NOBANIS – Invasive Alien Species Fact Sheet

Rosa rugosa

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Species description

Scientific names: *Rosa rugosa* Thunb. ex Murray, Rosaceae
Synonyms: None
Common names: Japanese Rose, Rugosa Rose (GB), Kartoffel-Rose (DE), Rynket Rose (DK), Kurdlehine kibuvits (EE), Kurtturuusu (FI), Garðarós (IS), Raukšlėtalapis erškėtis (LT), Rievainā roze (LV), Rimpelroos (NL), Rynkerose (NO), Róża pomarszczona (PL), Морщинистая роза (Morshchinistaya rosa) (RU), Vresros (SE).

Fig. 1. *Rosa rugosa* dominating in a Danish coastal landscape, photo by Lise Frederiksen.

Fig 2, 3 and 4. *Rosa rugosa* flowers and hips, photos by Lise Frederiksen.

Species identification
Rosa rugosa is a small sprouting shrub that forms dense thickets. The surface of the leaves is wrinkled, dark green, smooth above while pubescent and slightly sticky underneath. The twigs are stout and covered with thin, straight sharp spines of various sizes. The flowers are big (8-10 cm across) and can be white or light to dark pink depending on the cultivar, also doubled flowers occur in the wild. The fruits are large and slightly flattened, shiny, deep red and fleshy "rose-hips" which ripen in late summer.

Native range
Rosa rugosa occurs naturally in Eastern Asia from Ochotsk and southern Kamchatka to Korea and the northern parts of Japan and China.

Alien distribution

History of introduction and geographical spread
Rosa rugosa is a relatively recent newcomer in the region. The first records of the species being introduced from Japan to Europe are from 1796, but only after 1845 did the species become more abundant (Langeland 1994). In the late 1800s and throughout the 20th century the interest in utilising the species has grown. The first records of naturalised Japanese Rose in the region are from Germany in 1845 (Kowarik 2003) and Denmark in 1875 (Svart and Lyck 1991, Nilsson 1999). In Sweden the first observation was made in 1918 (Milberg 1998) while the first seashore locality was registered in 1928 (Nilsson 1999). In Finland the species was observed in 1919 (Erkamo 1949) and in Lithuania in 1937 (Gudžinskas 2000). In Norway, the species was first found naturalised in the 1940s, as judged from herbarium material (Fremstad 1997). In Poland *Rosa rugosa* was introduced in 1960 (Tokarska-Guzik 2003).

The species was initially introduced as an ornamental plant in many places of Europe. In the Brandenburger area of Germany 119 years went by before the species became invasive (Kowarik 1995). Dispersal in the other parts of the region has apparently also had a “lag phase”, although somewhat shorter. On the island Anholt the species at first was noted at the lighthouse in 1941, and

by 1961 it was found on several places, e.g. in the dunes near Sønderbjerg and at the coast along Flakket (Christensen and Johnsen 2001). In Finland the effective spreading began in the 1930s, twenty years after the initial naturalisation (Arto Kurtto pers. comm.).
In the Netherlands, the species was first found naturalised in 1926 (Leni Duistermaat pers. comm.).

Pathways of introduction
The species is very common all over Denmark (Adsersen 1978, Jacobsen and Ejrnæs 2004) and Sweden (Hylander 1970). In Norway (Fremstad 1997) and Finland (Uotila 1988, Kurtto and Helynranta 1998) the species is still spreading in a northwards direction along coastal sites. In Norway it has recently been recorded in Tromsø at almost 70^{o} N (Alm *et al*. 2004), but is still a casual species at that latitude. *Rosa rugosa* is quite common in northern Germany with big populations in coastal areas and declining to the southern parts where mostly only single bushes are recorded (Oberdorfer 2001, www.floraweb.de, F. Klingenstein pers. comm.). The species is scattered throughout Poland, but is more frequent in SW Poland and is still spreading (Tokarska-Guzik 2003).

Often seashore stands are descendants of shrubs planted in gardens of villas and summer cottages. New localities are, however, also found in inland areas e.g. in Norway, Finland and Germany. In the inland, roadside plantings are also important sources of naturalisation. Furthermore, the shrub is commonly planted along highways, since, as a seashore plant, it belongs to the rare species that tolerate the wintertime salting of roads (Kurtto and Helynranta 1998). In Ireland and Northern Ireland *Rosa rugosa* is widely planted as a roadside and flower bed plant by local councils and roads authorities, but is not considered to be a very invasive species in these countries (John Early pers. comm.).

