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PEST PLANT SCORE OF ALIEN *Robinia pseudoacacia* IN RĪGA (LATVIA) AND KAUNAS (LITHUANIA)

Lina Straigytė[#], Gunta Čekstere, Māris Laiviņš, and Vitas Marozas

Institute of Biology, University of Latvia, Miera iela 3, Salaspils, LV-2169, LATVIA;
lina.straigyte@asu.lt

[#] Corresponding author

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Robinia pseudoacacia *is an alien tree species that has wide distribution in green areas of Rīga and Kaunas. In recent years, the spread and invasion of this species was observed. The aim of this study was to determine the relative importance of invasiveness of* R. pseudoacacia *in Rīga and Kaunas. The degree of species invasion was estimated by applying the Pest Plant Prioritization Process, which is based on the Analytic Hierarchy Process method. The results showed that the invasive degree of* R. pseudoacacia *was near medium (0.4); the present compared to potential distribution rating was medium (0.57) and the social, environmental and economic impact score was very low (0.17). The Final Pest Plant Score for* R. pseudoacacia *was near medium (0.426). The obtained estimates indicated that black locust was medium invasive, and that well-lit conditions favour its establishment.*

Key words: *black locust, spread, green areas, invasiveness, urban environment.*

INTRODUCTION

Black locust (*Robinia pseudoacacia* L.) is native to North America. It is a pioneer species that occurs mostly in disturbed sites on fertile to poor soil. In Europe, black locust was recorded beginning in 1600 (Ramanauskas, 1973), but the exact year of its introduction to Europe is unknown. According to K. Wein (1930), 1601 as the year of the first introduction to France is erroneous. The first reference to *R. pseudoacacia* in Britain is from 1634 (Cierjacks *et al*., 2013). After introduction, *R. pseudoacacia* become naturalised in grassland, semi-natural woodland and urban habitats. *R. pseudoacacia* was planted in Poland since the mid-18th century and now it is present throughout the country and has invasive character (Rahmonov, 2009). *R. pseudoacacia* was brought to Japan about 100 years ago as an ornamental tree. It has been observed that in places where these trees dominate, other plants are lacking, and that the vegetation beneath the trees is poor (Nasir *et al*., 2005). It is recommended as an urban tree in the face of climate change (Roloff *et al*., 2009), but is expected to spread vigorously as a response to warming (Kleinbauer *et al*., 2010).

R. pseudoacacia is the most popular species from *Robinia* genus in Latvia (Roze, 2014). It was first cultivated in Rīga in a tree nursery (Zigra, 1805) from where it spread. In the 20th century, according to several plant determination books (Bickis, 1920; Pētersone and Birkmane, 1980) and lists of vascular plant flora (Ašmanis, 1923; Līvena, 1957) *R. pseudoacacia* was an ornamental plant in Latvia. Only at the end of the 20th century, almost 200 years after the first attempts (trials) to grow *R. pseudoacacia* in Latvia, it was classified as an escaped garden species or ergaziophygophyte with rare naturalisation (domestication) tendencies (Laiviņš and Zundāne, 1989; Gavrilova and Šulcs, 1999). *R. pseudoacacia* is widespread in parks and greeneries, grows in ruderal and partly natural habitats, especially in urban environments, as well as in abandoned house sites, non-managed gardens, and along roads and railways. The naturalisation level of *R. pseudoacacia* in Latvia could be characterized as intensive (Laiviņš *et al*., 2009).

In Lithuania, *R. pseudoacacia* was introduced in the 18th century. In 1781, Jean Emanuel Gilibert mentioned *R. pseudoacacia* in a description of Gardin district trees. This tree in Vilnius botanical garden historical documents was first mentioned in 1799 (Skridaila, 2001). J. Rauktys (1938) described this species as being very often grown in southern Lithuania and as a popular ornamental tree on residential land. J. Rauktys (1933) recommended to plant it in sunny places in poor, dry soil, and as suitable in trees boulevards and high hedges. *Robinia* was planted as forest in Lithuania in 1954 and 1958 (Ramanauskas and Matiliauskas, 1962). In Lithuania *R. pseudoacacia* is considered an invasive alien tree species.

