United States Department of Agriculture

Weed Risk Assessment for *Impatiens parviflora* DC. (Balsaminaceae) – Smallflower touch-me-not, small balsam

United States Department of Agriculture

Animal and Plant Health Inspection Service

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Version 1

Top left: *Impatiens parviflora* plants on railroad track; bottom left: plant with flower (source: Barbara Tokarska-Guzik, University of Silesia, Bugwood.org); right: stand in understory habitat in Hungary (source: Robert Vidéki, Doronicum Kft., Bugwood.org)

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Introduction Plant Protection and Quarantine (PPQ) regulates noxious weeds under the authority of the Plant Protection Act (7 U.S.C. § 7701-7786, 2000) and the Federal Seed Act (7 U.S.C. § 1581-1610, 1939). A noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment" (7 U.S.C. § 7701-7786, 2000). We use weed risk assessment (WRA)—specifically, the PPQ WRA model (Koop et al., 2012)—to evaluate the risk potential of plants, including those newly detected in the United States, those proposed for import, and those emerging as weeds elsewhere in the world.

Because the PPQ WRA model is geographically and climatically neutral, it can be used to evaluate the baseline invasive/weed potential of any plant species for the entire United States or for any area within it. As part of this analysis, we use a stochastic simulation to evaluate how much the uncertainty associated with the analysis affects the model outcomes. We also use GIS overlays to evaluate those areas of the United States that may be suitable for the establishment of the plant. For more information on the PPQ WRA process, please refer to the document, *Background information on the PPQ Weed Risk Assessment*, which is available upon request.

Impatiens parviflora DC. – Small balsam, Smallflower touch-me-not

Species Information

Family: Balsaminaceae

Synonyms: *Impatiens nevskii* Pobed. (NGRP, 2013).

Initiation: On March 29, 2012, Ingrid Berlanger (PPQ Plants for Planting Import and Policy) asked the PERAL Weed Team to evaluate *Impatiens parviflora* for potential listing as a Federal Noxious Weed (Berlanger, 2012). This species has been listed under APHIS' Not Authorized Pending Pest Risk Analysis (NAPPRA) regulations as a pest plant (APHIS, 2013b).

Foreign distribution: *Impatiens parviflora* is native to Asia in Afghanistan, China (Xinjiang), Kazakhstan, Kyrgyzstan, Mongolia, Russia, Tajikistan, and Uzbekistan (CABI, 2013; eFloras, 2013; GBIF, 2013; NGRP, 2013). It has been introduced into other parts of Asia (Turkmenistan, Khabarovsk in Russia), Europe (Austria, Belarus, Belgium, Bulgaria, Croatia, the Czech Republic, Czechoslovakia, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, the Netherlands, Norway, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, the United Kingdom), and Canada (British Columbia, New Brunswick, Nova Scotia, Prince Edward Island, Quebec) in North America (CABI, 2013; Dana, 2002; NGRP, 2013; GBIF, 2013).

U.S. distribution and status: In 2013, hundreds of plants of *Impatiens parviflora* were detected in a dense stand on a wooded slope in Portland, Oregon (Zika, 2013). Based on this find, Moore et al. (2013) list Oregon as part of its naturalized distribution. Prior to this find, European flora noted it as present in the United States (cited in CABI, 2013), but we were unable to verify these sources. A U.S. stakeholder commented on APHIS' proposed rule (APHIS, 2011) that *I. parviflora* is already growing in California. To verify this, we searched several online garden databases (e.g., Dave's Garden, 2013; GardenWeb, 2013), online plant finders (e.g., Backyard Gardener, 2013), and other works (e.g., Bailey and Bailey, 1976; Kartesz, 2011; NGRP, 2013; NRCS, 2013; UC, 2007, 2010), but we found no evidence it is growing in California or that it is in U.S. cultivation. If it *is* in U.S. cultivation, we

think that is true only at a very minor and local scale.

WRA area[1]: Entire United States, including territories.

1. *Impatiens parviflora* analysis

Establishment/Spread Potential

Impatiens parviflora is a widely distributed annual herb. Beyond its native range in temperate Asia, it has spread to and naturalized in much of Europe (Perglová et al., 2009), becoming one of the most common alien species in central European forests (Brundu et al., 2001). It spreads rapidly (Dunn, 1905; Porteres, 1950; Webster, no date), forms dense mats (Groom, 2012; Hejda, 2012), does well in shade (Tabak and Von Wettberg, 2008), produces hundreds of seeds (Coombe, 1956), and is self-compatible (Coombe, 1956; Salisbury, 1961). It is dispersed by birds, other animals, and water (CABI, 2013; Schmitz, 1998; Valkenburg and Duistermaat, 2012). Its seed also spread as a contaminant of soil, flower seeds, plants, and, in particular, transported timber (CABI, 2013; Coombe, 1956; Valkenburg and Duistermaat, 2012). We had low uncertainty with this element.

Risk score = 20 Uncertainty index = 0.08

Impact Potential

Impatiens parviflora can invade both disturbed and undisturbed vegetation (EPPO, 2013a; Schmitz, 1998). In forests, it is associated with structural changes in the herb layer (CABI, 2013; Hejda, 2012), it reduces native biodiversity (DAF, 2011; Eliáš, 1999; EPPO, 2013a), and, as a gap colonizer (Coombe, 1956; Schmidt, 2012) it may disrupt succession in the forest (CABI, 2013). However, its impact on biodiversity seems to be limited and is in need of further study (cited in CABI, 2013; Chmura and Sierka, 2006; Godefroid and Koedam, 2010; Hejda, 2012). We found only one source reporting control efforts in a natural system (Adamowski and Keczynski, 1999). Although it is reported as a weed of gardens, managed forests, timber plantations, and orchards (CABI, 2013; Coombe, 1956), we found no evidence of control in these systems. We had greater than average uncertainty for this element.

Risk score = 2.5 Uncertainty index = 0.23

Geographic Potential

Based on three climatic variables, we estimate that about 84 percent of the United States is suitable for the establishment of *Impatiens parviflora* (Fig. 1). This predicted distribution is based on the species' known distribution elsewhere in the world and includes point-referenced localities and areas of reported occurrence. The map for *I. parviflora* represents the joint distribution of Plant Hardiness Zones 3-10, areas with 10-100 inches of annual precipitation, and the following Köppen-Geiger climate classes: steppe, Mediterranean, humid subtropical, marine west coast, humid continental warm summers, humid continental cool summers, subarctic, and tundra. Note that in this weed risk assessment we had high uncertainty as to whether *I. parviflora* occurs in the steppe climate class and in areas with only 10-20 inches of annual precipitation. For this prediction, we assumed that these climate areas were suitable for it, because it occurs along riverbanks and in moist places along canals in its native range (eFloras, 2013) and could therefore occur in microhabitats within these climate areas (CABI, 2013). We also had high uncertainty for it occurring in the humid subtropical climate class because the evidence for this class was from only a very small

