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# Developing Crab Creek : fifteen points of view on economy and ecology in an estuary : a simulation for advanced students exploring coastal resource management decisions in Virginia

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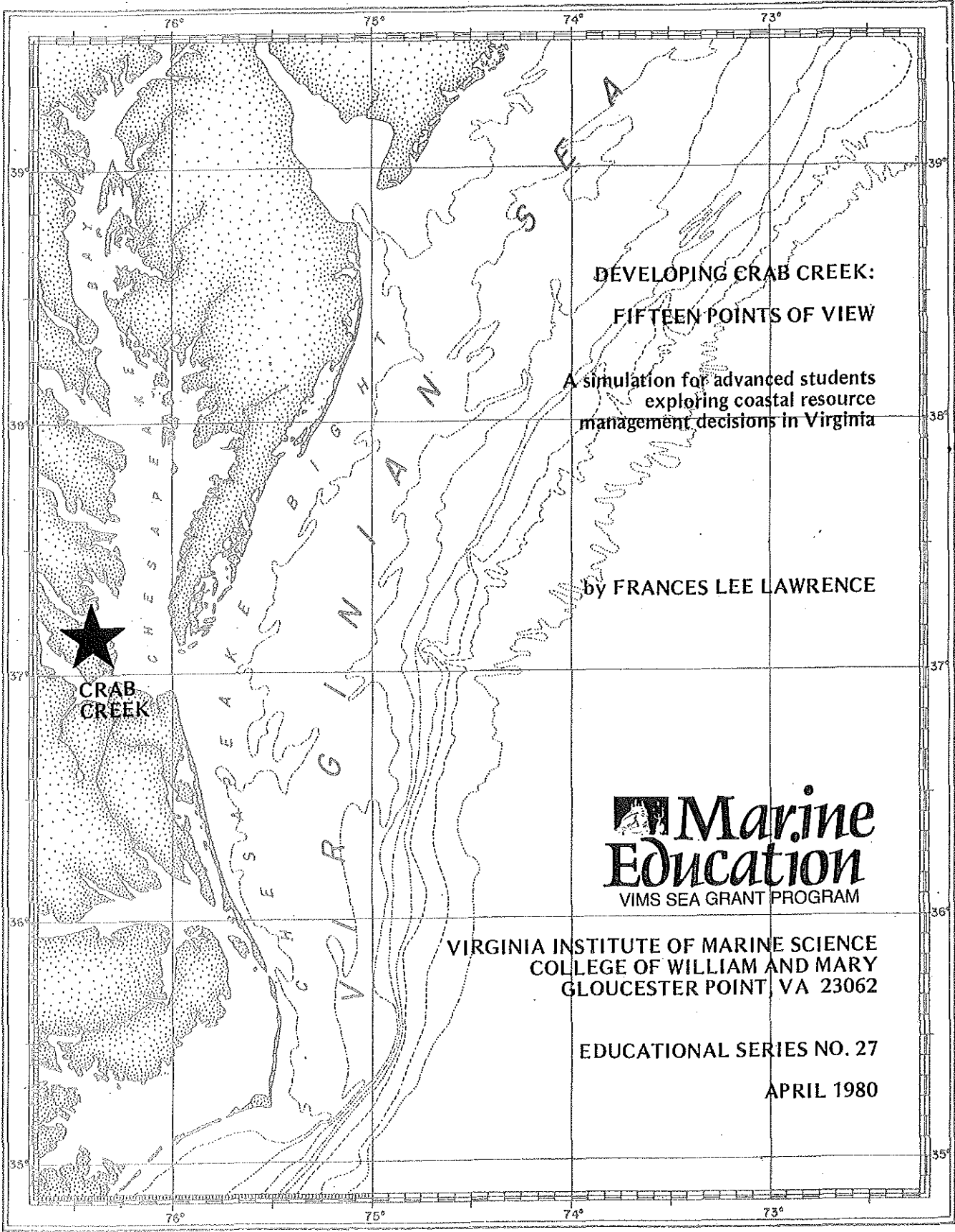
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## Recommended Citation

Lawrence, F. L. (1980) Developing Crab Creek : fifteen points of view on economy and ecology in an estuary : a simulation for advanced students exploring coastal resource management decisions in Virginia. Educational series; no. 27. Virginia Institute of Marine Science, College of William and Mary. <https://doi.org/10.21220/V5K45X>

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**CRAB  
CREEK**

**DEVELOPING CRAB CREEK:  
FIFTEEN POINTS OF VIEW**

A simulation for advanced students  
exploring coastal resource  
management decisions in Virginia

by **FRANCES LEE LAWRENCE**

 **Marine  
Education**  
VIMS SEA GRANT PROGRAM

**VIRGINIA INSTITUTE OF MARINE SCIENCE  
COLLEGE OF WILLIAM AND MARY  
GLOUCESTER POINT, VA 23062**

**EDUCATIONAL SERIES NO. 27**

**APRIL 1980**

DEVELOPING GRAB CREEK:  
FIFTEEN POINTS OF VIEW ON  
ECONOMY AND ECOLOGY  
IN AN ESTUARY

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decisions in Virginia

Frances L. Lawrence

Virginia Institute of Marine Science  
Sea Grant Marine Advisory Services  
School of Marine Science  
College of William & Mary

Educational Series Number 27  
1980

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## Acknowledgements

For their review and suggestions appreciation is expressed to N. Bartlett Theberge, Jr., and Thomas A. Barnard, Virginia Institute of Marine Science, and Ronald N. Giese, School of Education, College of William and Mary. Thanks also go to Richard Crews for drafting the land-use map and to Annette Stubbs, VIMS Reports Center, for preparation of manuscript drafts.

This work was sponsored by the Virginia Institute of Marine Science Sea Grant Institutional Program, supported by the Office of Sea Grant, NOAA, under Grant Number NA 80AA-D-00021.

## INTRODUCTION

Crab Creek County is a hypothetical small Virginia county on the Chesapeake Bay. This simulation explores the coastal management issues involved in developing a point of land in Crab Creek County fronting on the Chesapeake Bay to the North, and Crab Creek to the South. The game is based on key Virginia and federal laws and agencies affecting coastal resources, and provides insights into the human and technical interactions involved in the "permitting" processes. Players fill fifteen roles representative of private interests as well as local, state, and federal activities.

Laws, permits, and agencies are only part of the coastal management picture. Economics, politics, and informal power structures present in any human interaction impact on the decision-making process. This game is designed so that the actions of participants will simulate actual occurrences.

Eighteen state agencies work within the legal framework of numerous state and federal laws to conduct 75 coastal management activities in Virginia. Eighteen federal actions affect shorelines throughout the nation. The interplay of all these agencies and activities is far beyond the scope of this simulation game. Although the simulated roles of the players and agencies are based on fact, some simplification was necessary to make the game suitable for classroom use. Rather than being an in-depth study of coastal law, this game is an introduction to the processes of coastal decision making and management in Virginia.

The basic simulation is simple. Three private groups draw up plans for the development of several parcels of land, as selected by a local government. These plans are presented to appropriate local, state, and federal "agencies" for permits. Disputes are settled by "judges." Special interest "clubs" are free to support projects of their choosing. Activities of "agencies" and "judges" are a simplification of Virginia's actual coastal management procedures. "Clubs" are entirely fictitious, representing opposing points of view, rather than actual organizations.

The most effective strategy for winning is knowledge of the laws and issues involved, and the ability to translate that knowledge into effective planning and action. Some background information is provided with the game. The practical application of factual information is not always an easy process for students, therefore players should be well prepared before beginning the game. This simulation should follow a study of coastal ecology and problems.

## DIRECTIONS FOR THE SIMULATION GAME LEADER

### Preparation

Review the entire game, familiarizing yourself with instructions and role assignments. Prepare copies of the "Topo-Land Use" map and legend (pages 8-9) and the "Game Permit Programs" information sheet (page 18), one copy per player. Make a copy for each group of their "Responsibilities and Role" (pages 10-17). Three copies of the "Joint Permit Application" (pages 19-22) will be needed.

Some reference materials are included with the game. They will be adequate for play; however, if you are able to obtain other references and supplemental materials the players may find them useful.

Prior to beginning the simulation, several lessons will be needed to introduce the issues and vocabulary your students will encounter in the game. Newspaper articles about actual coastal management disputes and agency activities may help motivate students. You could assign individual or group research reports on some of the agencies and environmental problems associated with coastal management. Several good films are available on the subject of coastal resources (see "Teaching Materials," page 23).