Alien status in region
Rosa rugosa is recorded as an established garden escape in 16 European countries (Bruun 2005; see also table 1). Maps of the distribution of *Rosa rugosa* may be found in Kurtto *et al.* (2004) and in Essl (2008).

The species is found naturalised in Estonia and Latvia (Šmite 1996), Denmark (Svart and Lyck 1991), Lithuania (Gudžinskas 2000), Norway (Fremstad 1997), Poland (Tokarska-Guzik 2003), Sweden (Milberg 1998), Finland (Erkamo 1949, Uotila 1988), Austria (Essl and Rabitsch 2002) and Germany (Oberdorfer 2001). R. rugosa has not yet been naturalised on the Faroe Islands, although the species is grown in gardens and sets viable seeds (Tróndur Leivsson, pers.comm.). This species is not found in Greenland (Gert Steen Mogensen, pers. comm.).

Country	Not found	Not established	Rare	Local	Common	Very common	Not known
Austria				X			
Belgium				X			
Denmark						X	
Estonia				X			
European part of Russia							
Finland					X		
Faroe Islands		X					
Germany				X			
Greenland	X						
Iceland			X				
Ireland					X		
Latvia					X		
Lithuania					X		
Netherlands				X			
Norway						X	
Poland					X		
Sweden						X	

Table 1. The frequency and establishment of *Rosa rugosa*, please refer also to the information provided for this species at www.nobanis.org/search.asp. Legend for this table: **Not found** –The species is not found in the country; **Not established** - The species has not formed self-reproducing populations (but is found as a casual or incidental species); **Rare** - Few sites where it is found in the country; **Local** - Locally abundant, many individuals in some areas of the country; **Common** - Many sites in the country; **Very common** - Many sites and many individuals; **Not known** – No information was available.

Ecology

Habitat description

Rosa rugosa grows on sandy or gravely beaches as well as in dune grassland communities in its native range (Bruun 2005). In its native range the species is only one component of a species rich shrub zone between open dune grassland and landward dune forest (Nakanishi and Fukomoto 1994).

In its alien range the species is found in similar habitats. In coastal dunes *Rosa rugosa* occurs in a diversity of dry dunes, from the yellow (unstable) dune with *Ammophila arenaria*, across short grasslands of grey dunes with *Phleum arenarium*, *Agrostis capillaris* and *Corynephorus canescens* and shrubland of *Hippophaë rhamnoides* to brown (stabilised) dunes with heathland of *Empetrum nigrum* or *Calluna vulgaris* (Isermann 2008b). In Norway, Finland and Denmark, it forms dense thickets also in a variety of other seashore habitats; on sandy, gravely or stony shores from drift walls and upwards. On rocky shores smaller stands or singular shrubs are found just above the upper reach of winter storms.

In general the shrub in NW-Europe establishes with different invasion success in various communities (Isermann 2008b). The species also occurs in various open habitats like road verges, railway slopes, and in ruderal habitats such as building sites and field edges (Fremstad 1997). In Poland it is also found in dry meadows and shrubs as well as forest edges (Tokarska-Guzik 2003).

Rosa rugosa occurs under a broad range of environmental conditions, probably with much broader ranges in its new distribution areas (Isermann 2008b). A relationship between the soil pH and growth was shown in Danish dunes, the tallest plants were found at relatively low pH (Schlätzer 1974), and in NW Europe generally at a lower pH in its new range (Isermann 2008b).

Rosa rugosa has had a remarkable success in comparison to other introduced *Rosa* species. Several factors contribute to this. The native climate of *Rosa rugosa* is comparable to the climate in the region, and it thrives well in its new range. *Rosa rugosa* has photosynthetic leaf characteristics (in comparison to other roses) that may support the occurrence in more northern regions (Ueda *et al*. 2000). Furthermore, the species has several ways of spreading seeds and rhizomes, all of which have contributed to the naturalisation of the species. *Rosa rugosa* grows successfully in coastal areas, especially dunes, because the species is salt tolerant (Dirr 1978), and is adapted to moderate sand cover (Belcher 1977). The establishment in yellow dunes is supported by arbuscular mycorrhizae, which occurs in *Ammophila* species (Gemma and Koske 1997). Moreover, propagule pressure due to urban areas enhances spreading.

