

**CAPE HATTERAS NATIONAL SEASHORE
SEABEACH AMARANTH (*AMARANTHUS PUMILUS*) SURVEYS
2014 ANNUAL REPORT**



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INTRODUCTION

Seabeach amaranth (*Amaranthus pumilus*) is a federally threatened plant species found in barrier island beach environments, where it grows in overwash flats at accreting ends of islands and at the foot of frontal dunes. The species is intolerant of competition and thus is limited to highly dynamic areas that are marginally conducive to plant growth. It survives in these habitats as a “fugitive” or “pioneer” species, continually moving around in the landscape to occupy suitable habitat as it becomes available. Amaranth must recruit annually either from existing seed bank or from seeds dispersed by wind, water, or anthropogenic factors (i.e., dredging, beach nourishment) (Jolls 2004). Populations can therefore be highly variable from year to year in any given area, but dormant seeds may remain viable for many years.

The natural habit of seabeach amaranth makes it vulnerable to both man-made and natural disturbances. The primary threat to the species is habitat destruction. Man-made beach-stabilizing structures (i.e., bulkheads, jetties, continuous barrier dunes) and off-road vehicle and pedestrian traffic on beaches have contributed to major habitat loss (USFWS 1996). Barrier islands are extremely dynamic in nature and are constantly being shaped by hurricanes and storm events, resulting in the rapid creation and elimination of potential amaranth habitat. Other threats to amaranth include herbivory by insects and mammals, competition from non-native, invasive plants, and sea level rise.

In 1993, *Amaranthus pumilus* was listed as federally threatened with extinction under authority of the Endangered Species Act (USFWS 1993). At the time of its listing, the species had been eliminated from two-thirds of its historic range that extended from Massachusetts to South Carolina (USFWS 1996). Cape Hatteras National Seashore (CAHA) was once heavily populated with amaranth, hosting three to fifteen thousand individuals per year in the late 1980s. Seabeach amaranth has since been in decline at CAHA, and was last documented here in 2005. Since populations can be highly variable, park staff continues to survey for the species annually.

METHODS

Some notable research in the past several decades has assessed the life history and habitat requirements of seabeach amaranth (Bucher and Weakley 1990, Johnson 2004, Jolls et al. 2004, Sellars and Jolls 2004, Strand 2002). Compilation and review of these studies, many of which address the crucial habitat characteristics that determine likelihood of amaranth occurrence (i.e., elevation, overwash disturbance potential, and competition), have provided a baseline for the selection of survey locations and methods at CAHA. Locations of historic amaranth occurrences at CAHA are also taken into consideration. Specific habitats surveyed include high beach (between the wrackline and foredune), sandflats on accreting ends of the islands, and large dune blowouts. All surveys are conducted in accordance with the CAHA Seabeach Amaranth Monitoring Protocol created in 2013 and amended in 2014. The protocol also calls for documentation of other state-listed rare plants encountered during amaranth surveys, including *Ipomoea imperati*, *Polygonum glaucum*, and *Yucca gloriosa*.

Surveys for seabeach amaranth are ideally conducted in July-September when the plants are sufficiently large to locate and document. CAHA staff begins surveying for plants in mid-July,

usually starting where seasonal resource closures for nesting shorebirds are being removed. These are areas where off-road vehicle and pedestrian traffic has been excluded for the growing season. Historically at CAHA, when plants were found, they were typically found in vehicle-free areas, often the same areas protected for nesting birds. In the case that plants are found, the location of all individual plants or plant clusters are recorded with a GPS device with sub-meter accuracy. The diameter (mm) is recorded and whether it is located in an area open or closed to pedestrian and/or ORV traffic. Any evidence of these uses (e.g., footprints or tire tracks) within 20 feet is also recorded. In areas where plants are observed, a follow-up monitoring survey in late September is recommended to examine survivorship and seed production (Marion 2005).

Beginning during the 2014 season, all spatial and tabular data associated with amaranth surveys and state-listed rare plant occurrences are housed in the Cape Hatteras National Seashore Vegetation Monitoring Database (Veg DB). The Veg DB is an ArcSDE relational geospatial database and web service housed on the Federated Enterprise Mapping Program (FEMP), Insidemapservices.nps.gov (internal ArcGIS Server), and Arcgisonline.com (public-facing ArcGIS Server). Tabular data included with the survey transects include: protocol followed, date of monitoring, observer(s), individual person minutes, habitat type(s), and survey results. Since we were transitioning to this database in 2014, shared spreadsheets were also kept as backup.

RESULTS

Plant surveys were conducted from mid-July through mid-August 2014 in areas of the Seashore that contain potential habitat for seabeach amaranth. Staff spent over 75 hours surveying specifically for amaranth, covering roughly 40 lineal miles of potential beach habitat by foot. More hours were actually spent in potential habitat than was actually recorded, as other field work required staff to be in the historical and potential habitat. No amaranth was found anywhere within the survey areas. Three occurrences of *Ipomoea imperati* on Hatteras Island and eleven on Ocracoke Island were encountered during the surveys.

DISCUSSION

Seabeach amaranth populations have fluctuated greatly since surveys began at CAHA in 1985 (Table 1). In the last 15 years, numbers were the highest in 2002 with 93 plants. More recently numbers have declined with only one plant found in 2004 and two plants found in 2005. No plants have been observed since that time and the plant is currently thought to possibly be extirpated from CAHA. The area on Bodie Island spit where amaranth had been located in 2004 and 2005 has been continuously protected through summer and winter resource management closures. At Cape Point, a portion of the area where amaranth was historically found has also been continuously protected through summer and winter resource closures. No plants were found within any of these protected areas. At Hatteras Inlet, large portions of the historic range are simply no longer present due to continued erosion. While it is thought that the plant may possibly be extirpated from CAHA, it should be noted that since plants are not evident every year, but may survive in the seed bank, populations of seabeach amaranth may still be present even though plants are not visible for several years (USFWS 2007).

