



## Open database on management measures for non-native trees

### Deliverable D.T3.1.1

Eddited by Aleksander Marinšek and Katharina Lapin on the 31th of August 2020.

## **BACKGROUND INFORMATION**

The open database will contain information on on-going and past non-native tree (NNT) management actions in the Alpine Space and elsewhere. The focus lies on the description of measures, costs/benefits, risks, and efficiency of measures. All knowledge materials produced for this deliverable will be available to other organisations/regions/countries outside the current partnership. The main objectives of WP T3 are to (i) synthesize knowledge on the management, use and risk assessment of NNT, (ii) develop decision support tools by incorporating the outputs from WP T1 and WP T2, and (iii) test and demonstrate technical recommendations within pilot actions. The output of the review of current knowledge on the management, use and risks of NNT in the Alpine Space will be handbooks and training materials as well as this database on open database on management measures for non-native trees. All of this information will be shared in the ALPTREES Knowledge Hub.

### **SHORT REPORT ON DELIVERABLE D.T3.1.1 in the Activity A.T3.1:**

In the frame of Work Package 3 - Transnational network, Knowledge transfer & Technical Guidance we made an open database of management measures of *50 pre-selected non-native tree species* which are, or it is expected to be, very important for the Alpine space forest ecosystem and urban landscape. The database is mainly made on the basis on existing information in the professional literature and online. For some species we were not able to find any useful information, but the open database will be constantly updated during the project.

The data base is available in Excel format in the ALPTREES cloud. Please ask the project managed for authorisation to *preview the database*. The last version of the database will be published in the ALPTREES Knowledge Hub ([non-native-trees.eu](http://non-native-trees.eu)) by End of 2021.

### **FEEDBACK WANTED!**

We appreciate any feedback at the current stage! We have collected almost 100 expert opinions on the management of the NNT listed. But there might be still information out there we have overlooked! Please contact the editors Katharina Lapin ([katharina.lapin@bfw.gv.at](mailto:katharina.lapin@bfw.gv.at)) or Aleksander Marinšek ([aleksander.marinsek@gozdis.si](mailto:aleksander.marinsek@gozdis.si)), if you want to share knowledge on NNT in the Alpine space!

NNT NAME (scientific)	COMON NAME (Alpine Space languages)	Management and Use in FOREST in the Alpine Space	Management and Use in URBAN AREAS in the Alpine Space	If Invasive: Prevention & Management of INNT spread
<i>Abies bornmuelleriana</i>	Türkische Tanne (GER) Sapin de Bornmüller (FR) Abete di Bornmüller (IT) Bornmüller's fir (ENG) Bornmüllerjeva jelka (SLO)	<i>Abies bornmuelleriana</i> has similar characteristics to <i>Abies alba</i> but grows faster. Outside of its natural range it is very well suited for enriching Maple, Oak, Douglas Fir or Spruce stands. It can also be mixed with leguminous plants such as <i>Alnus glutinosa</i> . Because the species is sensitive to drought when young, it is recommended to enrich the seedlings with chaff residues to prevent them from drying out quickly. Single planting should be preferred to nest planting so as not to provoke a bark beetle herd. The failure rate after late frosts is lower than with related species.	Just like the Nordmann fir, <i>Abies bornmuelleriana</i> appears mainly as a Christmas tree and ornamental shrub in parks and large gardens. In Italy the species is already frequently planted along roads. A problem is their extensive crown, but on the other hand, the deep taproot system ensures that the trees do not fall over so quickly in storms.	No reference reported on invasiveness

<p><i>Abies cephalonica</i></p>	<p>grška jelka (SLO)                  Greek fir, Grecian fir (ENG)                  Griechische Tanne (GER)                  L'abete di Cefalonia (IT)                  Sapin de Céphalonie (FR)</p>	<p>There are many information gaps about the species, such as ecological and competitive position (Bergmeier, 2002), which makes it more difficult to establish proper management for the species. Species reproduces mainly via seed, artificially with cuttings (Brus, 2004). Greek fir is vulnerable to fire. It is considered one of the most sensitive to frost Mediterranean fir species. Grows on all types of soil. Parent material can be limestone, dolomite, serpentine, gneiss or flysch. Endures drought and heat a lot better than <i>Abies alba</i>, but needs more light. Silvicultural measures in Greece aimed at converting their current structure of even-aged stands, partly due to the irrational use applied in the past (e.g. clearings, illegal cuttings and overgrazing) to uneven-aged stands, where all tree ages are present and continuous natural regeneration occurs (Dafis, 1988).</p>	<p>No useful data found.</p>	<p>No reference reported on invasiveness</p>
---------------------------------	--	--	------------------------------	--

<p><i>Abies grandis</i></p>	<p>velika jelka (SI) / Grand fir (ENG) / Küsten Tanne (DE) / Abete bianco americano (IT) / sapin de Vancouver, sapin geant (FR)</p>	<p>Mature tree: <i>A. grandis</i> has excellent self-pruning qualities. Notice the thin bark and low taper - together with narrow crowns, all these features contribute to the high productivity of the species. Young tree: Planting <i>A. grandis</i> on sites where it is exposure-tolerant is usually successful; however, on warm, and water-deficient sites, a temporary protection by hardwood nurse-trees, such as <i>Alnus rubra</i>, improves survival of the planted seedlings. Regeneration: As a moderately shade-tolerant tree, <i>A. grandis</i> may regenerate in intermediate light conditions on shallow and friable forest floors or exposed mineral soil. Such conditions usually occur in the understory of hardwood stands.</p>	<p>No useful data found.</p>	<p>No reference reported on invasiveness</p>
-----------------------------	---	---	------------------------------	--

<p><i>Abies nordmaniana</i></p>	<p>Nordmantanne, Kaukasustanne (GER) Nordmann fir/Caucasion fir (ENG) Le sapin de Nordmann (FR) L'abete del Caucaso (IT) kavkaška jelka (SLO)</p>	<p>Various field experiments have shown the great silvicultural potential of the species. It is ideally suited as a mixed tree species for the enrichment of deciduous and hardwood stands. As the species is sensitive to drought when young, it is recommended to enrich the seedlings with chaff residues to prevent them from drying out quickly. Single planting should be preferred to nest planting in order not to provoke a bark beetle herd. The failure rate after late frost is lower than that of related species, but nevertheless it should not be cultivated on sites prone to late frost. Cultivation on soils exposed to stagnant water should also be avoided. The Bavarian State Forestry Administration (Germany) recommends the species only conditionally and only under scientific supervision for forest management, as its suitability has not yet been conclusively clarified. Suitable as a Christmas tree on plantation.</p>	<p>No useful data found.</p>	<p>No reference reported on invasiveness</p>
---------------------------------	---	---	------------------------------	--

<p><i>Acer negundo</i></p>	<p>ameriški javor, negundovec (SLO) / boxelder, ash-leaved maple, black ash, cut-leaved maple, maple ash, negundo maple (ENG), Eschen- Ahorn, Eschenahorn (GER) / acero a foglie di frassino, acero americano (IT) / erable a feuilles de frene (FR)</p>	<p><i>Acer negundo</i> occurs in all countries - Slovenia, Italy, Austria, Germany and France and is considered invasive in all countries. Among counteracting measures used to control this invader in secondary range, destroying spontaneous seedlings seems to be preferable since cutting of the grown trees was not effective as the species can re-grow from the stumps (Valantinaite et al., 2011). Also, at a local scale, Merceron et al. (2016) showed higher effectiveness of the yearly repeated girdling and additionally removing seedlings of the invader from understory layer when applying girdling on adult and sapling individuals for induction of higher mortality of <i>Acer negundo</i>.</p>	<p>For urban ecosystems, Säumel &amp; Kowarik (2010) demonstrated that a risk of <i>Acer negundo</i> invasion could be prevented with help of planting native tree species along river corridors. Kostina et al. (2016) suspected that progressing affection of <i>A. negundo</i> leaves by fungus <i>Phyllosticta negundinis</i> and non-infectious leaf toxicosis can decrease its invasive potential.</p>	<p>In Slovenia there were actions within project Go For Mura for its eradication from local areas, such as physical removal and suppression in the phase of young trees (Kovač &amp; Božič, 2016). In the same project the result was a plan for management of different NNT and they proposed establishment of a suitable number of research plots with a goal to study suppression of INNT and development dynamics of boxelder. Höfle et al. (2014) also suggest increasing the proportion of shade-bearing species as well as increasing the age as successful strategies to limit the dispersion. Eradications of invasive tree species requires the use of several methods, often used in combination, at the same time considering the ecology and growing stage of the species. There have only been a few studies that have applied their findings to build mitigation strategies and to establish best management practices according to Hulme et al. (2014). It is also important to note that there is currently no</p>
----------------------------	--	---	--	---

formal coordination among nature reserves and countries on methods and priorities for eradication of invasive tree species (Brunel et al., 2013).

