# CHAPTER 8

# AQUATIC HABITATS

8-1. General.

a. Aquatic habitat development is the establishment of biological communities on dredged material at or below mean tide in coastal areas, and in permanent water in lakes and rivers. Potential developments include such communities as tidal flats, seagrass meadows, oyster beds, clam flats, fishing reefs, and freshwater aquatic plant establishment. This habitat development alternative has great potential that is just now beginning to be realized through various District projects. The bottom of many water bodies potentially could be altered using dredged material; this could simultaneously improve the characteristics of the site for selected aquatic species and permit the disposal of significant quantities of material (item 72).

b. A number of applications of this alternative have been made by CE Districts in recent years, including development of razorshell clam sites in Portland District, creation of gravel riffles in the Tennessee-Tombigbee Waterway in Mobile and Nashville Districts, razor clam and mussel habitat in St. Paul District, and establishment of artificial fishing reefs in a number of Districts. Unsuccessful attempts to establish seagrasses on dredged material have been made, and is a concept to be reattempted using the newest techniques and very careful site selection.

c. The recent creation of an underwater berm using coarse-grained dredged material has been tested at Virginia Beach, Virginia, in Norfolk District. This will not only provide aquatic habitat, but will serve to protect the shoreline through storm wave dissipation, sand stockpiling for beach nourishment, and allowing a reduction in maintenance dredging in some tidal inlets. Three smaller sites have also been developed as underwater berms for aquatic habitat: Thimble Shoal, Virginia, in Norfolk District; Kings Bay, Georgia, in Jacksonville District; and Charleston Harbor, South Carolina, in Charleston District.

8-2. Aquatic Habitat Development. Limited aquatic habitat development has been tested in Florida (items 72 and 77), the Great Lakes, and several west, east, and Gulf coast Districts. It is a still-developing concept, with much still unknown about what is likely to be encountered or considered at any site. Each aquatic habitat site should be approached as a unique situation until further guidelines are made available.

a. Advantages. Several advantages to aquatic habitat development are recognized. It provides high biological production, has a potential for wide application, complements other habitats, and provides habitat where none previously existed or had been destroyed. Aquatic habitats may be highly productive biological units. Seagrass beds are recognized as exceptionally valuable habitat features providing both food and cover for many fish and shellfish. Oyster beds and clam flats have high recreational and commercial importance. Fishing reefs built on flat, relatively sterile lake, river, or bay bottoms provide habitat diversity, food, and cover, as well as recreation for fishermen. Dredging material disposal projects impacting aquatic communities predictably incur strong criticism, and in these cases reestablishment of similar communities may be feasible as a mitigation or enhancement technique. In many instances it may be possible to establish aquatic habitats as part of a wetland habitat development project. This concept potentially has very wide application, as most dredging projects are flanked by open water. Often, the selective subaquatic placement of material will both enhance the disposal site and accommodate large amounts of dredged material. In the case of fishing reefs built of dredged material, the material is usually bedrock or rubble from new work dredging operations suitable for reef formation. This kind of dredged material is also well suited for oyster and clam bed development since it gives oysters and clams places to attach.

b. Disadvantages. The primary and overriding disadvantage of aquatic habitat development is an inadequate understanding of techniques for applying this alternative. Careful site-by-site determination combined with local biological and engineering expertise is necessary. Seagrass establishment to date has largely been on disturbed sites that did not involve dredging (items 76 and 77), and its application to disposal sites thus far has been very limited. Development of freshwater aquatic habitat has been limited to providing protective structures via barge-transported coarse-grained material to allow natural plant development, in the case studies listed in para 8-lb.

8-3. Guidelines for Aquatic Habitat Development. The lack of more specific engineering and environmental guidance on aquatic habitat development should not eliminate the consideration of this alternative. References which provide guidance by experts in coastal areas include items 64 and 76-78. Most aspects of habitat development presented in the preliminary assessment and the detailed evaluation of feasibility (Figure 4-6) will be applicable to aquatic habitat development. Of particular significance will be hydraulic energies along the bottom and circulation patterns. The interaction of the texture of the material with the hydraulic energies of the site will be significant, as the material must provide a stable surface substrate. The possibility that alteration of the bottom configuration of a waterway could adversely affect current patterns should be carefully considered, especially with fishing reefs and protective structures for freshwater aquatic plants. In large projects or in those projects where some question exists regarding the impact, it may be advisable to develop physical, chemical, and biological models of the aquatic system prior to project implementation.

