NOBANIS - Invasive Alien Species Fact Sheet

Prunus serotina

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Species description

Scientific names : *Prunus serotina* Ehrh. 1788, Rosaceae.
Synonyms: *Padus serotina* (Ehrh.) Borkh. 1797, *Cerasus serotina* (Ehrh.) Loisel., sometimes incorrectly named *Prunus virginiana* L. 1753.
Common names: Black Cherry (GB), Spätblühende Traubenkirsche, Späte Traubenkirsche (DE), amerikansk kirsebærtræ, glansbladet hæg, sildig hæg (DK), Kiiltotuomi, Syystuomi (FI), Harilik virsikupuu, Hilistoomingas (EE), rum cherry (IE), vėlyvoji ieva (LT), Romhegg (NO), Czeremcha pózna (PL), черемуха поздняя (RU), Amerikanskt körsbärsträd, Glanshägg (SE).

Fig 1. Young tree in flower (Teltow, Germany), photo by Uwe Starfinger.
Fig 2. Typical dense shrub layer under *Pinus sylvestris* (Grunewald, Berlin), photo by Uwe Starfinger.


Fig. 3 and 4. Flowering raceme and fruits, photos by Uwe Starfinger.

Species identification

Prunus serotina is a deciduous shrub or tree – in its native range up to 40 m tall, in Europe mostly < 20 m. The flowers in erect or spreading racemes appear later in spring than those of the native European *Prunus padus* (hence the name, which means late-flowering). The flowers are white, fragrant. The fruit is a drupe ('cherry'), black when ripe and it is edible. *P. serotina* is the only species in the genus with a persistent calyx (diagnostic feature against *P. virginiana and P. padus*).

Native range

The native range of *P. serotina* covers much of the eastern half of North America; it occurs from Nova Scotia west to Minnesota, south to central Florida and Texas and in the mountains of Central America from Mexico to Guatemala. A distribution map was produced by Fowells (1965). It occurs at altitudes between sea level in the coastal plains and ca. 2,000 m above sea level in the southern Appalachians.

Alien distribution

History of introduction and geographical spread

Prunus serotina was first brought to Europe in the early 17th century and grown in Paris around 1630 (Wein 1930). It was used as an ornamental plant in parks and gardens. In the late 19th century it was tested for timber production in forestry – with little success. Foresters have still planted it quite widely in the 20th century for several reasons: In coniferous plantations *P. serotina* was used as wind and fire breaks and as a soil improver, because it was hoped to speed up soil processes due to the low C/N ratio in its leaves. In Poland the species was introduced in 1813 and in 1911 its naturalization started (Hereźniak 1992). In Denmark the species is often used in windbreaks mixed with other species, as it is frost hardy, wind tolerant, and easy to establish on sandy soils. In Norway it has been frequently used as an ornamental tree during latter years, and it is known to be naturalized at least in the cities of Fredrikstad and several places in Kristiansand since 1980. In Estonia *P. serotina* was first introduced in 1932 in Tallinn (Estonian Alien Species Database). In Lithuania this species first was recorded as naturalized alien in Rambynas Regional Park (SW Lithuania) (Gudžinskas 2000). In Lithuania the species is regarded as an intensively spreading invasive alien. Today it is widely distributed and frequent in much of Germany, Poland and Denmark. In Russia it was introduced in the 17th century, but it is not known to be naturalized before the second half of the 20th century (Деревья и кустарники 1954, Игнатов и др. 1990). In the Netherlands, this species has been planted for forestry purposes since the beginning of the 20th

century, and the species became considrerd a pest sincethe 1950's and planting was abandoned as such.

Pathways of introduction
Prunus serotina has been introduced intentionally both as an ornamental in parks and gardens and as windbreaks in forest and in the more open agricultural landscape.

Alien status in region
In Germany, *P. serotina* is fully naturalized and common in areas with sandy soils – i.e. most of the northern half of the country plus some regions in the south (Starfinger 1997). As it occurs in natural vegetation it is listed as an agriophyte here (Lohmeyer & Sukopp 2001). In Poland the species is rather common, and is also regarded as agriophyte (Tokarska-Guzik 2003). It is more invasive in coniferous and mixed coniferous forests than in deciduous forests. It occurs frequently in the territory of the whole country, but is rare in NE Poland and in the Carpathian Mts. In Sweden it is locally found on sandy soils, mostly in the SW. In Finland *P. serotina* has not established itself in nature, and it is not very common in cultivation either, and that there is one recorded case of escaping to nature, in the vicinity of a garden. The species appears to have difficulties in establishing under the climatic conditions in Finland (Henrik Väre, pers. comm.). In Estonia *P. serotina* is rare. In Russia it is very rare: there are unique cases of naturalization in north-west of Russia and in some cities parks (Игнатов и др. 1990, Губарева 1995). In southern regions of Russia *P. serotina* is established more often but it is not very common in cultivation (Григорьевская и др. 2004). The species is also naturalized and common over much of central Europe, but rare or lacking in Mediterranean countries (see also table 1).