### Beginning the Game (Rounds 1 and 2)

The game is divided into five rounds. Expect each round to take about one class period. Explain the instructions for each round to the class before beginning the round. You may call "time outs" for group discussions of problems that arise during the game whenever you feel a class discussion will be helpful.

Read the "Background Information" (page 7) to the group. Distribute copies of the "Topo Land Use" map and legend, and make sure everyone in the class is able to interpret the map.

### Round 1

The first activity is a brain-storming session, in which all players suggest ideas for possible uses of the three land areas to be developed. List these on a blackboard as they are suggested. Develop at least 20. The players then group land uses that are similar. Three to five category groupings are desirable. Probable groupings are "recreational uses," "industrial uses," etc. Record the groupings, as they will be needed later.

Assign players their roles as follows. The game needs at least 22 players. The numbers given in parentheses are minimums; ideally each role should have at least two players.

You may have players draw role assignments from a hat or make specific role assignments based on your knowledge of the players' interests and abilities. Give each group a copy of its "Responsibilities and Role" and a copy of "Game Permit Programs."

Wetlands Board (2-3 players)

Virginia Marine Resources Commission (VMRC) (2-3 players)

State Department of Health (SHD) (1-2 players)

State Water Control Board (SWCB) (1-2 players)

U.S. Army Corps of Engineers (ACE) (2-3 players)

Environmental Protection Agency (EPA) (1-2 players)

State Judge (1 player)

Federal Judge (1 player)

Commerce Club (2 players)

Chesapeake Club (2 players)

Virginia Institute of Marine Science (VIMS) (1-2 players)

Project 1 (2-3 players)

Project 2 (2-3 players)

Project 3\* (2-3 players)

\*Project 3 is optional, and may be omitted if the class is small.

The class elects a three member "Board of Supervisors" (by open nomination and secret ballot, one vote per player) who select, from the groups developed earlier, three specific projects which they feel would most benefit Crab Creek County. Only one project may be selected from each group. The Board of Supervisors then assigns a project and one of the three development sites to each project planning team. After this task is completed "Supervisors" return to their previously assigned roles.

## Round 2

Present the slide-illustrated lecture "Coastal Decisions," or, if the group is already familiar with coastal resource management practices, review the roles of key agencies. Following this, distribute copies of the "Joint Permit Application" to project planning teams. Allow 20 minutes for groups to study their roles. During this time, agencies, clubs and judges are to prepare one-minute presentations on their responsibilities. Project planning teams begin planning their projects. The last 20 minutes of this round is devoted to presentations by agencies, clubs, and judges. Project planning teams do not make a presentation at this time. Questions and answers are allowed. Proceed to round 3 when all players seem to understand their role assignments.

### Playing the Game (Rounds 3-5)

Before beginning round 3, read the following playing instructions to the players.

The "rules" of the game are imbedded in the permitting procedures and the responsibilities of the various groups, agencies, and individuals as described.

Players may use any research resources available to them but the basic procedures explained in this booklet may not be altered. Laws and regulations unearthed by players through research may be incorporated into game play by assuming they are waived or not applicable. For example, players would assume the NPDES permit and NMFS approval are not required because these steps are not specifically included in the game. Scientific-environmental information is always admissible, if applicable.

Disputes may arise as to the acceptability of legal explanatory material found in references. These disputes will be resolved by the appropriate judge, who will hear both sides of the dispute. The judges' decisions are final. No appeals are permitted. All rulings by judges must be posted in plain sight of all the players, because once these rulings are made they become permanent game "rules" and apply to everyone for the remainder of the game. They may not be applied retroactively. Judges have the power to issue court orders temporarily removing from play players who unnecessarily obstruct game progress. If requested, judges may impose time limits if they feel this is necessary.

Agencies must process applications in the order in which they are received. When an application is returned to an applicant for revision, the agency begins work on the next application. Upon resubmission of the first, revised application, it is placed on the bottom of the stack to wait its turn.



Since the agencies will conduct their reviews together, and will often consult with each other, the room should be arranged so members of agencies can be seated in front, together, at one large table, or in a semi-circle facing the class.

### Round 3

At least one-half class period maybe devoted to further planning and research. During this time agencies develop check lists for evaluating projects, and project groups finish developing a detailed plan for an activity of their choosing within their assigned category. Each project planning group must complete the "Joint Permit Application." The information sheet "Game Permit Programs" will help teams determine which permits they must apply for. Each project design must incorporate sound ecological planning and be developed so it will be acceptable to the permitting agencies. When planners have specific questions, agencies furnish information from within their area of responsibility or expertise. References may be used. Each group should select a spokesman. A deadline for completion of applications may be set by the game leader.

When plans and applications are complete, planning groups give the completed "Joint Permit Application" and a drawing of the proposed project site and structures (on a copy of the Topo Land Use Map) to the Wetlands Board. Project planning teams must indicate on the "Record of Permitting Action" which permits they need.

The Wetlands Board, after it has received all applications, conducts a public hearing. At this time, each project is explained by the applicants.

A question and answer period follows, during which anyone may ask the applicants questions about their project. No revisions or official review of applications are to be made during this session.

### Round 4

Official review and revision (if necessary) of applications must begin with the Wetlands Board, which grants or denies a wetlands permit, based on the "Wetlands Guidelines." The Wetlands Board must seek the opinion of the Virginia Institute of Marine Science (VIMS) before taking action. If the applicant has failed to request a wetlands permit, and the Board feels one is needed, this should be noted on the application, and the application returned to the applicant for correction. If the applicant disputes the action of the Wetlands Board, the applicant may appeal to the Virginia Marine Resources Commission VMRC for a decision. If a project does not require approval of the Wetlands Board, the application is passed directly to the state agencies.

After Wetlands Board approval, the state agencies who are seated together in front of the room must rule on the permits within their authority. During this stage of the review process, the VMRC and the Virginia Water Control Board issue or deny the permits within their authority. Applications which these groups find incomplete or unsatisfactory are returned to applicants for revision. Disputes at this level are resolved by the state judge.

Federal agencies, who are also seated in front of the room, rule on applications after they have been completed to the satisfaction of state agencies. The United States Army Corps of Engineers (ACE) issues necessary permits for each project, taking into consideration the advice of the Environmental Protection Agency (EPA) on all environmental questions. The federal judge resolves disputes at this level.

The processes of review and revision continue until the projects have obtained all permits necessary. The game leader and/or the judges may set deadlines if necessary, but at least two projects must receive their permits before round 5 begins.

#### Round 5

The game leader makes the announcement: Mrs. Sook's heirs have contested the will with some success. Two million dollars will go to them, leaving only \$1,000,000 for property development. Now the Board of Supervisors has a difficult decision: which project is to be built?

An election for a new three member County Board of Supervisors is held. Nominations may be made by any player. Members of project teams with approved applications are not eligible to serve on this Board, due to obvious conflict of interest, but they may nominate and vote. Balloting is secret, one vote per player.

The final decision is the Board of Supervisors'. The people on this Board must put aside their former loyalties and do what they feel is best for the entire community. The Board may request a last brief question and answer session for each project under consideration. Project team members may call on the Chesapeake Club or the Commerce Club for assistance with this session, if they wish.

The Board of Supervisors holds a closed meeting to make its decision. It then convenes a public meeting and announces the winner. A spokesman explains the decision, which is final.

## BACKGROUND INFORMATION

Crab Creek County fronts on the Chesapeake Bay. Crabtown, an old town of 25,000 is located just south of a small tidal creek named Crab Creek. West of the creek and the town, there is a 10 mile wide band of rural land (farmed or wooded) which separates Crabtown from a large city. To the east is the Chesapeake Bay, which opens into the Atlantic only 20 miles away.

Of those 15,000 Crabtonians employed, roughly one-third commute to one of the two near-by big cities, one third works in Crabtown, and one third is involved in some way with commercial fishing or shellfishing. Most of the fishermen work out of a neighboring town which has docking and processing facilities.