<i>Acer saccharinum</i>	Silver maple, Creek maple, Silverleaf maple, Soft maple, Large maple, Water maple, Swamp maple, White maple (EN), srebrni javor (SLO), Silber-Ahorn (GER), Érable argenté (FR), L'acero saccharino, acero argenteo (IT)	No information found.	<i>Acer saccharinum</i> is not a forestry species, but it is good urban/park tree. Branch strength rated as weak to medium weak, root damage potential rated as high. Its disadvantage is its sensitivity to wind and heavy snowfall, which makes it necessary to prune frequently. It is fastgrowing tree species. The fragile branches of the silver maple like to break, so it can be dangerous in storms, strong winds or heavy snowfalls. Recommended is planting in open places, not recommended planting near houses, roads and power lines. Develops chlorosis in alkaline soils.	
<i>Acer tataricum</i>	tatarski javor (SLO)/ Tatar/Tatarian maple (ENG)/ Tatarische Steppen-Ahorn (GER)/ Acero dei tartari (IT) / l'Érable de Tartarie (FR)	No information found. Otherwise it is ornamental, often multi-thick tree, or bush.	No useful information found.	
<i>Aesculus x carnea</i>	mesnatordeči divji kostanj (SI) / red horse-chestnut (ENG) / Rotblühende Rosskastanie (GER) / Ippocastano rosa (IT) / Marronnier à fleurs rouge (FR)	No information found.	Branches droop as the tree grows, and this require pruning for vehicular or pedestrian clearance beneath the canopy. A tree usually grows with several trunks but can be trained to grow with a single trunk. It requires pruning to develop strong structure. Trunk bark may crack when exposed to the direct sun so keep it shaded as much as possible by leaving lower branches on small trees and don't over-prune the tree, exposing the trunk suddenly to direct sun. Leaf and flower litter in the summer and fall may be objectionable to some people since the leaves are large and decompose slowly.	No reference reported on invasiveness

<p><i>Ailanthus altissima</i></p>	<p>veliki pajesen (SLO) / Tree of heaven (ENG) / Götterbaum (GER) / Ailanto, Albero del paradiso (IT) / ailante, ailante glanduleux, arbre des dieux, arbre du ciel (FR)</p>	<p>According to a study of Čarni et al. 2017, susceptibility to invasion by tree of heaven is mainly influenced by macro-climatic conditions; in the transitional zone, communities thriving on shallow soils over carbonate bedrock are more vulnerable. Forests that are less susceptible to tree of heaven invasion are montane beech forests, chestnut forests, sessile oak forests, scots pine forests and forests dominated by beech, Norway spruce and silver fir.</p>	<p>No useful information found. (!?)</p>	<p>The methods used to control Ailanthus include manual, mechanical and chemical measures, and burning, grazing, and biocontrol (Hoshovsky, 1988; Hunter, 2000). As Ailanthus is very difficult to remove once it has established a taproot, all treatments require subsequent monitoring and control of shoots emerging from remaining seeds, roots or stumps. Thus far, the combination of mechanical and chemical treatment appears to provide the best results. Hand pulling can be performed on very young seedlings but soon becomes ineffective as seedlings rapidly develop an extended root system. Root suckers emerge from remaining root fragments (see above). It is common to cut and chop stems, but this leads to heavy root and stump sprouting and thus requires extensive follow-up treatment (Kowarik and Säumel, 2007). Girdling the cambial tissue on the stem induces root sprouting as does burning (Hoshovsky, 1988; Hunter, 2000). Burch</p>
-----------------------------------	--	---	--	--

and Zedaker (2003) recommended chemical control with a combined mixture of different herbicides. Best results were achieved with a combination of picloram and triclopyr, which reduced the stem density. Whether or not a targeted control of Ailanthus in protection forests is reasonable in the long term strongly depends on the current forest structure and species present (Wunder et al., 2018).

<p><i>Alnus cordata</i></p>	<p>Italian alder (ENG), Herzblättrige Erle (GER), L'Aulne de Corse, Aulne cordé (FR), L'ontano napoletano (IT), srčastolistna jelša (SLO)</p>	<p><i>Alnus cordata</i> is of little importance in Alpine Space, therefore no measures for management are known.</p>	<p><i>Alnus cordata</i> is of little importance in Alpine Space, therefore no measures for management are known.</p>	<p>No reference reported on invasiveness</p>
<p><i>Broussonetia papyrifera</i></p>	<p>Papiermaulbeerbaum (GER) Paper mulberry (ENG) papirnata murva (SLO) Broussonetia o gelso da carta (IT) Mûrier à papier (FR)</p>	<p>No information found.</p>	<p>No useful information found.</p>	<p>At present, efforts in Africa to control <i>Broussonetia papyrifera</i> are minimal. The future use of herbicides in forest reserves is being discussed. Wherever the introduction of <i>Broussonetia papyrifera</i> is potentially possible, the risk of invasiveness should be considered. The vegetative propagation of male plants only is a good option to avoid problems on a case-by-case basis. In principle, its use as a raw material source for specialty papers in Africa can have a certain future and economic potential.</p>

<p><i>Catalpa bignonioides</i></p>	<p>navadni cigarovec, ameriška katalpa (SLO) / Southern catalpa, common catalpa, cigartree (ENG) / Gewoehnlicher Trompetenbaum (GER) / Catalpa americana (IT) / Catalpa commun (FR)</p>	<p>No information found.</p>	<p>When placed as an ornamental in a yard, certain care must be taken to ensure it is not too close to a building, fence, property line, power line, or septic system. Ample space should be provided to let it reach a mature height. Litter and smell are the biggest management problems with ornamental catalpas. Trees drop a heavy load of flowers in the spring, then a plentiful supply of leaves in the fall, and finally a lot of large seedpods in the winter. Green leaves give off a disagreeable odour when crushed (USDA). Catalpas can readily be grown from seed. Seeds which are collected after overwintering in the mature seedpod have a higher germination rate than those collected in the fall. Root cuttings may also be used to propagate trees (USDA). Its tolerance of poor, sandy soils, as well as of soils that are periodically inundated with water, makes the tree ideal for planting in habitats that have been badly disturbed or where spring flooding is a problem (Del Tredici, 1986).</p>	<p>No reference reported on invasiveness</p>
<p><i>Catalpa ovata</i></p>	<p>Japonska katalpa (SLO) / Catalpa a foglie ovate (IT) / Catalpa jaune (FR) / Kleinblütiger Trompetenbaum (GER) / Chinese/yellow/Japanese catalpa (ENG)</p>	<p><i>No information found.</i></p>	<p>No useful information found.</p>	<p>No reference reported on invasiveness</p>

<p><i>Cedrus deodara</i></p>	<p>deodar cedar, Himalayan cedar (ENG), Himalaya-Zeder (GER), cèdre de l'Himalaya (FR), cedro dell'Himalaya (IT), Himalajska cedra (SLO)</p>	<p>Only few information about the management of <i>Cedrus deodara</i> is given in Europe. Experimental plantations of Deodar trees in northwestern Italy showed good results regarding an economic usage in form of short rotation coppice. Before trees were planted in a 6 x 6 m layout, soil was fertilized with a seed bed fertilizer (500 kg/ha) and ploughed at a depth of 0.5 m. To control weed growth a disc harrow was used twice, in the first and the third year of cultivation. When the rotation time of 14 years was reached, the mean diameter at breast height was 260 mm and the average tree height at 18.5 m. The yield of wood biomass was around 300 tons per hectares. Although the economic and energy view was satisfying, the authors recommend using the basal parts of the trees (6-8 m) for industrial applications, such as oriented-stranded boards or other wood-based materials for a higher added value. Sometimes trees are cultivated for Christmas trees.</p>	<p>As the tree species requires high demands in moisture and is also susceptible to late frost events, the usage of <i>C. deodara</i> in the Alpine space is very limited. Due to the flat rooting system of Himalayan cedar, trees should be planted in places with low windspeed. Furthermore the location, where this tree species is planted, should have enough space, due to the sweeping branches of <i>Cedrus deodara</i>. Finally trees of Deodar require a lot of light and enough warmth for optimal growth. The perfect timing to plant the trees is in spring, so that the trees can establish well until winter. In general urban trees of this tree species don't need any special treatments. The only exceptional are drought periods, where the saplings need to be watered.</p>	<p>No reference reported on invasiveness</p>
------------------------------	--	--	--	--

<p><i>Cedrus libani</i></p>	<p>Lebanon cedar (ENG), Libanon-Zeder (GER), libanonska cedra (SLO), Cèdre du Liban (FR), Cedro del Libano (IT)</p>	<p>Although there are some cultivation and provenance trials with <i>C. libani</i> in Switzerland, Germany, France and Italy, the current knowledge is not yet sufficient for silvicultural recommendations. According to the current state of knowledge, <i>C. libani</i> is recommended for shallow locations on limestone, whereby origins from Lebanon should be avoided, because they are at risk of late frost. Further, indications of an increased risk of wet snow were reported. However, a study from Bavaria (Germany) showed good growth potential for the climatic conditions of Central Europe.</p>	<p><i>Cedrus libani</i> is a widely used species for ornamental purposes. Due to its horizontal and spreading branches, it is only suitable for solitary placement in large gardens and parks, such as royal or stately parks. On public grounds a regular tree inspection is obligatory, and the appropriate tree maintenance must be carried out.</p>	<p>No reference reported on invasiveness</p>
<p><i>Chamaecyparis lawsoniana</i></p>	<p>Port Orford Cedar/Lawson Cypress/Oregon Cedar (ENG), Lawson Scheinzypresse (GER), Lawsonova pacipresa (SLO), Cyprès de Lawson (FR), Cipresso di Lawson (IT)</p>	<p><i>C. lawsoniana</i> is able to grow either under a forest canopy or as a pioneer in the open. However, silvicultural experience shows that the cultivation on open land can lead to bushy growth with extreme twig formation. However, it is a shade-tolerant tree species that is suitable for planting in gaps in the stand or for underplanting or pre-planting. In these cases, the twig formation is much less. The inner forest climate protects against frost damage, but over-shaded it will lose growing potential. Generally, growth rate is relatively slow for young trees, but older trees retain their ability to respond to more light and space and can become dominant in old-growth forests. It is usually found in mixed coniferous forests (fir, spruce, pine), or with broadleaved species such as oak.</p>	<p><i>C. lawsoniana</i> is a widely used species for ornamental purposes. More than 200 ornamental varieties exist. On public grounds a regular tree inspection is obligatory, and the appropriate tree maintenance must be carried out.</p>	<p>No references on invasiveness found. According to EASIN the status is low/unknown.</p>

