Ammophila arenaria **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Liliopsida	Cyperales	Poaceae

Common name European beachgrass (English), oyat (French), ammophile des sables (French), marram (English), marram grass (English), élyme des sables (French), helm (Dutch), grama de las dunas (Spanish), Peskoljubka Pescanaja (Russian), sparto pungente (Italian), roseau des sables (French), Strandhafer (German), sand-hjaelme (Danish), barrón (Spanish)

Synonym
Arundo arenaria , (Linnaeus)
Ammannia coccinea purpurea , (Lam.) Koehne
Ammannia teres , (Raf.)
Calamagrostis arenaria , (L.) Roth

Similar species

Summary
Commonly known as marram grass, *Ammophila arenaria* is a beach grass native to Europe, the Mediterranean, and the coasts of the Black Sea. Widely distributed to stabilise and establish sand dunes for forestry plantings, property protection and erosion control, it can compete with and displace native vegetation communities and alter habitats with further consequences for invertebrate communities and bird species such as the 'Endangered (EN)' Chatham Island oystercatcher (see *Haematopus chathamensis*). Once established, it spreads through rigorous rhizome growth and is difficult and costly to control.

view this species on IUCN Red List

Species Description
Ammophila arenaria is a coarse, perennial grass with stout culms that may reach 120 cm tall (Huiskes, 1979; in Buell *et al.*, 1995) with dense, spike-like panicles and long, sharp leaf blades which may reach up to five feet (Green, 1985). It has extensive and deep, scaly rhizomes (Green, 1965) which may give it an advantage in accessing water and nutrients (Partridge, 1995; in Dixon *et al.*, 2004).

Notes
In Europe, two different subspecies, which correspond to northern (ssp. *arenaria*) and southern (ssp. *arundinacea*) ecotypes, have long been recognized (Rodriguez-Echeverria *et al.*, 2008)

Lifecycle Stages
In the United States, inflorescences of *Ammophila arenaria* are initiated in autumn of the second year after germination and mature in May or June with flowering occuring from May to August (Russo *et al.*, 1988). In Europe, anthesis occurs in July and August but has been reported as early as May with mature fruits being dispersed in September, and seeds germinating in the following spring (Russo *et al.*, 1988). The viability of seeds however is very low with most reproduction occuring vegetatively through rhizome fragments (Russo *et al.*, 1988).

Uses
Ammophila arenaria has been widely distributed along coasts to stabilise and establish sand dunes for forestry plantings, property protection and erosion control (Russo *et al.*, 1988; Dixon *et al.*, 2004; Hilton, 2006).

Habitat Description
Ammophila arenaria grows in substrates with low organic matter and free drainage, growing most vigorously in mobile or semi-stable sand dunes (Huiskes, 1979; in Buell *et al.*, 1995) and thriving in wind-blown, foredune areas above the high tide line (Buell *et al.*, 1995). It is highly adapted to sand accretion, growing vigorously with the continued addition of fresh sand, and requiring it to avoid senescence (Russo *et al.*, 1988). Burial by sand promotes elongation of the leaves and the development of adventitious roots (Ranwell, 1959; in Russo *et al.*, 1988). It tolerates a range of soil pH from 4.5 - 9.0, soil temperatures from 10 - 40°C (Ranwell, 1959; in Russo *et al.*, 1988), and salt concentrations of no more than 1 - 1.5 % (Pickart, 1997). In its native range *A. arenaria* alone makes up the foredune plant community (Russo *et al.*, 1988). Further inland, other species are able to establish when the sand movement stabilises and *A. arenaria* subsequently begins to senesce (Russo *et al.*, 1988). In introduced habitats, *A. arenaria* initiates the formation of foredunes but does so differently than native plants, altering the habitat and subsequently displacing various native coastal species (US Fish and Wildlife Service, 2001; Moore & Davis, 2004).

Reproduction
Ammophila arenaria primarily reproduces vegatatively both from rhizomes and small basal buds located at the base of stems under their lower leaf sheaths (Green, 1965). It is capable of flowering from the end of June through August (in Oregon) but rarely produces viable seeds (Green, 1965). Seedlings have been found in nature but occur rarely with any seedlings that are observed usually living no longer than seven weeks due to small-scale sand erosion, desiccation, or burial (Huiskes, 1977). However, at certain locations where water is retained by an impermeable layer of boulder clay and the soil remains damp for longer periods, seedlings may establish (Huiskes, 1977).