To make informed decisions about the optimal method of weed control in urban areas, it is necessary to determine the relative importance of each weed.

The aim of the study was to determine the relative importance of *Robinia pseudoacacia* invasiveness in Rīga and Kaunas. Invasiveness can be determined by considering: (1) invasive and rate of spread; (2) the present and potential extent of the species; (3) the social, environmental and economic impacts of the species.

MATERIAL AND METHODS

Growth and seedling distribution of *Robinia pseudoacacia* in Rīga (56° 57′ 05″ N, 24° 06′ 10″ E), the capital of Latvia, and Kaunas (54° 53′ 50″ N, 23° 53′ 10″ E), the second largest city in Lithuania, were determined.

Calculation of invasiveness score. The species with highest risk have the greatest potential to affect valued resources. Information that is needed to assess threats include:

- The species that could threaten the region either now or in the future;
- Information about the biology of each species and its potential rate of spread;
- The level of impact that a species could have on social, environmental and economic resources;
- The values that land managers assign to affected resources.

The Pest Plant Prioritization Process (PPPP) is a hierarchical system (Fig. 1), the components of which are weighted using the Analytic Hierarchy Process (AHP) to allow the determination of a Pest Plant Assessment score for individual species.

The Pest Plant Assessment score is expressed as:

$$\text{Pest Plant Score} = \alpha\,(\text{Invasiveness score}) + \\ + \beta\,(\text{Present: Potential Distribution}) + \gamma\,(\text{Impact}) \quad (1)$$

where α, β, and γ are weightings of the subcomponents. For urban greeneries in Rīga and Kaunas, the following weightings were given: $\alpha = 0.56$, $\beta = 0.32$ and $\gamma = 0.12$.

Experts gave a preliminary ranking of the three subcomponents of the PPPP.

The scored intensity ratings for each criterion and their weightings were then calculated to produce a final invasiveness score:

$$\text{Invasiveness Score} = \Sigma\,(\text{Rating} * \text{Weight}) \quad (2)$$

Assessment of plant invasiveness was done by evaluating biological and ecological characteristics, such as germination requirements, growth rate, competitive ability, reproduction ways, and dispersal mechanisms. The intensity rating for each group was determined by assessment of species characteristics (Table 1). Assessments were made using data in literature and direct observations in urban greenery in Rīga and Kaunas where *R. pseudoacacia* occurs and is spreading.

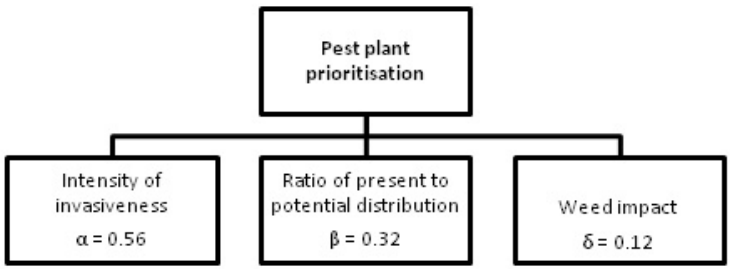

Fig. 1. Hierarchy illustrating components of the Pest Plant Prioritisation Process (PPPP) (Weiss and McLaren, 2002).

Table 1

INVASIVENESS CRITERIA USED IN INTENSITY RATING ASSESSMENT

Group/ Criteria	Intensity rating*			
	Lowest threat (L)	Medium Low (LM)	Medium High (MH)	Highest Threat (H)
1	2	3	4	5
Establishment				
Germination/ propagules requirements	Requires specific environmental factors that are not part of an annual cycle of the system to germinate (e.g. specific temperatures, floods, fire) or human-caused disturbance such as ploughing.	Requires unseasonal or uncommon natural events for germination, e.g. flooding, fire.	Requires natural seasonal disturbances such as seasonal rainfall, spring/summer temperatures for germination / striking/ set root.	Opportunistic germinator, can germinate or strike/ set root at any time whenever water is available.
Seedling/ Propagule Establishment requirements	Requires additional and very specific factors such as nutrient and water that are deliberately added or highly eutrophic conditions.	Requires more specific requirements to establish. e.g. open space or bare ground with access to light and direct rainfall	Can establish under moderate canopy/litter cover	Can establish without additional factors.