<p><i>Corylus colurna</i></p>	<p>Baumhasel (GER), Turkish hazel (ENG), Nocciola (IT), Noisetier de Byzance (FR), turška leska (SLO)</p>	<p>Stand establishment: In open spaces Turkish hazel should be planted in distances from 2 x 1 m up to 3 x 1,5 m and at least in squads. Sometimes wider pitches with 5 x 5 m or 7 x 7 m are planted. Although reports claim that wild animals don't feed on <i>Corylus colurna</i>, it is still recommended to apply protection measures against browsing and against mice. Due to the high growth of their roots, saplings should not be older than 2 years (50-80 cm), when they are planted in forests. Furthermore, it should be taken care of keeping the roots moist enough before and while planting, for maximizing the success of planting measures. In old-grown stands with Turkish hazel, natural regeneration is an option also. Another possibility is to sow seeds in Autumn.</p> <p>Possibilities of mixture: <i>Corylus colurna</i> usually occurs in mixed stands in its native range. This tree species poses a good option to add an extra tree species to the current spectrum of tree species and to reduce the risk of failure. It is recommended to plant Turkish hazel saplings not as solitary trees but in squad, groups, hoards or stripes (3-5 rows) in distances, which are commonly used for noble hardwood plantations. The tree species works well together with <i>Fagus sylvatica</i>, <i>Quercus petraea</i>, <i>Acer platanoides</i>, <i>Sorbus torminalis</i>, <i>Carpinus betulus</i>, <i>Tilia</i> spp. and <i>Castanea sativa</i>. At least in juvenile stages Turkish hazel shows tolerance to shade,</p>	<p><i>Corylus colurna</i> is very unsensitive regarding immissions, which makes it suitable for planting along streets or as protective plantation close to industry areas. Another good point is that Turkish hazel is very resistant against summer droughts. It is also very popular as ornamental tree in parks or gardens. As a result of being very densely leafed, Turkish hazel is often planted for noise prevention and or for providing shade.</p> <p>The only problematic aspect is that <i>Corylus colurna</i> is sensitive to road salt. On very poor soils, Turkish hazel can be fertilized by a 3 to 5 cm thick layer of compost in the autumn. This way trees will grow faster. In younger stages Turkish hazel might not have a well-established rooting system. Therefore it is necessary to water saplings in drought summers. Watering should not be done on a daily basis, since this will lead to very flat roots. The better method is to water the saplings intensively for half an hour once or twice a week.</p>	<p>No reference reported on invasiveness</p>
-------------------------------	---	--	---	--

which gives forest managers the possibility to plant this tree species even in smaller gaps.

Concepts for tending and management:  
In open spaces as well as under light canopies, *Corylus colurna* grows in perfect shapes. The form of the crown is strongly dependent on the site conditions and the offered growing space. This means that the quality of the trees can be impacted very well by silvicultural treatments. The optimal concepts are currently not fully known, but regular thinnings from above are essential for keeping radial increment high enough. In the latest stage, stems with good stem-form and high quality should have gaps of 10 to 12 m. Like many other broadleaved trees, *Corylus colurna* loses its dead branches in a natural way. Therefore, branchless stems up to a height of 6-8 m can be produced by keeping stands dense. Nevertheless, it is highly recommended to apply pruning treatments for producing high quality timber.

Turkish hazel can be used as mixed tree species in form and should be planted in squads, groups or hoards for extending the current spectrum of tree species and to scatter the risk of cultivation. Due to the fact that there are hardly any old grown stands of *Corylus colurna* in Austria or Germany, no solid statements can be given regarding growing rate and harvestable volume of timber. First results of experimental sites revealed that growth rate of *Corylus colurna* is comparable to the one of native tree

species, if grown on same site conditions. On very drought soils the growth of Turkish hazel is higher than the one of native tree species. No precise recommendations regarding provenance and origin exist yet.

<p><i>Cupressus sempervirens</i></p>	<p>Echte Zypresse, Mittelmeerzypresse (GER) Italian cypress, Mediterranean cypress (ENG) Cypres commun, Cypres vert (FR) Cipresso commune (IT) Italijanska cipresa (SLO)</p>	<p>At present, the species is mainly found in the Alpine region as an ornamental plant in parks and gardens. In its natural range, <i>C. sempervirens</i> has been shown to be suitable for the restoration of degraded forests and against desertification due to its adaptability on poor sites. The litter and the crown are hardly inflammable, which is why it can be used as a fire protection layer in regions with persistent heat and drought. The limited forest use outside its natural range is probably due to the lack of knowledge about its actual potential.</p>	<p>Due to their good properties against heat and drought, the cultivation of <i>C. sempervirens</i> in regions strongly affected by climate change could increase in the next few years. The species is considered highly adaptable and shows good growth even in dry and nutrient-poor soils.</p>	
--------------------------------------	--	---	--	--

<p><i>Fraxinus pennsylvanica</i></p>	<p>Rotesche (GER), Green ash (ENG), Frêne rouge (FR), Pensilvanijski jesen (SLO), frassino di Pensilvania (IT)</p>	<p>In Croatia, diverse species were used to afforest sites, where native tree species like narrow-leafed ash (<i>Fraxinus angustifolia</i> Vahl) struggled with the prevailing conditions. Beside others, <i>F. pennsylvanica</i> was planted on heavy and wet sites, as no native tree species could endure longlasting floodings without damages. That is why forest managers established Green ash stands in floodplain forests in central and south eastern Europe. (Kremer et al., 2006; Vor et al., 2015)</p> <p>Silvicultural treatments do not differ from those used for the native ash species (e.g. common ash), because both show high demands in light. (Küßner and Wagner, 2002) Shade tolerance decreases with enhancing tree age, which also means a decline of competitiveness to other tree species. Therefore, older Green ash trees need enough growing space to make full use of its growing power. Without any treatment, <i>F. pennsylvanica</i> is not able to compete with other trees with longer-running growth like <i>Quercus</i> sp. (Albrecht et al, 2014; Vor et al., 2015)</p> <p>Due to the vigorous growth of Green ash during the first 20 – 30 years, Kremer (2006) recommends using this tree species in short rotation plantations. Arguments for this reference are the stagnation in growth and the higher susceptibility to calamities (e.g. wind, ice, snow) after the age of 30. Another way of use can be as a pioneer for restoration purposes. Planting Green ash on sites with depression can benefit site</p>	<p><i>F. pennsylvanica</i> is commonly used in parks, boulevards and along streets, as trees can deal either soils with high moisture or dry, well-nourished soils. Another potential usage of green ash tree is for restoration purpose on attle heaps. Furthermore Green ash shows good characteristics concerning wind resistance (Boomkwekerij Gebr. Van den Berk B.V, 2020), therefore trees sometimes are planted as wind and erosion control (MDC, 2020). Its resilience hardiness against frost and its high tolerance regarding salt import, makes Green ash suitable even for urbans with continental climates. (Böll et al., 2014; Boomkwekerij Gebr. Van den Berk B.V, 2020; Roloff et al., 2009; Vor et al., 2015) The tree species also has a low potential for ozone creation (Kuttler,2012) and does not suffer from pollution (Vitali et al., 2019) Extreme droughts and very low temperatures are the only limitations for the possible use of <i>F. pennsylvanica</i>. (Vor et al., 2015) Böll et al. (2014) declares Green ash to be a good alternative to urban common ash trees, as the non-native species is less susceptible to ash dieback disease and because of its decorative autumn colouring. Moreover the authors recommend the provenance „Summit“ for urban plantations because good experiences regarding heat resistance are already known from south France. LWG (2019) also claims that the masculine Green ash provenance “Summit” does not exhibit any invasive potential. Since native common ash is reduced strongly due to the ash dieback disease, <i>F. pennsylvanica</i> represents a good</p>	<p>Due to today’s perception that Green ash is not worth for long-term silvicultural use, the tree species should not be planted outside of urban areas. (Vor et al., 2015) In urban areas only the masculine sorts “Summit” should be planted, as this provenance shows no invasibility (LWG, 2019). Furthermore it is recommended to decline occurrences of Green ash outside European cities. The reduction in number of <i>F. pennsylvanica</i> is very elaborate due to the distinct growth from the stump and root sprouting. Furthermore mechanical or mechanic-chemical counter measures need to be planned and executed for a longer period to be effective. Nevertheless positive examples of reduction measures exist in Europe. For instance, Hungarian silvicultural mangers introduced Green ash for enhancing productivity in their floodplain forests. As high expectations in the yield were not fulfilled, it was planned to gradually remove this tree</p>
--------------------------------------	--	--	---	---

condition, so that species like black alder (*Alnus glutinosa*) can arrive and grow faster. (Kremer, 2006)  
 Regarding Green ash's low importance for silviculture and its invasive potential, it is not recommended to actively promote this tree species in Europe. (BN, 2020; Vor et al., 2015)  
 A research study in an urban forest of Bremen in Germany showed that Green ash has only weak competitiveness outside of riparian forests.

alternative for urban use. (Rozsypálek et al., 2017)  
 Another good reason to plant Green ash in cities, is the high resilience concerning accidental injuries like pruning, major root removal or stem damages during roadworks, even if the trees suffer multiple damage.

species from Hungarian forests. The result was a decline of the amount of riparian forest area from 19 percent in 1954 to 11 percent in 1994. Another example of counter measure took place in Germany to conserve the FFH – habitat type Elbenau. (Vor et al., 2015)

Mechanically girdling:  
 Old grown trees of *F. pennsylvanica* can be girdled either by chainsaw or by tree milling machine. Only the measure using chainsaw showed reliable results concerning crown dieback of Green ash. Admittedly the trees sprout again underneath the chainsaw cuts. (Schmiedel et al., 2013; Schönbrodt and Jurgeit, 2008; Vor et al., 2015) Since these girdling methods create a lot of light in the stand, trees should not be treated in this way after heavy seed rain. (Schmiedel et al., 2013)

Cutting down of infrequent distributed trees:  
 If scattered Green ash trees are cut down, only small canopy gaps will be created.