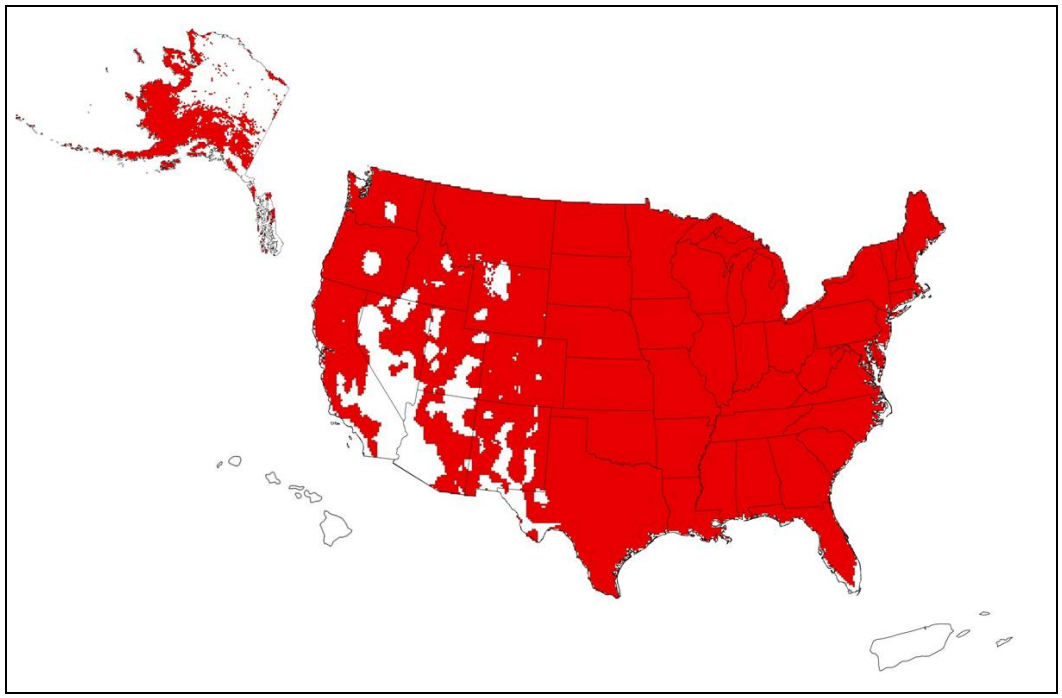
[1] "WRA area" is the area in relation to which the weed risk assessment is conducted [definition modified from that for "PRA area" (IPPC, 2012).

area in one country.

The area estimated likely represents a conservative estimate as it only uses three climatic variables. Other environmental variables, such as soil and habitat type, may further limit the areas in which this species is likely to establish. *Impatiens parviflora* is adapted to a wide range of mineral soils that are moist, but not waterlogged, and with a pH range from 4.5 to 7.6 (Coombe, 1956). Its habitats include disturbed and undisturbed areas, natural and semi-natural forests, moist to wet forests, forest edges, deciduous and mixed conifer forests, beech forests, riparian zones, wetlands, stony mountain slopes, moist shady places, managed forests, timber plantations, orchards, rail and roadsides, urban and peri-urban areas, gardens, and parks (CABI, 2013; Drake and International Council of Scientific Unions. Scientific Committee on Problems of the Environment., 1989; EPPO, 2013a; Perglová et al., 2009; Schmitz, 1998; Valkenburg and Duistermaat, 2012).

Entry Potential We did not assess the entry potential of *I. parviflora* because this species is already present in the United States (Moore et al., 2013; Zika, 2013).

Figure 1. Predicted distribution of *Impatiens parviflora* in the United States. Map insets for Alaska, Hawaii, and Puerto Rico are not to scale.



2. Results and Conclusion

Model Probabilities: P(Major Invader) = 88.9%
P(Minor Invader) = 10.7%
P(Non-Invader) = 0.4%

Risk Result = High Risk
Secondary Screening = Not Applicable

Figure 2. *Impatiens parviflora* risk score (black box) relative to the risk scores of species used to develop and validate the PPQ WRA model (other symbols). See Appendix A for the complete assessment.

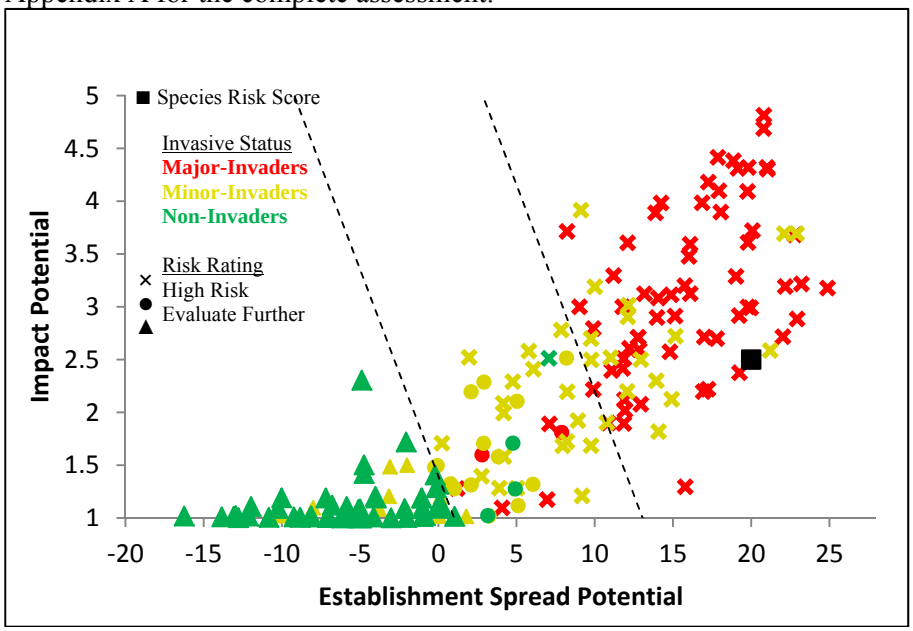
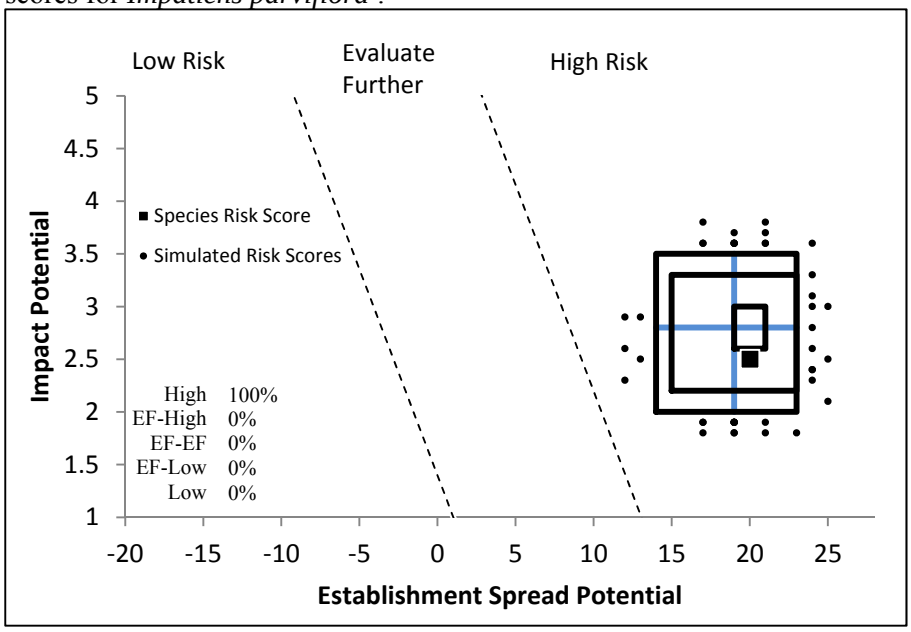


Figure 3. Monte Carlo simulation results (N=5,000) for uncertainty around the risk scores for *Impatiens parviflora*[a].



[a] The blue "+" symbol represents the medians of the simulated outcomes. The smallest box contains 50 percent of the outcomes, the second 95 percent, and the largest 99 percent.

3. Discussion

The result of the weed risk assessment for *Impatiens parviflora* is High Risk. This species is an annual herb that is a weed of natural and semi-natural forests, managed forests, timber plantations, orchards, and gardens. Comparison of *I. parviflora* to the 204 species used in the validation of the WRA model indicates that it shares many of the same traits and impacts as other major-invaders and high-scoring minor-invaders; however, for species with similar E/S risk scores, it had a relatively low impact score (Fig. 2). Our level of uncertainty was low for the establishment/spread risk element, but above average for the impact potential element. Despite that, all simulated risk scores resulted in a conclusion of High Risk (Fig. 3), so the overall model conclusion of High Risk seems very robust.

