Teaching Fisheries Management: New Role for Computers

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Virginia's fisheries—how can we train scientists to manage these complex systems?

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Teaching Fisheries Management:

NINETEEN seventy-two has arrived—the computer age continues. Today computers are involved with almost all aspects of our lives. Banks use computers to keep customers' accounts in order. Industry uses computers to make financing and salary operations easier. Just how far can computers go? Fortunately, anyone who believes that computers will eventually take over the world has been watching too many science fiction movies.

A computer is an extraordinary tool which can perform simple calculations with amazing speed. Calculations which would take a man days to complete can be handled by a computer in a matter of seconds. In addition, computers extend man's memory by electronically storing great volumes of information. However, all this information must be fed into a computer. Storing inaccurate information in a computer completely destroys its value as a tool and slave for man. The whole computer world, then, relies on man's capacity to gather information.

Now, let me introduce that famous fisherman, Fred Flycaster. Imagine that the number of largemouth bass caught by Fred at the lake last Sunday afternoon indirectly had something to do with computers. Completely ridiculous! Right? However, such a statement may not be so ridiculous ten years from now due to a new method of teaching fisheries management. Teaching "games" form the basis of this method. Games that teach? Sounds a little strange, doesn't it? A teaching game is simply a model of a fishery in an aquatic environment, such as a lake or reservoir. A student, in playing the game, actually *manages* the fishery. The game responds to the student's managerial decisions exactly as the real fishery would. Results of playing the game are determined by a computer.

Developing a model of a fishery requires many months of intense work. All available information on the fishery to be modeled is gathered by researchers. This information must then be carefully studied to determine the interactions taking place between the various parts of the fishery. To illustrate, consider the development of a model of the walleye fishery in Claytor Lake, Pulaski County. Suppose that after studying the available information, researchers decide that three of the most important interacting parts in this fishery are alewives, walleye, and fishermen. They might find that, annually, 90% of the alewives are eaten by walleyes and 35% of the walleye are caught by fishermen. Thus, the interactions between these three parts of the fishery have been determined. This is, of course, a very simplified example. Most of the interactions taking place in a fishery are very complex and much time and work is needed to understand them.

Management decisions are entered on computer cards.

After all the necessary interactions have been determined, this information is put into mathematical form which can then be used in model development. Such development involves many calculations, requiring the use of a computer. If the information which the researchers accumulated accurately reflects the interactions taking place, a realistic model will be produced. This model can then be used as a *teaching game*. Any student who plays the game will be provided with realistic results based on actual past happenings.

How does one play such a game? This question can be answered best by an example. Again consider the hypothetical game dealing with the walleye fishery in Claytor Lake. Fisheries science student Max Manager will serve as player. Max begins play by studying the instructions which include a description of the fishery. These instructions tell him that his goal will be to maximize the walleye catch on an annual basis. In

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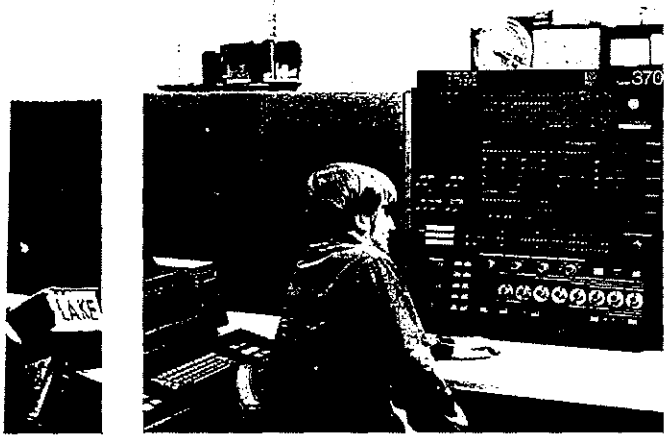
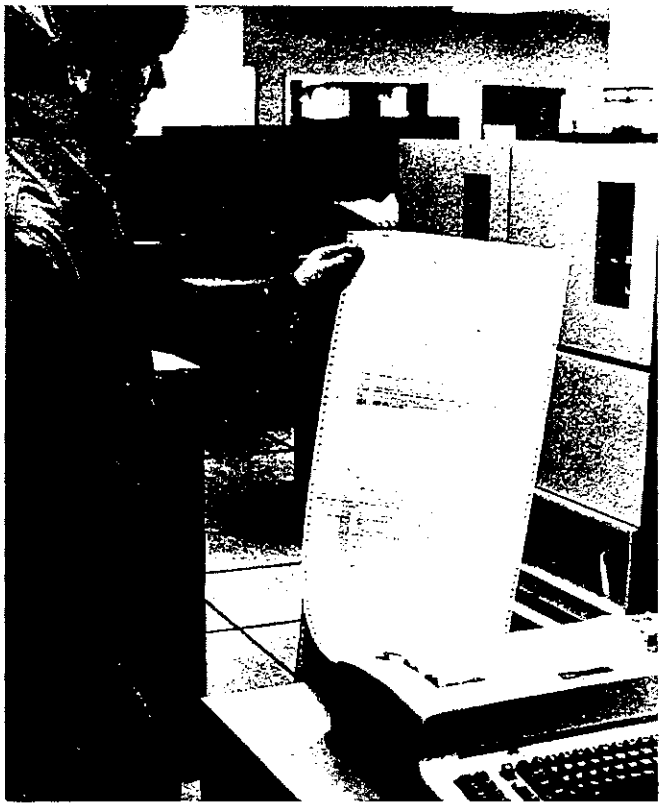
New Role For Computers





Left to right: The game (program) is fed into the computer, and management decision cards added. Computer calculates the effect of student's management plan for the fishery in seconds, and prints out results—what would have happened to the fishery if the student's decisions really had been carried out.

managing the fishery, he will have to control the water level fluctuation in the lake. After having carefully studied the situation, he might first decide to decrease the water level 5 feet during April and increase it 5 feet in October. Suppose the fluctuation decided upon was bad for the fishery (remember that all results are based on actual occurrences in the past), Max would receive a comment such as this: *This year's poor catch of walleye has the fishermen very upset. How's your pitching arm?* If Max's decisions led to an increase in the number of walleye, his results might include this statement: *The fishermen are satisfied with the recent walleye catch, but improvements can still be made.*

By evaluating the results from each play in terms of past results, Max can determine where he has made mistakes, change his managerial decisions accordingly, and play the game again. After each such play, his understanding of the fishery should increase. As a result of this understanding, his decision making with each successive play should bring him closer and closer to achieving the goal—maximum catch for the fishermen.

The projected increase in use of America's recreational fisheries is astounding. The growing need for intensive management of our fisheries is apparent to anyone who has fished lately. Reservoirs, in particular, need to be efficiently managed. Many capable men, well versed in the techniques of effective fisheries management, are needed to meet this increase in demand. This ability is based largely on actual managerial experience which has not previously been available in the classroom. While actual managerial experience in the field is irreplaceable in terms of quality, there are limitations to the use of field work in the university training of fisheries personnel. The time and money involved make managerial work in the field impractical for the preliminary training of fisheries managers. After all, fisheries are too important to trust to a student.

Through the use of computer teaching games, decision-making experience can be gained within a few days. Errors in decision making occur in the classroom with no waste of natural resources. Several teaching "games" are being used at VPI & SU and form an important part of the education of our new fisheries managers.