8-4. Design of Seagrass Habitat. There are few well-documented examples of seagrass habitat development on dredged material, though a few successful transplants have been made in southern California and on one site in Florida. Revegetation of reclaimed subtidal bottom has been successfully accomplished (item 76), and results from these projects can be applied to dredged material.

Transplanting techniques are described in item 76. Figures 8-1 and 8-2 show the coring method of transplanting plugs, in this case, of shoal grass at Port St. Joe, Florida. Figure 8-3 shows a bareroot propagule of eel grass. Figure 8-4 shows turtle grass being transplanted into sand. Seagrass development will help stabilize dredged material through the binding action of roots and rhizomes, and in the dissipation of wave and current energy, thereby reducing erosion processes.

a. Location. Seagrasses normally occur along shorelines with low wave and current energies. Development of seagrass habitat in higher energy areas will require permanent protection with breakwaters or planting within lagoons created within dredged material islands.

b. Depth. Bottom elevations within seagrass beds extend from mean low water to -2 m in estuaries and -10 m in coastal environments.

c. Water Quality. Surveys to predict expected annual fluctuations in water quality at a site will be needed to assess suitability. Data should be collected as frequently as possible so that the site can be adequately characterized. Presence of natural seagrass beds in the vicinity of a proposed site will also be a strong indicator of general water quality suitability.

(1) Light. The foremost need of seagrasses is sufficient light penetration through the water column to support growth. High water column turbidity is an indication that a site is not suitable for habitat development.

(2) Salinity. Most of the common species of seagrasses require salinities greater than 20 ppt, though some local variations may exist where plants tolerate salinities as low as 10 to 15 ppt.

(3) Temperature. Though seagrasses require relatively low-energy environments, the area needs to be well flushed and currents must circulate to prevent lethal temperature extremes from occurring.

d. Sediment Type. Sediment grain size is not usually a limiting factor, as most seagrasses can tolerate a wide range in sediment from coarse sand to mud.

e. Vegetative Establishment.

(1) Plant selection. In most geographic regions, species selection will be based on salinity, though along the southeast Atlantic and Gulf coasts where two or three seagrass species occur, other considerations need to be made. In this area, environmental tolerances or species growth rate may be a prime factor in species selection (item 48).

(2) Propagule selection. Seagrass habitat development is almost exclusively restricted to transplanting mature plants from a donor bed, as nursery

Figure 8-1. Removing plugs of shoal grass from an existing bed near Port St. Joe, Florida. They were transplanted on a nearby dredged material site.

Figure 8-2. Temporary storage for the shoal grass plugs was provided by containers of seawater, which were transported to the dredged material site by skiff.

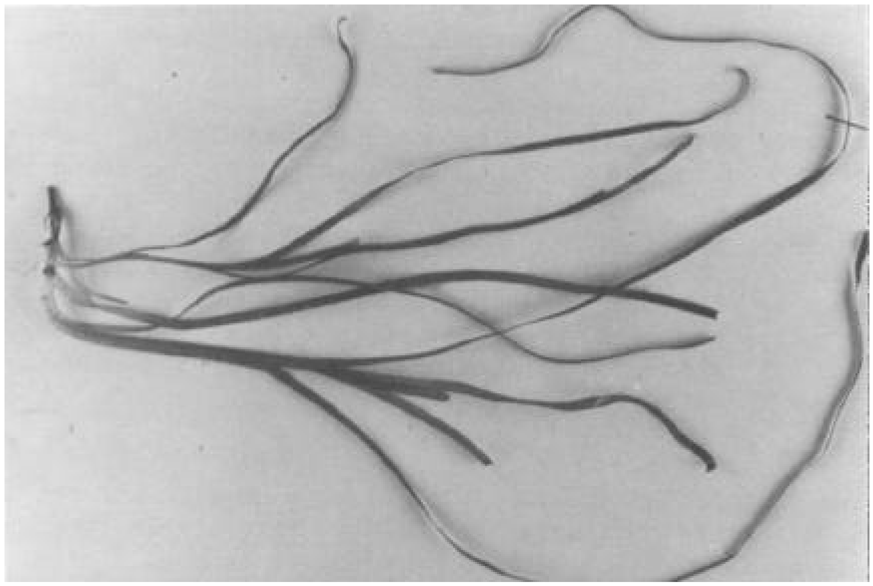

Figure 8-3. A bareroot propagule of eel grass ready for transplantation. This is the most efficiently handled and cost effective type of propagule.