Reproduction and life cycle

Rosa rugosa is a woody perennial shrub. It has hermaphroditic flowers which are insect pollinated and mainly cross-pollinated, although self-fertilisation has been reported to take place under experimental conditions (ref. in Bruun 2005). The importance of insects as pollinators for this species has been observed directly on the Faroe Islands, as wasps introduced in 2000 markedly increased the seed production of *R. rugosa* (Tróndur Leivsson, pers.comm.). The seeds of *Rosa rugosa* are developed in large rose hips that are fleshy and very tasty to animals (*i.e.* small rodents, birds) and humans. The plants furthermore reproduce vegetatively by rhizomes.

Dispersal and spread

Rosa rugosa has several methods for dispersal. In Norway, Finland and Denmark it has been reported to occur on uninhabited isolated islands where human dispersal is unlikely (Fremstad 1997, Jessen 1968, Kurtto and Helynranta 1998). Experiments by Jessen (1958) showed that the hips of Japanese rose are extraordinarily buoyant and can float up to 40 weeks in both fresh water and seawater. After this the hips would disintegrate revealing the seeds inside. The seeds, however, are also buoyant for several weeks on their own, due to special tissues in the cell walls of the seeds. In the other rose species investigated by Jessen (1958) neither hips nor seeds would float for a very long time, indicating that *Rosa rugosa* is indeed very well adapted to dispersal by this mechanism.

Instances of seed dispersal of *Rosa rugosa* by birds have been reported from several countries (Fremstad 1997, Bruun 2005). Seeds dispersed by resident birds may not be transported far from the seed source, but this mode of dispersal could be important in explaining local transport. In Finland the fruits ripen just at the time when most of the migratory birds start moving southwards. *E.g.* thrushes (genus *Turdus*), green finch (*Carduelis chloris*) and bohemian waxwing (*Bombycilla*

garrulus) eat the fruits in coastal areas and most probably carry the seeds to distant islands where they rest before flying over the sea (Terhi Ryttari, pers. comm.).

Furthermore *Rosa rugosa* has long rhizomes that ensure local dispersal. The rhizomes break off in exposed areas and after transportation, *e.g*. by water, and new individuals may establish themselves from minor rhizome pieces (Fremstad 1997, Bruun 2005).

Impact

Affected habitats and indigenous organisms

The effects of *Rosa rugosa* on native flora and fauna are generally negative by reducing the number of native species present at the invaded sites (Schepker and Kowarik 2002, Jacobsen and Ejrnæs 2004, Isermann 2008a,c). *Rosa rugosa* displaces the natural flora of beach and dune vegetation affecting both common and rare species (Härdtle & Vestergaard 1996, Fremstad 1997, Milberg 1998, Hellemaa 1998, Isermann 2008a). Typical dune species like *Arenaria serpyllifolia*, *Empetrum nigrum*, *Festuca rubra* ssp. *arenaria*, *Galium mollugo*, *Poa pratensis* ssp. *subcaerulea*, *Veronica arvensis*, *Viola tricolor* as well as mosses and lichens decline. Thickets of *Rosa rugosa* are species-poor, irrespective of the dune type in which the shrub is established (Isermann 2008a). The strong reduction of the species diversity is caused by the shading effect of *Rosa rugosa* (Isermann 2008a,c). When the local plant life is displaced the animal species that depend on these plants are also threatened (such as butterflies that lay the eggs only on certain seashore plants).
Moreover, it was shown that the biological invasion of *Rosa rugosa* facilitates other non-native species probably in a self-preventing system of positive feedback circles (Isermann 2008b).

A special problem is that *Rosa rugosa* has ecological demands comparable to those of *R. pimpinellifolia* and that especially young succession phases in dunes are affected (Kowarik 2003).

Jessen (1958) mentions that thickets of *Rosa rugosa* were seen starting dune formation, thereby altering the physical habitat substantially.

