The PlantRight PRE: a New Screening Process for Invasiveness©

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INTRODUCTION

Sustainable Conservation's initiative to stop the sale of invasive ornamental plants in California's horticultural industry, PlantRight, is introducing its Plant Risk Evaluation (PRE) tool to commercial leaders in the horticultural industry. We are working to promote adoption by the industry and have launched a pilot project with a handful of leading growers and propagators who introduce new horticultural plants to determine how our tool can fit into their new plant development process. We developed the PRE tool, which has a 98% accuracy rate in predicting invasive plant characteristics, in collaboration with University of California, Davis (U.C. Davis) and the University of Washington to screen plants with the long-term goal of industry wide adoption to prevent the introduction of new ornamental invasive plants in the nursery supply chain.

Screening new ornamental plants to determine the risk of invasiveness is the most cost-effective way to prevent the introduction of invasive plants (Leung et al., 2001; NISC, 2001). The PRE tool estimates the risk of an ornamental plant species becoming invasive in a defined geographic or climatic region, which can help a company determine not only where a given plant species (or subspecies) poses a potential invasive risk, but also where it does not represent an invasive risk and could potentially be grown and sold. Invasive ornamental plants represent both a risk and an opportunity for the nursery industry, particularly for plant propagators and companies that develop new plant material. Since companies make a significant financial investment in developing new plant material, predictive tools like the PRE are a cost-effective way to determine risk of invasiveness early in the research and development phase, avoiding USDA-APHIS quarantine restrictions (Q37) (Koop et al., 2010), and preventing the unintended negative economic and ecological consequences of new invasive plants. Despite the large number of new ornamental plants introduced by the industry, less than 1% have become invasive (Gordan and Gantz, 2008). We expect a low percentage of new ornamental plants would screen as invasive with the PRE tool.

The PRE provides other valuable information about plant species for propagators including detailed information on taxonomy, patent information, history (culinary and medicinal uses, toxicity, etc.), regional climatic suitability, plant demographics (growth, reproduction, and dispersal), and ecological characteristics that provide insight into a plant's suitability as an ornamental (pests and disease problems, aggressiveness, changes soil chemistry, fire hazard, etc.).

MATERIALS AND METHODS

Six industry leaders participated in our pilot project (Ball Horticultural, Blooms of Bressingham, EuroAmerican Propagators, Hines Horticulture, L.E. Cooke, and Quarryhill Botanical Garden) by supplying a list of plant names of their choice to screen with the PRE tool. They did not disclose why they chose those species or what they expected the results to be. All species were screened with the PRE tool between July and Sept. 2013. We will meet with each company individually to review their PRE results, gather their feedback on the findings, and discuss what value the PRE tool has for their company.

The PRE tool, developed by Dr. Lizbeth Seebacher (University of Washington),

calculates a score associated with the risk of a plant species becoming invasive in a defined region by answering 29 weighted Yes/No questions about life history, biogeography, biology, and ecology (Pheloung et al., 1999). To answer the questions, a complete literature review is conducted using peer-reviewed literature, online and plant taxonomic and invasive species databases, books, and government and Non-Governmental Organization (NGO) factsheets. Questions that cannot be answered due to lack of available information are answered "unknown". Plants with a score >18 are rejected (high risk of invasiveness), 15 to 18 require "further evaluation", and <15 are accepted (low risk of invasiveness). The "evaluate further" score requires additional assessment by an expert panel. The PRE is conducted by trained graduate students from U.C. Davis Department of Plant Sciences.

RESULTS/DISCUSSION

Of the 49 perennial plant species screened with the PRE (Table 1), the majority (80%) were accepted (low risk of invasiveness), while only 6% were rejected (high risk of invasiveness), and 14% were classified as "Evaluate Further" (Fig. 1).

We also evaluated which questions in the PRE tool were most predictive of invasiveness (Fig. 2). Ninety-eight percent of the plant species that scored as invasive were also found to be invasive in other parts of the world or were members of a genus with other invasive species, while less than half of the species that screened as non-invasive shared those characteristics. Similarly, a much higher percentage of species that scored as invasive had highly aggressive growth and reproductive characteristics.

Table 1. Plant species screened with PlantRight PRE for pilot project.