Although *I. parviflora* has been reported as being in the horticultural trade and was probably introduced into Europe as a "botanical curiosity" (CABI, 2013; Dunn, 1905), it is no longer used as a garden plant, except possibly in botanical gardens (CABI, 2013). Based on extensive review of the scientific literature, gardening retail sites, and community garden forums, we found no evidence that this species is in cultivation or in commercial trade (horticultural, ornamental, or other) in the United States. However, it is possible that it is cultivated in the United States by plant specialists, but at such a minor level that it does not show up in searches.

4. Literature Cited

7 U.S.C. § 1581-1610. 1939. The Federal Seed Act, Title 7 United States Code § 1581-1610.

7 U.S.C. § 7701-7786. 2000. Plant Protection Act, Title 7 United States Code § 7701-7786.

Adamowski, W., and A. Keczynski. 1999. Success of early eradication: the case of *Impatiens parviflora* in Bialowieza National Park (NE Poland). Proceedings 5th International Conference on the Ecology of Invasive Alien Plants, Sardinia, Italy, 13-16 October, 1999.

APHIS. 2011. Plants for planting whose importation is not authorized pending pest risk analysis: Notice of availability of data sheets for taxa of plants for planting that are quarantine pests or hosts of quarantine pests. Federal Register 76(143):44572-44573. Last accessed September 12, 2011, http://www.gpo.gov/fdsys/.

APHIS. 2013a. Phytosanitary Certificate Issuance and Tracking System (PCIT). United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS). https://pcit.aphis.usda.gov/pcit/faces/index.jsp. (Archived at PERAL).

APHIS. 2013b. Plants for planting whose importation is not authorized pending pest risk analysis; Notice of addition of taxa of plants for planting to list of taxa whose importation is not authorized pending pest risk analysis. Federal Register 78(75):23209-23219. Last accessed April 18, 2013, http://www.gpo.gov/fdsys/.

Backyard Gardener. 2013. Plant Finder [online database]. BackyardGardener.com. http://www.backyardgardener.com/plantbuddysearch.html. (Archived at PERAL).

Bailey, L. H., and E. Z. Bailey. 1976. Hortus Third: a concise dictionary of plants cultivated in the United States and Canada (revised and expanded by The Staff of the Liberty Hyde Bailey Hortorium). Cornell University. 1290 pp.

Berlanger, I. 2012. *Impatiens parviflora* - consideration for FNW? Personal communication to Anthony Koop on March 29, 2012, from I. Berlanger (USDA APHIS Plant Protection and Quarantine - Plant Health Programs - Regulations,

Permits and Manuals - Plants for Planting Import and Policy). Archived at the PERAL Library, Raleigh, NC.

Borsic, I., M. Milovic, I. Dujmovic, S. Bogdanovic, P. Cigic, I. Resetnik, T. Nikolic, and B. Mitic. 2008. Preliminary check-list of invasive alien plant species (IAS) in Croatia. Natura Croatica 17(2):55-71.

Brundu, G., J. Brock, I. Camarda, L. Child, and M. Wade (eds.). 2001. Plant Invasions: Species Ecology and Ecosystem Management. Backhuys Publishers, Leiden, The Netherlands. 338 pp.

Brunel, S. (ed.). 2005. Proceedings of the International Workshop on Invasive Plants in Mediterranean Type Regions of the World. Council of Europe Publishing, Mèze, France. 285 pp.

Brunel, S., A. Uludag, E. Fernandez-Galiano, and G. Brundu (eds.). 2010. Proceedings of the 2nd International Workshop on Invasive Plants in the Mediterranean Type Regions of the World. Steering Committee, Trabzon, Turkey. 445 pp.

Burrows, G. E., and Tyrl. 2001. Toxic Plants of North America. Iowa State University Press, Ames, IA, U.S.A. 1342 pp.

CABI. 2012. Crop Protection Compendium. Commonwealth Agricultural Bureau International (CABI). http://www.cabi.org/cpc/. (Archived at PERAL).

CABI. 2013. Crop Protection Compendium. Commonwealth Agricultural Bureau International (CABI). http://www.cabi.org/cpc/. (Archived at PERAL).

CALS. 2013. Animal Science - Plant Poisonous to Livestock. Cornell University, College of Agriculture and Life Sciences (CALS). http://www.ansci.cornell.edu/plants/index.html. (Archived at PERAL).

Chmura, D., and E. Sierka. 2006. Relation between invasive plant and species richness of forest floor vegetation: A study of *Impatiens parviflora* DC. Polish Journal of Ecology 54(3):417-428.

Chmura, D., and E. Sierka. 2007. The invasibility of deciduous forest communities after disturbance: A case study of *Carex brizoides* and *Impatiens parviflora* invasion. Forest Ecology and Management 242(2-3):487-495.

Coombe, D. E. 1956. Biological Flora of the British Isles: *Impatiens parviflora* DC. Journal of Ecology 44(2):701-713.

Cooper, M. R., and A. W. Johnson. 1984. Poisonous Plants in Britain and Their Effects on Animals and Man. Her Majesty's Stationery Office, London. 305 pp.

Csiszár, Á., M. Korda, D. Schmidt, D. Šporčić, P. Süle, B. Teleki, V. Tiborcz, G. Zagyvai, and D. Bartha. 2013. Allelopathic potential of some invasive plant species occurring in Hungary [Abstract]. Allelopathy Journal 31(2):309-318.

Csontos, P. 1984. Ecological and phytosociological studies in a stand of *Impatiens parviflora* DC. at the Vadallo Rocks, Pilis Mts., Hungary (Az *Impatiens parviflora* DC. Vadallokovi (Pilis) allomanyanak conologiai es okologiai vizsgalata) [Abstract]. Abstracta botanica 8:15-34.

Csontos, P. 1986. Dispersal and establishment of *Impatiens parviflora* an introduced plant, in a hardwood forest. Abstracta botanica 10(2):341-348.

DAF. 2011. Invasive and Harmful Plants: Wild Balsam. Prince Edward Island Canada, Department of Agriculture and Forestry (DAF). Last accessed August 15, 2013, http://www.gov.pe.ca/ffw/index.php3?number=1039004.

Dana, E. D., Sanz-Elorza, M. & Sobrino, E. 2002. Plant invaders in Spain (checklist): The unwanted citizens. University of Almeria, Department of Plant Biology and Ecology. Last accessed December 22, 2008, http://www.ual.es/personal/edana/alienplants/.

Dave's Garden. 2013. Dave's Garden. http://davesgarden.com/. (Archived at PERAL).

Drake, J. A., and International Council of Scientific Unions. Scientific Committee on

Problems of the Environment. 1989. Biological invasions : a global perspective. Published on behalf of the Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) by J. Wiley, Chichester ; New York. xxiv, 525 pp.

Dunn, S. T. 1905. Alien Flora of Britain. West, Newman, and Co., London, U.K. 208 pp.

eFloras. 2013. Flora of China. Missouri Botanical Garden, St. Louis, Missouri & Harvard University Herbaria, Cambridge, Massachusetts. http://www.efloras.org/flora_page.aspx?flora_id=2. (Archived at PERAL).

Elias, P. 1992. Vertical structure, biomass allocation and size inequality in an ecotonal community of an invasive annual (*Impatiens parviflora* D.C.) on a clearing in SW Slovakia [Abstract]. Ecology (CSFR) 11(3):299-313.

Eliáš, P. 1999. Biological and ecological causes of invasion of *Impatiens parviflora* DC. into forest communities in central Europe. Acta horticulturae et regiotecturae 2(1):1-3.