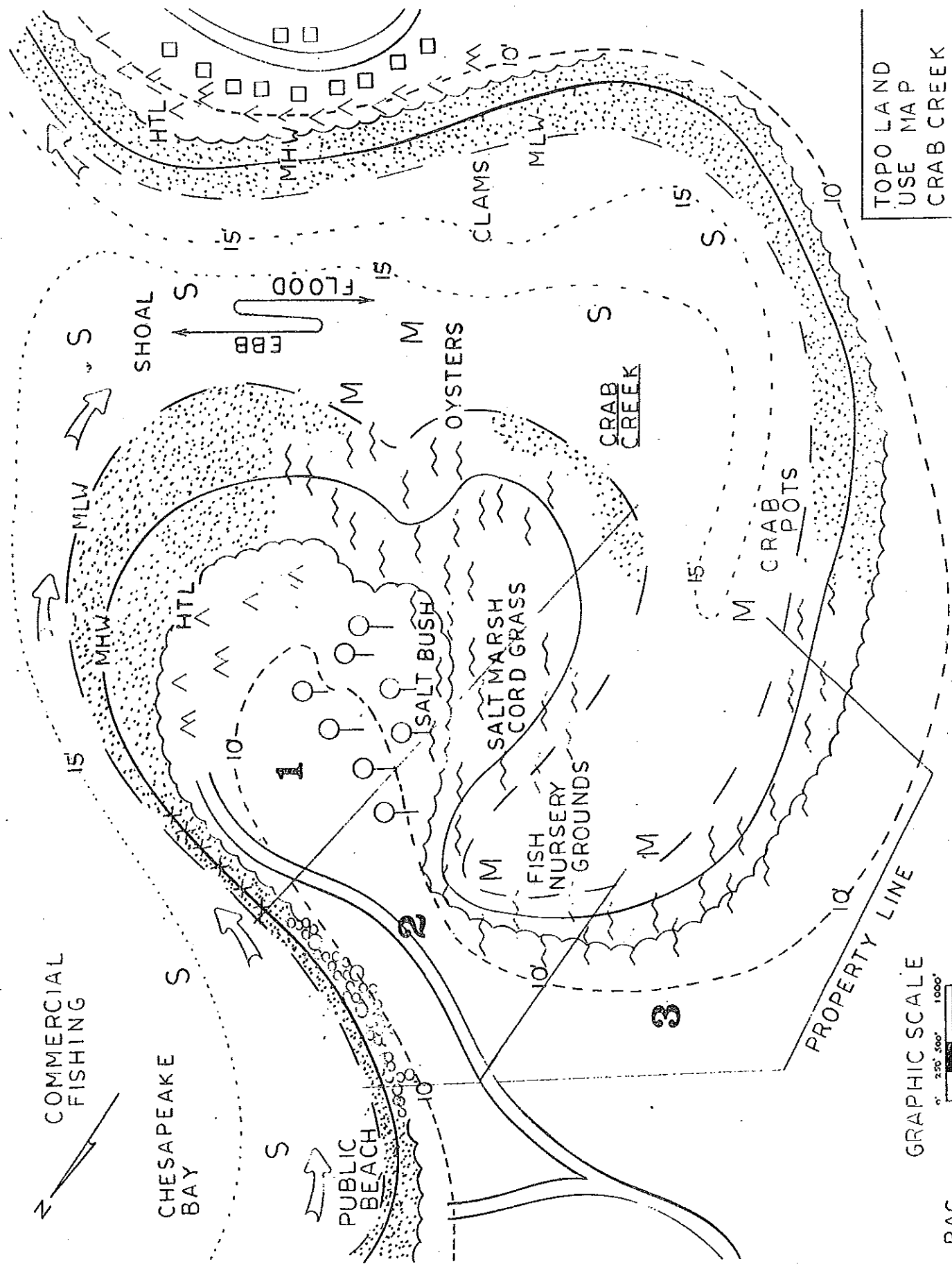
The average income in Crab Creek County is far below the state average. Town facilities (water, sewage, power, schools etc.) are adequate, but residents feel that they pay too much for these services. As compared to nearby communities, taxes are quite high. Residents are worried about the County's future. The county has no major productive businesses, and young people are moving to the cities for jobs.

A recent bequest is creating excitement and discord among the citizens of Crab Creek County. Mrs. Sook, the town's wealthiest resident has died and left three parcels of waterfront property to develop. In her will, she set forth four conditions for development.

1. Projects must be of benefit to Crab Creek County and its citizens.
2. The County's Board of Supervisors must select the three projects to be built from preliminary proposals made to them.
3. Only projects sponsored by private enterprise are to be considered.
4. Each of the three projects selected will receive \$1,000,000 from her estate for project implementation after all necessary permits have been obtained.

Because of the county's economic problems, the Board of Supervisors is particularly interested in projects which will contribute to the economic health of the County.

The Board of Supervisors is holding the deed to the land and the money. Construction will begin as soon as the three projects which the Board of Supervisors selects obtain necessary permits.



TOPO LAND  
USE MAP  
CRAB CREEK

GRAPHIC SCALE  
0' 250' 500' 1000'

R.A.C.

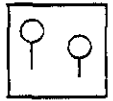
## LEGEND



MARSH



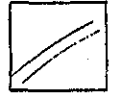
DUNES



TREES



ROCKS



ROADS



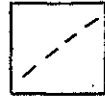
HOUSES



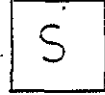
SAND BEACH



UNDERWATER MUD



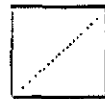
LAND CONTOUR



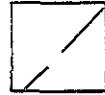
UNDERWATER SAND



ERODING BANK



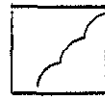
UNDERWATER CONTOUR



MEAN LOW WATER



MEAN HIGH WATER



HIGH TIDE LINE



DIRECTION OF LONGSHORE CURRENT

## JUDGES

### RESPONSIBILITIES AND ROLE

Judges have several responsibilities. They must be familiar with permitting programs, and may use reference materials and call on the Virginia Institute of Marine Science (VIMS) and the Environmental Protection Agency (EPA) for advice.

While they must maintain order and rule on disputes, their intervention must be specifically requested by an agency or individual, and may only be sought as a last resort after all other means of solving a problem have been exhausted. If necessary, they may impose court orders, set time limits, or take whatever action is necessary to solve problems. Judges have the power to issue a court order temporarily removing from play anyone who seriously obstructs permitting processes. Judges may consult with each other, but they rule independently: the state judge on matters over which states have jurisdiction, and the federal judge over federal matters. The judges may use the information sheet "Game Permitting Programs" to help them rule on disputes concerning jurisdiction. They must explain their decisions to all the players. They judges' rulings must be posted, and they become permanent game rules.

THE STATE JUDGE handles disputes involving the state agencies: Virginia Marine Resources Commission (VMRC), State Water Control Board (SWCB), and groups working with or advising these agencies. The state judge is the final authority for state level problems.

THE FEDERAL JUDGE assists with problems that are associated with the Army Corps of Engineers (ACE) permitting program.

## PROJECT PLANNING TEAMS

### RESPONSIBILITIES AND ROLE

As soon as project teams are assigned, members meet to develop their project plan. In order to plan as quickly and efficiently as possible, team members should familiarize themselves with the guidelines the various agencies will be using in their review, and with the ecological issues involved. This information will be presented during Round 2 through the slide lecture "Coastal Decisions" and the agency presentations which follow.

Background information on the area to be developed and a site map are provided. Using these, and any other sources desired, project members develop a project plan. The "Joint Permit Application" (pages 19-22) must be filled out in full, and a detailed and descriptive drawing must be included. Planners should be particularly careful to apply for all needed permits. The "Game Permit Program" information sheet may be helpful. Planners may, and should, feel free to ask questions of the permitting agencies and advisory groups or seek assistance from the clubs, The Chesapeake Club and the Commerce Club or are private special interest groups who may choose to give their support and assistance to any project, but they are also free to withdraw their support at any time.

After permit applications have been completed they are given to the local Wetlands Boards which subsequently conduct a public hearing during which planning teams present their plans.

It is important that planning teams move their application quickly and efficiently through the permitting, review, and revision process.

## WETLANDS BOARD

### RESPONSIBILITIES AND ROLE

The Wetlands Board is a local group, appointed by local governing authority (Board of Supervisors) as specified by the Virginia Wetlands Act of 1972. This act requires that Board decisions be based on the following policy:

"To preserve the wetlands and to prevent their despoilation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation."

The Wetlands Board must obtain an official opinion from the Virginia Institute of Marine Science (VIMS) before awarding or denying a permit.

Wetlands Guidelines, issued by the Virginia Marine Resources Commission (VMRC), is the Board's handbook. Board members should study it carefully, particularly pages 5-8 and 37-43. Wetlands Permits must be issued to those projects which meet the criteria outlined in the booklet.