General Impacts
Ammophila arenaria is a strong competitor, capable of completely displacing native vegetation communities in some parts of its introduced range (Pickart, 1997; Hilton *et al.*, 2005). This is attributed primarily to the ability of *A. arenaria* to rapidly accrete sand and survive the subsequent burial for much longer than native plant species (Hilton, *et al.*, 2005) in addition to its higher drought resistance (Dixon, *et al.*, 2004), vigorous rhizomatous reproduction (Hertling & Lubke, 2000) and ecological tolerance, including resistance to erosion (Hertling & Lubke, 2000; Hilton *et al.*, 2006).
It has also been suggested that *A. arenaria* may acculmulate local pathogens to the detriment of nearby native plants (Eppinga *et al.*, 2006).
A. arenaria forms dense monospecific stands which can differ greatly from the sparse native coastal vegetation that are the norm for some invaded areas in the United States and New Zealand (US Fish and Wildlife Service, 2001; Moore & Davis, 2004). This alters the natural dynamics of dune systems and can result in a drastically changed coastal topography or beach profile (Russo *et al.*, 1988), with the creation of taller and steeper dunes than normal (US Fish and Wildlife Service, 2001; Moore & Davis, 2004).
In addition to altering the impact and effect of storms and reducing the supply of sand to nearby areas (Dolan *et al.*, 1973; in Russo *et al.*, 1988), this can also reduce the nesting habitats of birds including the 'Endangered (EN)' Chatham Island oystercatcher (see *Haematopus chathamensis* in the IUCN Red List of Threatened Species) (Moore & Davis, 2004) and the federally listed snowy plover, (See *Charadrius alexandrinus* in the IUCN Red List of Threatened Species) (US Fish and Wildlife Service, 2001). *A. arenaria* is also known to significantly alter invertebrate communities, with even small percentages of cover severely depressing arthopod populations (Slobodchikoff & Doyen, 1977) and with dunes planted with *A. arenaria* having a higher Diptera abundance but lower Isopod abundance when compared to unmodified dunes (Web *et al.*, 2000).

Management Info
Please follow this link for a detailed account of the management and control of *Ammophila arenaria*. A summary can be found below.

Physical control: Physcial control is the most effective, but also the most cost and labour intensive management option; it involves hand pulling or digging out plants with a shovel or alternatively using heavy machinery to excavate and bury or rip underground rhizomes (Pickart, 1997).

Chemical Control: Glyphosate based herbicides such as Roundup and Rodeo have been found to be effective as well as haloxyfop based herbicides such as Gallant (Pickart, 1997; Moore & Davis, 2004). Haloxyfop based herbicides have the advantage of being grass-specific and therefore will not kill non-target native broadleaf species like glyphosate based herbicides (Moore & Davis, 2004).

Integrated management: All chemical treatment programs will have to include a physical removal element, as regrowth is not sufficiently exposed enough for follow up herbicide use, and dead biomass needs to be manually cleared before native habitat can be restored (Pickart, 1997). Futhermore, integrated management involving the use of prescribed fires (which are ineffective if used alone) followed by glyphosate-based herbicide use have shown promising and cost-effective results as an alternative to physical control techniques (Hyland & Holloran, undated).

Pathway
Most introductions of *Ammophila arenaria* to new locations result from intentional planting to the stabilize sand dunes (Aptekar & Rejmanek, 2000).*Ammophila arenaria* may be dispersed to new locations by the marine transport of dormant rhizomes, which can withstand submersion for long periods (Pickart, 1997).

Principal source: Pickart, Andrea J. 1997. Control of European Beachgrass (*Ammophila arenaria*) on the West Coast of the United States. California Exotic Pest Plant Council, The Nature Conservancy Lanphere-Christensen Dunes Preserve Arcata, CA 95521.
Russo, Mary; Andrea Pickart; Larry Morse and Rick Young, 1988. Element Stewardship Abstract for *Ammophila arenaria* European Beachgrass.