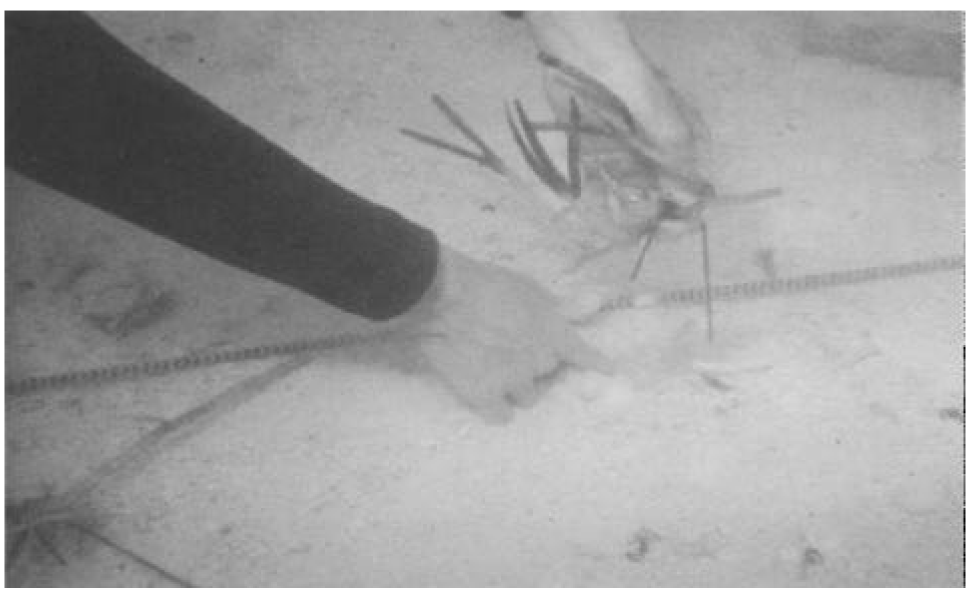

Figure 8-4. Transplanting a bareroot propagule of turtle grass on a sandy site. The transplant is held in place with a long staple, which prevents waves and currents from washing it out.

stock is currently unavailable. Mature plants reproduce by branching. Methods using seeds or seedlings have not been adequately developed.

(3) Plant spacing. The rate at which seagrass will cover the bottom is dependent on species growth rate and spacing of transplants. Some species are much faster growing than others. Spacing guidelines can be found in item 76.

(4) Handling plant material. Plants need to be handled as carefully as possible to avoid damage to roots and shoots. Turtle grass meristematic tissue protection is critical for that species' reproduction. Short-term plant storage (hours) can be in well-aerated containers, while longer term storage (days, weeks) should be in floating pens or flowing seawater tables. Plants should never be directly exposed to sun and air for more than a minute or two.

(5) Pilot propagation study. In a seagrass development project where there are unknown factors such as water quality, rate of plant spread, or lack of experience in similar projects, it is prudent to conduct a pilot study. A pilot project is particularly advisable if the project is a large and costly one. A pilot study's main purpose is to determine whether or not the propagules will grow under conditions found on the site. The study can be conducted in less than a year, but the test species should be allowed to grow for one full season before conclusions are drawn. Such a project should be of sufficient size that it will accurately reflect future operational difficulties. The size of the pilot study is limited only by the desired tests, the time available for such testing, and funding. A simple statistical design will permit quantitative evaluation of the study where prediction of degree of success or failure can be made. The success of these plants can generally be evaluated by observation of survival. Test plots established should be evaluated on a regular basis to determine survival and growth.

(6) Time of planting. Almost without exception, spring is the best time for planting seagrasses. Transplanting can be successful in other seasons, but with less overall survival.