The authority of Wetlands Boards covers only vegetated wetlands.\* Note also the exemptions to authority indicated on the "Game Permit Programs" information sheet. If the Wetlands Board decides to deny a permit, it must furnish the permit applicants with:

1. Letter and number designating the criterion not met (pages 37-43, Wetlands Guidelines).
2. Recommendations for an acceptable revision of project plans.

Project applicants have the option of appealing the Wetlands Board decision to the VMRC if they can show some documented evidence, from the Wetlands Guidelines or Virginia's Wetlands Act, that the Wetlands Board has not acted as it should or is in error.

\* Note: Recent legislation, the Coastal Primary Sand Dune Protection Act of 1980, extends the authority of Wetlands Boards to cover sand dunes in addition to vegetated wetlands. This Act restricts activities which would interfere with the natural flow of sand to and from primary (waterfront) dunes. The act is administered under the same general policies and procedures that Wetlands Boards use in managing vegetated wetlands.



## VIRGINIA MARINE RESOURCES COMMISSION (VMRC)

### RESPONSIBILITIES AND ROLE

According to Virginia law, the Virginia Marine Resources Commission (VMRC) must issue permits for uses of subaqueous (underwater) land. The purpose of this law is the protection and preservation of these resources for the good of all the people of the Commonwealth. Permitting authority under this law covers all internal waters and extends seaward for three miles.

To dump, build on, or remove materials from subaqueous lands, a Subaqueous Permit is required. Further, the VMRC will not issue this permit until the State Health Department (SHD) has approved sewage treatment plans, if sewage disposal is involved in a project plan. Therefore, the VMRC must consult with the State Health Department if sewage disposal is part of a project plan.

In making decisions about subaqueous permits, the VMRC must consider:

1. The effects of the project upon other users of Virginia waters, including marine and fisheries resources, wetlands, nearby activities, and anticipated benefits.
2. Side slopes of dredged area should not exceed two horizontal to one vertical slope.
3. To protect fish and shellfish population from the adverse effects of dredging, limitations may be imposed if the following species are present or nearby in commercially significant quantities: oysters, clams, crabs, spawning fish, larval fish.
4. Dredged material may not be temporarily placed at one location in the waterway, later to be redredged for proper disposal at another location.
5. Dredged material may not be permanently placed within the waterway or on most wetlands (exceptions made at the discretion of local Wetlands Boards). Dredged sand may be placed on beaches. Sites for dredge disposal must be approved by the VMRC, with every effort made to avoid creating ecological and aesthetic problems.
6. Private piers for non commercial purposes do not require subaqueous permits, however applicants planning to build piers for money-making purposes must obtain a permit. All piers should be open-pile and must clear the tops of existing vegetation.
7. Marinas need ample water for access and use of boats and the rights of nearby property owners must be respected.
8. Structures may not extend more than one-third across a waterway.
9. Dead end canals may not be constructed in the vicinity of waste-generating activities.
10. Sloped stone or rubble ripraps are preferred to vertical designs, and bulkheads must go behind existing wetlands.
11. Sediment transport patterns must be considered before approving jetties.
12. Mooring buoys may not be constructed within 200 feet of a recreational beach.

## STATE WATER CONTROL BOARD (SWCB)

### RESPONSIBILITIES AND ROLE

The State Water Control Board (SWCB) is particularly concerned with matters affecting water quality. If a project involves any discharge of wastes or dredge and fill materials into navigable waters, a "401 Certificate" must be obtained. Although this certification program is handled by a state agency in Virginia, the process was created by federal law: The Federal Water Pollution Control Act Amendments of 1972. It is administered by the Environmental Protection Agency (EPA), which has delegated responsibility to the SWCB in Virginia. If the proposed activities will not degrade water quality below existing levels of quality, the SWCB issues the certificate. The information folder "Ugly Faces of Pollution" may provide some ecological information useful to this Board. Disputes should be referred to a state judge.

The SWCB should look for assurances from project planners that they have made plans which provide for protection of water quality.

ADVISORY AGENCIES  
RESPONSIBILITIES AND ROLE

Advisory agencies advise anyone who asks about scientific or ecological matters. Agency representatives may use "The Ugly Faces of Pollution" and any other references available. It is important that their advice be built on scientific fact. The advisory agencies should expect to do research work with references in response to requests from other agencies, judges, or clubs.

VIRGINIA INSTITUTE OF MARINE SCIENCE (VIMS)

State and local groups and individuals frequently turn to this agency for scientific advice. In so far as possible, the VIMS representative must assist anyone who needs scientific information. Brief informative presentations on key environmental issues may be requested by agencies or judges. VIMS must assist the Wetlands Board by assessing projects involving wetlands.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Federal agencies depend on the EPA for assistance and advice. Advisory review of ACE decisions by EPA is routine. The environmental interests of EPA are broad: EPA offers opinions on water quality, impact on wetlands, and marine life among other things. The EPA may disagree with local or state level decision. Working closely with the Army Corps of Engineers, the EPA plays a major role in coastal decision making. In addition to its other responsibilities, the EPA must approve proposed dredge spoil disposal sites before the ACE will grant its permit. EPA may use various sources for ecological research. It may find the VMRC booklets "Wetlands Guidelines" and "Subaqueous Guidelines" helpful as its members consider the wisest places to put dredge spoil.

STATE HEALTH DEPARTMENT (SHD)

The advice of the State Health Department is sought by local and state agencies on matters concerning sewage disposal. The VMRC will not issue its permit until the SHD has reviewed and approved sewage disposal plans. The "Ugly Faces of Pollution" may be used as a reference, as may other information sources the SHD has available. The particular area of concern for the SHD is the effect of a proposed project on private and commercial shellfishing grounds.

## UNITED STATES ARMY CORPS OF ENGINEERS (ACE)

The United States Army Corps of Engineers, sometimes referred to "The Corps" or "ACE" exercises considerable environmental management power. Much of this power is derived from the United States River and Harbor Act of 1899, a federal law which provides for the maintenance of navigability of waterways (Section 10). In recent years, the responsibilities of the Corps have been expanded by the Department of the Army and federal courts to cover all structures or activities affecting navigable waters, and the wetlands adjacent to them.

Section 404 of the Federal Water Pollution Control Act of 1972 gives the Corps the responsibility of regulating the discharge of dredged or polluted fill material into the Nation's waters. Federal courts have ruled that the jurisdiction of Corps management under section 404 extends to the high tide line in non-vegetated wetlands, and to the upper limit of vegetation in vegetated wetlands. In administering Section 404, the Corps is assisted by the Environmental Protection Agency (EPA). The Corps only issues its permit after EPA has approved a proposed dredge spoil disposal site. The Corps relies on EPA for advice and assistance with environmental issues.

Although the Corp's review of each project may cover many aspects, and is mandated by more than one federal law, only one permit is issued. The Corps does not consider issuing this permit until all appropriate local and state permits have been awarded.

In addition to the areas of responsibility mentioned above, the Corps must approve plans for canals, dams and ocean dumping.

Decisions of the Corps are based primarily on one consideration: Is the project in the public interest?

Factors the Corps always considers include:

1. Effects on wetlands, fish, wildlife, water quality, and scenic and recreational value.
2. Interference with nearby properties or projects.
3. Flood plains.
4. Necessity of locating on the water.

The Corps particularly wishes to avoid or minimize discharges during spawning season, discharges which affect the movement of aquatic species, discharges into wetlands, and discharges into breeding or nesting areas.

PRIVATE INTEREST CLUBS  
RESPONSIBILITIES AND ROLE

Chesapeake Club

This Club is a private, special interest group. The group's special interest is ecology, and it fights to preserve and protect the environment. Club members usually oppose any activity which impacts on the environment.

The only power this group possesses is what it generates itself, through getting involved in environmental issues. Environmentally oriented project planners welcome the support of this group, because Chesapeake Club members work hard for causes they believe in. Their volunteer lawyer is skillful at finding procedural errors in opponents applications. They are adept at confusing agencies and delaying action on opponents' projects through introduction of irrelevant or emotional issues.

Commerce Club

The Commerce Club usually supports activities which the Chesapeake Club opposes. Club members are ambitious business people who want economic growth for the community.

Like the Chesapeake Club, this is a private club which is free to be choosy about activities it will support. Most of the members are prominent socially and professionally, and businesses profit from the support of this club.

The club has paid lawyers who sometimes are successful in halting rival projects on a technicality. The group recognizes the importance of public support and is noted for its clever public relations programs.