These gaps can be closed by nearby native trees and there won't be enough light for regeneration by *F. pennsylvanica*. (Schmiedel et al., 2013)

<p><i>Ginkgo biloba</i></p>	<p>ginko, dvokrpi ginko (SI) / Kew tree (ENG) / Entenfussbaum, Ginkgo, Ginkgobaum (GER) / ginco (IT) / arbre à noix, arbre à pattes de canard, arbre aux pagodes (FR)</p>	<p>Perennial plantations are raised with a plant to plant spacing of 3 to 6 m. It prefers full sunlight and well-drained soil with mean soil temperature 15 to 27 °C. Ginkgo tree is an extremely slow growing one and its regeneration through seeds is very poor. Therefore, vegetative multiplication through cuttings is the only possible option for augmenting regeneration (Singh et al., 2008). The stimulation of adventitious root formation in stem cuttings treated with auxins and commercial rooting mixture containing auxin is well known (Blazich, 1988).</p>	<p>Results from a study from Japan (Kagotani et al., 2016) showed that stomatal conductance in ginkgo was significantly increased by pruning mulch and daily irrigation, with increase in leaf photosynthesis, therefore they concluded that pruning mulch and irrigation effectively offset the negative impact of moderate water stress on leaf photosynthesis in summer in ginkgo via stomatal regulation. This living fossil adapts well to urban conditions, and its use to line urban thoroughfares has become fashionable among the Parks and Gardens Departments of many European and American towns and cities. Because seeds of female trees give off an odor of butyric acid, most of the trees planted are male (Carinanos &amp; Casares-Porcel, 2011).</p>	
-----------------------------	---	--	---	--

<p><i>Gleditsia triacanthos</i></p>	<p>Amerikanische Gleditschie (GER), honey locust (ENG), févier d'Amérique (FR), Ameriška gledičija (SLO), spino di Giuda (IT)</p>	<p>Honey locust has almost no importance for silviculture in central Europe, as the tree species puts high demands in light and shade tolerant tree species always become dominant in closed forests. Thus, no reports about silvicultural management of <i>Gleditsia triacanthos</i> exist for Europe.</p> <p>In its natural distribution range, stands of honey locust are established by direct seed or planting. In the USA the tree species was investigated regarding its suitability for short rotation forestry. Trees were harvested every year and tree mortality was very low even after fourth rotation.</p>	<p>Various sorts of <i>Gleditsia triacanthos</i>, which are used as ornamental trees in parks and gardens, exist and some of them are without needles. Those provenances without needles are preferentially planted as ornamental tree or wind break on drought sites.</p> <p>Generally, honey locust has perfect characteristics for being planted as hedges or wind protected formation. After trimming, thorny and impassable hedges are grown by the strong resprouting. When used for wind protection, <i>Gleditsia triacanthos</i> has an average annual height growth of about 50 cm in the first seven years.</p> <p>It can be stated generally that provenances from the northern parts of the natural distribution range show higher frost tolerance, while trees from the southern parts grow fruits with higher nutrient content.</p> <p>Most honey locust trees that can be bought in Europe are provenances with lower rates for fruit production.</p> <p>Due to its good frost hardiness, drought resistance and resistance considering high temperatures, <i>Gleditsia triacanthos</i> is a good choice as tree along streets or parks in urban areas.</p>	<p>The biggest efforts concerning the management of this invasive non-native tree species are reported from Queensland in Australia. In the early 1990s radical combat was done by deep ploughing or pushing down the trees by heavy machines. Beside these methods, honey locust has also been treated chemically by herbicides (triclopyr or mixture of picloram and 2,4,-D). These treatments were very successful and led to few isolated occurrences in Australia today.</p>
-------------------------------------	---	--	--	---

<p><i>Juglans nigra</i></p>	<p>črni oreh (SLO) / black walnut, American walnut (ENG) / Schwarzer Walnusbaum (GER) / noce nero americano (IT) / noyer noir, noyer noir d'Amérique (FR)</p>	<p>In European countries, where black walnut is cultivated on different scales, the exclusive goal of its culture is the production of top-quality wood for superior uses. To achieve this goal, in countries like France, the veneer logs should have a minimum diameter at mid-length of 60 cm, and a minimum length of 2.5 m. Such large-diameter trees are produced in stands managed as high forests, with exception of France (Nicolescu et al., 2020). In Europe, black walnut is not able to regenerate naturally by seed under the canopy of high forest stands, therefore it is treated as standard tree in coppice-with-standards like in France. Black walnut can be established artificially by both direct (manual) sowing and planting. The forest reproductive material is collected from individual 'plus' trees, certified / selected seed stands and seed orchards (ibid.). Direct seeding of cleaned (without green husk) nuts, after soil preparation, is carried out either in autumn, immediately after fruit dispersal, which eliminates additional seed handling, or in spring (March–April), resulting in higher stocking, possibly due to the decreased time of exposure to seed predators, generally at 6–8 (10) cm depth (Oršanić et al., 2010). Producing 1-year-old seedlings is preferred all over Europe as it is cheap, provides the best survival rate and the long taproot is not damaged during the transplanting. Seedlings are usually planted in spring, to avoid late freezes. Mechanised weed control, by hoeing, disking, or mulching, or chemical control, should be carried out both within and</p>	<p>No useful information found.</p>
-----------------------------	---	--	-------------------------------------

between the rows of plantation or areas manually seeded. Wider spacings (3.0 m, 3.6 m, or 4.0 between rows) are recommended in both Europe and in native range, because they reduce the costs of tending young plantations by mechanized weed control. In Europe, black walnut is planted as both a monoculture (e.g., in Bosnia and Herzegovina, Czech Republic, Hungary, Serbia, Slovenia) and in mixed stands (Nicolescu et al., 2020).

Black walnut is regenerated by planting or direct seeding on bare land, in monocultures and mixed stands. The management of stands with black walnut, with a rotation period generally up to 80 years, include weeding (mandatory), cleaning-respacing (in dense stands), thinning (mostly from above), high and formative pruning (mandatory), with the aim of producing valuable wood for sliced veneer, solid furniture, flooring/parquet, cabinetry, panelling, sculpture, musical instruments, gunstocks (Nicolescu et al., 2020).

<p><i>Koelreuteria paniculata</i></p>	<p>Latnati mehurnik (SLO);                  Die Blasenesche, die                  (Rispiger) Blasenbaum                  (GER); Golden rain tree,                  pride of India, China                  tree, varnish tree (ENG);                  La koelreuteria, albero                  delle lanterne cinesi (IT);                  Arbre a vernis de Chine,                  Koelreuteria paniculee                  (FR)</p>	<p>It is not reported to be found in forests in                  Alpine space.</p>	<p>No information found.</p>	
---------------------------------------	---	--	------------------------------	--

<p><i>Larix kampfieri</i></p>	<p>japonski macesen (SLO) / Japanese larch (ENG) / Japanische Laerche; japanische Lärche (GER) / larice Giappone (IT) / mélèze du Japon (FR)</p>	<p>The variation in Japanese larch is not related to geography as it is in European larch. The growth behaviour of a provenance in one area will not necessarily be the same under different conditions. According to Wright (1962), variation in Japanese larch is random and each provenance is a story of its own (MacGillivray, 1969).</p> <p>Seed production for improved European, Japanese and hybrid larch is often restricted by irregular flowering, frost damage, and low seed-set per cone. Several experiments have shown promise in stimulating larch flowering (precocious and early) through treatments of fertilization, root pruning, girdling, strangulation, mulching and applications of gibberellins (Li &amp; Wyckoff, 1994). Results from a Belgium study (Perin et al., 2016) indicate that Japanese larch growth rate appears to be particularly sensitive to stand density variation as already highlighted by Pauwels et al. (2007), who recommended lower stand density for larch than for Norway spruce and Douglas-fir.</p>	<p>No useful information found.</p>	<p>No reference reported on invasiveness</p>
-------------------------------	--	--	-------------------------------------	--

<p><i>Liquidambar styraciflua</i></p>	<p>Ameriški ambrovec (SI) / American sweetgum (ENG) / Amerikanische Amberbaum (DE) / Storace americano (IT) / Copalme d'Amérique (FR)</p>	<p>IN THE FORESTS IN AS: NO DATA AVAILABLE, IN FORESTS IN USA: Sweetgum enters site via wind-blown seeds which are particularly adapted to wind dissemination through the presence of small winged structures on the seed. Sweetgum can be considered a weed or nuisance tree in the context of some stand management objectives (USDA, 2002).</p>	<p>Adequate sunlight is required for sweetgum to reach its potential. Young trees are able to withstand crowding, however, they become intolerant to competition with increasing age. Removal of overstory trees results in rapid growth of young sweetgum trees (USDA, 2002). Best in full sun to partial shade in deep, moist, bottomland soils. Transplant difficult due to shallow, fleshy root system. Slow to establish.</p>	<p>No reference reported on invasiveness</p>
<p><i>Liriodendron tulipifera</i></p>	<p>Tulpenbaum (GER), Tuliptree (ENG), Tulipier de Virginie (FR), L'albero dei tulipani (IT), Navadni tulipanovec (SLO)</p>	<p>Forestry experiments have shown that <i>Liriodendron tulipifera</i> fits perfectly into European forest communities. Mixtures with coniferous and hardwood species are possible. The species is best used in mixtures with other light demanding hardwoods and as a repair for sycamore maple rejuvenation. The rapid growth when young and the immense frost hardiness as well as the general health and resistance to pests and fungi speak for the cultivation of this species. <i>L. tulipifera</i> can grow up to 3 years under canopy. After that, the trees need more space. A good protection against browsing is necessary, as the leaves are eaten by game very quickly. <i>Liriodendron tulipifera</i> is a suitable alternative on ash sites and can play an important role in the adaptation of forests to climate change in the future.</p>	<p><i>Liriodendron tulipifera</i> is only of limited suitability in urban areas. It requires a lot of space and develops an extensive root system. It is therefore less suitable along roads than in large parks and public gardens. Studies have shown that although the species is winter hardy, it must be classified as problematic in terms of its drought tolerance.</p>	