Table 1 (continued)

1	2	3	4	5
How much disturbance is required for seedling establishment to occur	Major disturbance required with little or no competition from other plant species.	Establishes in highly disturbed natural ecosystems (roadsides, wildlife corridors – or areas that have a greater impact by humans – such as tourist areas or campsites) or in overgrazed pastures/poorly growing or patchy crops.	Establishes in relatively intact or only minor disturbed natural ecosystems (wetlands, riparian, riverine, grasslands, and open woodlands); in vigorously growing crops or in well-established pastures.	Establishes in healthy and undisturbed natural ecosystems (e.g. mallee, alpine, heathlands)
Growth/ competitive ability				
Life form	Others	Geophytes, climber or creepers	Grasses, leguminous plants	Aquatic (submerged, emergent, floating) and semi aquatic.
Allelopathic properties	None	Minor properties	Allelopathic properties seriously affecting some plants	Major allelopathic properties inhibiting all other plants.
Ability to tolerate herbivory pressure and produce propagules	Preferred food of herbivores. Eliminated by moderate herbivory or reproduction entirely prevented.	Consumed and recovers slowly. Reproduction strongly inhibited by herbivory but still capable of vegetative propagule production (rhizomes or tubers); weed may still persist	Consumed but non-preferred or consumed but recovers quickly; capable of flowering /seed production under moderate herbivory pressure. (Moderate = normal; not overstocking or heavy grazing)	Favoured by heavy grazing pressure as not eaten by animals/ insects.
Normal growth rate	Slow growth, will be exceeded by many other species.	Maximum growth rate less than many species of same life-form.	Moderately rapid growth that will equal competitive species of same life form.	Rapid growth rate that will exceed most other species of the same life form.
Stress tolerance of established plants to frost, drought, water logging, salinity, fire	Maybe tolerant of 1 stress, susceptible to at least 2	Tolerant to at least 2 and susceptible to at least 2	Highly tolerant of at least 2 of (drought, frost, waterlogging, fire and salinity) and maybe tolerant of another. Susceptible to at least 1.	Highly resistant to at least 2 of (drought, frost, waterlogging, fire and salinity) not susceptible to more than 1 (cannot be drought or waterlogging).
Reproduction				
Reproductive system	Sexual but either cross or self pollination	Sexual (self and cross pollination)	Vegetative reproduction	Both vegetative and sexual reproduction
Number of propagules produced per flowering event	Less than 50	50–1000	1000–2000	Above 2000
Seed longevity	Seeds survive yrs, or lower viability but survive 5–10 yrs or vegetatively reproduces.	25% of seeds survive 5–10 yrs in soil, or lower viability but survive 10–20 yrs	25% of seeds survive 10–20 yrs in soil, or lower viability but survive 20+ yrs	25% of seeds can survive 20 yrs in the soil.
Reproductive period	Mature plant produces viable propagules for only 1 yr.	Mature plant produces viable propagules for only 1–2 yrs.	Mature plant produces viable propagules for 3 –10 yrs	Mature plant produces viable propagules for 10 yrs or more, or species forms self-sustaining dense monocultures.
Time to reach reproductive maturity	Greater than 5 yrs to reach sexual maturity.	2-5yrs	Produces propagules between 1–2 yrs after germination.	Reaches maturity and produces viable propagules in under a year.
Dispersal				
Number of dispersal mechanisms	Propagules mainly spread by gravity	Propagules can also be spread by attaching to humans or animals	Propagules spread by wind, water, animals (not birds) or light vehicular traffic.	Very light, wind dispersed seeds, or bird dispersed seeds or has edible fruit that is readily eaten by highly mobile animals.
How far do propagules disperse	Very unlikely to disperse greater than 200 m most will be less than 20 m	Very few to none will disperse to 1 km, most 20–200 m	Few propagules will disperse greater than 1 km but many will reach 200–1000 m	Very likely that some propagules will disperse greater 1 km