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

Table 1. The frequency and establishment of *Prunus serotina*, 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

In its native range *Prunus serotina* occurs in a wide range of forest types. It grows best on deep, rich and moist soils on the Allegheny plateau in the eastern U.S. Here it can dominate an early successional stage but is outcompeted by shade tolerant trees. Therefore it is of minor importance in the climax stage (Marquis 1990). The species has invaded oak savannas on drier sandy soils in the Midwest after fires were controlled by European settlers. In forests on poorer soils, *e.g.* oak forests, *P. serotina* usually does not grow up to the canopy but remains a shrub or small tree.
In Europe *P. serotina* occurs in both forests and in open vegetation. It reaches the highest cover values in stands of shade intolerant trees such as oak, pine, or birch. In the dense shade of beech, maple, or hornbeam it does not grow well. It tolerates a wide range of moisture conditions and can invade wetlands, *e.g.* bogs and their degeneration stages, but also dry grassland too dry for most other woody plants. A recent study indicates that the species is related to sandy and acidic soils in Denmark (Fischer and Roelsgaard 2009). It is sometimes planted in hedgerows in the agricultural landscape and can reproduce and disperse here. It is also common in urban areas, parks and gardens, in particular in less intensively managed situations.

Reproduction and life cycle

P. serotina reproduces both sexually by seeds and asexually by root suckering and sprouting. It can start to flower at the age of seven years and produces seeds abundantly where it receives enough light. Plants under a dense canopy produce few seeds even if they are older. Though the tree may live at least 250 years in its native range, most specimens on poor soils in the invaded range appear to die much earlier (ca. 30 years), partially due to infestation by a fungus (Starfinger 1991). There are, however, no consistent differences between *P. serotina* in its native and alien ranges, but differences found within both ranges are the result of the species' reaction to climate and soil.

Dispersal and spread

Seeds are spread by generalist frugivorous birds and mammals. Dispersal distances in Germany appear to be limited to less than 1 km in 40 years (Starfinger *et al.* 2003). Dispersal speed is higher in open landscapes than in forests (Deckers *et al.* 2005) and higher in managed and disturbed forest, *e.g.* after thinning (Starfinger *et al.* 2003).
The main driving force for the large range extension was planting rather than dispersal by natural means. A recent paper from Belgium confirms that invasive spread potential is not as high as was often assumed (Vanhellemont et al. 2009).

Impact

Affected habitats and indigenous organisms

P. serotina is often called a 'forest pest' in Germany, Denmark and the Netherlands; however, impacts are generally not well documented. Biodiversity impacts in forests include the out-shading of ground vegetation; the species richness decreases with increasing *P. serotina* cover in the shrub and tree layers (Starfinger 1997, Schepker 1998). This affects mostly common species of relatively

low nature conservation value. Since these shrub layers can prevent rejuvenation of native forest trees from establishing, it may have a long lasting effect on forest succession. In open vegetation such as dry grasslands and bogs biodiversity effects are more pronounced since these often contain rare species of high nature conservation value. An example is *Calluna* heath vegetation which is threatened by *P. serotina* in central and west Jutland of Denmark (U. Rose Andersen, pers. comm.). *P. serotina* litter has a potential to exert allelopathic effects on other species. The whole plant contains cyanic acid and wilted leaves have been reported to poison livestock.

The positive impacts on the soils are probably much lower than was often expected, in spite of the low C/N ratio the litter may even lead to a decrease in soil pH and nutrient availability (Starfinger *et al.* 2003).

Genetic effects
None reported or expected. The late flowering time isolates *P. serotina* from congeners in Europe.

Human health effects
None reported or expected. Even though parts of the plant are poisonous, they are not likely to be eaten – the fruits are edible.

Economic and societal effects (positive/negative)
Dense shrub layers impede forest management measures such as thinning, timber harvesting or planting. They also hinder the natural regeneration of shade intolerant tree species. This is not only a negative economic impact but also stands in the way of a near natural forestry which is a declared policy in some parts of Germany and other countries.

The overall loss to the German economy through yield reduction and control costs was estimated at 25 Mill € per year (Reinhardt *et al.* 2003). A similar figure was estimated for the Netherlands (Olsthoorn & van Hees 2002). The various control methods may cost between 150 and 1,500 € per ha and year (Spaeth *et al.* 1994).