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Review:

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ALIEN RANGE

[2] AUSTRALIA
[1] CHILE
[5] NEW ZEALAND
[7] UNITED STATES
[2] CANADA
[1] FALKLAND ISLANDS (MALVINAS)
[1] SOUTH AFRICA

Red List assessed species 4: EN = 2; VU = 1; NT = 1;

Charadrius obscurus **EN**
Haematopus chathamensis **EN**
Sterna nereis **VU**
Thinornis rubricollis **NT**

BIBLIOGRAPHY
43 references found for **Ammophila arenaria**

Managment information

Bergin, D.O., FitzSimons, P., Freeman, C., Herbert, J.W., Kesby, N.A. 1997. Management of marram grass in the restoration of indigenous coastal dune vegetation in Australia and New Zealand. Pacific Coasts and Ports 97. Proceedings Volume 1. pp. 431-436. Sep 1997.
Summary: Problems with degradation and management of sand dunes occur in both Australia and New Zealand. Many parts of sandy coastlines have been modified, particularly since European settlement. Marram grass (*Ammophila arenaria*), introduced last century to both countries to assist in stabilising dunes, has become a successful coloniser of dunes in higher latitudes where the climate is temperate. Management of marram grass-dominated sites is becoming a major issue in situations where coastal management agencies and community Coast Care groups wish to restore sites to indigenous vegetation communities while maintaining sand stability. Use of marram grass in New Zealand and the south-eastern states of Australia is reviewed. Examples of research and operational projects designed to replace marram grass with indigenous species are described. Continuing collaboration between research providers and dune managers on both sides of the Tasman is likely to result in enhancement of the natural character of the dunes without compromising the stabilising role of the vegetation cover.
Hyland, Tim and Pete Holloran, undated. Controlling European beachgrass (*Ammophila arenaria*) using prescribed burns and herbicide
Summary: Available from: http://ic.ucsc.edu/~kholl/envs160/holloran&hyland.pdf [Accessed 1 November 2009]
Konlechner T.M. and Hilton M.J., undated. *Ammophila arenaria* dispersal and Invasion in New Zealand.
Summary: Available from: http://www.dunestrust.org.nz/mar08conf/TeresaKonlechner.pdf [Accessed 1 November 2009]
Moore P. & Davis A., 2004. Marram grass *Ammophila arenaria* removal and dune restoration to enhance nesting habitat of Chatham Island oystercatcher *Haematopus chathamensis*, Chatham Islands, New Zealand. Conservation Evidence (2004) 1, 8-9 www.ConservationEvidence
Summary: Available from: http://www.conservationevidence.com/Attachments/PDF69.pdf [Accessed 1 November 2009]
Pickart, Andrea J. 1997. Control of European Beachgrass (*Ammophila arenaria*) on the West Coast of the United States. California Exotic Pest Plant Council, The Nature Conservancy Lanphere-Christensen Dunes Preserve Arcata, CA 95521.
Pope, Paul., 2006. The comparative seed ecology of marram grass (*Ammophila arenaria*) and pingao (*Desmoschoenus spiralis*) New Zealand Garden Journal, 2006, Vol. 9(1)
Summary: Available from: http://www.rnzih.org.nz/RNZIH_Journal/Pages_2-5_from_2006_Vol9_No1.pdf [Accessed 1 November 2009]
Putnam, Emily Smith and Dr. Ingrid Parker, undated. Coastal Dune Restoration through removal of invader *Ammophila arenaria* on whole community and endangered species, *Chorizanthe pungens* var. *pungens*. Poster
Summary: Available from: http://bio.research.ucsc.edu/people/parker/people/UGArchive/Smith.pdf [Accessed 1 November 2009]
Russo, Mary, Andrea Pickart, Larry Morse, and Rick Young., 1988. Element Stewardship Abstract for *Ammophila arenaria* European Beachgrass
Van der Putten, W.H. and Peters, B.A.M. 1995. Possibilities for management of coastal foredunes with deteriorated stands of *Ammophila arenaria* (marram grass). Journal of Coastal Conservation 1 (1), pp. 29-39.
Wiedemann, Alfred M. and Pickart, Andrea. 1996. The *Ammophila* problem on the Northwest coast of North America. Landscape & Urban Planning. 34(3-4). 1996. 287-299.