* Intensity rating described according to PPPP methodology (http://vro.depi.vic.gov.au/dpi/vro/vrosite.nsf/pages/invasiveness_criteria)

Distribution was determined based on the results of inventory data of urban parks in Rīga (Pūka *et al*., 1988) and field assessment in summer 2014, as well as woody plant inventory data of Kaunas green areas conducted in 2011–2014.

The ratio of present to potential distribution provided an indication of the stage of spread of the alien tree species.

Assessment of plant impacts was determined by the extent to which the species affected environmental, economic, and social resources. The influence of the species was evaluated according to 24 criteria (Tables 2, 3), rating them by intensity differences (Weiss and McLaren 2002), based on the following formula (eqn. 3):

$$\text{Impact Score} = \Sigma\ (\text{Rating} * \text{Weight}) \qquad (3)$$

The weighting was made by experts. Where some information was missing, likely responses were estimated. Rating was scored in five categories: L – the lowest threat, ML – medium low, M – medium, MH – medium high, H – the highest threat.

RESULTS

Invasiveness score of *Robinia pseudoacacia.* The ability of *R. pseudoacacia* seedlings to establish has lower than medium threat; ability to disperse, grow and compete for establishment — higher than medium threat. Ability to reproduce varies from low (seed longevity and time to maturity) to high (reproductive system and period) threat. Values of parameters used to determine the Invasiveness Score in Rīga and Kaunas are shown in Table 4.

The calculated invasiveness score of 0.4 for *R. pseudoacacia* is moderately invasive.

Evaluating the present compared to potential distribution. The present distribution of *R. pseudoacacia* in Rīga and Kaunas shows that it is widespread (Figs. 2, 3). Intensity ratings for evaluating the ratio of present to potential distribution are shown in Table 5. We estimated that the intensity rating was medium (weight 0.57).

Determining the social, environmental and economic impacts. Criteria ratings for determining the social, environmental and economic impacts of pest plants are shown in Table 6, The impact on indigenous fauna was estimated as medium high. Impact on vegetation community structure was medium. This species does not affect natural resources and agriculture.

Pest Plant Score. The final stage of the PPPP is to use the estimated invasiveness (Table 4), distribution (Table 5), and impact (Table 7) to determine Pest Plant Score. The formula for calculating the Pest Plant Score (PPS) is:

PPS = 0.56 * 0.4002+ 0.32 * 0.57 + 0.12 * 0.1678 = 0.426.

The obtained invasiveness Pest Plant Score for *R. pseudoacacia* was medium (0.426).