Rosa rugosa plants can be a nuisance to landowners at the seaside and to visitors to the beaches. The rhizomes quickly form an impenetrable thicket and the stems are covered with sharp thorns. When plants are cut down, vigorous regrowth takes place. The dead stems with thorns remain for an extended period after the plant has been killed with herbicides (Lægaard 1987).

Rosa rugosa in Canada is a new host for the introduced leaf galler *Diploleppis polita*, which normally occurs only on *Rosa acicularis* (Shorthouse 1994). *Rosa rugosa* may thereby act as a reservoir for a potential pest species. *Rosa acicularis* is a native species of Finland and Sweden but this potential new interaction has not been investigated.

Fig. 5. *Rosa rugosa* outcompetes other species, *in casu Rosa pimpinellifolia*, on a Danish coastal site, photo by Lise Frederiksen.

Genetic effects
Under cultivation cultivars and hybrids with several other *Rosa* species have been reported and some are also observed in nature (Mang 1985, Epping and Hasselkus 1989, Palmén *et al*. 1995, Bruun 2005, Hans Henrik Bruun, pers. comm., E. Fremstad, pers. comm.). In Germany a hybrid between *Rosa mollis* and *R. rugosa* is known from the Geltinger Birk (Eigner 1998). In Norway spontaneous hybrids between *R. rugosa* and *R. majalis* are known from at least seven localities in the southeastern part of the country (Lid & Lid 2005).

Human health effects
No negative effects on human health have been recorded, although allergies towards the pollen or fragrance of roses may occur for hypersensitive individuals.

Economic and societal effects (positive/negative)
Rosa rugosa may be considered a useful plant with large and attractive flowers. New plants are easily propagated from rhizomes and the species has been planted widely as a hedge or as windbreaker. In spite of its invasive nature the species is still sold in plant nurseries (*e.g.* in Denmark and Norway). Furthermore, the species is used in the breeding of other cultivars of roses.

It is also a common plant for landscaping e.g. along highways and in cities (*e.g*. in Germany, the Netherlands and Norway). Other positive effects include its use for erosion control.

It might be questioned whether the plant under some circumstances may have a positive effect on tourism, since it is, *e.g.* on the German isle of Sylt, regarded as a typical plant of the landscape (and is called the “Sylt-Rose”). Similarly, the species is being shown in tourist brochures and on

postcards in Denmark. On the other hand, the species may have negative effects on outdoor recreation, hindering e.g. walking and sun bathing on sandy seashores.

Rosa rugosa also has culinary uses in preserves, jelly and in wine production. Furthermore, the floral scent is used in perfumes and in personal care articles. Extracts of the flowers or hips have also been used in herbal medicines and vitamin products.

Management approaches

Prevention methods
It is important to stop using *Rosa rugosa* for plantings in the countryside, particularly in coastal areas (= at least 50 km away from the coast). In more inland localities, e.g. in Germany, the species occurs only as single bushes and does not threaten native conservation values (Frank Klingenstein, pers. comm.). The Danish Forest and Nature Agency has produced a folder that explains about invasive *Rosa rugosa* and warns against planting this rose along coastal sites, suggesting a range of indigenous species as alternatives (Miljøministeriet *et al.* 2004, web-version).

Eradication, control and monitoring efforts
Once control measures for this plant are initiated there is a need for continued dedication to the chosen approach. Therefore, it is only advisable to initiate measures if sufficient capacity is available to ensure successful eradication.

The techniques used for control of *Rosa rugosa* have been digging, cutting, grazing, or the use of herbicides.

The most efficient method for removing the species is to dig it up. There is a need to ensure that all rhizomes and roots have been removed. Furthermore, the procedure needs to be repeated until one is certain that all rhizome pieces have been found and removed. For small areas this method is preferable, but for larger areas the method has proven effective but labour intensive. In dune areas complete removal of the plant from large areas may lead to sand drift, since no other vegetation will be left to cover the sand.

Mechanical removal by a kind of caterpillar machines with a loading shovel has been used in Hanko district, Finland. The machines have taken a whole layer of sand away from the depth were the rhizomes were found. As a result, the above-ground shrubs and most of the rhizomes have been removed. Pieces of rhizomes have been left and these have been treated manually afterwards. The managed seashore was about half a kilometre long and full of *Rosa rugosa*.