<p><i>Magnolia grandiflora</i></p>	<p>Immergrüne Magnolie (GER), Southern magnolia, Evergreen magnolia, Bull bay (ENG), Magnolia a grandes fleurs (FR), Magnolia sempreverde (IT), Velevetna magnolija (SLO)</p>	<p>In the Alpine region, <i>Magnolia grandiflora</i> is only found as an ornamental plant in parks and gardens because it cannot tolerate the long-lasting cold winters. In forests it can only be used in regions with mild winters or in special climatic locations. A possible alternative, however, could be <i>Magnolia kobus</i>, which is much better able to tolerate the Central European climate conditions.</p>	<p>The use of <i>Magnolia grandiflora</i> is only recommended in summer warm, very mild winter locations. In the Alpine region it is therefore only suitable for planting to a limited extent. On unsuitable sites the species cannot develop its full potential. The vitality and aesthetics are reduced, the intensity of care decreases and the failure rate increases. For urban locations in south-eastern Europe, however, it offers a promising alternative to greening. As it is an evergreen species, the pollution of pavements is also lower compared to related species. The rainfall in their native range is almost twice as high as in Central Europe, so they depend on a continuous watering system. In rainy summers they tend to develop mildew. Snails can infest young plants.</p>	<p>No reference reported on invasiveness</p>
<p><i>Magnolia x soulangiana</i></p>	<p>Tulpen-Magnolie (GER) Lenne`s magnolia, Saucer magnolia (ENG), Magnolia de Soulange (FR) Soulangeeva magnolija (SLO)</p>	<p><i>Magnolia x soulangeana</i> is mainly cultivated as an ornamental plant in the Alpine region. The species is not suitable for forestry use and the climate is too cool for many magnolia species in the region. Furthermore, there are no wild forms of the species and its reproduction is difficult. However, experiments with different magnolia species have shown that <i>Magnolia kobus</i> in particular can be an interesting species for the design of forest edges even in cooler climates.</p>	<p><i>Magnolia x soulangeana</i> is an attractive solitary tree and is used exclusively as an ornamental tree on streets, in parks and gardens due to its aesthetic qualities. However, its establishment in an urban environment should be limited due to its solitary position and vulnerability to drought. To develop its full potential, it needs sunny locations with good water supply.</p>	<p>No reference reported on invasiveness</p>

<p><i>Paulownia tomentosa</i></p>	<p>princess tree, empress tree, Kiri tree, foxglove tree, phoenix tree (ENG) / Chinesischer Blauglockenbaum, Kaiser-Paulownie, Kiribaum (DE) / Paulownia (FR) / Paulownia (IT) / Pavlovnija (SI)</p>	<p>In Europe, the princess tree is mainly used in plantation for timber and for the generation of the bioenergetics biomass, else as an ornamental in urban areas and parks. It is likely that it does not play an important role as a forest tree in the Alpine Space because it is a shade intolerant tree species and is not able to establish in forest systems as it cannot persist where the canopy is too dense to regenerate (Stimm et al., 2015). But in contrast to this, Longbrake and McCarthy (2001) considered this species to establish populations even in low light conditions.</p>	<p>Little is known about the use of the paulownia in the urban area, except that it was originally planted as an ornamental tree (Hu, 1961).</p>	<p>Once the species has established it is recommended to eradicate the princess tree by pulling out seedlings, removing the entire root by hand before the taproot is well developed, felling the tree close to the ground and repetitive spraying of the remaining stump with herbicides is also recommended (Remale, 2005). A complete elimination is necessary, because the species is very strong in vegetative distribution via root brood and stick rash. Where necessary, seed production can be avoided by girdling (Stimm et al., 2015). Thus, to prevent any ecological risks, the princess tree should not be cultivated on a larger scale and nearby open habitats of high conservation value (Essl, 2007; Stimm et al., 2015). In the most forest sites spread is unlikely since the princess tree will not be able to compete against shade tolerant species in the course of succession.</p>
-----------------------------------	--	--	--	---

<i>Picea omorika</i>	Serbische Fichte (GER) Serbian spruce (ENG) Epicea de Serbie (FR) Abete rosso della Serbia (IT) omorika (SLO)	The species is not used for silvicultural purposes to any significant extent outside the natural processing area, apart from a few experimental plots. In Bosnia and Herzegovina it is successfully used for the reforestation of high altitude areas.	<i>Picea omorika</i> is often used for urban greening in cities due to its tolerance to urban pollution and its aesthetic qualities. It can be planted in groups, solitary or as an evergreen street tree and serves as a screen. Because of its low water and nutrient requirements, the species is also often used in gardens.	No reference reported on invasiveness
<i>Picea pungens</i>	srebrna smreka (SLO) / Colorado Spruce, blue spruce (ENG) / Blaufichte; Stechfichte (GER) / abete del Colorado; picea pungente (IT) / Épicéa du Colorado (FR)	Currently used anecdotally in European forests, far from its natural habitat in Colorado and Utah. It is considered as an ornamental tree.	Due to its deep and tracing root system, it is not recommended to plant it too close to buildings and roads and outside garden or parks.	No reference reported on invasiveness

<p><i>Picea sitchensis</i></p>	<p>Sitka-Fichte (GER), Sitka spruce (ENG), Il peccio di Sitka (IT), Épinette de Sitka (FR), sitka smreka (SLO)</p>	<p>The silvicultural management of <i>Picea sitchensis</i> should depend on the climatic and site conditions, but in general, mixed stands are the goal of every plantation containing Sitka spruce to spread the potential risk. <i>Picea sitchensis</i> grows well together with <i>Fagus sylvatica</i>, other possibilities are <i>Larix kaempferi</i>, Douglas fir or Norway spruce. On very wet soils Sitka spruce can be mixed with <i>Alnus glutinosa</i>. Sitka spruce has high demands in light that's why the crown space of the trees should be adapted early on. (Weller et Meiwes, 2014)</p> <p>For cultivation, Röhe et al. (1997) recommend planting 2.500 to 3.000 sapling per hectar, which is a good compromise for light demand and branchiness.</p> <p><i>Picea sitchensis</i> shows distinct shade tolerance that also makes it possible to regenerate stands naturally or artificially under canopy. The first thinning phase should take place at a height of 12 to 15 metres, depending on the crown length of the Sitka spruce trees. This crown length shouldn't decrease from this stage because it is substantial to make full usage of the growth rate of <i>Picea sitchensis</i>. If the trees are in danger to lack of water supply and to prevent the stand from experiencing damage by insects (e.g. <i>Dendroctonus micans</i>), low thinnings with high intensity and high frequency will be conducted. Due to the necessity of high crown diameters, the number of final crop trees is set to 150 trees per hectare, which is lower than the one of <i>Picea abies</i> (~200-250 trees/ha). The rotation</p>	<p>In the interest of not spreading Sitka spruce unintentionally, the urban use should be prohibited in regions with specific climatic conditions, which favour invasiveness of <i>Picea sitchensis</i>. Following that this tree species shouldn't be planted anywhere at the western coast of Norway. Outside this small area, the usage in urbans can happen without any restriction. Thus, the continental climate in central and eastern Sweden already prohibits the spreading of Sitka spruce, which also applies to central Europe. (Sjöman et al., 2016)</p> <p>One aspect that might negate intensive urban usage of Sitka spruce is that its resistance against air pollution is very low. (Savil, 2019; EUFORGEN, 2020) Even at a weak exposure of air pollutants, <i>Picea sitchensis</i> starts to struggle. (Savill, 2019)</p> <p>Another negative point is the low drought resistance of the species, which makes it unattractive to use the trees in cities of central and eastern Europe. On the other side, Sitka spruce shows high strength against salt. (Pedersen et Bille-Hansen, 1995, EUFORGEN,2020) As road salt is huge problem for a high number of tree species, this could be a reason for planting this tree along streets.</p>	<p>IF INVASIVE: Creation of buffer area:        Nygaard et Øyen (2017) recommend that new Sitka spruce plantations shouldn't be created closer than 200 metres from protective areas. This especially concerns forest enterprises located at coastal areas. According to the fact that information about the invasive characteristics of <i>Picea sitchensis</i> are rare, further studies providing long term data should be conducted in future. Avoiding Disturbances:        To reduce the susceptibility of coastal heathlands to invasion by Sitka spruce, an important measure is the prevention of fires. A reason for that is the charcoil, which absorbs phytotoxins produced by the heath species and prepares soil for regeneration of <i>Picea sitchensis</i>. (Vikane, 2013)</p> <p>Tending natural regeneration/thinning:        On most sites, where Sitka spruce occurs, the tree species shows only weak invasivness. Therefore, no special treatment must be set</p>
--------------------------------	--	--	--	---

time is linked to the depth and the water supply of the soil. On bad stand conditions the rotation times should be kept low with treatment measures of high intensity and high frequency. If the soils are profound with high availability of water, the rotation time can be extended to longer periods, so that high quality timber with greater dimensions can be produced. (Weller et Meiwes, 2014) Yet the standard management of Sitka spruce in Ireland and the UK is to grow it in planted even-aged stand with rotations of 40-50 years and harvest it by applying patch clearcuts. As the knowledge about the importance of ecosystem services of forest area enjoyed a rise in the last two decades, forest management systems considering continuous cover forestry were worked out. By using natural regeneration, mixed stands can be established, and near-natural forestry can be executed with all the benefits for the forest ecosystem. (Mason, 2015) In Holland *Picea sitchensis* is only rarely planted nowadays. Although in some cases the growth of Sitka spruce exceeds the one of *Picea abies*, the tree species is not that attractive to silviculture. The only reasons for management of *P. sitchensis* is when natural regeneration occurs. Even in this case, other tree species like *Fagus sylvatica* or *Pinus sylvestris* are preferred. (Mohren, 2020) Sitka spruce won't be an option for forestry in the Alpine Space as its ecological amplitude is quite small and the demand of an oceanic climate (mild winters and high precipitation) isn't covered. Considering climate change and

in those stands. Removal strategies can be executed during state of the art tending measures of natural regeneration or during first thinnings. (Mohren, 2020)

its impact on precipitation regime, the usage of Sitka spruce in the Alpine space becomes even more unlikely. (Weller et Meiwes, 2014)