P. serotina timber is valuable and a forest management towards a marketable growth form is still discussed among foresters.

Management approaches

Prevention methods
Since many of the problematic stands result directly from plantation, the further use of the species should be restricted in the future. Large scale planting and planting in the vicinity of vulnerable biotopes in particular should be no longer applied. In Germany, for example, this is in line with the Federal Nature Conservation Act (art. 41), which demands that alien species must not be released into the wild without a permit.

Eradication, control and monitoring efforts
Mechanical control is feasible but labour- and cost-intensive. It involves the cutting of trees and larger saplings with subsequent uprooting of the stub using either horses or bulldozers. Smaller plants can be pulled by hand. Herbicide application on the leaves was tested with hand-held sprayers, but this was not very successful as a stand-alone method. Instead a combination of mechanical and chemical control can be successfully applied (van den Tweel & Eijsackers 1987, Brehm 2004). Trees are cut and glyphosate is spread on the stems to prevent resprouting.

In any case, a thorough monitoring of the area and checking for newly emerged seedlings or root sprouts for five years is essential. In addition, re-invasion from adjacent areas has to be precluded. A forest management scheme which uses shade tolerant species like beech can successfully suppress *P. serotina* regeneration.

Fig 5. Heavy mechanical control includes uprooting of trees (Berlin, Grunewald), photo by Uwe Starfinger.

Information and awareness

The general public is sometimes informed by newspapers and journals. In some of the German Federal States forestry headquarters have had information campaigns for their foresters.

Knowledge and research

There is a long history of research on the species especially in areas with sandy soils where *P. serotina* was perceived as a problem, in particular in the Netherlands (van den Tweel & Eijsackers 1987) and Germany (Starfinger *et al.* 2003), in Belgium (Deckers *et al.* 2005), N. France *etc.* The aims of the research were to explain the invasion success and to recommend successful management schemes. The species is still of interest to researchers and is studied with novel methods like genetic markers (Pairon 2007).

Recommendations or comments from experts and local communities

Any control effort should start with a monitoring and assessment of the actual impacts in the specific situation. Control measures should never be undertaken without making sure in advance that an appropriate method is available and that funding is sufficient to continue the work for five years and to preclude reinvasion. In all other cases it will result in a sheer waste of money and effort. In most cases this will result in a refraining from measures for large scale infestations in forests, since the cost of measures compares poorly to the return from timber. The control in limited areas, however, may be worthwhile, in particular for nature conservation reasons. Control of a few seedlings by uprooting in an early stage of invasion is much easier to achieve than control of large invaded areas. Therefore application of an early warning system with immediate control of the species is helpful in, for instance, Natura 2000 areas and other areas of high conservation value. The choice of methods will depend on resource availability as well as the legal frameworks for herbicide application *etc*. A mechanical control program may be successful in many situations.

References and other resources

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Links
Fact sheet from NeoFlora Handbuch – in German
Fact sheet from DAISIE : http://www.europe-aliens.org/speciesFactsheet.do?speciesId=13913
USDA – Forest Service Index of species information on Prunus serotina
USDA – Forest Service – fact sheet

References
Brehm, K. (2004). Erfahrungen mit der Bekämpfung der Spätblühenden Traubenkirsche (Prunus serotina) in Schleswig-Holstein in den Jahren 1977-2004. Schriftenreihe des LANU SH – Natur 10: 66-78. Web-version

Deckers, B., Verheyen, K., Hermy, M. & Muys, B. (2005). Effects of landscape structure on the invasive spread of black cherry *Prunus serotina* in an agricultural landscape in Flanders, Belgium. Ecography 28:99-109.

Fowells, H.A. (1965). Silvics of forest trees of the United States. Agriculture Handbook No 271. 1965: USDA Forest Service.