GAME PERMIT PROGRAMS\*

	Local Wetlands Board	Virginia Marine Resources Commission	State Water Control Board	U.S. Army Corps of Engineers
Laws or programs administered	Virginia Wetlands Act of 1972, Coastal Dune Act of 1980	Virginia Subaqueous Law	Federal Water Pollution Control Act Amendments 1972, Sec. 401	Federal Water Pollution Control Act Amendments, Sec. 404  U.S. River and Harbor Act of 1899
Purpose	Preservation of vegetated wetlands, sand dunes	Protection of public property and marine resources	Maintenance and enhancement of water quality	Protect navigable waters and maintain the quality of the nations waters
Permit Authority	Issues Wetlands Permits appeal to VMRC, further appeal to State Judge allowed	issues permits, further appeal to State Judge allowed	Awards "401 Certificates, as required by EPA, further appeal to State Judge allowed	Issues "Corps Permit (ACE)," further appeal to Federal Judge allowed
Scope	local/state	state	state/federal	federal
Geographic extent	MLW to 1.5 times mean tide range (approx. to upper limits of marsh vegetation)	MLW to three miles seaward and internal waters	navigable waters and the wetlands adjacent to them	navigable waters and the wetlands adjacent to them
Controlled activities	all activities disturbing vegetated wetlands or sand dunes	structures on or over state bottoms and all bottom-disturbing activities	all activities resulting in discharges into or affecting navigable waters	all structures or work in or affecting navigable waters Disposal of dredge and fill material
Exemptions	Noncommercial, open pile piers Non-vegetated wetlands	private piers, public water access facilities	none	none
Advisory opinions	VIMS, SWCB, SHD	VIMS, SWCB, SHD must approve sewage disposal plans	VIMS, EPA	EPA comments on environmental issues and must approve dredge spoil sites

\*The "laws" and "agencies" presented here are simplified and have been adapted for this simulation game.

JOINT PERMIT APPLICATION

This permit is designed to assist the various local, state, and federal agencies in reviewing projects for permits and approval.

Technical assistance and advice are available from agencies during planning, review, and revision sessions.

One completed Joint Permit Application must be filled out for each project.

1. Name of Applicant(s)
2. Concise description of proposed activity.
3. Name of waterway \_\_\_\_\_.
4. Project purpose
5. What public benefits will come from your project?
6. Will you be dumping, filling, or altering wetlands? \_\_\_Yes \_\_\_No
7. Will there be any discharge (direct or indirect) of waste material (including dredge spoil, sewage, and any other type of discharge) into state waters at any time during your project?  
\_\_\_Yes \_\_\_No.

8. How long will it take to complete your project? \_\_\_\_\_
9. What will be the total cost of your project?
10. Will your project involve bulkheads, dredging, filling, jetties, or riprap? \_\_\_ Yes \_\_\_ No

If yes, answer questions a-i

- a. what basic construction materials will you use?
  - b. where will the work be done in relation to the tide lines?
  - c. how many truckloads of material do you plan to dredge?  
\_\_\_\_\_
  - d. where will you put the dredge material?
  - e. what type of material will you dredge? \_\_\_\_\_
  - f. is fill to be used? \_\_\_ Yes \_\_\_ No Where? \_\_\_\_\_
  - g. where will fill come from? \_\_\_\_\_
  - h. what is the approximate total area to be filled? \_\_\_\_\_
  - i. how far channelward will the project extend? \_\_\_\_\_
11. Will your project involve piers, boat ramps, moorings, or marinas? \_\_\_ Yes \_\_\_ No.

If yes, answer questions j-1

- j. what basic construction materials will you use?
  - k. how far channelward will the structure extend? \_\_\_\_\_
  - l. how many vessels will be accommodated? \_\_\_\_\_
12. On the extra site map provided, draw the project in detail. Use a separate piece of paper to provide any information which you feel will be helpful to agencies in assessing your project.

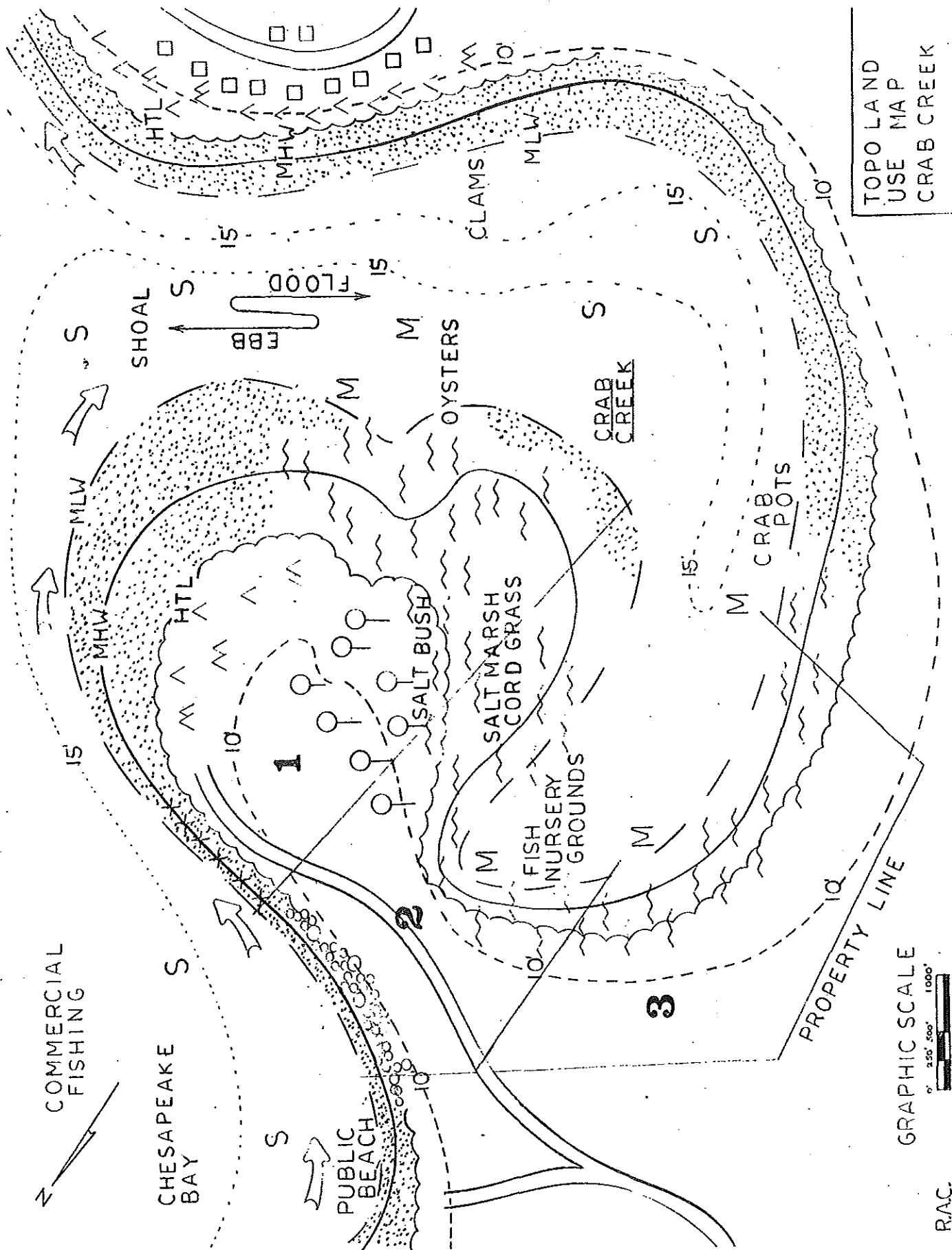


RECORD OF PERMITTING ACTION

Applicants place an X in the box to the left of the permits to be obtained. Agencies place an X in the box to the right when the permit is granted.

PERMITS	<u>Agency Use Only</u>
<input type="checkbox"/> Wetlands Permit	<input type="checkbox"/> permit granted <hr/> signature of agency representative
<input type="checkbox"/> Subaqueous Permit	<input type="checkbox"/> permit granted <hr/> signature of agency representative
<input type="checkbox"/> 401 Certificate	<input type="checkbox"/> certificate awarded <hr/> signature of agency representative
<input type="checkbox"/> ACE Permit	<input type="checkbox"/> permit granted <hr/> signature of agency representative

If agencies must return this application to applicants for revision, briefly note reasons for return, and suggested remedial action.



TOPO LAND  
 USE MAP  
 CRAB CREEK

GRAPHIC SCALE  
 0 250' 500' 1000'

R.A.C.