Due to its huge distribution range, numerous of provenances of Sitka spruce are in use for silviculture. If these are categorised roughly, 4 basic provenances can be divided: Alaskan, Queen Charlotte Island, Oregon and Washington source. The Alaskan source shows very weak growth rates that is the reason why this provenance is not used for economic plantation forestry. Queen Charlotte Island is the most commonly planted source in Ireland but recent investigations remark that other sorts might be a better option for plantations. The Queen Charlotte Island provenance has weaker frost hardiness and no benefits in wood quality. Furthermore the trees are less stable and exhibit less productivity per hectare, if compared to Oregon or Washington sources. Therefore, it is recommended, that Queen Charlotte Island sources should not be planted anymore in Ireland. IN

Avoiding Disturbances:  
To reduce the susceptibility of coastal heathlands to invasion by Sitka spruce, an important measure is the prevention of fires. A reason for that is the charcoil, which absorbs phytotoxins produced by the heath species and prepares soil for regeneration of *Picea sitchensis*. (Vikane, 2013)

Tending natural regeneration/thinning:

On most sites, where Sitka spruce occurs, the tree species shows only weak invisibility. Therefore, no special treatment must be set in those stands. Removal strategies can be executed during state of the art tending measures of natural regeneration or during first thinnings. (Mohren, 2020)

<p><i>Pinus nigra</i></p>	<p>Austrian pine, black pine, European black pine (ENG); Pin noir (FR), Österreichische Schwarzkiefer, Schwarzkiefer, Schwarzföhre (GER); pino nero, pino Austriaco (IT); črni bor, Avstrijski bor, (SLO)</p>	<p>Reforestation with the Austrian Pine on the marly subsoils of the Southern Alps under the Upland Restoration Scheme (RTM) is an original forest restoration experience spanning more than 100 years. The ecological developments since the middle of the 19th century puts a fresh perspective on current issues relating to the regeneration of stands and the durability of the protection they provide against erosion. In addition to overcoming the difficulties involved in natural regeneration of the Austrian pine, special forestry measures are needed to successfully conduct the supporting phase for the rehabilitated ecosystem. However, there are many outstanding issues: ecological viability of some stations, possible dynamics, role of the Austrian pine for second generation forest stands.</p>	<p>It was planted also in urban areas of AS, but not anymore, especially because it is very sensible for the processionary caterpillar (<i>Thaumetopoea pityocampa</i>) and its high risk connected with the human health.</p>	<p>No reference reported on invasiveness</p>
---------------------------	---	---	--	--

<p><i>Pinus strobus</i></p>	<p>gladki bor, zeleni bor (SI) / Eastern white pine, Weymouth pine (ENG) / Weymouth-Kiefer, Strobe (DE) / Pino strobo, pino di Lord Weymouth (IT) / Pin Weymouth, pin du lord, pin blanc (FR)</p>	<p>Growth potential and other silvicultural features justified the early introduction and a periodical expansion of eastern white pine in different European countries. Blister rust was and continues to be the major limitative factor for introduction and expansion of this species.</p> <p>Natural regeneration of <i>Pinus strobus</i> has been observed, up to 2 generations, when the blister rust is absent, in some areas of Switzerland and Germany, mixed with <i>Fagus sylvatica</i>, <i>Pinus sylvestris</i> and some common spruces. IN CASE OF PESTS AND DISEASE: the classical silvicultural protective methods should be applied, as follows : clear-cut currant bushes in the proximity of the new plantations; avoidance of pure white pine stands on large areas and promote mixed other species stands; when plant the main species, alongside the upper storey do not forget to simultaneously introduce the middle- and the understorey including shrubs plantation; their crown have the capacity of limiting the blister rust spores migration.</p>	<p>No useful information found.</p>	
-----------------------------	---	---	-------------------------------------	--

<p><i>Pinus uncinata</i></p>	<p>planinski bor, pritikavi gorski bor, rušje (SLO) / Mountain pine (ENG) / Hakenkiefer, Spirke (GER) / pino uncinato (IT) / pin à crochets (FR)</p>	<p>Regarding management there are mostly studies about fire effects in <i>P. uncinata</i> plantations from Spain and even those are scarce. Severe wildland fires did not occur frequently there in the past, but in the last years several fires with extreme fire behaviour have affected <i>P. uncinata</i> stands. The results from a study by Cardil et al. (2016) showed that the species seems to be very tolerant to low and medium fireline intensity, but fire effects were very significant when fire line intensity was high. Results from this work supports that prescribed burning might be used to efficiently decrease fuel load and fuel vertical continuity while avoiding considerable <i>P. uncinata</i> mortality. It also displayed that when fuel management has been implemented, <i>P. uncinata</i> mortality might be limited even under extreme fire behavior.</p>	<p>No useful information found.</p>	<p>No reference reported on invasiveness</p>
<p><i>Pinus wallichiana</i></p>	<p>Himalajski bor (SI) / Bhutan Pine, Himalayan blue pine, Himalayan white pine (ENG) / Tranenkiefer (DE) / pino dell'Imalaia, pino excelsa (IT) / pin de l'Himalaya, pin pleureur (FR)</p>	<p>Currently used anecdotally in European forests, far from its natural habitat in the mountainous region of lower Asia as it is considered an ornamental tree.</p>	<p>The tree is widely used as an ornamental plant and appreciated in cities for its resistance to pollution (Farjon, 2013). Suitable for dry soil, tolerates no paving. Young trees, in particular, require support in windy sites and are sensitive to frost. Tolerates dry conditions.</p>	<p>No reference reported on invasiveness</p>

<p><i>Platanus acerifolia</i></p>	<p>javorolistna platina (SLO) / London plane tree (ENG) / ahornblaettrige Platane; Bastardplatane; gewoehnliche Platane (GER) / platano; platano commune (IT) / platane; platane commun (FR)</p>	<p>No information found.</p>	<p>It is a very commonly planted tree in parks, gardens, along roads, etc. (Brus, 2004). London plane tree is strongly recommended as a street plant suitable for urban areas, especially because it is tolerant to air pollution. The plant develops adaptive reactions, which cause strengthened anatomic xeromorphic characteristics of the leaf, which is regarded as adaptive response, aimed at combating the adverse effects of pollution (Dineva, 2004). The London plane tree is more resistant to standard diseases and pests and is more cold hardy than the American sycamore (Morton &amp; Gruszka, 2008).</p> <p>Massetti (2018) shows that artificial light affects leaf fall phenology of <i>Platanus x acerifolia</i> and that trees exposed to higher level of light maintained green leaves longer in winter.</p> <p>Nitschke et al. (2017) in a study from Australia says that for <i>P. acerifolia</i>, irrigation through summer and autumn during below average rainfall year are likely the best options as this would reduce the potential for progressive xylem cavitation and facilitate leaf onset in spring.</p> <p>The species tolerates paving, suitable for avenues and broad streets, parks, squares, theme parks, cemeteries, large gardens, windbreaks.</p>	<p>No reference reported on invasiveness</p>
-----------------------------------	--	------------------------------	--	--

<p><i>Populus x canadensis</i></p>	<p>Kanadski topol (SLO) / Canadian poplar, hybrid black poplar (ENG) / Kanadische Pappel (GER) / pioppo canadese; pioppo ibrido (IT) / Peuplier du canada, Peuplier noir hybride, Peuplier hybride euraméricain (FR)</p>	<p><i>Populus x canadensis</i> is not a forest tree. It is used to produce wood (on plantations). It is cultivated mainly in open fields or valleys. It can be encountered on rare occasions in the mountains under certain soil conditions (depth, humidity) at low altitude. Robust cultivars have been obtained by genetic manipulation capable of adapting to different climatic situations and resistant to pathogens.</p>	<p>Poplars have a strong tracing root system, which may cause damage in urban contexts (possible damages on ground coverings), particularly in the case of waterproof floor coverings. The rapid tree growth which can quickly reach 30 m in height can sometimes be also problematic in urban areas (management, proximity with buildings for example). Poplar are dioecious essence (separate male and female feet). The female plant produces down-fruits during spring which can cause discomfort for city dwellers. Male feet may cause sometimes pollen allergies for human. The tree tolerates paving, is resistant to frost, suitable for: avenues and broad streets, theme parks, coastal areas, windbreaks.</p>	
<p><i>Prunus cerasifera</i></p>	<p>cherry plum, myrobalan plum (ENG), Myrobolan ou Prunier-cerise (FR), Kirschpflaume (GER), amolo, mirabolano, brombolo, marusticano (IT), mirobalana(SLO)</p>	<p>The species is hardly found in the forests in general, also in Alpine Space.</p>	<p>The cherry plum is a popular ornamental tree for garden and landscaping use, grown for its very early flowering. Numerous cultivars have been developed, many of them selected for purple foliage.</p>	<p>Control cannot be achieved by simply cutting trees down, as the plant will resprout from trunks and roots.</p>