EPPO. 2013a. EPPO data sheet on Invasive Plants: *Impatiens parviflora* (05-11832, P IAS point 7.2) (Draft). European and Mediterranean Plant Protection Organization (EPPO). Last accessed August 7, 2013, http://www.eppo.int/QUARANTINE/Pest_Risk_Analysis/PRA_documents.htm.

EPPO. 2013b. PQR - EPPO's Plant Quarantine Data Retrieval System Version 5.0. European and Mediterranean Plant Protection Organization (EPPO), Paris, France.

Essl, F., and W. Rabitsch. 2004. Austrian action plan on invasive species. Federal Ministry of Agriculture, Forestry, Environment and Water, Vienna, Austria. 15 pp.

FAO (ed.). 2003. FAO Expert Consultation on Weed Risk Assessment. Food and Agriculture Organization (FAO) of the United Nations, Rome. 122 pp.

GardenWeb. 2013. GardenWeb: The Internet's Garden and Home Community. http://www.gardenweb.com/. (Archived at PERAL).

GBIF. 2013. GBIF, Online Database. Global Biodiversity Information Facility (GBIF). http://data.gbif.org/welcome.htm. (Archived at PERAL).

Godefroid, S., and N. Koedam. 2010. Comparative ecology and coexistence of introduced and native congeneric forest herbs: *Impatiens parviflora* and *I. noli-tangere*. Plant Ecology and Evolution 143(2):119-127.

Groom, Q. 2012. Manual of the Alien Plants of Belgium: *Impatiens parviflora*. National Botanic Garden of Belgium. Last accessed August 13, 2013, http://alienplantsbelgium.be/content/impatiens-parviflora-0.

Gudzinskas, Z. 2009. Invasive Plants: Lithuanian Invasive Species Database Ministry of Environment of Lithuania, National Advisory Council on Invasive Species. http://www.ku.lt/lisd/index.html. (Archived at PERAL).

Heap, I., H. Glick, L. Glasgow, and W. Vencill. 2012. International Survey of Herbicide Resistant Weeds. Herbicide Resistance Action Committee, the North American Herbicide Resistance Action Committee, and the Weed Science Society of America. http://www.weedscience.org/In.asp. (Archived at PERAL).

Heide-Jorgensen, H. S. 2008. Parasitic Flowering Plants. Brill, Leiden, The Netherlands. 438 pp.

Hejda, M. 2012. What is the impact of *Impatiens parviflora* on diversity and composition of herbal layer communities of temperate forests? Plos one 7(6).

IPPC. 2012. International Standards for Phytosanitary Measures No. 5: Glossary of Phytosanitary Terms. Food and Agriculture Organization of the United Nations, Secretariat of the International Plant Protection Convention (IPPC), Rome, Italy.

Kartesz, J. T. 2011. North American Plant Atlas [maps generated from Kartesz, J.T. 2010. Floristic Synthesis of North America, Version 1.0. Biota of North America Program (BONAP). (in press)]. The Biota of North America Program (BONAP),

Chapel Hill, N.C. http://www.bonap.org/. (Archived at PERAL).

Klinkenberg, B. 2013. E-Flora BC: Electronic Atlas of the Plants of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. http://www.geog.ubc.ca/biodiversity/eflora/. (Archived at PERAL).

Koop, A., L. Fowler, L. Newton, and B. Caton. 2012. Development and validation of a weed screening tool for the United States. Biological Invasions 14(2):273-294.

Lipinska, A. 2005. Invasiveness of small balsam (*Impatiens parviflora*) in Poland: causes and effects. Plant Protection and Plant Health in Europe: Introduction and spread of invasive species, held at Humboldt University, Berlin, Germany, 9-11 June 2005. . Last accessed August 16, 2013, http://p11631.typo3server.info/fileadmin/alte_Webseiten/Invasive_Symposium/articles/S6-19_Lipinska-093.pdf.

MAFF. 2012. Finland´s National Strategy on Invasive Alien Species. Ministry of Agriculture and Forestry in Finland (MAFF). 126 pp.

Moore, G., P. Zika, and C. Rushworth. 2013. Balsaminaceae (Draft document under review). Flora of North America.

NGRP. 2012. Germplasm Resources Information Network (GRIN). United States Department of Agriculture, Agricultural Research Service, National Genetic Resources Program (NGRP). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl?language=en. (Archived at PERAL).

NGRP. 2013. Germplasm Resources Information Network (GRIN). United States Department of Agriculture, Agricultural Research Service, National Genetic Resources Program (NGRP). http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl?language=en. (Archived at PERAL).

Nickrent, D. 2009. Parasitic plant classification. Southern Illinois University Carbondale, Carbondale, IL, U.S.A. Last accessed June 12, 2009, http://www.parasiticplants.siu.edu/ListParasites.html.

NRCS. 2013. The PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service (NRCS), The National Plant Data Center. http://plants.usda.gov. (Archived at PERAL).

Perglová, I., J. Pergl, H. Skálová, L. Moravcová, V. Jarošík, and P. Pyšek. 2009. Differences in germination and seedling establishment of alien and native *Impatiens* species. Preslia 81(4):357-375.

Porteres, R. 1950. Naturalisation du *Chrysopogon aciculatus* Trinius à la Côte d' Ivoire. Bull Soc Bot France 97:101-102.

Pysek, P., J. Sadlo, and B. Mandak. (Article). 2002. Catalogue of alien plants of the Czech Republic. Preslia (Prague) 74(2):97-186.

Randall, J. M. 2007. The introduced flora of Australia and its weed status. CRC for Australian Weed Management, Department of Agriculture and Food, Western Australia, Australia. 528 pp.

Randall, R. P. 2012. A Global Compendium of Weeds, 2nd Edition. Department of Agriculture and Food, Western Australia. 1115 pp.

Ricketts, T. H., E. Dinerstein, D. M. Olson, C. J. Loucks, W. Elchbaum, D. DellaSala, K. Kavanagh, P. Hedao, P. T. Hurley, K. M. Carney, R. Abell, and S. Walters. 1999. Terrestrial Ecoregions of North America: A Conservation Assessment. Island Press, Washington D.C. 485 pp.

Salisbury, E. 1961. Weeds and aliens. Collins, London. 384 pp.

Schmidt, W. 2012. How natural are strict forest reserves? Neophytes and therophytes as geobotanical indicators [Wie naturnah sind Naturwaldreservate? Neophyten und Therophyten als geobotanische Indikatoren] [Abstract]. Forstarchiv 83(2):93-108.

Schmitz, G. 1998. *Impatiens parviflora* D.C. (Balsaminaceae) as a neophyte in Central European forests and woodland-a biozonal analysis. Zeitschrift für ökologie und naturschutz 7(4):193-206.

Tabak, N. M., and E. Von Wettberg. 2008. Native and introduced jewelweeds of the Northeast. Northeastern naturalist 15(2):159-176.

Torok, K., Z. Botta-Dukat, I. Dancza, I. Nemeth, J. Kiss, B. Mihaly, and D. Magyar. 2003. Invasion gateways and corridors in the Carpathian Basin: Biological invasions in Hungary. Biological Invasions 5:349-356.

UC. 2007. The Jepson Herbarium. University of California (UC), Berkeley. http://ucjeps.berkeley.edu/jepson_flora_project.html. (Archived at PERAL).

UC. 2010. The Consortium of California Herbaria University of California (UC), Berkeley. http://ucjeps.berkeley.edu/consortium/. (Archived at PERAL).

Valkenburg, J. v., and L. Duistermaat. 2012. Q-bank Invasive Plants database. Wageningen, the Netherlands. http://www.q-bank.eu/. (Archived at PERAL).

Verloove, F. 2006. Catalogue of neophytes in Belgium (1800-2005). National Botanic Garden of Belgium, Meise, Belgium. 89 pp.

Vrchotová, N., B. Šerá, and J. Krejčová. 2011. Allelopathic activity of extracts from impatiens species. Plant, Soil and Environment 57(2):57-60.

