Pirri-pirri burr (*Acaena novae-zelandiae*)

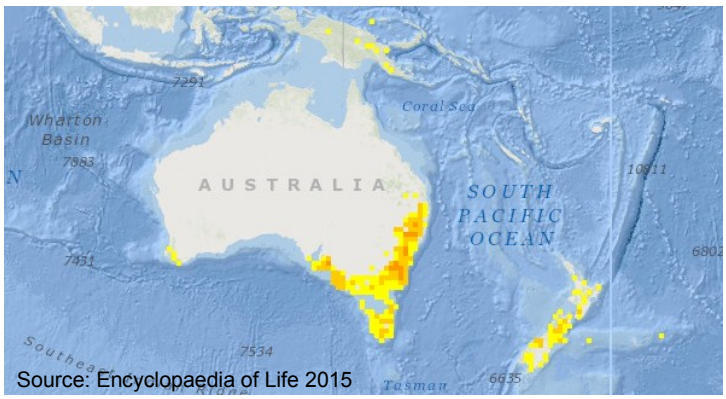
- Dwarf shrub, 2—15 cm high, which produces distinctive red burrs.
- Introduced as a contaminant of wool imports.
- Well established in England, a few populations in Wales and Scotland.
- Prefers sand dunes but also found on other sandy soils.
- Forms dense vegetation mats which prevent native plants from establishing.
- Grows in areas where threatened native plants occur.

History in GB

Originally introduced to Britain as a wool contaminant, first recorded in the wild in 1901. Now recorded in 138 of 2823 hectads in Great Britain. Current distribution extends from the south coast of England to southern Scotland, particularly coastal areas in southern and north east England. Earlier records were mainly from coastal areas, but more recent records have been from inland.

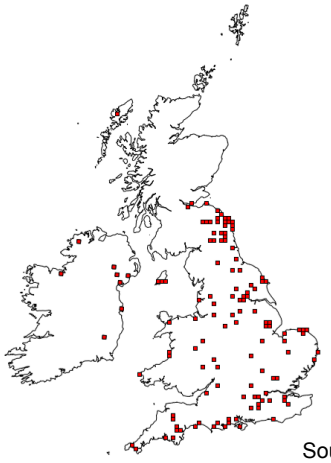
Native distribution

Native to south-eastern Australia and New Zealand



Source: Encyclopaedia of Life 2015

Distribution GB



Source: NBN 2015

Impacts

Environmental

- Forms persistent dense vegetation mats in open habitats which prevent establishment and spread of native species.
- Reports of birds being impacted by having burrs attached to their feathers.

Economic

- Management costs.
- Potential loss of grazing land if grazing animals excluded from affected areas to prevent further spread.

Social

- None known.

Introduction pathways

Ornamental (very likely) - traded as an ornamental plant in GB.
Hitch-hiker on wool (very unlikely) - originally introduced as a contaminant of wool imports, although advances in thermal treatment of wool and processing should destroy seed germination.

Spread pathways

Natural (slow) - short distance spread by clonal growth and seeds.
On animals (intermediate) - particularly sheep, rabbits and dogs.
On clothing (rapid) - in Australia, 40% of seeds attached to socks of walkers in a national park were still attached after a 5km walk.

Summary

	Risk	Confidence
Entry	VERY LIKELY	VERY HIGH
Establishment	VERY LIKELY	VERY HIGH
Spread	INTERMEDIATE	MEDIUM
Impacts	MAJOR	MEDIUM
Conclusion	HIGH	MEDIUM

Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at:
https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=51
comments should be emailed to nnss@apha.gsi.gov.uk

Rapid Risk Assessment of: *Acaena novae-zelandiae*, Pirri-pirri-bur
Author: Katharina Dehnen-Schmutz

Version: Final (April 2016) – Draft 1 (November 2013), Peer Review (March 2014), NNRAP 1st review (September 2014), Draft 2 (January 2015).
Signed off by NNRAP: September 2014
Approved by Programme Board: September 2015
Placed on NNSS website: November 2015

GB Non-native species Rapid Risk Assessment (NRRA)

Introduction:
The rapid risk assessment is used to assess invasive non-native species more rapidly than the larger GB Non-native Risk Assessment. The principles remain the same, relying on scientific knowledge of the species, expert judgement and peer review. For some species the rapid assessment alone will be sufficient, others may go on to be assessed under the larger scheme if requested by the Non-native Species Programme Board.