<p><i>Prunus serotina</i></p>	<p>pozna, ameriška čremsa, ameriška črna češnja (SLO) / black cherry, wild black cherry, wild cherry (ENG) / Ahlkirsche, Amerikanische Traubenkirsche, Elsenkirsche (GER) / ciliegio nero, ciliegio tardive, prugnolo tardive (IT) / capulin; cerisier noir (FR)</p>	<p>In Western and Central Europe, and in Slovenia in some places, it is subspontaneously spreading in the forest edges and open forests. There is little data about its distribution in Slovenia, due to its similarity with native <i>Prunus padus</i> and therefore errors regarding the species definition (Brus, 2012). On the East of Slovenia, it is already naturalized and locally invasive (Life ARTEMIS, accessed 6. 4. 2020). In Krumm and Vítková (2016) they gathered all silvicultural measures aimed at reducing the spread of the species in Italy; avoid clearcutting and openings (Terwei et al., 2013), mowing suckers and conversion of coppice to high forest (Caronni, 2009), underplant or seed shade-tolerant species (Skowronek et al., 2014), ageing with absence of treatments (allowing other tree species to follow in the succession without any other treatment (Starfinger et al., 2003), maintain or facilitate closed canopy, single tree selection or group selection and promotion of native species (Annighöfer et al., 2015), girdling (Annighöfer et al., 2012). Scheepens &amp; Hoogerbrugge (1989) performed a study in Netherlands, where they treated black cherry with <i>Chondrostereum purpureum</i> fungus, which could represent an effective microbial herbicide, safe for the environment as an alternative to chemicals. But on the other hand, it can act as a parasite to some species, therefore some studies were done assessing risks of its spread (e. g. De Jong et al., 1990; De Jong et al., 1991).</p>	<p>In Slovenia it is a relatively rare tree, which can be hardly found as an ornamental tree in the cities (Brus, 2004). Elsewhere in Europe it is planted as an ornamental tree, due to its beautiful blossoms, coloured leaves, quick growth and good tolerance to pruning (ibid.). The species is proposed to be included on a list of invasive alien species in Italy with a goal to include it on the list of Union concern. After introduction to Europe, control measures were adopted as soon as the species began to spread rapidly outside plantations or confined areas, but most of these measures proved to be unsuccessful. Therefore the authors concern is and prediction is that it will spread to other areas with similar climate as northern Italy and suggest control measures, continuing monitoring and awareness-raising campaigns in order to control the species before it will be too late (Forte et al., 2019).</p>	<p>(?!)</p>
-------------------------------	--	---	---	-------------

<p><i>Prunus serrulata</i></p>	<p>Japonska češnja (SLO) / Japanese cherry (ENG) / Japanische Blütenkirsche (GER) / Ciliegio del Giappone (IT) / Cerisier a fleurs (FR)</p>	<p>In Europe, no other use than ornamental planting is known so far (e.g. Konarska et al. 2016).</p>	<p>Japanese cherry is well-known ornamental plant worldwide (Yan et al. 2016). It is grown as a flowering tree, both in its native countries and throughout the temperate regions of the world. The ‘Kanzan’ cultivars are primarily grown for their spring cherry blossom during April which is a major tourist attraction in many countries around the world. In Europe, it is commonly cultivated along roads, parking spaces, walking paths, or in other urban green spaces (Ninić-Todorović et al. 2012). The cultivars ‘Shirotae’ and ‘Taijaku’ are commonly used along walking pathways but also in shopping centers and hospitals. If regularly pruned, Japanese cherry trees require little maintenance and they are resistant to diseases and pathogens (Gartenjournal 2020). However, one has to be cautious where space is limited since cherry can lift pavements and kerbs posing risks to the public (Forrest 2006). Moreover, if pollinator-friendly habitats are planned for urban areas the cherry should be excluded as it is not attractive to pollinating insects (Strzałkowska-Abramek 2019).</p>	<p>No reference reported on invasiveness</p>
--------------------------------	---	--	---	--

<p><i>Pseudotsuga menziesii</i></p>	<p>ameriška duglazija (SLO) / Douglas fir (ENG) / Douglasie, Gewöhnliche Douglasie, Küsten-Douglasie, (GER) / Abete di Douglas (IT) / Douglas bleu, Douglas vert (FR)</p>	<p>Douglas fir was initially used for ornamental reasons and has been used in European forestry since the end of the 19th century (Spellmann et al., 2015; Van Loo &amp; Dobrowolska, 2019). Douglas fir is now widely distributed across European forests and considered among the most productive conifers (Spiecker et al., 2019). Based on long-term experiences in provenance trials and silvicultural systems, Douglas fir is considered worth for cultivation, also because of its perceived adaptive capacity towards future climatic conditions (Bauhus et al., 2013; Spellmann et al., 2015). However, although Douglas fir seems to be adapted to current climate conditions it might not be suited to future climate change at all sites. Thus, cultivating pure stands over large areas should be avoided (Knook &amp; Hanewinkel, 2019). It is considered challenging to develop optimized situation-specific management strategies because the interests and production goals in Douglas fir uses considerably vary among different forest owners and regions across European countries. Additionally, management strategies have to consider the locally applied societal and legal context including certifications. The use of appropriate nursery stocks and application of site-adapted planting techniques are important for the successful establishment and cultivation of this tree species. It is suggested to choose a provenance adapted to the local conditions, for example, the use of the coastal or intermediate variety is</p>	<p>Based on the available literature, it appears as if the focus of interest is primarily on using Douglas fir as a forest tree rather than as an urban tree. However due to its characteristics, it might also play an important role in urban forestry to improve climate resilience in cities with extreme environmental conditions, such as drought and higher temperatures. For example, Douglas fir has been reported among the most commonly planted pine trees in a city in France, however no further information on the particular locations and environmental conditions are provided (Rossi et al., 2016).</p>	<p>The designation of buffer zones around susceptible habitats has been suggested to limit the spread of this species (Ammer et al., 2016; Bindewald &amp; Michiels, 2018). Buffers of 300 m are mandatory for state forest in Southwestern Germany (ForstBW, 2014), others suggest 1-2 km (Walentowski, 2008). These buffers should contain Douglas fir within the cultivated forest area and avoid any further spread into sensitive areas. Where necessary, forest management can decrease the establishment and spread potential of Douglas fir by planting competitive native tree species and by early removing of single trees before they produce seeds (Spellmann et al., 2015). Any undesired occurrence of Douglas fir can be mechanically removed with low effort since the tree does not regenerate by regrowth from root material or via coppice shoots (Spellmann et al., 2015). Further and regular monitoring of semi-natural (forest) habitats is recommended to support</p>
-------------------------------------	---	---	--	--

generally recommended for cultivation in Western and Central Europe (Kohnle et al., 2019). Usually Douglas fir is artificially regenerated; but the importance of this species establishing naturally under canopy shelter is increasing, particularly within the concept of 'close-to-nature' forest management (Bauhus et al., 2013). Natural regeneration is possible in most ecological conditions through regular regeneration thinning of stands to reduce canopy competition (Kohnle et al., 2019). It is advised to plant no more than 1000-2000 Douglas fir per hectare and regularly remove major competitors to optimise gross volume and timber quality production (Klädtker et al., 2012; Klädtker, 2016). With low planting densities, pruning is a common management activity in Douglas fir stands to improve the wood quality. In some parts of Central Europe Douglas fir stands have a very long production time to achieve target diameters of 80-100 cm. However, for these stands there is often a risk of storm damage, because large target diameters are associated with tall stands (Knook & Hanewinkel, 2019). For example, storm damage of Douglas fir growing in southwestern Germany appears as frequently as in Norway spruce which is known to have high storm risk among European tree species (Albrecht et al., 2013). Cultivation of Douglas fir is increasingly advised in admixtures of native tree species to increase biodiversity and thus improve the resistance and resilience of forest stands to pests and diseases (Spellmann et al., 2015;

		<p>Kohnle et al., 2019). Additionally, there is a better link of the non-native species to natural forest communities, which is particularly important within close-to-nature forest management (Bauhus et al., 2017).</p>		
<p><i>Quercus coccinea</i></p>	<p>scarlet oak (ENG), Chêne écarlate (FR), Scharlach-Eiche (GER), quercia della cocciniglia; quercia scarlatta d'America (IT), škrlatni hrast (SLO)</p>	<p>No current use in the forests of the Alpine Space.</p>	<p>Scarlet oak is sometimes planted as an ornamental tree, popular for its bright red fall colour offering magnificent and spectacular scarlet foliage in autumn. His shadow is also much appreciated. Since it is a large tree, it must be planted in a location where it will have sufficient space to grow upward and spread to its mature size.</p>	

<p><i>Quercus rubra</i></p>	<p>rdeči hrast (SLO) / northern red oak, common red oak (ENG) / Rot-Eiche (GER) / Quercia rossa (IT) / Chêne rouge d'Amérique (FR)</p>	<p>In forests, northern red oak is cultivated in mixtures e.g. with beech for wood production. The production target for northern red oak stocks is the cultivation of best quality trees with strong trunk wood. Breast height diameters of 65 cm can be achieved in production periods of 80 to 120 years. Northern red oak is often cultivated on sites that are also suitable for native oak species and other noble deciduous trees due to same location requirements (Seidel and Kenk, 2003).</p> <p>Northern red oak performs well across a relatively broad range of sites (Stratmann and Warth, 1987). Although the wood quality and the timber revenues of northern red oak cannot keep up with those of the native oaks (Seidel and Kenk, 2003), height growth is comparable to sycamore and even outperforms native oaks and European beech, both when comparing monocultures and mixed plantations in more light sites (Nagel, 2015). The extremely strong self-differentiation of northern red oak is emphasized as it leads to self-preservation of the understorey also in stands of the same age (Bauer, 1953a; Göhre and Wagenknecht, 1955; Stratmann and Warth, 1987; Danusevičius et al., 2002; Mauerhof, 2011).</p> <p>From the age of 25 (only 50-year-olds show full seed production) and at periodic intervals of 2-5 years northern red oak shows good fructification. Germination capacity is usually very low (only one percent), because a large proportion of acorns are eaten by animals.</p>	<p>Little is known about the urban use of northern red oak in the Alpine Space or in other parts of Europe. A study on urban trees has been performed in Dresden (a city in the middle east of Germany and thus not in the Alpine Space) where northern red oak has been planted as a street tree since the end of the 19<sup>th</sup> century (Gillner, 2012). Dendrochronological studies in this city indicate a strong climatic growth dependence and high winter hardiness for northern red oak trees in urban areas: Compared to <i>Acer platanoides</i> and <i>Acer pseudoplatanus</i>, northern red oak showed significant higher values of water use efficiency (WUE) during atmospheric drought which indicates a more economical use of water compared to the two maple species. Based on this study, northern red oak is considered considerably resistant to drought in urban areas and thus might be an important candidate to mitigate climate change in cities in the Alpine Space.</p>	<p>It is recommended to prevent the spread of this species by establishing buffer zones of 2 km around specific light, dry and acidic sites, such as rock biotopes (Starfinger and Kowarik, 2011b). In addition, repeated spring or summer coppicing, and soil tillage can limit the spread of northern red oak (Meloni et al., 2016). Mechanical removal of 1-2-year-old regeneration is possible, since northern red oak does not reproduce via growth from roots (Dreßel and Jäger, 2002). Removal of older trees will inhibit seed production, but sites need to be revisited regularly. Girdling is cheap and feasible for older trees. Uprooting of whole trees is expensive and just as effective as planting shade-tolerant tree species. Chemical treatment is cheap but often not suitable for environmental reasons (Oosterbaan and Olsthoorn, 2005). Planting native species (e.g. European beech) instead of bringing in northern red oak should be considered either way (Nagel, 2015).</p>
-----------------------------	--	---	---	---