Table 2

IMPACT SCORE CRITERIA AND WEIGHT FOR EVALUATING INFLUENCE OF THE PLANT

Criteria	Weight
SOCIAL (tourism, visual aesthetics, experience, cultural sites)	
1. To what extent does the weed restrict human access?	0.0259875
2. To what level does this weed reduce the tourism / aesthetics/ recreational use of the land?	0.0471625
3. To what level is the plant injurious, toxic, or spines affect people?	0.01435
4. How much damage is done to indigenous or European cultural sites?	0.0125
NATURAL RESOURCES – soil, water and processes	
5. To what extent does this weed affect the water flow within watercourses or waterbodies?	0.041625
6. To what extent does the weed affect water quality (ie. dissolved 02, water temperature)?	0.083375
7. To what extent does the weed increase soil erosion?	0.075
8. To what extent does the weed reduce the biomass of the community? (nb. biomass acting as a carbon sink).	0.005
9. To what extent does the weed change the frequency or intensity of fires?	0.045
FAUNA AND FLORA / vegetation & EVCs	
10. To what extent does this weed affect the vegetation composition on the following:	
a. High value EVCs	0.081991
b. Medium value EVCs	0.04978025
c. Low value EVCs	0.01464125
11. To what extent does this weed affect the structure of a vegetation community?	0.0690625
12. What effect does the weed have on threatened flora spp.?	0.060775
FLORA & FAUNA/FAUNA	
13. What effect does the weed have on threatened fauna spp.?	0.05474
14. What effect does the weed have on nonthreatened fauna spp.?	0.02632875
15. To what extent does this weed provide benefits or facilitates the establishment of indigenous fauna?	0.02305625
16. To what extent is the plant toxic, its burrs or spines affect indigenous fauna?	0.01666
FLORA AND FAUNA/ FAUNA /Pest Animal	
17. To what extent does this weed provide a food source to assist in success of pest animals?	0.011186
18. To what extent does this weed provide habitat / harbor for serious pests?	0.016779
AGRICULTURE – quality, quantity, cost of production, effect on land use and value	
19. To what extent does this weed affect the quantity or yield of agricultural produce?	0.0189
20. To what extent does the weed affect agricultural quality?	0.0324
21. To what extent does this weed affect land value?	0.054675
22. To what extent does this weed cause a change in priority of land use?	0.1008
23. To what extent the presence of the weed increases the cost of harvest?	0.011925
24. To what extent does this weed act as an alternative host or vector for diseases of agriculture?	0.0063

Table 3

INVASIVENESS RATING FOR *Robinia pseudoacacia*, ACCORDING TO CRITERIA

Criteria	Comments	Rating
Establishment		
1. Germination requirements	Germination rate of fresh seeds is low under natural conditions ((Roberts & Carpenter 1983), soil pH values of 3.2–8.2 (Huntley 1990; Kowarik 1992)	M
2. Establishment requirements	From seeds seedlings occur in open spaces	ML
3. Disturbance requirements	Established near roadsides, in land after fire	ML
Growth/competitive ability		
4. Life form	15-meter-hight leguminous tree, live up to 80–100 years (Navasaitis, 2004)	MH
5. Allelopathic properties	Leaves issue Robinetin, quercetin, myricetin (Nasir *et al*. 2005). Fixes nitrogen in the soil, which inhibits the growth of species adapted to nutrient poor soils.	M
6. Tolerates herbivory pressure	Grazing by goats (Böcker and Dirk, 2004)	M
7. Normal growth rate	Colonises gaps on sandy soil	M
8. Stress tolerances	Well adapted to urban stress (heat, drought; Sjöman and Nielsen 2010), sometimes damaged by frost (Navasaitis, 2004)	MH
Reproduction		
9. Reproductive system	Reproducing by seeds and root suckers	H
10. Propagule production	A single tree can produce 6–12 kg of seeds per year (Schutt, 2010)	M
11. Seed longevity	Seeds are able to germinate in 2–3 years (Ramanauskas, 1973). Dry seeds can be stored and remain viable for as long as 10 years at 0–5°C (Huntley, 1990)	L
12. Reproductive period	Fertile season is almost every years	H
13. Time to reproductive maturity	Tree begins to fruit 5–10 years of age (Ramanauskas, 1973). Seed production begins approximately after 6 years and fruit set occurs yearly or every 2 years (Huntley, 1990)	L
Dispersal		
14. Number of mechanisms	Propagules spread by root suckers. Seeds are widely dispersed by birds, animals	MH
15. How far do propagules disperse	Dispersal over short distances by root suckers up to 1 m year 1 (Kowarik, 1996); Wind over the snow disperses seeds distances up to 67 m (Morimoto *et al*., 2010)	M