1 - What is the principal reason for performing the Risk Assessment? (Include any other reasons as comments)

Response: *To rapidly assess the risk associated with this species in Great Britain*

2 - What is the Risk Assessment Area?

Response: *Great Britain*

3 - What is the name of the organism (scientific and accepted common; include common synonyms and notes on taxonomic complexity if relevant)?

Response: *Acaena novae-zelandiae* Kirk syns. *Acaena anserinifolia* auct.; *Acaena sanguisorbae* subsp. *novae-zelandiae* (Kirk) Bitter, Pirri-pirri-bur, Biddy-biddy, Bidgee-widgee

4 - Is the organism known to be invasive anywhere in the world?

Response:
Yes. *A. novae-zelandiae*, a native of south-eastern Australia and New Zealand, is reported as invasive in western Australia (Keighery and Longman 2004), North America (GRIN database 2013) and the British Isles (Gynn and Richards 1985). The species seems to be absent elsewhere in Europe with the exception of Denmark where it is classified as established, non-invasive, rare alien (NOBANIS 2013). *A. novae-zelandiae* is declared a noxious weed in the US states of Oregon, California and Hawaii (GRIN database 2013).

5 - What is the current distribution status of the organism with respect to the Risk Assessment Area?

Response: Introduced as a wool contaminant *A. novae-zelandiae* has been first recorded in the wild in Britain in 1901 (Preston et al. 2002). The species has been recorded in 138 hectads (BSBI 2013) out of 2823 total hectads for the Risk Assessment Area. The distribution ranges from the south coast of England up to the southern parts of Scotland with a focus on coastal areas in southern England and in particular the north east coast of England. Whereas earlier records have been mainly from coastal areas more recent occurrences have also been recorded from inland. As records do not usually include

spontaneous occurrences in gardens originating from the ornamental use of the species the distribution in particular inland may not be fully documented.

6 - Are there conditions present in the Risk Assessment Area that would enable the organism to survive and reproduce? Comment on any special conditions required by the species?

Response:
Yes. *A. novae-zelandiae* is already present in the Risk Assessment Area (Preston et al. 2002). The species main occurrences in the Risk Assessment Area are in open sand dunes and similar sandy habitats with free draining soils corresponding to habitat requirements described from New Zealand (Gynn and Richards 1985). Increasingly it is also recorded in heaths, conifer plantations on sandy soils, old gravel workings, roadsides and disused railways (Day 2011).
In south-eastern Australia the species is found in grasslands, forests and cleared areas (Gynn and Richards 1985). Experimental evidence demonstrated that seedlings did not survive air temperature below -8 ^{0}C, however, observations from Lindisfarne showed that above ground parts of the plant would die back in severe frosts but regrow later (Gynn and Richards 1985).
In the horticultural literature *A. novae-zelandiae* is rated as fully hardy for the British Isles (Brickell 1996, Lord 2003).

7 - Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment Area or sufficiently similar for the organism to survive and thrive?

Response:
Yes. Climatic conditions in parts of *A. novae-zelandiae*'s native range are comparable to those in the Risk Assessment Area. However, the species native range in Australia as well as it's non-native range in North America includes also regions with a warmer climate than in Britain.

8 - Has the organism established viable (reproducing) populations anywhere outside of its native range (do not answer this question if you have answered 'yes' to question 4)?

Response: NA

9 - Can the organism spread rapidly by natural means or by human assistance?