Small seedlings suffer from lack of light and strong bite, which leads to high seedling mortality (Sander, 1990). A successful rejuvenation only occurs when the plants are already large and have a good root system. The germination capacity is increased by stratification of the seed for four months (Burkart, 2000). Seedlings of one to two years can be planted in clusters of 1x1, 1x1.5 or 2x0.75 m (Bauer, 1953; Gauer, 2013). The planting can be also done with 40 - 80 clumps per hectare (each clump 40 – 70 trees) and minimum distances between the clumps of 12 m. In order to be able to establish well, growth of blackberry (*Rubus fruticosus* L.) and pioneer tree species should be avoided in the understory; browsing should be monitored (Gauer, 2013). New stocks can also be established by stock rash (Sander, 1990), but this has not played an important role in Germany so far, since shoots are often browsed by wild animals (Nagel, 2015).

<p><i>Quercus suber</i></p>	<p>Cork oak (ENG), Chêne liège (FR), Korkeiche (GER), querce dasughero (IT), plutovec (SLO)</p>	<p>In the Alpine Space, this species is under management only in the Maures Range, department of Var, Provence Alpes Côte d'Azur region, France. The main management measures are the following ones: In a regularly harvested cork oak stand, the average rotation between two harvests is 12 years. If the stand is characterized by a long abandonment of the cork levees, with not very vigorous trees due to a too dense canopy (more than 60%), this age would rather be 15 years (for a cork thickness of 30 mm). For a given tree, the harvest operations initially include its development or cork removal (also call the unmasking operation): it is the first harvest ("male" cork removal) when the tree reaches 70 cm in diameter at 1 metre above ground, i.e. around the age of 40 years. After this first harvest then 6 successive other ones for removing the "breeding" cork (also called the "female" cork) every 12 years have to be done and should cover all trees found or surveyed 12 years previously. The height of the removals is fixed at twice the diameter on bark at 1 meter above ground (this coefficient must be less than 2 if the trees are of low vigour and with too tight tops). For renewing cork oak stand, the silvicultural measure is the systematic renewal by re-growth (using coppice production ability of oaks, with selection and promotion of stump rejections). In addition, plantations can be considered.</p>	<p>Cork oak is currently not used in urban areas in the Alpine Space.</p>	<p>No reference reported on invasiveness</p>
-----------------------------	---	---	---	--

<p><i>Rhus typhina</i></p>	<p>Staghorn sumac (ENG) / octovec (SLO) /Hirsch Horn Sumach, Essigbaum (GER)/ Sommacco americano (IT) / Sumac de Virginie, Sumac vinaigrier (FR)</p>	<p>No current use in the forests of the Alpine Space.</p>	<p>If invasive in urban area: Tree must be cut, and roots should be excavated. Then new shoots should be regularly removed. Cut part of tree can be coated with herbicides. Herbicides can only be used by persons who are certified to work with herbicides (Strgulc et al., 2016).</p>	<p>It is nearly impossible to eradicate <i>R. typhina</i> once the plant is established unless all the roots are dug out and taken away, because each root fragment can develop into a new individual (Wang et al., 2008).Cutting might increase sprout productivity. Seedlings or small plants should be hand-pulled (Wittenberg, 2005).The most effective way to deal with introduced biological invaders is to identify them as early as possible and attempt to eradicate or at least control them before wide spreading occurs (Weiss, 1999; Simberloff, 2003). Staghorn sumac is advised not to plant as a foundation plant, because soon it will consume the area and become nuisance (Cretti, 2015).</p>
----------------------------	--	---	--	--

<p><i>Robinia pseudoacacia</i></p>	<p>Robinier, Faux-Acacia (FR), Gewöhnliche Robinie, Robinie, Weiße Robinie, Falsche Akazie, Scheinakazie, Silberregen (GER), robinia, acacia (IT), Navadna robinija, neprava akacija (SLO), Black Locust, False acacia, yellow locust (ENG)</p>	<p>It is not so easy to install the Black Locust per planting, despite its great ability for vegetative regeneration (cuttings): plant dryness due to dry springs, wild game (rabbit, hare, deer) is fond of it, and the herbaceous competition are the main cause of plantation failure. To maximize the chances of successful planting, it is preferable to plant in the autumn, work the soil well, make a deep hole, put plants up to 1 year old with a good root system. Planting by direct sowing is to be avoided because the success of the operation is too uncertain.</p> <p>During establishment, protection from weeds and wildlife (deer) are the main management priorities. Due to the rapid early growth, and to self-defense by spikes, two years of protection are usually sufficient. Pre-plant site preparation to control weeds with tillage or herbicides is recommended, with continued weed control after planting. Where exceptional deer pressure exists, tubes or mesh sleeves may be required. Once established this species will not require active management unless straight trunks are desired for fence posts.</p>	<p>The Black Locust does not tolerate too much pruning and cutting. In Alpine space, it is often planted along streets and in parks, especially in large cities, because it tolerates pollution well. In urban areas, it is used as an alignment tree because it tolerates air pollution well. It is also used as an ornamental tree. There are many horticultural varieties, with yellow foliage, monophyllous leaves, thornless, or weeping. Other species of the genus <i>Robinia</i> are also planted for this purpose, including <i>R. hispida</i>, <i>R. viscosa</i>, both with pink flowers.</p>	<p>Annual mowing limits the spread of one-year-old seedlings with an undeveloped root system. Cutting, debarking or burning of mature trees, when used alone, should be prohibited. These mechanical techniques result in stump rejection and strong suckering of the trees. They are therefore often combined with chemical treatment. Black locust is easily propagated from softwood, hardwood, and root cuttings so the slash have to be permanently removed. An herbicide applied to the base of a young tree or to a stump cut at ground level will give good results. Seedlings can be successfully treated by brushing their foliage.</p>
------------------------------------	---	---	---	---

<p><i>Sophora japonica</i></p>	<p>Pagoda tree (ENG) Japanischer Schnurbaum, Pagodenbaum (GER) Japonska sofora, pagodovec (SLO) Sophora du Japon (FR) sofora del Giappone (IT)</p>	<p>No information about its current relevance for forestry in the Alpine Space was found.</p>	<p><i>S. japonica</i> prefers sunny locations, preferably somewhat sheltered from wind. It is resistant to emissions and road salt and is therefore a favored tree in parks and along streets. On public grounds a regular tree inspection is obligatory, and the appropriate tree maintenance must be carried out. The crowns can and should be cut regularly, so that deadwood can be safely removed from the crowns. <i>S. japonica</i> should be cut in autumn rather than in spring.</p>	<p>No reference reported on invasiveness</p>
<p><i>Thuja occidentalis</i></p>	<p>American arborvitae/Eastern White Cedar/ Northern White Cedar (ENG) Abendländischer Lebensbaum (GER) Ameriški klek (SLO) Thuja occidental (FR) Tuia occidentale (IT)</p>	<p><i>T. occidentalis</i> is not commercially exploited in forests of the Alpine region. However, it is known from its native distribution area that generally perennial silvicultural treatments with periodic harvests of low to medium intensity, retention trees or patches and protection of coarse woody debris are suitable for sustaining <i>T. occidentalis</i> in forests. Regeneration is sensitive to competition and game browsing, and its success depends on soil pH and stand density.</p>	<p><i>T. occidentalis</i> is a widespread species for ornamental purposes. Due to its evergreen leaves it is often used for hedges in private gardens and cemeteries. Pruning is necessary in case of fungal or insect infestation. In case of intensive infestation, the entire plant must be removed. On public grounds, regular tree inspections must be carried out.</p>	<p>No reference reported on invasiveness</p>

<p><i>Tsuga canadensis</i></p>	<p>Kanadska čuga (SLO) / eastern hemlock, Canadian hemlock (ENG) / Kanadische Hemlocktanne; Kanadische Schierlingstanne (GER) / Abete del Canada; Tsuga canadese (IT) / pruche du Canada; Tsuga du Canada (FR)</p>	<p>No information found.</p>	<p>No information found for AS, but IN GENERAL: The tree's preference for partial shade and tolerance of full shade allows it to be planted in areas where other conifers would not easily grow. In addition, its very fine-textured foliage that droops to the ground, its pyramidal growth habit, and its ability to withstand hard pruning make it a desirable ornamental tree. In cultivation, it prefers sites that are slightly acidic to neutral with nutrient-rich and moist but well-drained soil. It is most often used as a specimen, for a screen, or in small group plantings, though it can also be trained as a dense formal hedge. It should not be used on roadsides where salt is used in winter, as its foliage is sensitive to salt spray. It is also poorly adapted as a windbreak tree, as wind exposure causes dieback in winter. It has several drawbacks, such as a fairly low tolerance of urban stress, intolerance for very wet or very dry soils, and susceptibility to attack by the hemlock woolly adelgid, though this is treatable. Its tendency to shed needles rapidly after being cut down renders it unsuitable as a Christmas tree.</p>	<p>No reference reported on invasiveness</p>
--------------------------------	--	------------------------------	---	--