## TEACHING MATERIALS

Most of the resource and audio-visual materials listed below are available from the VIMS-Sea Grant Marine Education Center. Copies of publications listed under "MEMS Holdings: LAW, IMPACT, MANAGEMENT" may be obtained in microfiche form for \$.75 each, or paper copies for the cost of copying. Please mention both the MEMS number and the title when ordering. Audio-visual materials may be borrowed from the Center. Films rent for \$7.50 each.

In addition to the materials mentioned in this publication, the Center houses an extensive collection of educational materials useful for teaching many marine topics. The Marine Education Materials System (MEMS) is multidisciplinary: maritime music, art, and literature are among the topics other than marine science found in MEMS.

To obtain materials for use with this game or to find out more about other marine education materials, write or call:

Virginia Institute of Marine Science  
Sea Grant Marine Education Center  
Gloucester Point, Virginia 23062  
Telephone (804) 642-2111, ext. 111

### AUDIO-VISUAL MATERIALS

16 mm Color Films

High School and Adult

The Beach - A River of Sand. 20 min.  
Billion Dollar Marsh. 26 min.  
Commercial Fishing in the Chesapeake. 36 min.  
Estuarine Heritage. 28 min.  
It's Your Coast. 28 min.  
A Look at Virginia's Natural Resources. 27 min.  
The Salt Marsh. 28 min.  
Shellfishing in the Chesapeake. 25 min.  
The Story of Oil and Gas. 27 min.  
Watermen of the Chesapeake. 28 min.

### Filmstrips/Cassettes

Chesapeake at Bay - 20th Century. 14 min.  
The Ecology of Mud Flats. 9 min.  
The Ecology of Sandy Beaches. 9 min.  
Virginia's Marshes - A World Between. 10 min.

### Slide Lecture

Coastal Decisions. 10 min.

MEMS Holdings: Law, Management, Impact

High School and Adult Materials

000076

1976

KNIGHT, H.

INTERNATIONAL FISHERIES MANAGEMENT

LA: LSU MAR SCI TEACH AID, CENT FOR WETLAND RESOURCES, LA STATE UNIV.  
BATON ROUGE, LA: 4PP.

SEAFOOD; FISHERY; RESOURCE; MANAGEMENT; CONSERVATION; LAW; BIOLOGY  
ARTICLE; ACTIVITY

000077

1973

KNIGHT, H.

INTERNATIONAL LAW OF FISHERIES

LA: LSU MAR SCI TEACH AID, CENT FOR WETLAND RESOURCES, LA STATE UNIV.  
BATON ROUGE, LA; 4PP.

SEAFOOD; FISHERY; LAW; RESOURCE; ECONOMICS; CONSERVATION; BIOLOGY  
ARTICLE; ACTIVITY

000087

1965

BAILEY, R.; BIGGS, F.

LET'S BE OYSTER FARMERS

VA: VA INST OF MAR SCI, GLOUCESTER PT. VA; 59PP.

OYSTER; MOLLUSK; BIOLOGY; AQUACULTURE; HISTORY; LIFE CYCLE;  
REPRODUCTION; LAW; MANAGEMENT; HARVESTING; POLLUTION; SEAFOOD  
BOOKLET

000088

N.D.

SHAFFER, T.

A LESSON PLAN FOR A LAND USE SIMULATION GAME

UNKNOWN; 8PP.

SIMULATION GAME; WETLAND; MANAGEMENT

LESSON PLAN

000096

1962

JAMES, C.

CURRICULUM GUIDE - NAVIGATION FOR FISHERMEN

NC: VOCAT MAT LAB, DIV OF VOCAT EDUC. STATE DEPT OF PUB INSTRU, RALEIGH,

NC; 53PP.

NAVIGATION; SAFETY; WEATHER; LAW

CURRICULUM

000111

1975

UNKNOWN

MARINE CAREERS

CR: OR STATE UNIV MAR SCI CENT, NEWPORT, CR; 35PP.

CAREER; TRAINING; ENGINEERING; TRANSPORTATION; NAVIGATION; HARVESTING;  
FISHERY; INSTRUCTION; RESOURCE; MANAGEMENT; SEAFOOD  
CONFERENCE PROCEEDINGS

000118

1975

DEWEES, C.; POOPER, J.

MARINE MAMMALS

CA: SG MAR ADV PUB LEAFLET 2274, UNIV OF CA; 7PP.

MAMMAL; WHALE; DOLPHIN; PORPOISE; SEAL; SEA LION; WALRUS; OTTER;  
BIOLOGY; LAW  
BOOKLET

000139

1975

OBIS

OBIS OIL SPILL

CA: OUTDOOR BIOL INSTRUC STRATEGIES, UNIV OF CA, BERKELEY, CA; 5PP.

POLLUTION; OIL; PHYSICS; PLANT; BIOLOGY; RECREATION; IMPACT STUDY  
GUIDE

000144

1968

TABER, R.; LAPORTE, L.; SMITH, E.

AN OCEANOGRAPHIC CURRICULUM FOR HIGH SCHOOLS

DC: US NAVAL OCEAN OFF, WASHINGTON, DC; 30PP.

CAREER; BIOLOGY; CHEMISTRY; GEOLOGY; PHYSICS; WAVE; TIDE; CURRENT;  
NUTRITION; METEOROLOGY; ICE; ESTUARY; TRANSPORTATION; POLLUTION;  
RECREATION; ENGINEERING; OIL; LAW; OCEAN FLOOR; LIMNOLOGY; SOUND;  
BIBLIOGRAPHY  
CURRICULUM

000203

1970

HON, W.

SEA FLAVOR PROGRAMS ABOUT COASTAL RESOURCES FOR YOUR CIVIC CLUB

NC: REG MAR SCI PROJ, BEAUFORT, NC; 11PP

MANAGEMENT; RESOURCE: POLLUTION; LAW; FISHERY; ECONOMICS; SEAFOOD;  
RECREATION; WETLAND; OIL; FOOD WEB; AQUACULTURE; PLANKTON; FIELD  
TRIP; TRAINING; INSECT; DIRECTORY

REFERENCE

000211

1977

STAFF

SEA WORLD

CA: SEA WORLD COMMUNICATIONS, SAN DIEGO, CA; 49PP.  
MANAGEMENT; RESOURCE; COASTLINE; HISTORY; POPULATION; CONSERVATION;  
WETLAND; INSTRUCTION; FISH; REPRODUCTION; BIOLOGY; HUMANITIES; FIELD  
TRIP; ART; LITERATURE; REVIEW; BIBLIOGRAPHY; SAND; WAVE; PLANT;  
BEACH; DUNE; SALTWATER AQUARIUM  
REFERENCE; CURRICULUM

000229

1972

US COAST GUARD

THE SKIPPER'S COURSE

CC: DEPT OF TRANSPORTATION, US COAST GUARD; 86PP.

RECREATION; SAFETY; LAW; WEATHER; EQUIPMENT; NAVIGATION; VOCABULARY  
UNIT

000246

1976

PFUND, R., ED.

STUDENT SYMPOSIUM ON MARINE AFFAIRS

HI: SG COLL PROG, UNIV OF HI; 104PP.

AQUACULTURE; MANAGEMENT; FISHERY; LAW; LOBSTER; CRUSTACEAN; TURTLE;

REPTILE; FISH; EROSION; CORAL; HERITAGE; OIL; GEOLOGY; BIOLOGY;

OCEAN FLOOR; RESOURCE

CONFERENCE PROCEEDINGS

000254

1970

UNKNOWN

THOSE ALLURING CAREERS IN OCEAN SCIENCES

THE KIPLINGER MAGAZINE, WASHINGTON, DC; 3PP.

CAREER; PHYSICS; CHEMISTRY; GEOLOGY; BIOLOGY; AQUACULTURE; RESOURCE;  
MANAGEMENT

ARTICLE

000258

1972

GOODWIN, H.

TODAY'S YOUTH IN TOMORROW'S SEA

CR: PACIFIC SG ADV PROG; 12PP.

CAREER; DIVING; PHYSICS; CHEMISTRY; GEOLOGY; BIOLOGY; INDUSTRY;

RESOURCE; INSTRUCTION; AQUACULTURE; CONSERVATION; LAW; ECONOMICS;

EMPLOYMENT

ARTICLE

000259

1971

GOODWIN, H.

TODAY'S YOUTH IN TOMORROW'S SEA

OR: OR STATE UNIV, EXT MAR ADV PROG. SG; 9PP.