Walker, R. 2010. Parasitic Plants Database http://www.omnisterra.com/bot/pp_home.cgi. (Archived at PERAL).

Wallentinus, I. 2002. Introduced marine algae and vascular plants in European aquatic environments. *in* E. Leppakoski, S. Gollasch, and S. Olenin, (eds.). Invasive Aquatic Species of Europe: Distribution, Impacts, and Management. Kluwer Acadmeic Publishers.

Weber, E. 2003. Invasive plant species of the world: A reference guide to environmental weeds. CABI Publishing, Wallingford, UK. 548 pp.

Webster, R. D. no date. Noxious Weeds of the Federal Noxious Weed Act, No. 20: *Chrysopogon* sp. United States Department of Agriculture, Plant Protection and Quarantine. 6 pp.

Williamson, M. 1996. Biological Invasions. Chapman & Hall, London. 244 pp.

Zika, P. 2013. *Impatiens parviflora*. Personal communication to Gerry Moore (National Plant Data Team - East National Technology Support Center - Natural Resources Conservation Service - United States Department of Agriculture) on August 22, 2013, from Peter Zika. Archived at the PERAL Library, Raleigh, NC.

Appendix A. Weed risk assessment for *Impatiens parviflora* DC. (Balsaminaceae). The following information came from the original risk assessment, which is available upon request (full responses and all guidance). We modified the information to fit on the page.

Question ID	Answer - Uncertainty	Score	Notes (and references)
ESTABLISHMENT/SPREAD POTENTIAL			
ES-1 (Status/invasiveness outside its native range)	f - negl	5	*Impatiens parviflora* is native to temperate Asia (NGRP, 2013; Verloove, 2006). It was first recorded in Europe in 1831 from a botanical garden in Geneva, and it is currently reported from 34 European countries (Perglová et al., 2009). It has "spread all over Europe, initially as a typical ruderal species, becoming after the late 1800s one of the most common alien species in central European forest" (Brundu et al., 2001). It "has become plentifully naturalised in various parts of Europe. It was not known in England before the year 1851…When once introduced its spread has been remarkably rapid in numerous English localities" (Dunn, 1905). "[I]ts spread has been rapid, it is abundant in many parts of its exotic range and is one of few plants to successfully invade undisturbed forest vegetation" (EPPO, 2013a). In Europe, it first invaded gardens and parks, then forests and their edges in the late 1800s to 1900s, and then in the 1900s "the invasive spread became much faster" (cited in CABI, 2013). The maximum rate of spread in Britain occurred in 1915 and was calculated to be 24 km per year (Williamson, 1996). Its exotic range has also spread to North America, where it was first recorded in British Columbia, in Canada in 1949 (Klinkenberg, 2013), and detected in Oregon in 2013 (Moore et al., 2013; Zika, 2013). Many other sources report it as an "invasive" species in Europe (e.g., Borsic et al., 2008; Brundu et al., 2001; Essl and Rabitsch, 2004; Gudzinskas, 2009; MAFF, 2012; Pysek et al., 2002; Torok et al., 2003; Verloove, 2006). The alternate answers for the Monte Carlo simulation are both "e."
ES-2 (Is the species highly domesticated)	n - low	0	We found limited evidence that this plant is cultivated and no evidence that it has been bred to reduce its likelihood of becoming a weed. The plant was introduced to central Europe because it was a "botanical curiosity" (CABI, 2013). Although some sources report it is "cultivated" (Randall, 2012) or in the ornamental trade (Wallentinus, 2002), CABI (2013) states that "apart from possibly botanical gardens, it is no longer used as a garden plant."
ES-3 (Weedy congeners)	y - negl	1	Randall (2007) lists other species in the genus as "invasive species" (Category #5) (e.g., *Impatiens glandulifera*, *I. capensis, I. balfourii*) and one species (*I. glandulifera*) as a "noxious (declared) weed under some form of legislation" (Category #4). *Impatiens glandulifera* is included in Weber (2003), which lists environmental weeds "that have significant negative effects on the native fauna and flora where they are introduced and invasive."
ES-4 (Shade tolerant at some stage of its life cycle)	y - negl	1	It prefers shade and half-shade (Valkenburg and Duistermaat, 2012). It occurs in shady places (Groom, 2012; Perglová et al., 2009; Salisbury, 1961; Valkenburg and Duistermaat, 2012). In its introduced range, "[m]ostly it is found in damp shady places" (Williamson, 1996). "Its ability to grow and reproduce in low light levels is considered the main factor enabling its spread into

Question ID	Answer - Uncertainty	Score	Notes (and references)
			forests" (Tabak and Von Wettberg, 2008). In Canada, it grows "in even the deepest forest shade" (DAF, 2011).
ES-5 (Climbing or smothering growth form)	n - negl	0	It is neither a vine nor an herb with a basal rosette. It is an erect annual herb, 20-150 cm (Coombe, 1956). It is a tall herb (Wallentinus, 2002), the stem being erect, simple or branched, and the height of the plant being 0.3 to 1.5 meters (Valkenburg and Duistermaat, 2012).
ES-6 (Forms dense thickets)	y - negl	2	It "often occurs in massive stands" (Groom, 2012). It can have "dense populations" and "dense stands" (Hejda, 2012). It "forms dense and constant layers in forest floor gaps after disturbance in unmanaged or managed forests alike" (Schmidt, 2012). It is "highly gregarious" (Coombe, 1956). In Canada, it forms "dense patches" (DAF, 2011). We found photographs showing it forming dense stands in natural settings (e.g., Groom, 2012; Schmitz, 1998).
ES-7 (Aquatic)	n - negl	0	*Impatiens parviflora* is not an aquatic species. Although its habitats include moist to wet forests (Brunel et al., 2010) and riparian areas (Perglová et al., 2009; Valkenburg and Duistermaat, 2012), seedlings cannot survive in waterlogged conditions (Valkenburg and Duistermaat, 2012). It is "relatively intolerant of waterlogging" (Coombe, 1956).
ES-8 (Grass)	n - negl	0	The plant is in the Balsaminaceae family (NGRP, 2012), not in the Poaceae family.
ES-9 (Nitrogen-fixing woody plant)	n - negl	0	This plant is not woody, and the Balsaminaceae family (NGRP, 2013) is not known to contain nitrogen-fixing species.
ES-10 (Does it produce viable seeds or spores)	y - negl	1	Reproduction is only by seed (CABI, 2013; Coombe, 1956; Godefroid and Koedam, 2010).
ES-11 (Self-compatible or apomictic)	y - negl	1	It is self-fertile (Coombe, 1956; Salisbury, 1961). The earliest of its flowers are often cleistogamous [=do not open and are self-pollinated in the bud] (Tabak and Von Wettberg, 2008). The plant is self-compatible; geitonogamous [=the transfer of pollen to a stigma of a different flower on the same plant] and allogamous [= characterized by cross-fertilization] pollination results in the same amount of seed-set (cited in CABI, 2013).
ES-12 (Requires special pollinators)	n - negl	0	"Visited mainly by hover-flies but probably also selfed" (Valkenburg and Duistermaat, 2012). "Flowers are visited mainly by Syrphidae, of which 19 species were found on *I. parviflora*" (cited in CABI, 2013). Even when there is low insect visitation, all flowers usually set seed (Coombe, 1956). Because cleistogamous flowers self-pollinate (CABI, 2013; Tabak and Von Wettberg, 2008), *I. parviflora* is not obligately dependent on a pollinator for sexual reproduction.
ES-13 (Minimum generation time)	b - negl	1	Is an annual (Borsic et al., 2008; Coombe, 1956; Torok et al., 2003; Valkenburg and Duistermaat, 2012; Wallentinus, 2002). “There is, normally at least, only one generation of this ‘summer annual’ in a year” (Salisbury, 1961). In Europe it normally germinates in March or April; the time from germination to flowering is 8-9 weeks, and seeds ripen 3-4 weeks later (CABI, 2013). "Most seeds of *Impatiens* species germinate simultaneously in the first spring following cold winter stratification" (Perglová et al., 2009). The alternate answers for the Monte Carlo simulation were both "a."
ES-14 (Prolific	y - negl	1	It has "prolific seed production" (EPPO, 2013a). "Sets seed