Digging up the plants can also be combined with application of herbicides (such as Glyphosate) if local conditions and legislation permit this approach. The herbicide should be applied specifically and only to *Rosa rugosa*. This can be achieved with some kind of "weeper" (a device with one or more wicks). For small areas a paintbrush can be used, for large areas hand carried or tractor driven devices are needed. The important issue is to avoid affecting other plant species. Education of the technical staff is often necessary (Didriksen 1999).

Cutting the roses down may be a solution, but this approach needs long-term commitment, since repeated cutting is needed (Didriksen 1999). Cutting only once will have an adverse effect since this will rejuvenate the bush.
The Directorate for Nature Management (DN) in Norway initiated in 2008 a two years research project aiming at finding good eradication methods for *Rosa rugosa*. The research project is investigating various mechanical and chemical ways of eradication, using a variety of combinations and a variety of herbicides. The most promising methods will be summarised in a manual in 2009. In addition DN will during 2009 start to work out a national action plan aiming at eradicating, or at least controlling, *Rosa rugosa* from selected nature reserves in Norway.

Fig. 6. Mechanical **c**ontrol by repeated cutting of *Rosa rugosa* in a coastal habitat in Denmark; the natural vegetation is expected to gradually come back in the holes created in the *R. rugosa* cover, photo by Inger Weidema.

Grazing as a control method is only relevant where *Rosa rugosa* enters an area that has previously been grazed. Grazing provokes vigorous regrowth by rhizomes, and very heavy grazing is necessary, often altering the plant community in an adverse direction. Goats are the only animals that seem to be able to graze *Rosa rugosa* enough to control it efficiently (Miljøministeriet *et al.* 2004).

In the future, biological control agents may also be identified for this species, since it has been shown that more insect and fungal species that may attack the species are found in its native range than in its introduced range (Bruun 2006).

All the above-mentioned measures have to be controlled and most likely repeated or supplemented by other measures in the following years. Single treatments of an area are not sufficient – a continued management plan for any particular areas is recommended.

Information and awareness
In Denmark a folder has been produced explaining the invasive nature of *Rosa rugosa* and warning against using the species outside gardens. This folder is directed towards the interested general public, landscape gardeners, horticulturists, advisors to farmers as well as interest groups and NGOs (Miljøministeriet *et al.* 2004, web-version). In Germany a fact sheet on biology and control is available in the Internet. In Finland, web-pages concerning *Rosa rugosa* were published in the summer 2005. At the same time a press release aimed to get publicity to the issue. In Norway, the Directorate for Nature Management in 2008 issued a general information letter recommending to suspend the cultivation, import, sale, and further use of a number of selected invasive alien plant species, of which *Rosa rugosa* was one of them.

Knowledge and research
Research is ongoing on the establishment success of *Rosa rugosa* in a variety of habitat types in an undisturbed coastal system in Denmark. These studies indicate that *Rosa rugosa* has a high growth potential in a variety of dune communities; establishment being mainly regulated by seed availability (Frederiksen 2005). Also in Germany, a research project until 2011 is dealing with patterns of biological invasion, regional identity, and biodiversity in relation to *Rosa rugosa* (http://www.vegetation.uni-bremen.de/isermann_e.html)

Recommendations or comments from experts and local communities
Rosa rugosa will continue to spread unless coherent and forceful management measures are initiated. Action is necessary in the early phases of establishment to prevent further spread of the species. It is very difficult to remove unwanted *Rosa rugosa*, unless commitment on a longer term is ensured. The plant is attractive and the general public may have difficulties in accepting that removal is necessary to provide room for native species. Education and raising awareness is needed. More research is needed regarding the potential for biological control of this species (Bruun 2006).

References and other resources

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Links

German site on Rosa rugosa (in German)

The virtual flora - *Rosa rugosa* (in Swedish)

Plant profile *Rosa rugosa* in USA (alien distribution in the US)

Finnish site on *Rosa rugosa* (in Finnish)

Finnish site on *Rosa rugosa* (in Swedish)

Norwegian information letter on *Rosa rugosa* (in Norwegian)

Invasive Alien Species in Estonia booklet – plant profile on Rosa rugosa (in Estonian)

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