General information

Aptekar, Rachel and Rejmanek, Marcel. 2000. The effect of sea-water submergence on rhizome bud viability of the introduced *Ammophila arenaria* and the native *Leymus mollis* in California. Journal of Coastal Conservation. 6(1). May, 2000. 107-111.
Australian Natural Resources Atlas (ANRA), 2002. Biodiversity Assessment: Wetland threatening processes
Summary: Available from: http://www.anra.gov.au/topics/vegetation/assessment/tas/ibra-kin-wetland-threats.html [Accessed 1 November 2009]
Beckstead, Julie and Parker, Ingrid M. 2993. Invasiveness of *Ammophila arenaria*: Release from soil-borne pathogens?. Ecology (Washington D C). 84(11). November 2003. 2824-2831.
Buell, Ann C., Pickart, Andrea J., Stuart, John D. 1995. Introduction history and invasion patterns of *Ammophila arenaria* on the north coast of California. Conservation Biology. 9(6). 1995. 1587-1593.
Dixon, Pip, Hilton, Mike, Bannister, Peter. 2004. *Desmoschoenus spiralis* displacement by *Ammophila arenaria*: the role of drought. New Zealand Journal of Ecology. 28(2). 2004. 207-213.
Summary: Available from: http://www.nzes.org.nz/nzje/free_issues/NZJEcol28_2_207.pdf [Accessed 10 November 2009]
Encyclopedia of Life (EOL), 2009. *Ammophila arenaria* (L.) Link European beachgrass
Summary: Available from: http://www.eol.org/pages/1114196 [Accessed 1 November 2009]
Eppinga, Maarten B., Rietkerk, Max, Dekker, Stefan C., De Ruiter, Peter C., Van der Putten, Wim H. 2006. Accumulation of local pathogens: a new hypothesis to explain exotic plant invasions. Oikos. 114(1). JUL 2006. 168-176.
Global Biodiversity Information Facility (GBIF), 2009. Species: *Ammophila arenaria* (L.) Link European Beachgrass
Summary: Available from: http://data.gbif.org/species/13753236/ [Accessed 15 June 2010]
Global Compendium of Weeds (GCW)., 2008. *Ammophila arenaria* (Poaceae)
Summary: Available from: http://www.hear.org/gcw/species/ammophila_arenaria/ [Accessed 1 November 2009]
Green, Diantha Louise. 1965. Developmental history of European beachgrass (*Ammophila arenaria* (L.) Link) plantings on the Oregon coastal sand dunes.
Hertling, U. M. and Lubke, R. A. 1999. Use of *Ammophila arenaria* for dune stabilization in South Africa and its current distribution: Perceptions and problems. Environmental Management. 24(4). Nov., 1999. 467-482.
Hertling, U. M. and Lubke, R. A. 2000. Assessing the potential for biological invasion: The case of *Ammophila arenaria* in South Africa. South African Journal of Science. 96(9-10). September-October, 2000. 520-527.
Summary: Available from: http://eprints.ru.ac.za/562/01/lubkea.pdf [Accessed 20 November 2009]
Hilton, M., Harvey, N., Hart, A., James, K., Arbuckle, C. 2006. The impact of exotic dune grass species on foredune development in Australia and New Zealand: A case study of *Ammophila arenaria* and *Thinopyrum junceiforme*. Australian Geographer Volume 37, Issue 3, November 2006, Pages 313-334.
Hilton, Michael J. 2006. The loss of New Zealand's active dunes and the spread of marram grass (*Ammophila arenaria*). New Zealand Geographer (2006) 62, 105–120.