Fischer, M. & Roelsgaard, J. (2009). Invasive plantearter I Danmark - kortlægning og vurdering. Specialerapport, Det Biovidenskabelige Fakultet, Københavns Universitet.
Gudžinskas Z. (2000). Conspectus of alien plant species of Lithuania. 16. *Rosaceae*. Botanica Lithuanica, **6(4)**: 345–364.
Hereźniak J., (1992). Amerykańskie drzewa i krzewy na ziemiach polskich. In: Ławrynowicz M., Warcholińska, A.U. (eds.): Rośliny pochodzenia amerykańskiego zadomowione w Polsce. - Łódzkie Towarzystwo Naukowe. Szlakami Nauki. 19: 97-150.
Lohmeyer, W. & Sukopp, H. (2001). Agriophyten in der Vegetation Mitteleuropas. 1. Nachtrag. In: Brandes, D. (ed.): Adventivpflanzen. Beiträge zur Biologie, Vorkommen und Ausbreitungsdynamik von Archäophyten und Neophyten in Mitteleuropa, vol 8. Universitätsbibliothek Braunschweig, Braunschweig: 179-220.
Marquis, D.A. (1990). *Prunus serotina* Ehrh. Black Cherry. Silvics of North America: 2. Hardwoods. Agriculture Handbook 654. R. M. Burns and B. H. Honkala. Washington, U.S. Department of Agriculture, Forest Service.
Olsthoorn, A. & van Hees, A. (2001). 40 years of Black Cherry (*Prunus serotina*) control in the Netherlands: lessons for management of invasive tree species, in Biological Invasions in Germany - A Challenge to Act? Contributions and results of a conference in Berlin, October 4th - 7th, 2000, U. Starfinger and I. Kowarik, Editors. 2001, Federal Nature Conservation Agency: Bonn. pp. 43-44.
Pairon, M., Jonard, M. & Jacquemart, A.-L. (2006): Modeling seed dispersal of black cherry, an invasive forest tree: how microsatellites may help? Can. J. For. Res. 36: 1385–1394
Reinhardt, F., Herle, M., Bastiansen, F. & Streit, B. (2003). Ökonomische Folgen der Ausbreitung von gebietsfremden Organismen in Deutschland. J.W. Goethe-Universität Frankfurt, im Auftrag des Umweltbundesamtes, Forschungsbericht 201 86 211.
Schepker, H. (1998). Wahrnehmung, Ausbreitung und Bewertung von Neophyten - eine Analyse der problematischen nichteinheimischen Pflanzen in Niedersachsen. Stuttgart.
Spaeth, I., Balder, H. & Kilz, E. (1994). Das Problem mit der Spätblühenden Traubenkirsche in den Berliner Forsten. Allgemeine Forst- und Jagdzeitung, 11: 234-236.
Starfinger, U. (1991). Population Biology of an Invading Tree Species - *Prunus serotina*. In: Seitz, A. & Loeschke, V. (eds.): Species Conservation: A Population Biology Approach. A. Birkhäuser Verlag, Basel: 171-184.
Starfinger, U. (1997). Introduction and naturalization of *Prunus serotina* in Central Europe. In: Starfinger, U., Edwards, K., Kowarik, I. & Williamson, M. (eds.) (1998): Plant Invasions: Ecological mechanisms and human responses. Backhuys Publishers, Leiden, The Netherlands, pp. 161-171.
Starfinger, U., Kowarik, I., Rode, M. & Schepker, H. (2003). From desirable ornamental plant to pest to accepted addition to the flora? - The perception of an alien plant species through the centuries. Biological Invasions 5: 323-335.
Tokarska - Guzik. B. (2003). The expansion of some alien plant species (neophytes) in Poland. In: Child, L.E., Brock, J.H., Brundu, G., Prach, K., Pysek, P., Wade, P.M. & Wiliamson, M. (eds.): Plant invasions: Ecological treats and management solutions. Backhuys Publishers, Leiden, The Netherlands, pp. 147-167.
van den Tweel, P.A. & Eijsackers, H. (1987). Black cherry, a pioneer species or 'forest pest'. Proc. K. Ned. Akad. Wet. Ser. C 90: 59-66.
Van der Meijden, R. 2006. Heukels' Flora van Nederland, ed. 23. Groningen.
Vanhellemont, M., Verheyen, K., de Keersmaeker, L., Vandekerkhove, K. & M. Hermy (2009) Does Prunus serotina act as an aggressive invader in areas with a low propagule pressure? Biological Invasions online first, DOI - 10.1007/s10530-008-9353-8
Wein, K. (1930). Die erste Einführung nordamerikanischer Gehölze in Europa. Mitteilungen der Deutschen Dendrologischen Gesellschaft 42: 137-163.
Деревья и кустарники СССР. 1954. Т. 3. М.-Л., Изд-во Академии наук СССР. 872 pp.
Григорьевская А.Я., Стародубцева Е.А., Хлызова Н.Ю., Агафонов В.А. 2004. Адвентивная флора Воронежской области: исторический, биогеографический, экологический аспекты. Изд-во ВГУ, Воронеж. 320 pp.
Губарева И.Ю. 1995. Флористические находки на Вислинской косе (Калининградская область). Ботанический журнал 80(8): 113-116.
Игнатов М.С., Макаров В.В., Чичев А.В. 1990. Конспект флоры адвентивных растений Московской области. В сб.: Флористические исследования в Московской области. Наука, М. pp. 5-105.

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