Table 4

INVASIVENESS SCORE OF *Robinia pseudoacacia* DETERMINATION

Group, criteria	Rating	Weight	Impact
Establishment			
Germination requirements?	0.5	0.0425	0.02125
Establishment requirements?	0.25	0.3355	0.083875
Disturbance requirements?	0.25	0.122	0.0305
Growth/competitive ability			
Life form?	0.75	0.00576	0.00432
Allelopathic properties?	0.5	0.00864	0.00432
Tolerates herbivory pressure?	0.5	0.0456	0.0228
Normal growth rate?	0.5	0.018432	0.009216
Stress tolerances?	0.75	0.01776	0.01332
Reproduction			
Reproductive system?	1	0.005593	0.005593
Propagule production?	0.5	0.05474	0.02737
Seed longevity?	0	0.030464	0
Reproductive period?	1	0.012019	0.012
Time to reproductive maturity?	0	0.016184	0
Dispersal			
Number of mechanisms?	0.75	0.094572	0.070929
How far do propagules disperse?	0.5	0.189428	0.094714
			0.4002

Table 5

INTENSITY RATINGS FOR EVALUATING THE PRESENT COMPARED TO POTENTIAL DISTRIBUTION OF *Robinia pseudoacacia*

Rating	Weight	Cities rating
Very high	1	Infestation(s) that is able to be eradicated with no chance of reinvasion from outside of area of control.
High	0.85	Infestation(s) that are able to be eradicated with some chance of reinvasion
Medium high	0.71	Several small infestations beyond eradication
Medium	0.57	A large partially dispersed infestation or few widely scattered small infestations
Medium low	0.42	Numerous large dispersed infestations or lots of scattered small infestations.
Low	0.28	The majority of region infested with some large areas still "clean" (more "clean" areas than infested)
Very low	0.14	The majority of region infested with some smallish areas still "clean" (less "clean" areas than infested)
Extremely low	0	Reached full potential – but may increase in density within infested area

DISCUSSION

Invasiveness can be defined as the ability to establish, reproduce, and disperse within an ecosystem. Plant propagules arrived at a new site with certain inherent characteristics that previously enabled their successful survival and

Fig. 2. Present distribution of *Robinia pseudoacacia* in Rīga (Raster 1 × 1 km).

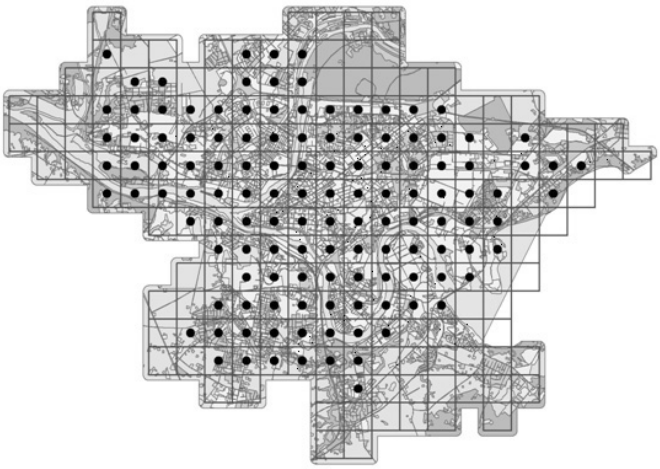

Fig. 3. Present distribution of *Robinia pseudoacacia* in Kaunas (Raster 1 × 1 km).

continued reproduction throughout their evolutionary history (Table 3). Compared with *Acer negundo* invasiveness score (0.79) in Rīga and Kaunas (Straigyte *et al*., 2015), *R. pseudoacacia* is less invasive.

Current and potential distributions are a major component required in the decision support system and AHP to predict the status of a weed. Tree species are more invasive in regions that are climatically similar to their native environment. In the USA, *R. pseudoacacia* occurs in hardiness zones 4–8 (United States Department of Agriculture (USDA)). The territories of Rīga and Kaunas are located in the 5–6 hardiness zones. This means that the winter climate in Rīga and Kaunas is very suitable for *R. pseudoacacia*. According to data of parks inventory, the frequency of this tree species in Rīga parks is 34%.