Hilton, Mike, Duncan, Megan, Jul, Anne. 2005. Processes of *Ammophila arenaria* (marram grass) invasion and indigenous species displacement, Stewart Island, New Zealand. Journal of Coastal Research. 21(1). January 2005. 175-185.
Huiskes, A. H. L. 1977. The Natural Establishment of *Ammophila arenaria* from Seed. Oikos, Vol. 29, No. 1 (1977), pp. 133-136
Integrated Taxonomic Information System (ITIS)., 2009. *Ammophila arenaria* (L.) Link
Summary: Available from: http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=40449 [Accessed 1 November 2009]
Invasives.org- Centre for Invasive Species and Ecosystem Health., 2009. European beachgrass *Ammophila arenaria* (L.) Link
Summary: Available from: http://www.invasive.org/species/subject.cfm?sub=5077 [Accessed 1 November 2009]
Knevel, Irma C., Lans, Thomas, Menting, Frank B. J., Hertling, Ursula M., van der Putten, Wim H. 2004. Release from native root herbivores and biotic resistance by soil pathogens in a new habitat both affect the alien *Ammophila arenaria* in South Africa. Oecologia (Berlin). 141(3). November 2004. 502-510.
Lubke, R.A. and Hertling, U.M. 2001. The role of European marram grass in dune stabilization and succession near Cape Agulhas, South Africa. Journal of Coastal Conservation Volume 7, Issue 2, 2001, Pages 171-182.
Lubke, R.A., Hertling, U.M., Avis, A.M. 1995. Is *Ammophila arenaria* (Marram grass) a threat to South African dune fields?. Journal of Coastal Conservation 1 (2), pp. 103-108.
Pratt, Ruth. 2001. Western Snowy Plover (*Charadrius alexandrinus nivosus*) Pacific Coast Populations Draft Recovery Plan. U.S. Fish and Wildlife Service. Portland , Oregon. Xix+ 630 pp.
Summary: Avialable from: http://www.westernsnowyplover.org/pdfs/draft_recovery_plan.pdf [Accessed 11 December 2009]
Rodriguez-Echeverria, S., H. Freitas, and W.H. van der Putten., 2008. Genetic Diversity and Differentiation of *Ammophila arenaria* (L.) Link as Revealed by ISSR Markers. Journal of Coastal Research, 24(1), 122&#65533;126. West Palm Beach (Florida), ISSN 0749-0208.
Slobodchikoff, C. N. and John T. Doyen., 1977. Effects of *Ammophila arenaria* on Sand Dune Arthropod Communities. Ecology, Vol. 58, No. 5 (Sep., 1977), pp. 1171-1175
USDA-ARS, 2009. Taxon: *Ammophila arenaria* (L.) Link. National Genetic Resources Program. Germplasm Resources Information Network - (GRIN) [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland.
Summary: Available from: http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?2911 [Accessed 1 November 2009]
USDA, NRCS. 2009. *Ammophila arenaria* (L.) Link European beachgrass. The PLANTS Database
Summary: Available from: http://plants.usda.gov/java/profile?symbol=AMAR4 [Accessed 1 November 2009]
Van der Laan, D., van Tongeren, O.F.R., van der Putten, W.H., Veenbaas, G. 1997. Vegetation development in coastal foredunes in relation to methods of establishing marram grass (*Ammophila arenaria*). Journal of Coastal Conservation 3: 179-190, 1997
Van der Putten, W.H. 1990. Establishment of *Ammophila arenaria* (Marram grass) from culms, seeds and rhizomes. Journal of Applied Ecology (1990), 27, 188-199.
Van der Putten, W. H., Yeates, G. W., Duyts, H., Reis, C. Schreck, Karssen, G. 2005. Invasive plants and their escape from root herbivory: a worldwide comparison of the root-feeding nematode communities of the dune grass *Ammophila* arenaria in natural and introduced ranges. Biological Invasions. 7(4). JUL 2005. 733-746.
Van der Putten, Wim, 2000. Summary of the final report: The impact of invasive grass species on the structure, function and sustainable use of coastal and inland sand dune ecosystems in Southern Africa - INVASS. Reconciling multiple demands on coastal zones. Project number: IC18CT970145 4th Framework Programme
Van Der Stoel, C. D., van der Putten, W. H., Duyts, H. 2002. Development of a negative plant-soil feedback in the expansion zone of the clonal grass *Ammophila arenaria* following root formation and nematode colonization. Journal of Ecology. 90(6). December 2002. 978-988.
Webb, Cameron E., Oliver, Ian, Pik, Anthony J. 2000. Does coastal foredune stabilization with *Ammophila arenaria* restore plant and arthropod communities in southeastern Australia?. Restoration Ecology. 8(3). September, 2000. 283-288.
World Register of Marine Species (WoRMS), 2009. *Ammophila arenaria* (L.) Link.
Summary: Available from: http://www.marinespecies.org/aphia.php?p=taxdetails&id=403902 [Accessed 1 November 2009]