cubic yard

ALTERNATIVE 5: This is an old dredged material placement site used many years ago. Vegetation on the 4 acre island is very sparse due to the erosion of the sand and lack of good soil for plant growth. If the dredged sand is piled to a height of 36 feet on top of the existing island, 230,000 cubic yards can be disposed of on the island.

Cost: $3.00 per cubic yard

ROLE PLAYING CARDS FOR THE GREAT DREDGING DECISION

Penny P. Incher - Corps of Engineers - Project Manager - Concerned with keeping costs as low as possible.	B. G. "Mussel" Mann - Commercial Clammer - Does not want to see any disposal areas used that may impact mussel beds.
Buck Badger - Corps of Engineers - Biologist- Keeps notes on biological comments, considers biological impacts.	J. Etski - Sporting goods seller - Would like to see some of the sand used to improve beaches in the area for recreation.
I. Wanadigg - Corps of Engineers - Dredge Operator - Wants to use the site that requires the shortest amount of time to set up (alt. 3 & 4).	I. N. Dustry - Barge Fleet Owner - Concerned about the delays that dredging may cause. Long delays cost money.
T. M. Burr - Corps of Engineers - Forester - Wants to avoid harvesting trees without a plan to replant those cut. Would like to see all sites reforested after the site is no longer used.	I. Ketchum - Commercial Fisherperson - The best areas to fish are in and near the wetlands and aquatic vegetation bed. Does not want to see these areas impacted
Walter Fowl - Wisconsin DNR - Wildlife Biologist - Concerned about the impacts on waterfowl and non-game wildlife.	T. X. Payer - Local Citizen - Concerned about government spending.
Norton Pyke - Wisconsin DNR - Fisheries Biologist - Concerned about the impacts on fish spawning sites, and mussel beds.	M. O. Mearth - Soil Conservation Service - Concerned about erosion problems on the spoil sites and wants to see them revegetated.
M. U. Skrat - Minnesota DNR - Wildlife Biologist - Concerned about the impacts on furbearers and vegetation.	Col. C. L. Over - Coast Guard - Says that the safe passage of vessels is the main objective, and that the channel must remain open.
Sandy Darter - Minnesota DNR - Fisheries Biologist - Concerned about the impacts on the scour hole. Does not want the scour hole to be used.	Pat "Pottery" Brusher - Archeology Professor- Has done extensive research on the archeological sites of Native American village sites and burial mounds along the river.
O. L. Coot - Fish and Wildlife Service - Concerned about the impacts of dredging on migratory waterfowl and shorebirds.	P. T. Mallard - Waterfowl Hunter - Believes that the best place to hunt ducks is in the wetland near alt. 1.
K. T. Fish - Fish and Wildlife Service - Concerned about impacts to fisheries.	A. V. D'Angler - Angler - Is concerned about the impacts of the dredging on fishing.
D. Veloper - Construction Contractor - Would like to see as much sand as possible be placed at a beneficial use site. Says that 2,500 cubic yards of sand could be used each year for construction purposes.	Indi G. O'Bunting - Local Bird Watcher - Enjoys the variety of birds that use the river. Some of the best places to see birds are the wetlands and island forests.


River Town
1
Mississippi River
2
3
4
5
Mississippi River
Legend
Aquatic Vegetation
Forested Island
Wetland
Uplands
Main Channel
Dredge Cut
Old Spoil Pile
Present Spoil Site
Scour Hole
Roads