Table 6

RATING OF SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT

Criteria No	Comments	Rating
1. Restrict human access?	Would not hinder human access	L
2. Reduce tourism?	The species is cultivated as ornamental tree in cities	L
3. Injurious, toxic, or spines affect people?	Trees branches have small spines.	ML
4. Damage to cultural sites?	The species is cultivated as ornamental tree in the cities. Unknown damage.	L
5. Impact on water flow?	It is not grown in swampy, damp sites.	L
6. Impact on water quality?	Terrestrial species	L
7. Increase soil erosion?	Protect disturbed soil erosion	L
8. Reduce the biomass of the community?	Seedlings become established in disturbed and bare sandy soil. Likely to increase biomass	L
9. Change fire regime?	Not impact on fire in cities	L
10. To what extent does this weed impact on the vegetation composition on the following:		
a. High value EVCs	EVC = Sandy grassland. Fixes nitrogen. Major displacement of dominant species within different strata	MH
b. Medium value EVCs	EVC = Sandy woodland. Fixes nitrogen. Major displacement of dominant species in gaps	M
c. Low value EVCs	EVC = Grassy woodland. Minor displacement of some dominant sp.	ML
11. Impact on vegetation community structure?	Affects ground cover, shrubs layer	M
12. Effect on threatened flora?	Not recorded in the city flora	L
13. Effect on threatened fauna?	Unknown negative effect	L
14. Effect on nonthreatened fauna spp.?	Unknown negative effect	L
15. Benefits indigenous fauna?	Provides food and shelter for birds, mammals.	MH
16. Injurious to fauna?	The spines of branches can damage, but effect on fauna is not known	ML
17. Food source to pest animals?	Seeds are edible, possible food sources for pest animals	M
18. Provide harbour?	Tree can provide shelter to pest fauna	MH
19. Impact yield?	Positive impact. Roots fix nitrogen in the soil	L
20. Impact on agricultural quality?	No impact on agriculture quality	L
21. Affect land value?	Not affect on land value	L
22. Change land use?	No change	L
23. Increase harvest cost?	No reports about increasing cost of harvest	L
24. Disease host?	Not host for diseases of agriculture	L

In Kaunas, *R. pseudoacacia* is grown for ornamental and protection purposes in parks, avenues, squares, and forest. As an ornamental tree, this species has very frequent occur-

Table 7

GROUP AND CRITERIA RATINGS FOR DETERMINING IMPACT OF *Robinia pseudoacacia*

Criteria	Rating	Impact
SOCIAL (tourism, visual aesthetics, experience, cultural sites)		
1. To what extent does the weed restrict human access?	0	0
2. To what level does this weed reduce the tourism / aesthetics/ recreational use of the land?	0	0
3. To what level is the plant injurious, toxic, or spines affect people?	0.25	0.00359
4. How much damage is done to indigenous or European cultural sites?	0	0
NATURAL RESOURCES – soil, water and processes		
5. To what extent does this weed impact on water flow within watercourses or waterbodies?	0	0
6. To what extent does the weed impact on water quality (ie. dissolved 02, water temperature)?	0	0
7. To what extent does the weed increase soil erosion?	0	0
8. To what extent does this weed reduce the biomass of the community? (nb. biomass acting as a carbon sink).	0	0
9. To what extent does the weed change the frequency or intensity of fires?	0	0
FAUNA AND FLORA / vegetation & EVCs		
10. To what extent does this weed impact on the vegetation composition on the following:		
a. High value EVCs	0.75	0.06149
b. Medium value EVCs	0.5	0.0249
c. Low value EVCs	0.25	0.0037
11. To what extent does this weed effect the structure of a vegetation community?	0.5	0.03453
12. What effect does the weed have on threatened flora spp.?	0	0
FLORA & FAUNA/fauna		
13. What effect does the weed have on threatened fauna spp.?	0	0.
14. What effect does the weed have on nonthreatened fauna spp.?	0	0
15. To what extent does this weed provide benefits or facilitates the establishment of indigenous fauna?	0.75	0.0173
16. To what extent is the plant toxic, its burrs or spines affect indigenous fauna?	0.25	0.00417
FLORA AND FAUNA/ FAUNA /pest animal		
17. To what extent does this weed provide a food source to assist in success of pest animals?	0.5	0.00559
18. To what extent does this weed provide habitat / harbor for serious pests?	0.75	0.01258
AGRICULTURE – quality, quantity, cost to production, effect on land use and value		
19. To what extent does this weed impact on the quantity or yield of agricultural produce?	0	0
20. To what extent does the weed impact on agricultural quality?	0	0
21. To what extent does this weed affect land value?	0	0
22. To what extent does this weed cause a change in priority of land use?	0	0
23. To what extent the presence of the weed increases the cost of harvest?	0	0
24. To what extent does this weed act as an alternative host or vector for diseases of agriculture?	0	0