Question ID	Answer - Uncertainty	Score	Notes (and references)
reproduction)			copiously every year" (Coombe, 1956). The number of seeds produced per plant is very variable depending on habitat and crowding (Coombe, 1956). The smallest number is 1-5 seeds per plant in certain over-crowded habitats, and the greatest amount is 10,000 seeds per plant (Coombe, 1956), but 1,000-2,000 is more common (cited in CABI, 2013). The average number of seeds per plant per year is about 220, but large plants in gardens may produce about 1,800 seeds per year (Salisbury, 1961). The number of plants per meter square reported also varies: e.g., 23 (Elias, 1992), 160 (Coombe, 1956), 190 (Csontos, 1984), 1,500 (Csontos, 1986), and 7,200 (Coombe, 1956). In one study with field collected *I. parviflora* seeds, the seeds had an average percentage germination of 95 percent (Perglová et al., 2009). Using this data, we estimate that *I. parviflora* can produce over 5,000 seeds per meter square per year.
ES-15 (Propagules likely to be dispersed unintentionally by people)	y - negl	1	"Unintentional seed transport due to human activity played an important role" in the spread of this plant in Central Europe (Schmitz, 1998). Long-distance dispersal of seed is thought to occur by people moving flower seeds and soil, and soil attached to the roots of plants and implements (cited in CABI, 2013; Coombe, 1956; Salisbury, 1961); "this would account for its frequent appearance in gardens of an area prior to its occurrence in less sophisticated stations" (Salisbury, 1961). "The dirt on vehicles used in forests may contain seeds, with 22 seeds per litre of soil trapped in the tyres and other parts of a vehicle found in one study" (thesis cited in CABI, 2013).
ES-16 (Propagules likely to disperse in trade as contaminants or hitchhikers)	y - low	2	Seeds can be transported with different parts of plants and are "easily transported with the bark of timber" (CABI, 2013). "Transport with timber is a likely cause for rapid spread in some areas. The frequent occurrence beside railway tracks is attributed to seed transport with timber on trains" (Valkenburg and Duistermaat, 2012). It was probably introduced unintentionally into Belgium on imported timber (Groom, 2012; Verloove, 2006). It is likely to be transported internationally as a contaminant (EPPO, 2013a).
ES-17 (Number of natural dispersal vectors)	3	2	The capsule is narrowly club-shaped, 15-20 mm long; 1-5 seeds per capsule; seeds are oblong, 4-5 mm long (Coombe, 1956).
ES-17a (Wind dispersal)	n - low		We found no evidence that wind contributes significantly to the dispersal of propagules. The seed possesses no obvious adaptations for wind dispersal. Seeds disperse short distances (up to 3.4 meters) via an explosive mechanism (CABI, 2012).
ES-17b (Water dispersal)	y - mod		It is dispersed by water (Valkenburg and Duistermaat, 2012). "A proportion of the seeds falling on water float," and "dispersal down rivers is common" (Coombe, 1956). Its habitats include river/stream banks (Perglová et al., 2009; Wallentinus, 2002) and lake shores (Coombe, 1956); it "occurs along considerable stretches of river banks" (Coombe, 1956). "Transport of floating seeds with water is possible but probably of limited importance, although the transport in river sediments with fast-moving water in winter floods may contribute to long-distance dispersal" (CABI, 2013). We used moderate uncertainty because it is unclear that this type of dispersal is important to the species and situation; that is, does it regularly occur or only during flooding?

Question ID	Answer - Uncertainty	Score	Notes (and references)
ES-17c (Bird dispersal)	y - high		"Singular observations of *I. parviflora* growing on trees show that birds transport seeds" (CABI, 2013). We found no other evidence for bird dispersal, therefore we used high uncertainty.
ES-17d (Animal external dispersal)	y - low		Dispersal mechanisms include being ectozoochorous (Valkenburg and Duistermaat, 2012). "[E]pizoochorous dispersal in the fur of mammals and in dirt on their feet is an important mode of long-distance dispersal (Trepl, 1984)" (CABI, 2013).
ES-17e (Animal internal dispersal)	n - low		"Deer species do not consume *I. parviflora* at all, or only minimally" (Schmitz, 1998). Rabbits do not attack it; "remarkably free in Europe from animal attack in the field" (Coombe, 1956).
ES-18 (Evidence that a persistent (>1yr) propagule bank (seed bank) is formed)	? - max	0	It has a "transient" seed bank (Godefroid and Koedam, 2010). Perglova et al. (2009) state that *I. parviflora* does not have a "persistent seed bank." In a field study where 3,120 seeds were buried in November 2005, "only one dormant seed of *I. parviflora* was found in March 2007 and one germinated seed in March 2008 [i.e., 0.06% of the original seed], suggesting that this species has little or no potential for developing a seed bank and that the presence of dormant seeds may be incidental" (Perglová et al., 2009). However, in another study, 5114 *I. parviflora* individuals were removed from a dense patch of it in an area of 100 meters square, as well as from scattered individuals in the surroundings, in June 1985, and then the following spring 720 individuals were counted in the same area (Csontos, 1986). Therefore, the seed-bank of *I. parviflora* "seems strong enough to ensure survival in an area, when seed production is hindered in a year" (Csontos, 1986). Also, CABI (2013) states that *I. parviflora* "[h]as propagules that can remain viable for more than one year." Based on conflicting evidence, we answered unknown.
ES-19 (Tolerates/benefits from mutilation, cultivation or fire)	n - mod	-1	We found no evidence that *I. parviflora* benefits from any physical biomass removal. "There is no indication that this annual would withstand cutting or mowing" (CABI, 2013). "Trampling and cutting only affect its abundance when carried out before the first seed is ripe"; because leafy shoots are never produced from the hypocotyl or roots, and the great majority of a year's seed germinates the following spring, cutting or pulling at the flowering phase before seed-set will give effective control of this plant (Coombe, 1956). "Vegetative reproduction normally none, but plants blown over occasionally produce adventitious roots from the stems" (Coombe, 1956). EPPO (2013a) answered "yes" to the question "Does it tolerate, or benefit from, cultivation, browsing pressure, mutilation, fire etc.?"; however, this source did not provide details to support this answer. We used moderate instead of low uncertainty because of the EPPO report (2013a).
ES-20 (Is resistant to some herbicides or has the potential to become resistant)	n - low	0	We found no evidence of *I. parviflora* being controlled with herbicides or of species in the genus *Impatiens* having herbicide resistance. Heap et al. (2012) do not list any species in the genus *Impatiens* as having herbicide resistance.
ES-21 (Number of cold hardiness zones suitable	8	0	