CAREER; DIVING; INSTRUCTION; PHYSICS; CHEMISTRY; GEOLOGY; BIOLOGY;

LAW; ECONOMICS; AQUACULTURE; EMPLOYMENT  
ARTICLE

000260

1977

GOODWIN, H.

TODAY'S YOUTH IN TOMORROW'S SEA

OR: OR STATE UNIV, EXT MAR ADV PROG; 12PP.

CAREER; PHOTOGRAPHY; SHIPBUILDING; INDUSTRY; DIVING; RESOURCE;  
EMPLOYMENT; SEAFOOD; FISHERY; MANAGEMENT; TRADE; RECREATION;  
AQUARIUM; MUSEUM; INSTRUCTION; COMMUNICATION; AQUACULTURE;  
OIL; SUBMERSIBLE

ARTICLE

000263

1970

PRESIDENT'S TASK FORCE ON OCEANOGRAPHY

MOBILIZING TO USE THE SEAS

DC: SUPERINTENDENT OF DOCUMENTS, US GOVT PRINTING OFF, WASHINGTON;  
12PP.

MANAGEMENT; RESOURCE; POLLUTION; EROSION; WEATHER; TRANSPORTATION;  
CONSERVATION; LAW; RECREATION; ECONOMICS; ENGINEERING

BOOKLET

000265

1966

COWEN, R.

BENEATH THE SURF...CHALLENGE AND REWARD

CC: NAT OCEAN ASSOC, WASHINGTON, DC; 17PP.

SEAFOOD; LAW; RESOURCE; OCEAN FLOOR; INDUSTRY; OIL; SHELL; FOOD  
WEB; HARVESTING; FISHERY; AQUACULTURE; DIVING; SUBMERSIBLE; SOUND;  
LIGHT

ARTICLES

000276

1977

CUMMINS, K.

FROM HEADWATER STREAMS TO RIVERS

THE AMER BIOL TEACH; 39(5): 305-312.

STREAM; RIVER; PLANT; TEMPERATURE; DETRITUS; BACTERIA; ALGAE; FISH;  
SEDIMENT; BIOLOGY; LIGHT; TURBIDITY; MANAGEMENT; PHOTOSYNTHESIS;  
RESPIRATION

ARTICLE

000281

1959

BAILEY, R.

TREASURES FROM THE SEA

VA: EDUC SER NO 10, VA FISH LAB, GLOUCESTER PT. VA; 22PP.

HISTORY; SEAFOOD; FISHERY; INDUSTRY; OYSTER; FISH; CRAB; RECREATION;

CONSERVATION; MANAGEMENT  
BOOKLET

000301

1978

STAFF

SEA WORLD

CA: SEA WORLD COMMUNICATIONS, SAN DIEGO, CA; 65PP.

VOCABULARY; BIRD; BIOLOGY; POPULATION; REPRODUCTION; POLLUTION;  
ENVIRONMENT; FISH; REEF; CTENOPHORE; COELENTERATE; PLANKTON; FOOD  
WEB; AQUARIUM; SEAL; RESEARCH; MAMMAL; SHARK; SOCIAL STUDIES;  
TRAINING; FIELD TRIP; PHOTOGRAPHY; DIVING; HERITAGE; TRADE;  
MILITARY; ART; LITERATURE; FISHERY; RECREATION; SHELL; MOLLUSK;  
HISTORY; FOSSIL; ANATOMY; ICE; FRESH WATER; SALINITY; TEMPERATURE;  
ECONOMICS; SEAFOOD; NUTRITION; CURRENT; PHYSICS; OIL; REVIEW;  
PROTECTION; COPEPOD; UPWELLING; PHOTOSYNTHESIS; CAREER; GEOLOGY;  
MANAGEMENT; TRANSPORTATION; AQUACULTURE; EMPLOYMENT; RESOURCE;  
INSTRUCTION; CONSERVATION; MATH; BIBLIOGRAPHY; DIRECTORY  
REFERENCE; ARTICLE; ACTIVITY

000305

1977

HEITZMANN,

AMERICA'S MARITIME HERITAGE: FROM SAIL POWER TO NUCLEAR POWER - BOOK  
11

PA: CON-STRAN PRODUCTIONS, PHILADELPHIA, PA; 33PP.

HERITAGE: ENERGY; HARVESTING; FISH; NUTRITION; SEAFOOD; ART; FISHERY;  
RECREATION; LAW; CURRENT; TIDE; PHYSICS; OIL; MILITARY;  
TRANSPORTATION; VESSEL; MUSIC; BIBLIOGRAPHY; DIRECTORY; MUSEUM  
WORKBOOK

000308

1975

DEWEES, C.; POOPER, J.

ESTUARY ECOLOGY

CA: SG MAR ADV PUB, UNIV OF CA; 4PP.

ESTUARY; ENVIRONMENT; FRESH WATER; SALINITY; SEAFOOD; INDUSTRY;  
BIOLOGY; MANAGEMENT; VOCABULARY  
BOOKLET

000382

1978

HAHN, H.; WILKIE, D.

OCEANOGRAPHY - SELECTED REFERENCES

CA: THE AQUAR, SCRIPPS INST OF OCEAN/UNIV OF CA, LA JOLLA, CA; 20PP.

BIBLIOGRAPHY; CAREER; PHYSICS; GEOLOGY; REEF; CORAL; CHEMISTRY;  
ENGINEERING; DIVING; NAVIGATION; HISTORY; LAW; BIOLOGY; POLLUTION;  
ALGAE; SHELL; IDENTIFICATION; FISH; SHARK; FISHERY; BIRD; REPTILE;  
MAMMAL; PERIODICAL  
REFERENCE



000399

1978

ESPARCIA, S.; TAYLOR, D.

ADVENTURE AFLOAT - INSTRUCTOR EDITION

WA: OUTDOOR EMPIRE PUBLISHING INC. SEATTLE, WA; 79PP.

SAFETY; RECREATION; VESSEL; FIELD TRIP; VOCABULARY; LAW; EQUIPMENT;

NAVIGATION; WEATHER

CURRICULUM

000400

1975

CARLOZZI, C.; KING, K.; NEWBOLD, W.

ECOSYSTEMS AND RESOURCES OF THE MASSACHUSETTS COAST

MA: MA COASTAL ZONE MANAGEMENT PROG, BOSTON, MA; 69PP.

GEOLOGY; COASTLINE; WAVE; ENVIRONMENT; MANAGEMENT; WETLAND; PLANT;

DUNE; BEACH; SAND; MUDFLAT; ZONATION; INTERTIDAL AREA; ESTUARY;

RESOURCE; BIOLOGY; AQUACULTURE; VOCABULARY; BIBLIOGRAPHY

BOOKLET

000465

1974

CONLEY

ECONOMIC AND POLITICAL EXPLOITATION OF MARINE RESOURCES

DE: COAST PROJ UNIT 235, 310 WILLARD HALL, UNIV OF DE, NEWARK, DE;

34PP.

SOCIAL STUDIES; HUMANITIES; ECONOMICS; RESOURCE; LAW; CONSERVATION;

WHALE; MAMMAL; SEAL; BIBLIOGRAPHY; OCEAN FLOOR; TRANSPORTATION

UNIT

000468

1974

HAGEN

POLITICAL DECISION-MAKING: ROLE PLAYING ACTIVITIES ON THE DELAWARE  
COASTAL ZONE ACT

DE: COAST PROJ UNIT 238, 310 WILLARD HALL, UNIV OF DE, NEWARK, CE;

19PP.

SOCIAL STUDIES; HUMANITIES; MANAGEMENT; ECONOMICS; INDUSTRY; CAREER;

COASTLINE; POLLUTION; RECREATION

UNIT

000512

1963

INTERAGENCY COMMITTEE ON OCEANOGRAPHY

BIBLIOGRAPHY OF OCEANOGRAPHIC PUBLICATIONS

DC: US GEOLOGICAL SURVEY; 23PP.

BIBLIOGRAPHY; PHYSICS; POLLUTION; SEDIMENT; GEOLOGY; OCEAN FLOOR; LAW;

NAVIGATION; HISTORY; EQUIPMENT; SAFETY; DIVING; PHOTOGRAPHY;

METEOROLOGY; RESOURCE; BIOLOGY; SEAWEED; FISH; FISHERY; MAMMAL; BIRD;

MOLLUSK; CAREER; TRAINING; DIRECTORY; FILM LIST; PERIODICAL

REFERENCE

000545

1978

ISIS STAFF

THE OCEAN

FL: FL STATE UNIV, TALLAHASSEE, FL; 88PP.