Scientific name	Common name
Herbaceaous forbs	
Anemone hupehensis 'Pretty Lady Diana'	windflower
Anemone hupehensis 'Pretty Lady Emily'	windflower
Anemone hupehensis 'Pretty Lady Julia'	windflower
Anemone hupehensis 'Pretty Lady Susan'	windflower
Argylia radiata	argylia
Aster ageratoides	chosen-nokongiku
Campanula poscharskyana 'Blue Rivulet'	bellflower
Campanula poscharskyana 'Blue Waterfall'	bellflower
Coreopsis rosea 'Sweet Dreams'	tickseed
Coreopsis verticillata 'Golden Dream'	tickseed
Coreopsis verticillata 'Sweet Marmalade'	tickseed
Cynoglossum amabile	Chinese forget-me-not
Echinacea purpurea 'Supreme Cantaloupe'	coneflower
Echinacea purpurea 'Supreme Elegance'	coneflower
Echinacea purpurea 'Supreme Flamingo'	coneflower
Euphorbia polychroma 'Bonfire'	spurge
Geranium 'Azure Rush'	cranesbill
Geranium 'Gerwat', Rozanne™ cranesbill	cranesbill
Gloxinia sylvatica	gloxinia
Helianthemum 'Hartswood Ruby'	sun rose
Helichrysum amorginum 'Blorub', Ruby Cluster™	strawflower
everlasting	

Table 1. Continued.

Scientific name	Common name
Heliopsis helianthoides var. *scabra* 'Bressingham Doubloon'	ox-eye sunflower
Heliopsis helianthoides 'Helhan', Loraine Sunshine™ ox-eye sunflower	ox-eye sunflower
Houttuynia cordata	chameleon plant
Hypericum olympicum	Mt. Olympus St. John's wort
Leucanthemum × *superbum* 'Engelina'	shasta daisy
Leucanthemum × *superbum* 'Freak!'	shasta daisy
Lithodora diffusa 'White Star'	lithodora
Nelumbo nucifera	East Indian lotus
Penstemon × *mexicanus* 'Sweet Joanne'	beard tongue
Perilla frutescens	mint perilla
Sedum kamtschaticum (syn. *Phedimus kamtschaticus*)	orange stone crop
Thalictrum delavayi	chinese meadow rue
Grasses	
Chondropetalum tectorum	cape rush
Cyperus luzulae	deeprooted sedge
Deschampsia cespitosa	tufted hair grass
Juncus thomsonii	zhan bao deng xin cao
Pennisetum purpureum 'Vertigo'	pearl millet
Shrubs	
Buddleja nivea	nivea butterfly bush
Calceolaria integrifolia	bush slipperwort
Cytisus × *spachianus*	sweet broom
Elaeagnus umbellata	autumn olive
Salvia canariensis	canary island sage
Senna didymobotrya	peanut butter cassia
Solanum pinnatum	no common name
Trees	
Acer davidii	David's maple
Cornus macrophylla	large-leaf dogwood
Elaeagnus angustifolia 'Cooke's'	velvet touch Russian olive

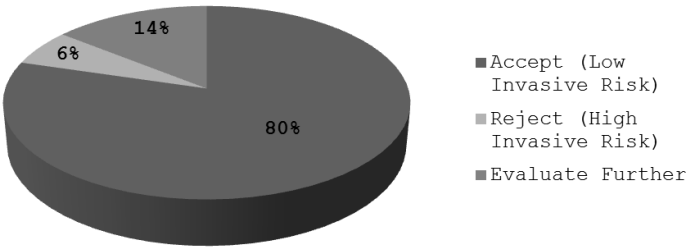

Fig. 1. Results of screenings for PlantRight PRE pilot project.