Question ID	Answer - Uncertainty	Score	Notes (and references)
for its survival)			
ES-22 (Number of climate types suitable for its survival)	8	2	
ES-23 (Number of precipitation bands suitable for its survival)	9	1	
IMPACT POTENTIAL			
General Impacts			
Imp-G1 (Allelopathic)	y - low	0.1	"Allelopathy may be a mechanism by which small balsam may interfere with its neighbours" (Lipinska, 2005). In a study to determine the allelopathic potential of some invasive plant species, non-concentrated leachates of *I. parviflora* "significantly reduced the germination (%), shoot and root length of test plant [white mustard (*Sinapis alba* L.)], compared to the control" (Csiszár et al., 2013). In another study, extracts of *I. parviflora* had inhibitory effects on germination of seeds *Leucosinapis alba* and *Brassica napus* (Vrchotová et al., 2011). We used low instead of negligible uncertainty because we based our answer mainly on only the one study with non-concentrated leachates.
Imp-G2 (Parasitic)	n - negl	0	*Impatiens parviflora* does not belong to a family known to contain parasitic plants (Heide-Jorgensen, 2008; Nickrent, 2009; Walker, 2010).
Impacts to Natural Systems			
Imp-N1 (Change ecosystem processes and parameters that affect other species)	n - low	0	We found no evidence for this type of impact. In Hungary, it is invasive in semi-natural forests, but not a "transformer" (Csiszár et al., 2013; Torok et al., 2003). It is reported to not cause impacts on ecosystem processes (e.g., hydrology, sedimentation, fire risk, nutrient cycling etc.) (EPPO, 2013a).
Imp-N2 (Change community structure)	y - low	0.2	It does "adversely affect community structure" (EPPO, 2013a). "The invasion of *I. parviflora* into forests can result in the addition of a herbaceous layer in the vegetation where this layer was formerly absent" (CABI, 2013). Based on a review of work by other researchers, "[i]t is clear that the invasion of *I. parviflora* is associated with structural changes in herbal layers of invaded forests" (Hejda, 2012). Also, it forms dense monotypic stands (see evidence in ES-6), which can affect structural diversity of a community.
Imp-N3 (Change community composition)	y - mod	0.2	Impacts from *I. parviflora* include "reduced native biodiversity" and "threat to/loss of native species" (CABI, 2013). EPPO (2013a) states it adversely affects natural communities (biodiversity, native populations, endangered or threatened species) by competition. "It can successfully compete with forest perennials" (Eliáš, 1999), and in Canada, its dense patches are described as "chocking out most herbaceous Acadian Forest species" (DAF, 2011). "Species richness in the herb layer significantly decreased with increasing abundance of *I. parviflora*" (Godefroid and Koedam, 2010). And, as a gap colonizer (Coombe, 1956; Schmidt, 2012), it may disrupt succession in the forest (CABI, 2013). However, "the overall biodiversity impact of *I. parviflora* seems to be limited," as it seems to compete with other plants only under certain conditions

Question ID	Answer - Uncertainty	Score	Notes (and references)
			and does not cause competitive exclusion (cited in CABI, 2013). Also, results from a field study suggest it is "more likely a passenger of ongoing changes rather than a driver of the degradation of invaded vegetation" (Hejda, 2012). Its role in affecting native species is not fully known and further studies are needed (Chmura and Sierka, 2006; Godefroid and Koedam, 2010).
Imp-N4 (Is it likely to affect federal Threatened and Endangered species)	y - high	0.1	While it usually does not invade unmanaged old-growth forests (Chmura and Sierka, 2007), *I. parviflora* can occur in undisturbed habitats (CABI, 2013; Schmitz, 1998). It is "one of the rare aliens to have penetrated stable vegetation" (Godefroid and Koedam, 2010). The literature indicates that it can be a threat to native biodiversity (e.g., DAF, 2011; Eliáš, 1999; EPPO, 2013a), but because of the conflicting evidence on this issue (see Imp-N3), we used high uncertainty.
Imp-N5 (Is it likely to affect any globally outstanding ecoregions)	n - high	0	Its predicted distribution in the United States includes globally outstanding ecoregions as defined by Ricketts et al. (1999, p. 34, Fig. 3.1), and there is evidence it can affect biodiversity (see Imp-N3). However, because of our uncertainty about how much impact, if any, it has on biodiversity (see Imp-N3), and because we found no evidence it can change ecosystem processes and parameters, we answered 'no' with high uncertainty.
Imp-N6 (Weed status in natural systems)	c - mod	0.6	It is listed as an "environmental weed" (Randall, 2012; Randall, 2007). In Europe, it has "had a large impact on the environment" (Lipinska, 2005). On the other hand, in Belgium, even in situations where it forms massive stands in natural settings, "it is rarely considered as a noxious environmental weed" (Groom, 2012). Although it is a very successful invader in its exotic range, "there is little evidence of negative…environmental impacts" (CABI, 2013). In a national park in Poland, attempts over multiple years were made to stop its expansion into forest communities of the Bialowieza National Park, by removing plants and drying the plant material in 105°C to prevent dissemination of seeds (Adamowski and Keczynski, 1999). We found no other evidence for its control in natural settings. The alternate answers for the Monte Carlo simulation were both "b."
Impact to Anthropogenic Systems (cities, suburbs, roadways)			
Imp-A1 (Impacts human property, processes, civilization, or safety)	n - low	0	We found no evidence of this type of impact. EPPO (2013a) states that it does not adversely affect property values.
Imp-A2 (Changes or limits recreational use of an area)	n - low	0	We found no evidence that it changes or limits recreational use of an area. It does not "have sociological impacts on recreational patterns" (EPPO, 2013a).
Imp-A3 (Outcompetes, replaces, or otherwise affects desirable plants and vegetation)	n - mod	0	In Central Europe, its habitats include botanical gardens, gardens, parks, and cemeteries (Drake and International Council of Scientific Unions. Scientific Committee on Problems of the Environment., 1989). "Frequently persistent in gardens"; can become "a serious weed of gardens in partially shaded sites" (Coombe, 1956). But we found no evidence that it displaces, outcompetes, or affects desirable plants.
Imp-A4 (Weed status in anthropogenic systems)	b - low	0.1	In the Czech Republic, it is an "invasive" plant found in the "modern urban and industrial landscape" (Pysek et al., 2002). It can become "a serious weed of gardens in partially shaded sites"

Question ID	Answer - Uncertainty	Score	Notes (and references)
			(Coombe, 1956). "This species occurs in ruderal vegetation in settlements," rail and roadsides, urban peri-urban areas (CABI, 2013), but that did not state it is a pest or invasive in those areas, like it did for managed and natural forests. We found no evidence of control in anthropogenic areas. The alternate answers for the Monte Carlo simulation were "c" and "a."
Impact to Production Systems (agriculture, nurseries, forest plantations, orchards, etc.)			
Imp-P1 (Reduces crop/product yield)	? - max		It is reported as not "competitive to agricultural and plantation crops or pasture plants" (EPPO, 2013a). However, its invasion "into forests can result in the addition of a herbaceous layer in the vegetation where this layer was formerly absent, thus affecting tree regeneration in silvicultural systems where this is important." (EPPO, 2013a). We found no other direct evidence of its effect on yields in silviculture, or for impacts in other production systems, therefore we answered unknown.
Imp-P2 (Lowers commodity value)	n - mod	0	We found no evidence. *Impatiens parviflora* is an alternative host for crop pests such as the aphid *Aphis fabae* and Cucumber mosaic virus, but "no estimates are available regarding the economic consequences." (CABI, 2013).
Imp-P3 (Is it likely to impact trade)	? - max		It is likely to be transported internationally as a contaminant (EPPO, 2013a). It can be a contaminant of plants, soil, and in particular timber (see evidence in ES-15 and ES-16). Randall (2012) cites one reference listing this species as a "quarantine weed." On the other hand, it is not listed as a regulated pest by any country according to APHIS (2013a) and EPPO (2013b).
Imp-P4 (Reduces the quality or availability of irrigation, or strongly competes with plants for water)	n - low	0	We found no evidence.
Imp-P5 (Toxic to animals, including livestock/range animals and poultry)	n - low	0	It is not harmful to animals as a poisonous plant (EPPO, 2013a). Neither the species nor the genus is listed in Cooper (Cooper and Johnson, 1984) and CALS (CALS, 2013). The leaves, stems, and flowers of plants in the genus *Impatiens* contain naphthoquinone lawsone (naphthalenic acid), which may cause mild to moderate irritation of the digestive tract (Burrows and Tyrl, 2001); but this reference did not say if this applies to just humans or animals as well.
Imp-P6 (Weed status in production systems)	b - low	0.2	*Impatiens parviflora* occurs in and invades production systems. In central Europe, it "occurs in coniferous plantations under *Pinus sylvestris*, *Picea abies*, etc." (CABI, 2013). In the Czech Republic, it is an "invasive" plant found in "traditional agricultural landscape" (Pysek et al., 2002). "It mainly invades forests that are under strong human influence, such as managed forests and timber plantations"; listed as "harmful (pest or invasive)" in managed forests, plantations, and orchards (CABI, 2013). A few sources consider it a weed of production systems (Salisbury, 1961; FAO, 2003), although not necessarily a weed of traditional row crops, as this species invades mostly natural and managed forests (CABI, 2013). We found no evidence of control in production systems. The alternate answers for the Monte Carlo simulation were both "c".

