New York Sea Grant

Short Report Series

New York Sea Grant Institute
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STABILIZATION OF SUBTIDAL SEDIMENTS BY THE TRANSPLANTATION OF THE SEAGRASS ZOSTERA MARINA L.

A. Coolidge Churchill, Anthony E. Cok, and Michael I. Riner

During 1975 and 1976, Churchill, Cok, and Riner studied the eelgrass Zostera marina to determine whether it could be successfully and economically transplanted on subtidal dredge spoil (or on any other denuded area) to stabilize spoil sediments and create or rehabilitate a Zostera meadow. The ability of vegetation to prevent erosion is well known and relates to two environmental problems:

- the impact of dredging and filling; and
- the continued destruction of one of the most productive coastal communities, the seagrass meadow.

Study Site

The study site, Sand Island, was created from dredge spoil dumped off the south shore of Long Island.

Procedure

In 1975 test plantings were completed and evaluated. Then in 1976 a field-scale planting used the technique which gave best results in the test plantings. The study of eelgrass seed production was an additional focus of the project.

Transplant Techniques

The researchers removed eelgrass from a Zostera meadow on the north side of West Fire Island. They prepared the transplants at the harvest site, and transplanted them the same day. The three transplant techniques used successively smaller amounts of eelgrass.

Plug technique:
A plug consists of a scoop of sediments about 20 cm (8 in) in diameter, containing an average of 19 eelgrass shoots, with a sediment ball remaining more or less intact around the rhizomes and roots. The researchers manually planted the plugs into holes, then molded the edges of the holes to conform to the surrounding sediments. Plugs were planted 91 cm (3 feet) apart in 4 x 5 row plots between 28 May and 3 June 1974.

Miniplug technique:
A miniplug consists of a cluster of 4 to 6 shoots with their entangled rhizomes and roots washed clean of all adherent sediments. The researchers planted the miniplugs by pushing the transplants into the sediments until the rhizomes were 2.5 to 7.5 cm (1-3 in) below the surface. There was no attempt to disentangle the roots from the rhizomes.

Single shoot technique:
These transplants were prepared by severing the small branches from the rhizome material and planting them similarly to the miniplugs. Two treatments were used on some single shoots:

- Some single shoots were soaked for 5 hours in one of two concentrations (1.0 or 10 mg/l) of the rooting hormone napthaleneacetic acid (NAA) before planting. This hormone promoted rooting and enhanced transplant survival in the seagrass Thallasia.
- Other single shoots were fertilized at the time of planting by adding 3.5 g (0.1 oz) of slow release fertilizer Osmocote 14-14-14 to each transplant.

Miniplugs and both treated and untreated single shoots were planted on the north side of Sand Island in May 1975, using a 30 cm (1 ft) spacing in plots of either 225 or 105 individual transplants.

Two methods were used to evaluate the impact of the transplants on the sediments:

- Elevations of the sediments in and around the plant area were recorded at the time of planting and again at the end of four months. Sediments within a seagrass bed typically are elevated with respect to surrounding barren areas because of increased deposition and substrate stabilization by the roots and rhizomes.

- They determined granulometric properties of sediments before and after planting. Sediments in eelgrass are generally finer than surrounding sediments without grass because grass slows with water movement so that it drops the sediment it is carrying.

Conclusions

The authors conclude that the eelgrass Zostera marina L. can be transplanted successfully onto sandy dredge spoil in shallow waters if the currents do not exceed 0.82 knots.

Miniplugs are recommended as the best method of transplantation, with over 80% survival after four months. During this time, the amount of rhizome material doubles and the number of shoots triples. Miniplugs are also easy to handle. They are sediment-free, easy to transport, and do not need anchoring devices.

Finding that survival and growth of the eelgrass depend on the initial transplant size, the researchers' results showed that plugs have the best survival rate.. However, after four months, the number of new shoots produced by the miniplugs is

nearly equal to that of the plugs. Single shoot transplants had the poorest survival rate and less new growth than that of the miniplugs.

Treating the transplants with the rooting hormone napthaleneacetic acid does not improve survival or growth and is not recommended. Although the nitrogen fertilizer supplement of .49 g per transplant had little effect, the authors suggest that higher doses should be tested.

The authors recommend transplanting early in the growing season--in April and May in New York waters. Later plantings showed slower growth and lower survival rates. Using the recommended spacing of 66 cm (2 feet) between transplants, the planting of 0.41 hectares (1 acre) costs about $3,370.

Seeding is an alternative method of establishing eelgrass, particularly in deeper water where hand planting is impractical. According to the authors, the best time to collect seeds in New York waters is between 26 June and 2 July. The authors developed a seed tape to minimize seed loss and implant the seeds several centimeters beneath the sediment surface.

The complete 48-page report by Churchill, Cok, and Riner, STABILIZATION OF SUBTIDAL SEDIMENTS BY THE TRANSPLANTATION OF THE SEAGRASS ZOSTERA MARINA L. (7 tables, 19 figures) is available for $1.50 from:

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