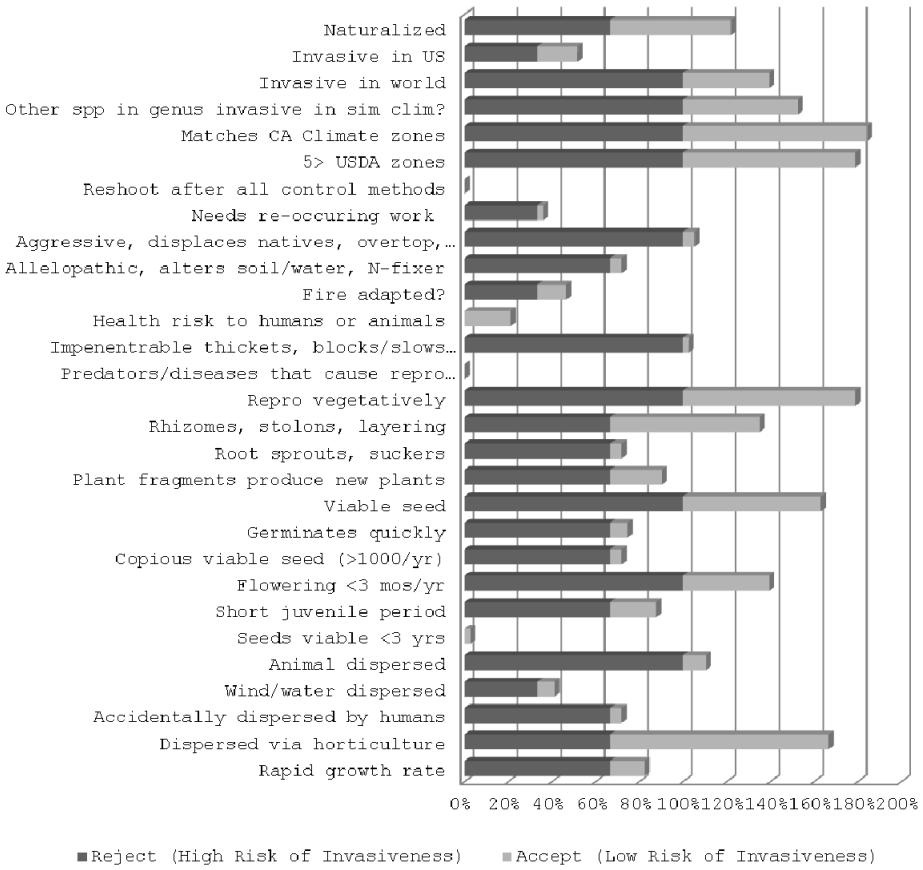

Fig. 2. Results for questions in the PlantRight PRE tool.

CONCLUSIONS

Our industry partners are excited with the project and information provided by the PRE tool. Corey Barnes, Nursery Manager for Quarryhill Botanical Garden "welcomes the opportunity to work with PlantRight to assist us in the endeavor to avoid cultivating and selling species that have the potential to escape their intended growing grounds. It seems nothing short of a win-win situation: added insurance for the status of both Quarryhill's plant material and Quarryhill's reputation and increased security for the native flora of

California." We are inviting propagators or growers to join us as co-designers and early adopters of the PRE tool.

QUESTIONS AND ANSWERS

Antonio Sanchez: Will this program only be for California?

Christiana Conser: The tool was originally designed for California and we're now broadening the scope of it to include species grown elsewhere in the USA. Basically, you can calibrate the tool for whatever scale you want (statewide, regional, or national).

Antonio Sanchez: The plants that came from Monrovia, were they only from California?

Christiana Conser: Yes.

Antonio Sanchez: Do you distinguish between southern and northern California when you screen?

Christiana Conser: Yes, plus we describe the climatic zones in which they're found.

Richard Criley: In Hawaii, our risk assessment process consists of 49 questions. Usually, their turn-around takes a couple days. How can you run your risk assessment in just a few hours?

Christiana Conser: Our tool has been simplified to 29 questions. I, along with another U.C. Davis research assistant, do all the screening and that's how long they take. Maybe we've gotten faster at it since we've done so many. We have access to really good resources like the U.C. Davis Arboretum and the Herbarium. As we conduct the screening we do a literature search and we document the source of each bit of information we use in the screening. That provides a way for anyone to check our findings. Other programs doing this kind of screening all have their own process and we've found ours to be quite effective.

Richard Criley: In the context of these screenings, how do you define "environment"? Are you referring to the natural environment or a created urban environment or some other?

Christiana Conser: We are only looking to see to what extent the plant in question will be invasive in a garden or landscape setting. We're primarily concerned with determining the likelihood of the plant escaping out of cultivation into the wild where it would have much less cultivation and irrigation.

Literature Cited

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