Table 1. Population Estimates of *Amaranthus pumilus* at CAHA by Site.

| Year | Bodie Is. Spit | Cape Pt. / South Beach | Hatteras Island Spit | Ocracoke Island | Total |
|------|----------------|------------------------|----------------------|-----------------|----------|
| 1981 | | | | 15 | 15 |
| 1984 | | | | 1 | 1 |
| 1985 | 0 | 300-500 | 300-500 | 100 | 700-1100 |
| 1986 | 0 | >200 | >300 | >100 | >600 |
| 1987 | 0 | 5,200 | 274 | 1,409 | 6883 |
| 1988 | 0 | 800 | 1,718 | 13,310 | 15,828 |
| 1990 | 0 | 2,830 | 252 | 250 | 3332 |
| 1994 | | | 0 | 0 | 0 |
| 1996 | 0 | 6 | 82 | 10 | 98 |
| 1997 | 0 | 59 | 16 | 6 | 81 |
| 1998 | 0 | 55 | 210 | 0 | 265 |
| 1999 | 0 | 3 | 5 | 0 | 8 |
| 2000 | 0 | 1 | 1 | 0 | 2 |
| 2001 | 0 | 27 | 16 | 8 | 51 |
| 2002 | 0 | 11 | 75 | 7 | 93 |
| 2003 | 0 | 16 | 3 | 11 | 30 |
| 2004 | 1 | 0 | 0 | 0 | 1 |
| 2005 | 1 | 0 | 0 | 1 | 2 |
| 2006 | 0 | 0 | 0 | 0 | 0 |
| 2007 | 0 | 0 | 0 | 0 | 0 |
| 2008 | 0 | 0 | 0 | 0 | 0 |
| 2009 | 0 | 0 | 0 | 0 | 0 |
| 2010 | 0 | 0 | 0 | 0 | 0 |
| 2011 | 0 | 0 | 0 | 0 | 0 |
| 2012 | 0 | 0 | 0 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 | 0 |
| 2014 | 0 | 0 | 0 | 0 | 0 |

Population estimates by NC Natural Heritage Program, East Carolina Univ. and NPS

Nationwide, amaranth populations have similarly declined since 2000. Numbers have dropped from 249,261 plants observed in 2000 to 1320 plants in 2013, a 99.5 percent decline (Dale Suiter, *pers. comm.*). The species' recovery plan is due for a 5-year review by US Fish and Wildlife Service. The Service is trying to understand rapid species decline and is considering options for reintroduction attempts in suitable areas. CAHA has been discussed as a potential reintroduction site since the CAHA Off-Road Vehicle Management Plan/EIS calls for possible development of a restoration plan in suitable habitat (NPS 2010). Park staff has been tasked with drafting a comprehensive report analyzing past and current amaranth research and reintroduction attempts in similar locations along the Atlantic coast. This report will be used to determine the feasibility of a seabeach amaranth restoration attempt at CAHA.

REFERENCES

Bucher, M. and A. Weakley. 1990. Status survey of seabeach amaranth (*Amaranthus pumilus*

Rafinesque) in North and South Carolina. Report to North Carolina Plant Conservation Program, NC Department of Agriculture, Raleigh, NC, and Asheville Field Office, USFWS, Asheville, NC. 149 pp.

Johnson, S.E. 2004. An assessment of the nearest associates and the effects of competition on the threatened dune annual, *Amaranthus pumilus*, Rafinesque (Amaranthaceae). East Carolina University, Department of Biology, M.S. Thesis.

Jolls, C.L., J.D. Sellars, S.E. Johnson and C.A. Wigent. 2004. Restore seabeach amaranth; A federally threatened species, habitat assessment and restoration of *Amaranthus pumilus*, (Amaranthaceae) using remote sensing data. 2001 Natural Resource Presentation Program, RMP Project Statement CAHA-N-018.000, National Park Service, Final Report. 116 pp.

Marion, J.L. 2005. Management, monitoring, and protection protocols for seabeach amaranth at Cape Hatteras National Seashore, North Carolina. Final report to NPS produced by USGS, Patuxent Wildlife Research Center.

National Park Service. 2010. Cape Hatteras National Seashore Off-Road Vehicle Management Plan/Environmental Impact Statement. Cape Hatteras NS, NC.

Sellars, J.D. and C.L. Jolls. 2004. Habitat modeling for *Amaranthus pumilus*: an application of light detection and ranging (LIDAR) data. Journal of Coastal Resources.

Strand, A. 2002. Characterization of geographic genetic structure in *Amaranthus pumilus*. Department of Biology, College of Charleston. Charleston, SC.

Suiter, Dale, USFWS. 2014. *Personal communication*.

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; determination of seabeach amaranth (*Amaranthus pumilus*) to a threatened species. Federal Register 58(65)18035-18042.

U.S. Fish and Wildlife Service. 1996. Recovery Plan for Seabeach Amaranth (*Amaranthus pumilus*) Rafinesque. Atlanta, GA.

U.S. Fish and Wildlife Service. 2007. Seabeach amaranth (*Amaranthus pumilus*) 5-Year Review: Summary and Evaluation. Ecological Services Office, Raleigh, N.C.