Restoring an Atlantic Barrier Island Endemic

by Chris Lea and
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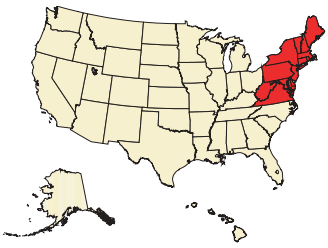

In 1967, graduate student Elizabeth Higgins conducted a floristic survey of Assateague Island, a barrier island straddling the Maryland-Virginia state line, found seabeach amaranth *(Amaranthus pumilus)* growing on several wash flats. In 1993, the Fish and Wildlife Service (FWS) found that this plant had declined to the point that it was vulnerable to extinction and warranted listing as a threatened species. By that time, its range was reduced to isolated population clusters on Long Island, New York, and on barrier islands of North and South Carolina. This plant is endemic to Atlantic barrier island beaches and was believed to be extirpated from six of the nine states in its historic range, which extended along the coast from Massachusetts to South Carolina.

The National Park Service (NPS) Northeast Region, the Maryland Departments of Natural Resources (MDNR) and Agriculture (MDA), The Nature Conservancy, and the FWS teamed up to plant seabeach amaranth on the beaches of Assateague Island National Seashore in 2000. This planting is one part of a multiyear restoration study by the NPS. Evaluating environmental and genetic factors is critical in the ongoing study to improve overall restoration efforts.

The seabeach amaranth seems to be well adapted to the harsh and windy habitat of the upper parts of barrier island beaches and wash flats where storm surges scour competing vegetation. It is a low-growing annual with somewhat succulent leaves. The plant's decline is primarily attributed to habitat alteration or loss caused by shoreline development and stabilization projects. A fecund seed producer, the seabeach amaranth may rely on seed banks and prolific dispersal to maintain populations when conditions for the growing plants are poor. Such a strategy is not successful when there is insufficient habitat.

Seabeach amaranth
Photo by Helen Hamilton/NPS

Maintenance of seabeach amaranth populations requires a balance between the processes of creation and stabilization: new habitat is created when beaches are scraped clean by storms, and existing habitat is lost when an absence of natural disturbances allows the succession of more competitive species.

Assateague Island changed greatly in the decades since the last sighting of the seabeach amaranth in 1967. Both the NPS at Assateague National Seashore and the FWS at Chincoteague National Wildlife Refuge had built high dunes on the island to protect park facilities and habitat for wildlife. Extensive sand flats had been overgrown by vegetation or converted to impoundments for waterfowl, preventing the ongoing creation of appropriate habitat for the amaranth.

Changes in shoreline management policy by the NPS and significant storm events during the 1990s restored some seabeach amaranth habitat to Assateague. While monitoring the piping plover *(Charadrius melodus)* in August 1998, NPS biological technician Shanna Ramsey found a single seabeach amaranth plant on the north end of Assateague Island. This and a nearby plant were the first seabeach amaranth seen on Assateague in more than 30 years.

Storm surges from Hurricane Bonnie threatened both plants in late August 1998. The NPS, MDNR, and the FWS conferred on emergency measures. Because these were the only known plants along 300 miles of coast, we removed one plant to a greenhouse for breeding; the other plant perished in the storm. The rescued plant was tended by MDA horticulturist Shelley Hicks and produced 20,000 seeds. Using the species-specific germination methods pioneered by Jerry and Carol Baskin at the University of Kentucky, Hicks grew 1,000 seedlings for transplanting.

Current threats to seabeach amaranth restoration may be competing plants such as the nonnative Asiatic sand sedge *(Carex kobomugi)* and the native American beachgrass *(Ammophila breviligulata)*. These species may threaten the maintenance of viable seabeach amaranth populations if natural disturbances do not create new areas of habitat. Because the nonnative occupies the same habitat as seabeach amaranth, efforts are planned to map Asiatic sand sedge colonies, identify appropriate control treatments, and monitor results.

Additional threats come from herbivore damage. Nonnative Sika deer *(Cervus nippon)* and native white-tailed deer *(Odocoileus virginianus)* caused some seabeach amaranth transplant deaths during 2000. Subsequently, marker flags were bent into a protective triangle over the plants to prevent browsing. Caterpillars of various moth species (webworms) also are known to cause significant seabeach amaranth mortality. We will monitor for insect damage weekly during the growing seasons.

Quantifying the amount of genetic variation present in the populations is another facet of the restoration effort. Despite reduced genetic diversity due to the fact that one plant was the progenitor of 20,000 seeds, we believe that variability could be restored by reintroducing large numbers of individual plants. In this case, we transplanted 800 of the 1,000 germinated seedlings, and we will follow up with assessments of genetic diversity.

Work on recovery of the seabeach amaranth contributes to the ecology of a mid-Atlantic barrier island ecosystem beleaguered by land use changes and urbanization pressures. Results of the restoration may be useful at other sites where seabeach amaranth exists now or was extirpated, including these units of the NPS: Fire Island National Seashore, Gateway National Recreation Area, Cape Hatteras National Seashore, and Cape Lookout National Seashore.

Early results of the restoration project on Assateague were seen in June 2001. Eight hundred seedlings have been found at the previous year's restoration sites, and small numbers continue to germinate. Perhaps equally as significant for restoration of seabeach amaranth as initial "in situ" reproduction is the ability of the new population to disperse to new habitat. Some of these new seedlings have appeared up to a mile from the nearest known sites for plants in 2000. One day, success might be defined as the time when we, like Elizabeth Higgins back in 1967, can call seabeach amaranth "just another plant" among many.

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(Above) Seabeach amaranths form small dunes that appear to protect the stems from moisture loss and allow growth of additional branches that in turn produce more flowers.
Photo by Helen Hamilton/NPS

(Below) A volunteer plants a seabeach amaranth seedling at Assateague Island National Seashore.
Photo by Alex Almaria/NPS