rence (58%) in public parks and squares. In forest this species was planted where soil is sandy.

R. pseudoacacia often occurs along roadsides, in forest gaps with sandy soil, and on the outskirts of the plantations. Porpagules of this species were not recorded on rich soil with dense grass cover. Its potential distribution includes areas that are well lit with bare soil, forest gaps after fire, and around *R. pseudoacacia* plantations.

Compared with the Impact Score (0.23) and Pest Plant Score (0.45) of *Acer negundo* in Rīga and Kaunas this species is less invasive (Straigyte *et al*., 2015). Among other invasive forest tree species, PPS of *R. pseudoacacia* is higher than 0.35 PPS calculated for *Acer pseudoplatanus* (Straigytė and Baliuckas, 2015) and 0.36 PPS for *Quercus rubra* (Riepšas and Straigytė, 2008). However, the PPS of these latter two tree species were not calculated for urban areas, but for forests in Lithuania. Weight for invasiveness was 0.12 and for impact was 0.56.

The spread of many alien species is heavily dependent on human activity (Panetta and Scanlan, 1995). Disturbance increases plant invasions by providing suitable microsites for germination and seedling establishment and by increasing light and nutrient availability that enhance seedling survival and growth (Orians, 1986; Hobbs and Huenneke, 1992). Human activity by increasing light contributes to the spread of *R. pseudoacacia* in the Rīga and Kaunas. Robinia is a light-loving tree, in shadow sites seedlings do not spread. In the urban territory only human activity can create more light.

Generally, *Robinia pseudoacacia* is widely distributed in parks, street tree, squares, forests, and other urban greeneries in Rīga and Kaunas. The species can spread in new areas after forest fire and clear felling causing increased light conditions and reduced grass cover. *R. pseudoacacia* has a very low social, environmental and economic impact in Rīga and Kaunas, therefore the final pest plant score is near medium.

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SVEŠZEMJU SUGAS *Robinia pseudoacacia* INVAZITĀTES NOVĒRTĒJUMS RĪGĀ (LATVIJA) UN KAUŅĀ (LIETUVA)

Robinia pseudoacacia ir svešzemju koku suga, kas plaši izplatīta Rīgas un Kauņas zaļajā zonā, kur pēdējos gados novērojama šīs sugas izplatīšanās un invāzija. Pētījuma mērķis bija novērtēt *R. pseudoacacia* invazitātes relatīvo nozīmi Rīgā un Kauņā. Sugas invāzijas pakāpe tika novērtēta, izmantojot *Pest Plant Prioritization Process*, kas pamatojas uz *Analytic Hierarchy Process Method*. Rezultāti parādīja, ka *R. pseudoacacia* invazitātes pakāpe bija vērtējama kā zemāka par vidējo (0,4); pašreizējā izplatības intensitāte salīdzinājumā ar potenciālo izplatības intensitāti vērtējama kā vidēja (0,57), savukārt sociālās, vides un ekonomiskās ietekmes novērtējums bija ļoti zems (0,17). Līdz ar to gala novērtējums *R. pseudoacacia* saskaņā ar *Final Pest Plant Score* bija tuvu vidējam (0,426). Iegūtais novērtējums norādīja, ka *R. pseudoacacia* ir vidējA invazitāte, bet piemērotos apstākļos, piemēram, gaismas palielināšanās gadījumā, tās izplatība pieaug.