Response:
Yes. *A. novae-zelandiae* can spread rapidly by seed attachment and use as an ornamental plant. Seed heads of *A. novae-zelandiae* contain 70-100 fruits forming a burr that sticks to animal fur, birds and human clothing and can thus be spread on a local as well as long distance scale (Gynn and Richards 1985, Pickering et al. 2011). Individual plants also spread through clonal growth and can reproduce vegetatively if rooted stolons are separated from the parent plant by mechanical damage (Gynn and Richards 1985). Spread may also occur from the trade of the species as an ornamental. *A. novae-zelandiae* is offered for sale by six nurseries in the Royal Horticultural Society's Plant Finder (RHS 2013) which indicates that it is not an unpopular species.

10 - Could the organism itself, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment Area?

Response:

Yes. The current main impact of *A. novae-zelandiae* is on native biodiversity. This is of particular concern in sand dune habitats. Even though there is little published evidence for these impacts available, the description of the dense, mat forming growth habit implies that habitats for native species may become fragmented and or severely modified.

It has been reported that ground nesting birds have died as a result of burrs of the species getting into their feathers (Day 2011, Ellis 1994), however, no further reference or information on the extent of this problem could be found. There is also a lack of investigation into the impacts of the species in other habitats. No economic or social impacts have been reported.

Entry Summary

Estimate the overall likelihood of entry into the Risk Assessment Area for this organism (comment on key issues that lead to this conclusion).

Response: *very likely*

Confidence: *very high*

Comments (include list of entry pathways in your comments):
A. novae-zelandiae is already present in the Risk Assessment Area since 1901 when it was introduced as a contaminant of wool imports (Preston et al. 2002). Further entry via this pathway is very unlikely. However, the species is also used and traded as an ornamental plant and entry from outside the Risk Assessment Area through the international plant trade very likely. One of six nurseries listed in the Plant Finder (RHS 2013) as selling the species is based outside Britain. The plant stock sold by British nurseries could also be from imports. A further potential pathway could be the revival of the use of sheep wool as fertiliser (Böhme et al. 2010) which has contributed to spread the species in the Risk Assessment Area in the past (Gynn and Richards 1985). However, the thermal treatment of the wool and processing into pellets is likely to destroy germinability of seeds.

Establishment Summary

Estimate the overall likelihood of establishment (comment on key issues that lead to this conclusion).

Response: *very likely*

Confidence: *very high*

Comments (state where in GB this species could establish in your comments, include map if possible):
The species is already established in the Risk Assessment Area (Preston et al. 2002). Further establishment is possible in habitats similar to the habitats where the species is already established, ie mainly sand dunes but also continuing the more recent observation of establishment in heaths, conifer plantations on sandy soils, old gravel workings, roadsides and disused railways inland (Day 2011). Further dune habitats along the north eastern coast of England as well as in south eastern Scotland where the species has already been found in some locations seem to be the most likely areas for further establishment; and similarly dune habitats along the southern and south eastern coasts of England. However, less exposed sites in the dune systems along the western coasts of Great Britain could also be potential habitats for establishment.

Spread Summary

Estimate overall potential for spread (comment on key issues that lead to this conclusion).

Response: *intermediate*

Confidence: *medium*

Comments (include list of spread pathways in your comments):

The distribution of *A. novae-zelandiae* in the Risk Assessment area has increased from records in 29 hectads reported by Gynn and Richards (1985) to 138 hectads today (BSBI 2013).

Spread of the species in the future could result mainly from the following pathways:
- vegetative clonal growth and short distance spread by seeds from existing populations (slow).
- ornamental plant trade (very rapid)
- attachment of seeds to animals, in particular sheep, rabbits and dogs (intermediate)
- attachment of seeds to clothing of walkers (rapid). It has been shown that 40% of seeds attached to socks of walkers in a National Park in Australia were still attached after a 5 km walk (Pickering et al. 2011).