BIOLOGY; BENTHOS; PLANKTON; NEKTON; OCEAN FLOOR; TIDE; CURRENT; WAVE;  
COASTLINE; SAND; ZONATION; INTERTIDAL AREA; WETLAND; ESTUARY;  
SALINITY; FISH; FOOD WEB; POLLUTION; MANAGEMENT; ECONOMICS;  
POPULATION; CHEMISTRY; HYDROLOGIC CYCLE; PHYSICS; GEOLOGY; PLATE  
TECTONICS; ADAPTATION; OSMOSIS; ICE; INSTRUCTION  
CURRICULUM

000570

1977

MERRITT, L.

WATER QUALITY: AN INTRODUCTION

THE AMER BIOL TEACH; 39(5): 313-315

MANAGEMENT; POLLUTION; RESOURCE; RECREATION; HABITAT; INDUSTRY;  
NAVIGATION; OXYGEN; BACTERIA; TEMPERATURE  
ARTICLE

000571

1977

CCON, H.; PRICE, C.

WATER-RELATED TEACHING ACTIVITIES

OH: ERIC/SMEAC CENT FOR SCI, MATH, AND ENVIRON EDUC, COLUMBUS, OH;  
149PP

HYDROLOGIC CYCLE; PLANT; PHYSICS; CHEMISTRY; BIOLOGY; ICE;  
TEMPERATURE; POLLUTION; EROSION; WEATHER; AQUARIUM; MATH; SOCIAL  
STUDIES; HUMANITIES; ART; LITERATURE; CONSERVATION; MANAGEMENT;  
SALINITY; FRESH WATER; TURBIDITY; INSECT; EQUIPMENT; DEPTH;  
PLANKTON; SEDIMENT; MUSIC; TIDE; OIL; TRANSPORTATION; RESOURCE;  
ENERGY; WETLAND; FILM LIST; DIRECTORY; FILMSTRIP LIST  
ACTIVITY: LAE EX; CEMC

000573

1976

NATURAL RESOURCES DEFENSE COUNCIL, INC.

WHO'S MINDING THE SHORE?

DC: OFF OF COASTAL ZONE MANAGEMENT, WASHINGTON, DC; 51PP.

MANAGEMENT; COASTLINE; ENVIRONMENT; OIL; CONSERVATION; RECREATION;  
INDUSTRY; ESTUARY; WETLAND; BEACH; DUNE; DIRECTORY  
BOOKLET

000603

1973

BEDARD, A.; BELLAVANCE, R.; BLAIS, M.; HARTMAN, R.; HAYS, R.;  
HODGKINSON, C.; WHITAKER, D.; WIPER, S.

MARINE AND ENVIRONMENTAL STUDIES FIELD MANUAL

RI: TITLE III, ESEA PROJ, CRANSTON-WARWICK, RI; 139PP.

BEACH; DUNE; GEOLOGY; SAND; COASTLINE; PROFILE; ZONATION; TEMPERATURE;  
COLLECTING; PLANT; DENSITY; WAVE; PHYSICS; NEKTON; BIOLOGY;  
FISH; FOOD WEB; ANATOMY; MIGRATION; PLANKTON; COPEPOD; CRUSTACEAN;  
LIFE CYCLE; CRAB; BARNACLE; ADAPTATION; CRAYFISH; LOBSTER; DIGESTION;  
EXCRETION; CIRCULATION; RESPIRATION; REPRODUCTION; HERMIT CRABS;  
SHRIMP; ARTEMIA; ISOPOD; WETLAND; EQUIPMENT; TIDE; TIDE POOL;  
INTERTIDAL AREA; POPULATION; POLLUTION; CHEMISTRY; OXYGEN; PH;  
TURBIDITY; HARDNESS; MOLLUSK; IDENTIFICATION; MUSSEL; CLAM; SNAIL;  
OYSTER; SCALLOP; OCTOPUS; WORM; NAVIGATION; SEAWEED; PHOTOSYNTHESIS;  
LIGHT; ALGAE; SPONGE; COELENTERATE; REGENERATION; LAW; SOCIAL  
STUDIES; CURRENT; ECONOMICS; PLATE TECTONICS; SEDIMENT; SALINITY  
CURRICULUM

000621

1976

DEWEES, C.; POPPER, J.

MARINE RESOURCE LAWS AND REGULATIONS

CA: SG MAR ADV PUB LEAFLET 2553, UNIV OF CA, BERKELEY, CA; 2PP.

FISH; LAW; CONSERVATION; MANAGEMENT

ARTICLE

000643

1977

PFUND, R.

STUDENT SYMPOSIUM ON MARINE AFFAIRS

HI: UNIV OF HI SG COLL PROG; 255PP.

ENGINEERING; RESOURCE; FISHERY; MANAGEMENT; AQUACULTURE; BIOLOGY;

ENERGY; TEMPERATURE; CONSERVATION; SHARK; FISH; INDUSTRY; DOLPHIN;

MAMMAL; LAW; RESEARCH; OIL; POLLUTION; COASTLINE; PROTECTION; CORAL;

REEF; COELENTERATE; EEL; PHOTOSYNTHESIS; LIFE CYCLE

RESEARCH PAPERS

000644

1975

LACKEY, R.

TEACHING WATER RESOURCE MANAGEMENT WITH THE AID OF A

COMPUTER-IMPLEMENTED SIMULATOR

VA: VA WATER RESOURCES RESEARCH CENT, VPI & SU, BLACKSBURG, VA; 55PP.

MANAGEMENT; IMPLEMENTATION; RESOURCE; BIBLIOGRAPHY

CURRICULUM

000668

1978

DECKER, C.; HOWARD, R.; KELLEY, J.

LET'S GO FISHING - A FISH AND FISHING PROJECT

NY: DEPT OF NATURAL RESOURCES, NY STATE COLL OF AGRICULTURE AND LIFE  
SCIENCES, CORNELL UNIV, ITHACA, NY; 34PP.

HARVESTING; RECREATION; FIELD TRIP; EQUIPMENT; VOCABULARY; KNOT;

SAFETY; LAW; CONSERVATION; IDENTIFICATION; ANATOMY; FISH; HABITAT;

SEAFOOD; BIBLIOGRAPHY; UNIT

## References and Materials Used in Preparing This Publication

- Brehmer, M. and F. Biggs. N.D. The Ugly Faces of Pollution.  
Virginia Institute of Marine Science.
- Council on the Environment. 1979. Coastal Management: A Description  
of Virginia's Coastal Resource Management Activities and their  
Coordination. Draft Number Four (unpublished).
- Council on the Environment. N.D. Virginia's Environment. 1 p.
- Virginia Coastal Resources Management Program. 1979. Report of the  
Secretary of Commerce and Resources to the Governor and the  
General Assembly of Virginia. Senate Document No. 8, 86 pp.
- Virginia Institute of Marine Science. N.D. Shoreline Permits.  
(unpublished) 4 p.
- Virginia Marine Resources Commission. N.D. Joint Permit Application,  
Local-State-Federal. Commonwealth of Virginia.
- Virginia Marine Resources Commission. 1979. Subaqueous Guidelines.  
9 pp.
- Virginia Marine Resources Commission. 1974. Wetlands Guidelines.  
47 pp.

## ADDRESSES

- |   |  |
|---|--|
| U.S. Army Corps of Engineers<br>Norfolk District, 803 Front Street<br>Norfolk, Va. 23510<br>(804) 441-3652  | Council on the Environment<br>903 Ninth St. Office Building<br>Richmond, Va. 23219<br>(804) 786-4500                       |
| Virginia Institute of Marine Science<br>Gloucester Point, Va. 23062<br>(804) 642-2111   | U.S. Environmental Protection<br>Agency<br>Region III<br>6th and Walnut Street<br>Philadelphia, PA 19106<br>(215) 597-4313 |
| State Water Control Board<br>2111 N. Hamilton St.<br>P.O. Box 11143<br>Richmond, Va. 23230<br>(804) 257-0381<br>Richmond, Va. 23230<br>(804) 257-0381 | Department of Health<br>Bureau of Shellfish Sanitation<br>109 Governor St.<br>Richmond, Va. 23219<br>(804) 786-7937        |
| Virginia Marine Resources Commission<br>2401 West Ave.<br>P.O. Box 756<br>Newport News, Va. 23607<br>(804) 254-2811                                   |  |

The College of  William & Mary

