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in weight from 40 to 625 lb. The riprap was placed over 9 in. of blanket stone varying in size from 1/4 to 4 in. in diameter. The toe of the wall was embedded 2 ft, 9 in. below the existing shore level and ties into the base of the bluff, forming an unobtrusive apron. The largest stone used was 24 in. in diameter because anything larger might entrap young pelicans making their way to water. All stone was placed by dragline on a floating barge to avoid damage to the critical nesting site on top of the bluff.

In 1984 the pelicans returned to the island in record numbers for recent years, and by mid-March at least 100 birds were in residence. The majority of birds began nesting activities either just behind the edge of the bluff or on the hillock. This site had been largely abandoned during the 1983 nesting season due to a tick infestation and possibly disturbance caused by rapid sloughing of the bank. During an inspection trip in June 1984, at least 120 birds were seen using the rocks as a loafing site. In addition to performing the original function of shoreline protection, the rocks also seem to serve as an excellent loafing site for adults and young in close proximity to their nests. Final estimates of 1984 nesting success revealed that 115 pairs of pelicans fledged 230 young.

In the Texas coastal zone, disposal operations and the creation and maintenance of dredged material islands are among the most complicated issues that resource managers must face. Therefore, it is gratifying when the construction agency, the resource agency, and environmental groups can agree on and pursue a course of action that satisfies project needs and makes use of available resources for the benefit of the environment.

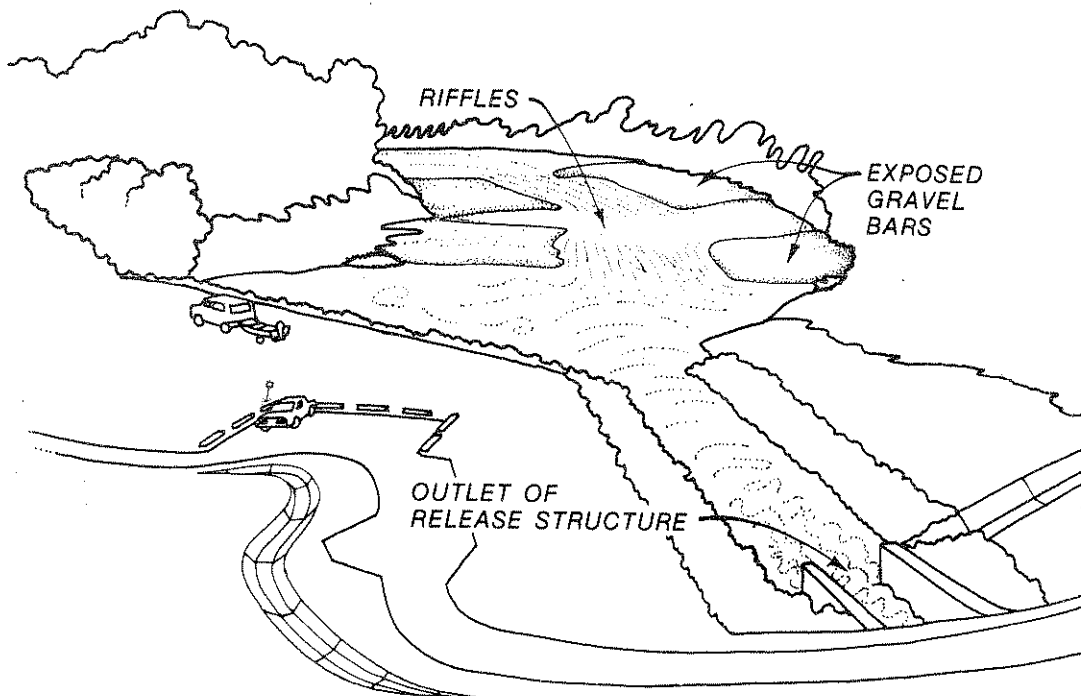
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AQUATIC HABITAT DEVELOPMENT ON THE TOMBIGBEE RIVER

In a unique project funded by the U.S. Army Engineer District, Mobile, biologists from the Aquatic Habitat Group of the U.S. Army Engineer Waterways Experiment Station designed a habitat for fishes, aquatic insects, and freshwater mussels that require shallow, rapidly flowing water over gravel substrate. Approximately 25,000 cu yd of 1- to 3-in. gravel were placed in the Tombigbee River to create the new habitat. The site is downriver of a minimum flow release structure in Columbus Dam of the Tennessee-Tombigbee Waterway (see figure on page 4).

After more than 6 months in place the gravel bars are stable with no significant erosion or sediment accretion. Thirty-one species of aquatic invertebrates, including immature mayflies, caddisflies, small clams, and crustaceans, have been collected in shallow riffles between the gravel bars. The presence of these organisms plus the crystal darter (*Ammocrypta asprella*), listed as endangered by the state of Mississippi, shows that a diverse aquatic community is developing at the site.

Data from the Columbus site will help planners and engineers rehabilitate areas altered by man's activities and provide habitat for organisms that are becoming uncommon in large waterways. In addition, the project provides a unique outdoor laboratory where growth and behavior of organisms living under



**DIAGRAMMATIC ILLUSTRATION OF GRAVEL BAR HABITAT CONSTRUCTED IN ABANDONED CHANNEL OF TOMBIGBEE RIVER, NEAR COLUMBUS, MISSISSIPPI (BASED ON A DRAWING BY HAP KERN, MOBILE DISTRICT)**

precisely designed physical conditions can be studied. For more information the authors may be contacted at the Mobile District (205/690-2723; FTS 537-2723) or Waterways Experiment Station (601/634-2141; FTS 542-2141).

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#### AVAILABILITY OF A NOTEBOOK ON HABITAT EVALUATION METHODS

A notebook on "Habitat Evaluation Methods" is now available from the Environmental Laboratory (EL), Waterways Experiment Station (WES). The notebook was developed as an information exchange document for individuals and offices concerned with applying and improving the use of habitat evaluation techniques. It is organized by selected topic headings in looseleaf format to facilitate storage of information and incorporation of new material. The notebook is an outgrowth of two Corps work units on habitat evaluation sponsored by the Environmental Impact Research Program of the Office, Chief of Engineers.

Material in the notebook was designed for use by individuals with various levels of training and experience in habitat evaluation. Many of the references pertain to specific methods, most commonly the Habitat Evaluation Procedures (HEP), but other techniques and general habitat information are