Question ID	Answer - Uncertainty	Score	Notes (and references)
GEOGRAPHIC POTENTIAL			
Plant cold hardiness zones			
Geo-Z1 (Zone 1)	n - negl	N/A	We found no evidence.
Geo-Z2 (Zone 2)	n - high	N/A	It occurs in Xinjiang, China (occ.) (eFloras, 2013; NGRP, 2013), and this region includes Zone 2; however, because this region is very large with multiple plant cold hardiness zones, and we do not have information on where exactly in this region it could be occurring, we answered no but with high uncertainty.
Geo-Z3 (Zone 3)	y - mod	N/A	China (Xinjiang) (occ.) (eFloras, 2013; NGRP, 2013), Russia (Gorno-Altay, Altay; Khabarovsk) (occ.) (NGRP, 2013).
Geo-Z4 (Zone 4)	y - negl	N/A	PS: Canada, Tajikistan, Switzerland, Austria, Sweden
Geo-Z5 (Zone 5)	y - negl	N/A	PS: Canada, Germany, Austria, Sweden.
Geo-Z6 (Zone 6)	y - negl	N/A	PS: Canada, Spain, Slovakia, Germany, Switzerland.
Geo-Z7 (Zone 7)	y - negl	N/A	PS: Canada, Spain, Hungary, France, Germany, Switzerland.
Geo-Z8 (Zone 8)	y - negl	N/A	PS: Canada, the United Kingdom, France, Germany, Belgium, Netherlands, Sweden.
Geo-Z9 (Zone 9)	y - negl	N/A	PS: Spain, Ireland, the United Kingdom, France, Netherlands.
Geo-Z10 (Zone 10)	y - low	N/A	PS: the United Kingdom (multiple points).
Geo-Z11 (Zone 11)	n - low	N/A	We found no evidence.
Geo-Z12 (Zone 12)	n - negl	N/A	We found no evidence.
Geo-Z13 (Zone 13)	n - negl	N/A	We found no evidence.
Köppen-Geiger climate classes			
Geo-C1 (Tropical rainforest)	n - negl	N/A	We found no evidence.
Geo-C2 (Tropical savanna)	n - low	N/A	We found no evidence.
Geo-C3 (Steppe)	y - high	N/A	PS: Spain (1 point); even though there is only one point for this climate class, answering yes because, based on it occurring in riverbanks and moist places along canals in its native range (eFloras, 2013), it could occur in microhabitats within this climate class. "In areas with steppe or semi-desert vegetation, the species can only occur in more humid forest patches, e.g. in floodplains or on northern slopes." (CABI, 2013)
Geo-C4 (Desert)	n - mod	N/A	We found no evidence.
Geo-C5 (Mediterranean)	y - low	N/A	PS: Canada, Spain. It has been declared as an “emerging invader” for Mediterranean type regions in the world (Brunel, 2005).
Geo-C6 (Humid subtropical)	y - high	N/A	PS: Germany; using high uncertainty because the points for this climate class are only in a small area in one country (Germany).
Geo-C7 (Marine west coast)	y - negl	N/A	PS: Canada, the United Kingdom, Ireland, France, Netherlands, Germany.
Geo-C8 (Humid cont. warm sum.)	y - high	N/A	PS: Tajikistan (1 point). It occurs in Xinjiang, China (occ.) (eFloras, 2013; NGRP, 2013), and this region includes this climate class.
Geo-C9 (Humid cont. cool sum.)	y - negl	N/A	PS: Canada, Germany, Austria, Hungary, Sweden, Poland, Estonia.
Geo-C10 (Subarctic)	y - negl	N/A	PS: France, Germany, Sweden, Finland.
Geo-C11 (Tundra)	y - negl	N/A	PS: Bulgaria, Norway, Switzerland, Austria.
Geo-C12 (Icecap)	n - low	N/A	We found no evidence.

Question ID	Answer - Uncertainty	Score	Notes (and references)
10-inch precipitation bands			
Geo-R1 (0-10 inches; 0-25 cm)	n - mod	N/A	We found no evidence.
Geo-R2 (10-20 inches; 25-51 cm)	y - high	N/A	PS: Spain (2 points); It occurs in Xinjiang, China (occ.) (eFloras, 2013; NGRP, 2013), and this region includes this precipitation band. Even though *I. parviflora* prefers moist conditions (Coombe, 1956; eFloras, 2013), we answered yes (but with high uncertainty) because it may occur in this zone in wetter microhabitats.
Geo-R3 (20-30 inches; 51-76 cm)	y - negl	N/A	PS: the United Kingdom, France, Sweden, Germany.
Geo-R4 (30-40 inches; 76-102 cm)	y - negl	N/A	PS: the United Kingdom, France, Norway, Sweden, Germany; Russia (Gorno-Altay, Altay; Khabarovsk) (occ.) (NGRP, 2013).
Geo-R5 (40-50 inches; 102-127 cm)	y - negl	N/A	PS: Canada, the United Kingdom, France, Norway, Sweden, Germany.
Geo-R6 (50-60 inches; 127-152 cm)	y - negl	N/A	PS: Canada, the United Kingdom, France, Germany.
Geo-R7 (60-70 inches; 152-178 cm)	y - negl	N/A	PS: the United Kingdom, Germany, Austria.
Geo-R8 (70-80 inches; 178-203 cm)	y - negl	N/A	PS: Tajikistan, Austria.
Geo-R9 (80-90 inches; 203-229 cm)	y - negl	N/A	PS: Canada, Norway.
Geo-R10 (90-100 inches; 229-254 cm)	y - low	N/A	PS: Canada, Norway.
Geo-R11 (100+ inches; 254+ cm))	n - low	N/A	We found no evidence.
ENTRY POTENTIAL			
Ent-1 (Plant already here)	y - negl	1	In 2013, hundreds of plants of *Impatiens parviflora* were detected in a dense stand on a wooded slope in Portland, Oregon (Zika, 2013). Based on this find, Moore et al. (2013) list Oregon as part of its naturalized distribution.
Ent-2 (Plant proposed for entry, or entry is imminent)	-	N/A	
Ent-3 (Human value & cultivation/trade status)	-	N/A	
Ent-4 (Entry as a contaminant)			
Ent-4a (Plant present in Canada, Mexico, Central America, the Caribbean or China)	-	N/A	
Ent-4b (Contaminant of plant propagative material (except seeds))	-	N/A	
Ent-4c (Contaminant of seeds for planting)	-	N/A	
Ent-4d (Contaminant of ballast water)	-	N/A	
Ent-4e (Contaminant of aquarium plants or other aquarium products)	-	N/A	

Question ID	Answer - Uncertainty	Score	Notes (and references)
Ent-4f (Contaminant of landscape products)	-	N/A	
Ent-4g (Contaminant of containers, packing materials, trade goods, equipment or conveyances)	-	N/A	
Ent-4h (Contaminants of fruit, vegetables, or other products for consumption or processing)	-	N/A	
Ent-4i (Contaminant of some other pathway)	-	N/A	
Ent-5 (Likely to enter through natural dispersal)	-	N/A	