Impact Summary

Estimate overall severity of impact (comment on key issues that lead to this conclusion)

Response: *major*

Confidence: *medium*

Comments (include list of impacts in your comments):
The main impact of *A. novae-zelandiae* is environmental due to its establishment in natural and semi-natural habitats. Further establishment of the species in dune habitats or on cliffs will increase this impact. There is a lack of information on possible impacts in inland habitats. Natural England holds records of the species in 35 SSSIs, however, not all of these have recent confirmations and there is no regular monitoring for the species. *A. novae-zelandiae* establishes in open habitats where it forms persistent dense vegetation mats (Gynn and Richards 1985) that prevent establishment and spread of native species depending on these open habitats. A study on Lindisfarne showed, however, that the dune slacks, where most of the rare native species were found, were less likely to be colonised by *A. novae-zelandiae* (Ellis 1994), but it is not known if that is still the case. There are also reports that birds have been negatively affected by burrs getting attached to their feathers (Day 2011, Ellis 1994). Further spread of this species on Lindisfarne may impact populations of the very rare endemic orchid *Epipactis sancta* that is restricted to Lindisfarne (Plantlife 2010).

Management costs are the main economic impacts although there is also a potential for the loss of grazing land if grazing animals were to be excluded from affected areas to prevent further spread. No health or social impacts are known.

Climate Change

What is the likelihood that the risk posed by this species will increase as a result of climate change?

Response: *medium*

Confidence: *medium*

Comments (include aspects of species biology likely to be effected by climate change (e.g. ability to establish, key impacts that might change and timescale over which significant change may occur):
The current distribution of the species in the risk assessment area seems to be more determined by habitat availability and chance of introduction rather than climate. The species is considered fully hardy in current climatic conditions (Gynn and Richards 1985, Brickell 1996). A warmer climate would, however, correspond more to the current global range of the species and could positively affect for example growth rates or seed production. There could also be a link between the recent trend of the species found more often in inland habitats and increasing winter temperatures.

There is also the possibility that the species might increase if more open, dry and free draining habitats would become available as a result of climate change.

Conclusion

Estimate the overall risk (comment on the key issues that lead to this conclusion).

Response: *high*

Confidence: *medium*

Comments:
A. novae-zelandiae is already well established in parts of the Risk Assessment Area and over the last decades has spread and established new populations. The habitats affected are mostly natural or semi-natural habitats of high conservation value often in designated areas. Further spread from existing populations as well as from the use as ornamental seems very likely. Due to the high value habitats affected the impacts of the species on native biodiversity are high.
There is a lack of systematic studies in particular regarding impacts, but also on habitats affected other than dunes and available management options. This is reflected in the confidence scoring.

Management options (brief summary):

1 - Has the species been managed elsewhere? If so, how effective has management been?

Response:
Yes. *A. novae-zelandiae* is managed as a "minor weed" in parts of its native range of Australia where hand-pulling before seedheads mature is recommended as the most effective control method, as well as precautionary measures like the removal of burrs from clothing to prevent further spread (Romanowski 2011). The species is also managed in California, where it has been successfully eradicated in some areas (Monterey County 2013, control method used not reported).

2 - List the available control / eradication options for this organism and indicate their efficacy.

Response:
There is not much information available on control/eradication options:
- chemical control: effective, but due to the often high value habitats and possible effects on native species not always feasible.
- hand pulling + digging: laborious and efficacy depending on successful removal of all rooted stolons.
- mechanical tillage: not effective, encourages more vegetative reproduction (Anonymous 2013)

3 - List the available pathway management options (to reduce spread) for this organism and indicate their efficacy.

Response:
The main pathways for further spread of *A. novae-zelandiae* in the Risk Assessment area are:
- exclusion of grazing animals and visitors from affected areas particular after seedheads mature: quite effective but probably difficult to achieve for wild animals (rabbits) and in highly popular recreation sites
- publicity and signs to ask visitors to remove seeds from shoes and clothing as well as dogs: efficacy highly dependent on voluntary compliance
- dragging carpets over plants to collect seeds: proved to be not very effective in a RSPB reserve (Day 2009)
- hand collect seeds: effective (Day 2009)
- stop use as ornamental species to prevent spread from gardens: effective

4 - How quickly would management need to be implemented in order to work?

Response:
Plants in the field have been observed to first produce a minimum size of about 300 cm^2 before producing flowers, and glasshouse trials suggest a time of up to 4 years to maturity (Gynn and Richards 1985). Given early detection an intervention before seedheads are produced seems therefore the best strategy to prevent further spread and achieve local eradication.

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Provide here a list of the references cited in the course of completing assessment

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